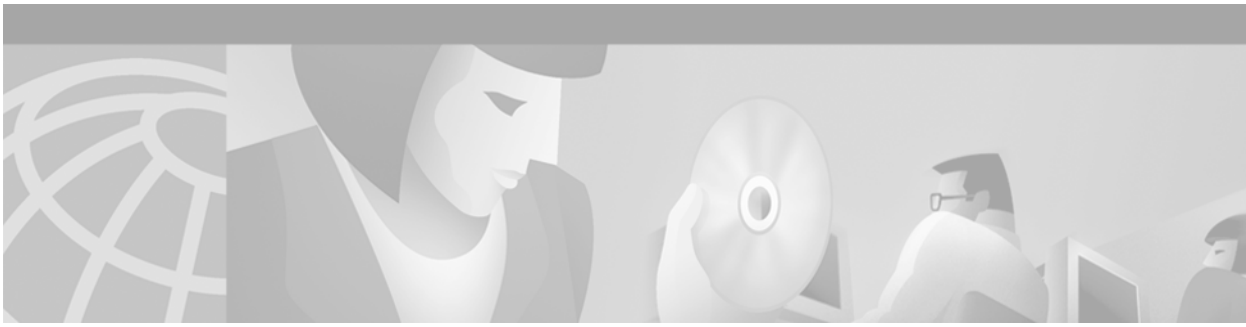


Preface

Objective

The Venezuela country feature package supports the R2 signaling tones, pulse code modulation (PCM) line signaling, and tone plan as stated in Chapter 2, “R2 Signaling Tones and Pulse Code Modulation Line Signaling” and Chapter 3, “Venezuela Tone Plan.”

Except where otherwise noted, this supplement describes the installation, configuration, operation and general functionality of the Venezuela country feature package as used with the following Virtual Central Office (VCO) and Specialty Digital Switch (SDS) platforms.

- VCO/4K running system software V5.x FSR00 PUN00 or higher
- VCO/20 running system software V4.0 FSR00 PUN00* or higher
- VCO/80 running system software V3.3 FSR00 PUN00** or higher
- SDS-1000 running system software V3.3 FSR00 PUN00** or higher
- SDS-500 running system software V3.3 FSR00 PUN00** or higher

* The PUN number was included as part of the V4.x system software numbering scheme at V4.0 FSR02 PUN00.

** The PUN number was included as part of the V3.x system software numbering scheme at V3.3 FSR05 PUN00.

Note Within any given country, there may be more than one tone plan in use by the various telecommunication service providers who operate privately and/or publicly within the country in question. Thoroughly review the tone plan listed in Chapter 3, “Venezuela Tone Plan,” to verify that this is the country feature package that you ordered.

Audience

This document is intended for all personnel using the Venezuela country feature package.

Document Organization

This document is organized as follows:

Chapter 1, “System Requirements,” lists the system requirements for running the Venezuela country feature package.

Chapter 2, “R2 Signaling Tones and Pulse Code Modulation Line Signaling,” describes the R2 signaling tones generated and detected by the MFCR2 transceiver cards, and the R2 pulse code modulation 2-bit signaling transmitted and received by E1 spans.

Chapter 3, “Venezuela Tone Plan,” details the modifications to the Digital Tone Generator (DTG or DTG-2) and the SPC-CPA service cards.

Chapter 4, “R2 Signaling Examples,” provides examples of R2 signaling.

Documentation Conventions

This document uses the following conventions:

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

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

Related Documentation

The *Cisco VCO/4K Venezuela Supplement* provides important information about running the Venezuela country feature package on the VCO and SDS platforms. If a topic is discussed in both the SDS/VCO documentation set and this supplement, refer to the information in this document.

You should have a working knowledge of R2 signaling.

Network signaling requirements appear in the following specifications:

- International Telecommunications Union (ITU, formerly Comité Consultatif Internacional Téléphonique et Télégraphique, CCITT) Q.421 Digital Line Signaling Code
- ITU Q.440 Interregister Signaling

Obtaining Documentation

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

World Wide Web

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

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

Documentation CD-ROM

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

Ordering Documentation

Cisco documentation is available in the following ways:

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

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

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

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

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

Documentation Feedback

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

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

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

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

We appreciate your comments.

Obtaining Technical Assistance

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

Cisco.com

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

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

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

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

http://www.cisco.com

Technical Assistance Center

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

Contacting TAC by Using the Cisco TAC Website

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

http://www.cisco.com/tac

P3 and P4 level problems are defined as follows:

- P3—Your network performance is degraded. Network functionality is noticeably impaired, but most business operations continue.
- P4—You need information or assistance on Cisco product capabilities, product installation, or basic product configuration.

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

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

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

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

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

Contacting TAC by Telephone

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

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

P1 and P2 level problems are defined as follows:

- P1—Your production network is down, causing a critical impact to business operations if service is
- P2—Your production network is severely degraded, affecting significant aspects of your business operations. No workaround is available.

CHAPTER 1

System Requirements

Installation and Configuration

This chapter lists system requirements for running the Venezuela country feature package on SDS and VCO platforms operating with system software V3.3 through V5.x. These requirements are categorized by hardware, firmware, and software. For any site-specific concerns, contact Cisco Systems as described in the preface.

The Venezuela country feature package consists of the following components:

- Digital Tone Generator (DTG) card or DTG-2 card
- Service Platform (SPC) cards, software-configured for CPA (displayed as SPC-CPA)
- SPC card software-configured for DTMF (displayed as SPC-DTMF)
- SPC software configured for MFCR2 (displayed as SPC-MFCR2)
- Diskette for the SPC card containing the download files

Note Service circuit cards must occupy only one resource group in the Resource Group Summary screen; further, different card types cannot share the same resource group.

Hardware Requirements

Refer to *Cisco VCO/4K Tone Plan Release Notes* for the A-law and Mu-law rules and timing rules governing the hardware configurations of cards with jumpers/DIPs, and the software configurations of cards without jumpers/DIPs.

Refer to the *Cisco VCO/4K Card Technical Descriptions* for each service circuit card and for each network card for jumper and DIP switch settings.

Firmware Requirements

Refer to the *Cisco VCO/4K Tone Plan Release Notes* for information regarding system firmware requirements particular to the Venezuela country feature package.

Refer to your system release notes for instructions to install firmware on either the DTG-2 mezzanine card or DTG card, and to install firmware on the MFCR2 card.

Software Requirements

Refer to the *Cisco VCO/4K Tone Plan Release Notes* for information regarding system software requirements particular to the Venezuela country feature package.

System software V5.1 FSR00 PUN24, or higher, is required to operate the Venezuela SPC software on the SPC.

Call Progress Analyzer and Service Platform Card Downloads

Your country feature package includes a 3.5-inch diskette containing the POST-P24 directory. This directory contains the following Service Platform Card (SPC) download files:

cpa.nor
cpa.spc
cpa.sit
cpa.ctg
mfcr2.sim
mfcr2.sma
mfcr2.utg
mfcr2.spc
mfcr2.smt
dtmf.spc

Copy the POST-P24 directory contents to your system's C:/BOOT directory. You must be using system software V5.1 FSR00 PUN24, or higher, in conjunction with this directory.

Refer to the *Cisco VCO/4K System Administrator's Guide* for step-by-step instructions in order to copy the above files to your system's C:/BOOT directory.

Note Always wear a wrist strap when installing software and handling system components.

The files are now loaded onto your hard disk. Complete the installation by loading the files from the hard disk to the cards. The method of loading depends on whether you are loading the files onto a new or existing installation. For new installations, refer to the "Loading the Software onto Cards—New Installations" section on page 1-2; for existing installations, refer to the "Loading the Software onto Cards—Existing Installations" section on page 1-3. Refer to the *Cisco VCO/4K System Administrator's Guide* for step-by-step instructions as you complete this installation procedure.

Loading the Software onto Cards—New Installations

To load files from the hard disk to cards on a new installation, follow these steps:

Step 1 If you have not already done so, access the Card Maintenance screen from the Maintenance Menu screen, and use the A command to add the SPC (the console displays this choice as either SPC-CPA or SPC-DTMF) to the database.

Step 2 Insert the SPC into the appropriate slot. The card automatically runs internal diagnostics. View the SPC LED matrix display.

Caution Do not unseat or otherwise disturb the card while running internal diagnostics.

The SPC's LED matrix display transitions from off (all LEDs unlighted) to on. When on, the LED matrix display lights the letters S, P, and C, one at a time repeatedly, and the lower right LED of the matrix display changes from unlighted to lighted repeatedly.

Step 3 Use the C command from the Card Maintenance screen to activate the card. The card takes the download. The service circuit spans are active, as can be seen from the Card Maintenance screen.

Caution Do not unseat or otherwise disturb the card while it is downloading.

Step 4 Verify the following received messages in your log file to ensure that the card has taken the download—FRM225, FRM226, FRM241, FRM242, "Begin downloading spec file C:/boot/xxx.xxx," and "End downloading spec file C:/boot/xxx.xxx."

Step 5 Create a resource group for the SPC service circuits.

You have completed the software installation.

Loading the Software onto Cards—Existing Installations

To load files from the hard disk to cards on an existing installation, follow these steps.

Caution This process disrupts in-progress calls and removes service circuits from operation for a few minutes.

Step 1 If you have not already done so, access the Card Maintenance screen from the Maintenance Menu screen, and take the SPC service circuits out of service (OOS).

Step 2 Use the C command from the Card Maintenance screen to activate the various SPC service circuits.

Caution Do not unseat or otherwise disturb the card while it is downloading.

Step 3 Verify the following received download messages in your log file to ensure that the card has taken the download: "Begin downloading spec file C:/boot/xxx.xxx," and "End downloading spec file C:/boot/xxx.xxx."

Note The SPC does not take a redownloading of the spc.dwn file.

You have completed the software installation.

Typical System Software Configurations

This section lists typical system software configurations used with the Venezuela country feature package. For more information on how to use and configure the various system software screens and menus, refer to the *Cisco VCO/4K System Administrator's Guide*.

Database Administration

Special consideration pertains to the following Database Administration menus and screens.

Card Summary Menu

The Card Summary menu displays the status and port availability of E1, 4xE1, and ICC cards. To assign operating characteristics to E1 spans, access the Configuration screen for that card from the Card Summary menu.

Note The term "E1 span" designates E1 and 4xE1 cards, or ICC cards with associated ICC-E1-I/O module.

Resource Group Summary Menu

You must define all SPC-MFCR2, SPC-DTMF, or SPC-CPA service circuit ports in a single resource group in the Resource Group Summary menu and Resource Group Configuration screen. To optimize outgoing call system performance, group E1 span outgoing ports into one or more resource groups.

Inpulse Rule and Outpulse Rule Screen

Typical inpulse and outpulse rule tokens used to support R2 signaling are listed in Table 1-1.

Table 1-1 Typical Inpulse and Outpulse Rule Tokens Used to Support R2 Signaling

Inpulse Tokens		Outpulse Tokens	
REP NEXT	CLR CHAR1 [xx]	REP END	OP ANI
MFCR2	WINK ENAB	REP NEXT	OP MFCR2
DIGITS [xx]	IP ANI [xx]	OP FIELD [xx]	
END CHAR1 [xx]	IP FIELD [xx]	OP CAT [xx]	

For more information about these and other inpulse and outpulse rule tokens, refer to the *Cisco VCO/4K System Administrator's Guide*.

For more information on how to construct inpulse and outpulse rules for R2 signaling, refer to Chapter 4, "R2 Signaling Examples."

Answer Supervision Template Screen

Refer to the "Tone Detection" section on page 3-2 for information on the answer supervision template function.

System Configuration

Special considerations pertain to the following System Configuration screen.

System Features Screen

The Enable MFCR2 Supervised Clear feature flag supports automatic call release on outgoing ports in response to backward MFCR2 supervision tones. When the Enable MFCR2 Supervised Clear feature flag is set to **Y**, an outgoing port is released when a B4, A4, or C4 backward tone is detected during R2 signaling. The system performs disconnect processing appropriate to the port, and generates an Outgoing Port Change of State ($DA) report that indicates a supervision error and specifies the backward tone. Backward supervision tones are described in Chapter 2, "R2 Signaling Tones and Pulse Code Modulation Line Signaling". The $DA report is discussed in the *Cisco VCO/4K Standard Programming Reference* and the *Cisco VCO/4K Extended Programming Reference.*

Note This feature flag enables/disables automatic call release on a system-wide basis. When the feature is enabled (set to **Y)**, any outgoing port receiving the backward error tones is automatically released. If the feature flag is disabled (set to **N**), the outgoing port remains in SETUP unless out-of-band supervision or a host command changes the port state.

Maintenance

Special considerations pertain to the following Maintenance screen.

Card Maintenance Screen

Use the Card Maintenance screen to add, delete, and change the card/port status for MFCR2 and SPC service circuits, and E1 spans. When an E1 span is added to the Card Maintenance screen, its span type is set to CAS/R2 by default.

For E1 spans set to CAS/R2, ports 1 and 17 of the card's 32 ports are reserved. Port 1 (Channel 0) carries the frame alignment pattern, remote alarm indication bit, and national-use bits. Port 17 (Channel 16) carries the multiframe alignment pattern, extra bits, and channel-associated signaling bits.

For 4xE1 and ICC cards, set the span type to CCS/31B from the Card Summary menu in order to use port 17 as a bearer port. Use E1-31B firmware on single span E1 cards in order to use port 17 as a bearer port.

Diagnostics

Special considerations pertain to the following Diagnostics screens.

Card Display Screen

The Card Display screen lists the operating status of E1 spans. Information on the Card Display screen varies according to card type.

Port Display Screen

The Port Display screen lists the processing states, rule processing, links, paths, and digit collection activity of E1 spans.

Test Port Card Screen

The Test Port Card screen tests individual E1 channels. A path is set up between three elements—the selected E1 channel(s), MFCR2 circuits, and a Digital Tone Generator (DTG) channel. The system compares the signals sent with the signals received by the MFCR2 and reports discrepancies. You can test all channels on E1 spans with one command. You can select the E1 span for port card diagnostic tests. The E1 span enters a local loopback mode during the test and sends out an all 1s (ones) pattern.

Test Service Circuit Screen

The Test Service Circuit screen tests MFCR2 cards and SPC-MFCR2 service circuits.

Host Commands and Reports

The host commands and reports are documented in the *Cisco VCO/4K Standard Programming Reference* and the *Cisco VCO/4K Extended Programming Reference*.

CHAPTER 2

R2 Signaling Tones and Pulse Code Modulation Line Signaling

This chapter describes the R2 signaling tones generated and detected by the MFCR2 transceiver cards, and the R2 pulse code modulation (PCM) 2-bit line signaling transmitted and received by E1 spans.

Forward and Backward R2 Signaling Tones

Table 2-1 through Table 2-5 provide R2 signaling information based on ITU Q.441 as it applies specifically to the Venezuela telephone network.

Table 2-1 R2 Signaling Group I Forward Signals

Token Data Field	Designation	Frequencies	Digit Meaning
1	G-I-1	1380 + 1500 Hz	Digit 1
2	G-I-2	1380 + 1620 Hz	Digit 2
3	G-I-3	1500 + 1620 Hz	Digit 3
4	G-I-4	1380 + 1740 Hz	Digit 4
5	G-I-5	1500 + 1740 Hz	Digit 5
6	G-I-6	1620 + 1740 Hz	Digit 6
7	G-I-7	1380 + 1860 Hz	Digit 7
8	G-I-8	1500 + 1860 Hz	Digit 8
9	G-I-9	1620 + 1860 Hz	Digit 9
10	G-I-10	1740 + 1860 Hz	Digit 0
11	G-I-11	1380 + 1980 Hz	Not applicable
12	G-I-12	1500 + 1980 Hz	Request not accepted (exchange without ANUM)
13	G-I-13	1620 + 1980 Hz	Not applicable
14	G-I-14	1749 + 1980 Hz	Access to announcement
15	G-I-15	1860 + 1980 Hz	End of number

Table 2-2 R2 Signaling Group II Forward Signals

Token Data Field	Designation	Frequencies	Meaning
1	G-II-1	1380 + 1500 Hz	Subscriber without priority
2	G-II-2	1380 + 1620 Hz	Subscriber with priority
3	G-II-3	1500 + 1620 Hz	Test equipment
4	G-II-4	1380 + 1740 Hz	Coin box
5	G-II-5	1500 + 1740 Hz	Operator
6	G-II-6	1620 + 1740 Hz	Data transmission
7	G-II-7	1380 + 1860 Hz	Redirect call
8	G-II-8	1500 + 1860 Hz	Not applicable
9	G-II-9	1620 + 1860 Hz	Not applicable
10	G-II-10	1740 + 1860 Hz	Not applicable
11	G-II-11	1380 + 1980 Hz	Not applicable
12	G-II-12	1500 + 1980 Hz	Not applicable
13	G-II-13	1620 + 1980 Hz	Not applicable
14	G-II-14	1740 + 1980 Hz	Not applicable
15	G-II-15	1860 + 1980 Hz	Not applicable

Table 2-3 R2 Signaling Group A Backward Signals

Token Data Field	Designation	Frequencies	Meaning
1	A-1	1140 + 1020 Hz	Send next BNUM digit (n + 1)
2	A-2	1140 + 900 Hz	Send previous digit (n – 1)
3	A-3	1020 + 900 Hz	Number complete send category; change over to reception of Group B signals
4	A-4	1140 + 780 Hz	Network congestion
5	A-5	1020 + 780 Hz	Send category only
6	A-6	900 + 780 Hz	Number complete charge, set up voice path
7	A-7	1140 + 660 Hz	Send second previous digit (n – 2)
8	A-8	1020 + 660 Hz	Send third previous digit (n – 3)
9	A-9	900 + 660 Hz	Send next ANUM digit (n + 1)
10	A-10	780 + 660 Hz	Not applicable
11	A-11	1140 + 540 Hz	Not applicable
12	A-12	1020 + 540 Hz	Not applicable
13	A-13	900 + 540 Hz	Not applicable
14	A-14	780 + 540 Hz	Not applicable
15	A-15	660 + 540 Hz	Not applicable

Table 2-4 R2 Signaling Group B Backward Signals

Token Data Field	Designation	Frequencies	Meaning
1	B-1	1140 + 1020 Hz	Subscriber line free with charge
2	B-2	1140 + 900 Hz	Number changed
3	B-3	1020 + 900 Hz	Busy
4	B-4	1140 + 780 Hz	Congestion
5	B-5	1020 + 780 Hz	Unallocated number
6	B-6	900 + 780 Hz	Line free with charging
7	B-7	1140 + 660 Hz	Line free, no charge
8	B-8	1020 + 660 Hz	Line barred to incoming traffic
9	B-9	900 + 660 Hz	Subscriber line intercepted
10	B-10	780 + 660 Hz	Data transmission
11	B-11	1140 + 540 Hz	Not applicable
12	B-12	1020 + 540 Hz	Not applicable
13	B-13	900 + 540 Hz	Not applicable
14	B-14	780 + 540 Hz	Not applicable
15	B-15	660 + 540 Hz	Not applicable

Table 2-5 R2 Signaling Group C Backward Signals

Token Data Field	Designation	Frequencies	Meaning
1	C-1	1140 + 1020 Hz	Send next BNUM digit (n + 1)
2	C-2	1140 + 900 Hz	Send previous digit (n – 1)
3	C-3	1020 + 900 Hz	Number complete send category; change over to reception of Group B signals
4	C-4	1140 + 780 Hz	Network congestion
5	C-5	1020 + 780 Hz	Send category only
6	C-6	900 + 780 Hz	Number complete charge, set up voice path
7	C-7	1140 + 660 Hz	Send second previous digit (n – 1)
8	C-8	1020 + 660 Hz	Send third previous digit (n – 2)
9	C-9	900 + 660 Hz	Send next ANUM digit (n + 1)
10	C-10	780 + 660 Hz	Not applicable
11	C-11	1140 + 540 Hz	Not applicable
12	C-12	1020 + 540 Hz	Not applicable
13	C-13	900 + 540 Hz	Not applicable
14	C-14	780 + 540 Hz	Not applicable
15	C-15	660 + 540 Hz	Not applicable

Pulse Code Modulation Line Signaling

Table 2-6 describes the 2-bit, channel-associated pulse code modulation (PCM) line signaling used by the VCO system equipped with E1 interface cards. Forward signals are used by originating or outgoing ports, while backward signals are generated by incoming ports. For more information on E1 cards, refer to the *Cisco VCO/4K Card Technical Descriptions*.

Table 2-6 R2 Pulse Code Modulation Line Signaling

Number	Signal	Exchange Signaling Forward		Backward	
		A*f*	B*f*	A*b*	B*b*
1	Idle	1	0	1	0
2	Seizure	0	0	1	0
3	Seizure acknowledge	0	0	1	0
	Clear forward before answer	1	0	1	1
6a	Release guard	1	0	1	0
4	Seize acknowledge	0	0	1	1
4	Answer	0	0	0	1
6b	Clear forward after answer	1	0	0	1
7b	Release guard	1	0	1	0
5	Clear-back	0	0	1	1
6a	Clear forward after clear back	1	0	1	1
7	Release guard	1	0	1	0
8	Blocking	1	0	1	1
9	Unblocking	1	0	0	0

CHAPTER 3

Venezuela Tone Plan

This chapter details the modifications to the Digital Tone Generator (DTG or DTG-2) and Service Platform (SPC)-CPA service circuits to support the following feature:

- Supervision tones specific to the Venezuela telephone network

The information in this chapter supersedes the information in the following manuals:

- *Cisco VCO/4K System Administrator's Guide*
- *Cisco VCO/4K Standard Programming Reference*
- *Cisco VCO/4K Extended Programming Reference*
- *Cisco VCO/4K Supervision and Call Progress Tone Detection*

Tone Characteristics

Table 3-1 summarizes the characteristics of the most frequently used supervision tones in the Venezuela network.

Table 3-1 Venezuela Digital Tone Generator Supervision Tones

Tone	Frequencies (Hz)	Amplitude (dBm)	Cadence	Detected by CPA?
Dial	425	–10	Continuous	Yes
Ringback	425	–10	1 second on, 4 seconds off REPEATED	Yes
Busy	425	–10	0.50 second on, 0.50 second off REPEATED	Yes
Fast Busy	425	–10	0.25 second on, 0.25 second off REPEATED	Yes
ISUP Tone 1	2010	–12	Continuous	Yes
ISUP Tone 2	1800	–22	Continuous	Yes

Tone Detection

SPC-CPA processing is modified to support the Venezuela network requirements. Use the system administration answer supervision templates function to control tone detection for the tones listed in Table 3-1. Supervision template processing is described in the *Cisco VCO/4K System Administrator's Guide*.

Answer Supervision Template Screen Terminology

The supervision events and tones listed in the Answer Supervision Template screen use standard North American network terminology. Table 3-2 shows the Answer Supervision Template screen terms to use with the Venezuela country feature package.

Table 3-2 Answer Supervision Template Screen Terminology for Venezuela

Answer Supervision Template Event and Tone Names	Venezuela Tone Names
Dial	Dial
Ringback	Ringback
Busy	Busy
Reorder	Fast Busy
SIT Tones	Not Applicable
Ring Cess.[1]	Not Applicable
Voice Det.[1]	Not Applicable
Voice Cess.[1]	Not Applicable
Wink[1]	Not Applicable
Answer[1]	Not Applicable
Time[1]	Not Applicable
Hook Flash[1]	Not Applicable
Pager Cue	Not Applicable
ISUP Tone	ISUP Tones 1 and 2
ISUP Cess.[1]	Not Applicable

1. Not a tone.

Tone Generation

Tone generation is performed through DTG outpulse and static tone channels. The allocation of these tones is controlled via inpulse rules, Voice Path Control ($66), and DTMF Collection Control ($67) commands.

Table 3-3 supersedes the tone generation table listed in the *Cisco VCO/4K Standard Programming Reference* and the *Cisco VCO/4K Extended Programming Reference*. It also supersedes the tone output level specifications found in the *Cisco VCO/4K Card Technical Descriptions*. For more information on generating tones, refer to the *Cisco VCO/4K System Administrator's Guide*.

The tones and their corresponding output levels, decimal values, hexadecimal values, and port addresses are summarized in Table 3-3.

Table 3-3 Tone Levels, Values, and Port Addresses

Tone	Output Level	Decimal Value	Hex Value	Port Addresses
Beep	—	0	00	None
Quiet (PCM idle pattern 01010100)	—	1	01	04C0
1 KHz	0 dBm	2	02	04C1
Dial	–10 dBm	3	03	04C2
380 Hz	–10 dBm	4	04	04C3
440 Hz	–13 dBm	5	05	04C4
480 Hz	–17 dBm	6	06	04C5
1400 Hz	–12 dBm	7	07	04C6
1000 Hz @max CODEC output	5.79 dBm	8	08	04C7
920 Hz	–13 dBm	9	09	04C8
404 Hz	0 dBm	10	0A	04C9
1004 Hz	0 dBm	11	0B	04CA
2804 Hz	0 dBm	12	0C	04CB
Steady Ringback	–10 dBm	13	0D	04CC
1760 Hz	–10 dBm	14	0E	04CD
Digital Test Pattern	—	15	0F	04CE
400 Hz	–14 dBm	16	10	04CF
Ringback	–10 dBm	17	11	04D0
Busy	–10 dBm	18	12	04D1
Fast Busy	–10 dBm	19	13	04D2
(NAK) 380 Hz	–10 dBm	20	14	04D3
Reserved	—	21	15	04D4
Reserved	—	22	16	04D5
Reserved	—	23	17	04D6
Reserved	—	24	18	04D7
ISUP Tone 1	–12 dBm	25	19	04D8
ISUP Tone 2	–22 dBm	26	1A	04D9
Reserved	—	27	1B	04DA
Reserved	—	28	1C	04DB
Reserved	—	29	1D	04DC
Reserved	—	30	1E	04DD
Reserved	—	31	1F	04DE
Reserved	—	32	20	04DF

Table 3-3 Tone Levels, Values, and Port Addresses (continued)

Tone	Output Level	Decimal Value	Hex Value	Port Addresses
DTMF digit 0 (steady)	–9/–7 dBm/freq	33	21	04E0
DTMF digit 1 (steady)	–9/–7 dBm/freq	34	22	04E1
DTMF digit 2 (steady)	–9/–7 dBm/freq	35	23	04E2
DTMF digit 3 (steady)	–9/–7 dBm/freq	36	24	04E3
DTMF digit 4 (steady)	–9/–7 dBm/freq	37	25	04E4
DTMF digit 5 (steady)	–9/–7 dBm/freq	38	26	04E5
DTMF digit 6 (steady)	–9/–7 dBm/freq	39	27	04E6
DTMF digit 7 (steady)	–9/–7 dBm/freq	40	28	04E7
DTMF digit 8 (steady)	–9/–7 dBm/freq	41	29	04E8
DTMF digit 9 (steady)	–9/–7 dBm/freq	42	2A	04E9
DTMF digit A (steady)	–9/–7 dBm/freq	43	2B	04EA
DTMF digit B (steady)	–9/–7 dBm/freq	44	2C	04EB
DTMF digit C (steady)	–9/–7 dBm/freq	45	2D	04EC
DTMF digit D (steady)	–9/–7 dBm/freq	46	2E	04ED
DTMF digit * (steady)	–9/–7 dBm/freq	47	2F	04EE
DTMF digit # (steady)	–9/–7 dBm/freq	48	30	04EF
MF digit 0 (steady)	–7 dBm/freq	49	31	04F0
MF digit 1 (steady)	–7 dBm/freq	50	32	04F1
MF digit 2 (steady)	–7 dBm/freq	51	33	04F2
MF digit 3 (steady)	–7 dBm/freq	52	34	04F3
MF digit 4 (steady)	–7 dBm/freq	53	35	04F4
MF digit 5 (steady)	–7 dBm/freq	54	36	04F5
MF digit 6 (steady)	–7 dBm/freq	55	37	04F6
MF digit 7 (steady)	–7 dBm/freq	56	38	04F7
MF digit 8 (steady)	–7 dBm/freq	57	39	04F8
MF digit 9 (steady)	–7 dBm/freq	58	3A	04F9
MF digit KP (steady)	–7 dBm/freq	59	3B	04FA
MF digit ST (steady)	–7 dBm/freq	60	3C	04FB
MF digit ST3P	–7 dBm/freq	61	3D	04FC
MF digit STP	–7 dBm/freq	62	3E	04FD
MF digit ST2P	–7 dBm/freq	63	3F	04FE

CHAPTER 4

R2 Signaling Examples

This chapter provides examples of R2 signaling that use the following call control elements:

- Inpulse rules
- Outpulse rules
- Host commands and reports

Two examples discuss R2 digit collections on incoming trunks (calls coming into the VCO/4K system); a third example describes R2 digit outpulsing on outgoing trunks (calls originating at the VCO/4K system). Each example begins with a brief explanation of the scenario, followed by a graphic representation of the call flow. These diagrams illustrate system processing and information flow between the VCO/4K system and host, and between the VCO/4K system and connected equipment (network registers). Direction of the information flow is indicated by arrows under the message data.

Using MFCR2 Outpulse Rule Tokens

MFCR2 outpulse rule tokens include the following tones:

- Forward tones—These tones fall into Groups I and II. All Group I and II tones use the ITU R2 forward group tone frequencies. Most of the tones in Group I are used for addressing and identification. Group II tones give information about the origin of the call. Group II tones are also sent by an outgoing MFCR2 service circuits in response to one of the following backward signals.
  - Change over to the reception of Group B signals.
  - Send calling party's category.
- Backward tones—These tones fall into Groups A, B, and C. The Group A tones acknowledge Group I forward signals. Under certain conditions, Group A tones also acknowledge Group II tones. Group B tones convey the following information to an outgoing MFCR2 register.
  - The condition of the switch equipment in the incoming exchange.
  - The condition of the called subscriber's line.

Group B tones are also sent in response to Group II tones once a changeover to the reception of Group B signal request is successfully completed.

These tones correspond to Category and Fields in the following manner.

- OP FIELD [xx] is populated with dialed digits. The first digit in OP FIELD [xx] is always sent first. Additional digits in OP FIELD [xx] are sent in response to an A-1 tone. The Group I-15 tone is sent forward if OP FIELD [xx] is exhausted. Transmission of the calling party number (ANI) starts from the top of OP FIELD [xx] in response to an A-9 tone.

- IP ANI [xx] is populated by the calling party's A number. The first digit in IP ANI [xx] is sent in response to the first A-9 backward tone.
- OP CAT [xx] data is the Group II signal, which indicates the calling party's service class. The single digit in OP CAT [xx] is sent in response to an A5 backward tone. The Group B backward tone is sent in response to the Group II signal and completes the MFCR2 signaling dialogue.

The Group B tones, as well as tone A-6, indicate a terminal status and complete the register signaling dialogue. Pulsed transmission of A-4 indicates a busy state. Receiving tones B-2, B-3, B-4, B-5, B-8, or A-4 cause the system to fail the call attempt.

Example #1—Incoming Call Using Inpulse Rules

Example #1 illustrates a simple R2 digit collection scenario after an incoming seize on the VCO/4K system E1 circuit at port address $00 61. A Venezuela specific inpulse rule is executed to perform R2 digit collection on this circuit.

The inpulse rule performs the following general tasks:

- Collects an unspecified number of called party number digits and stores them in Field 1. A-1 (send next digit) signals prompt the network register for each new digit. When an I-15 digit is received, the system sends an A-5 (send category), then sends an A-9 (send calling party digits).
- Collects the Group II signal and calling party number and stores it in the ANI number field. C-1 signals (send calling party's number) prompt the network register for each new digit. After the digits are received, the system sends an A-3 (send Group II) digit.
- Collects the Group II signal (1 digit) and stores it in Field 3. After the Group II signal is collected, the system sends a B-6 (set up speech conditions) digit.

At the end of this example, the system establishes speech conditions with the connected equipment (network register) and generates an Inpulse Rule Complete ($DD) report to the host. The processing flow for this example is shown in Figure 4-1. In this example, it is assumed that the Venezuela specific inpulse rule for the incoming circuit has been defined as inpulse rule #1 (shown below).

RULE #1

- REP EACH
- MFCR2
- END CHAR1 5
- CLR CHAR1 1
- DIGITS 0
- IP FIELD 1
- END CHAR1 9
- CLR CHAR1 5
- DIGITS 1
- IP FIELD 2
- END CHAR1 3
- CLR CHAR1 9
- IP ANI 0
- END CHAR1 1

- CLR CHAR1 3
- DIGITS 1
- IP FIELD 3

Refer to the *Cisco VCO/4K System Administrator's Guide* for more information about specific MFCR2 inpulse rule tokens.

Figure 4-1 Processing Flow For Example #1, Part 1 of 3

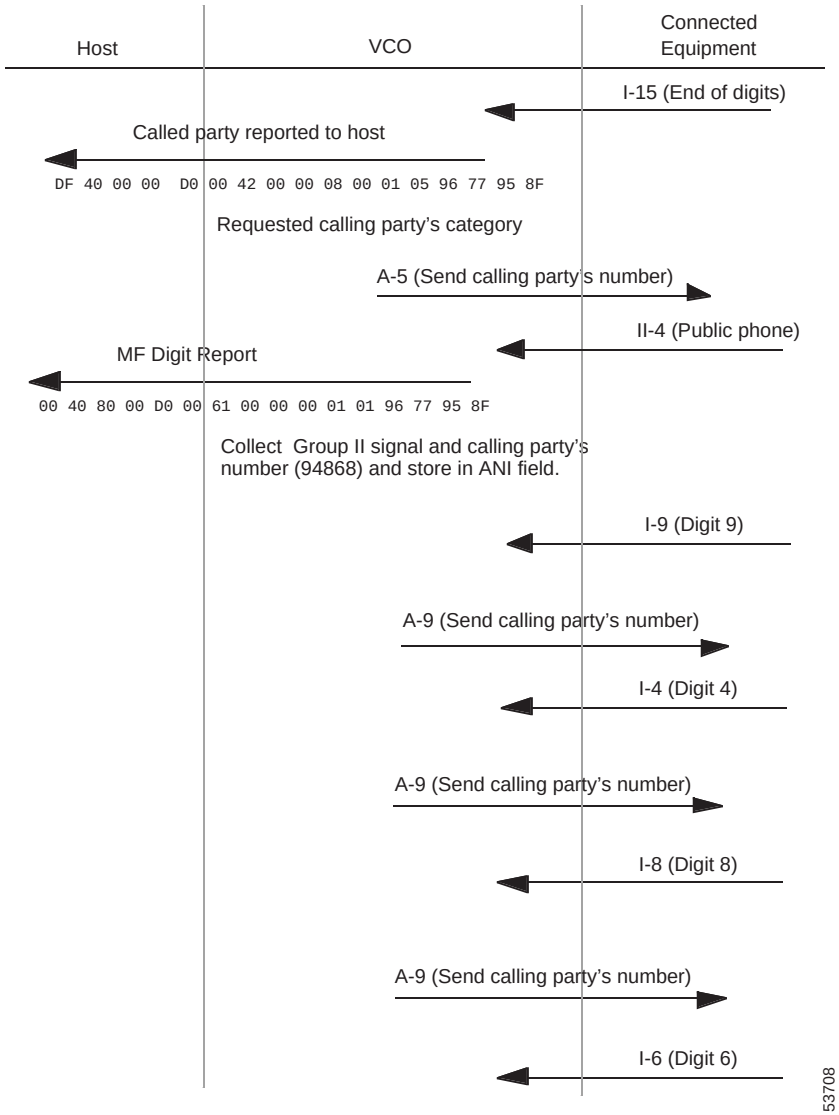


Figure 4-2 Processing Flow for Example #1, Part 2 of 3

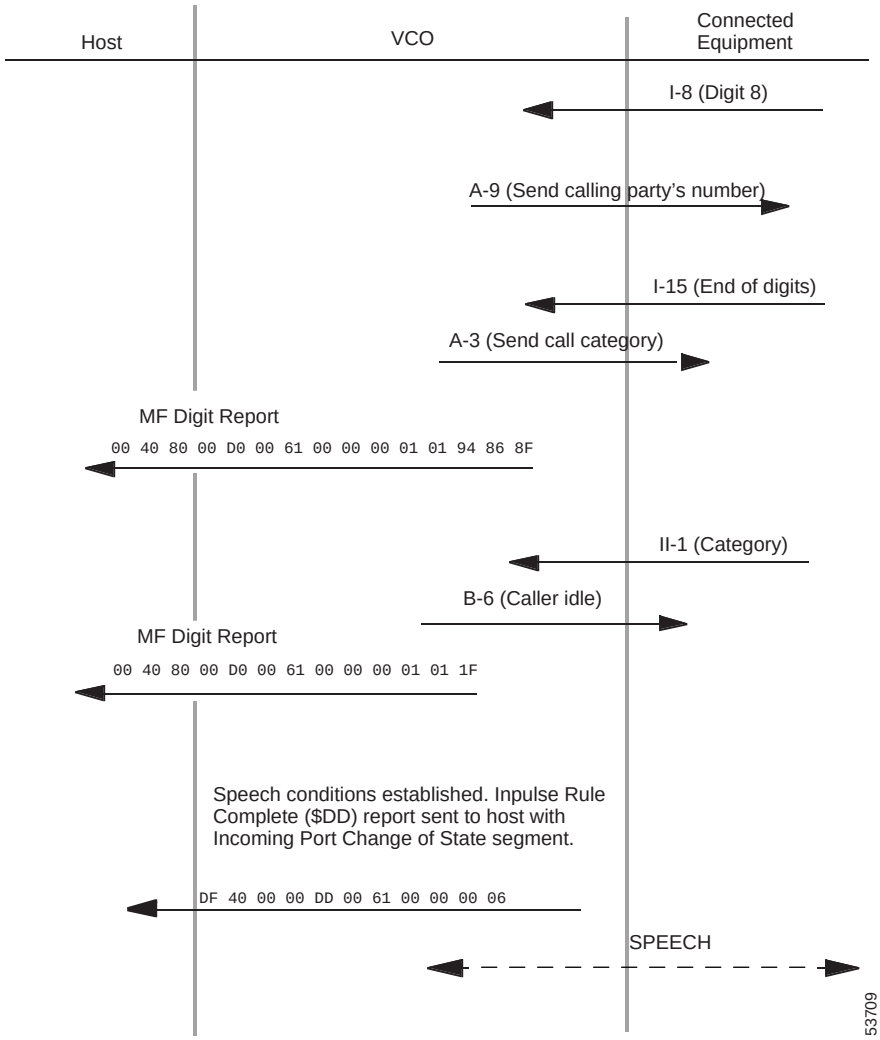
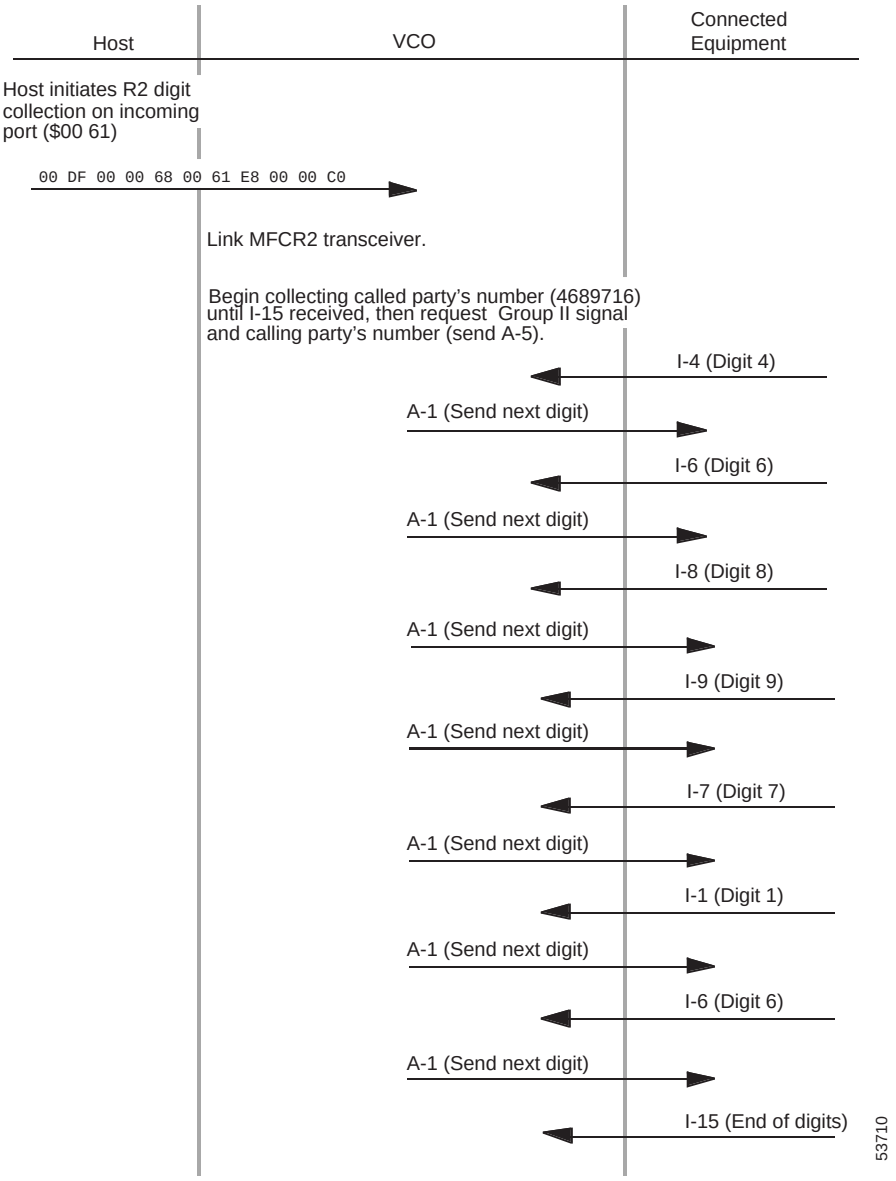


Figure 4-3 Processing Flow for Example #1, Part 3 of 3



Example #2—Incoming Call Using $68 Host Command

Example #2 also illustrates a simple R2 digit collection scenario on an incoming E1 circuit (port address $00 61). However, all R2 digit collections in this scenario are initiated by host command; no inpulse rule processing is used. Three MF Collection Control ($68) commands perform the following actions.

- Collect an unspecified number of called party number digits until I-15 digit is received, then send an A-5 to get the Group II signal.
- Collect the Group II signal followed by an unspecified number of calling party's digits until the I-15 digit is received by sending back A-1, then send back A-3 to get the Group II signal tone.
- Collect the Group II signal tone, then send a B-6 (set up speech conditions) digit.

An MF Digit ($D0) report reports each digit collection to the host.

At the end of this example, the system establishes speech conditions with the connected equipment (network register). The processing flow for this example is shown in Figure 4-4.

Refer to the *Cisco VCO/4K Standard Programming Reference* and the *Cisco VCO/4K Extended Programming Reference* for more information about the $68 command and the $D0 report.

Figure 4-4 Processing Flow For Example #2, Part 1 of 3

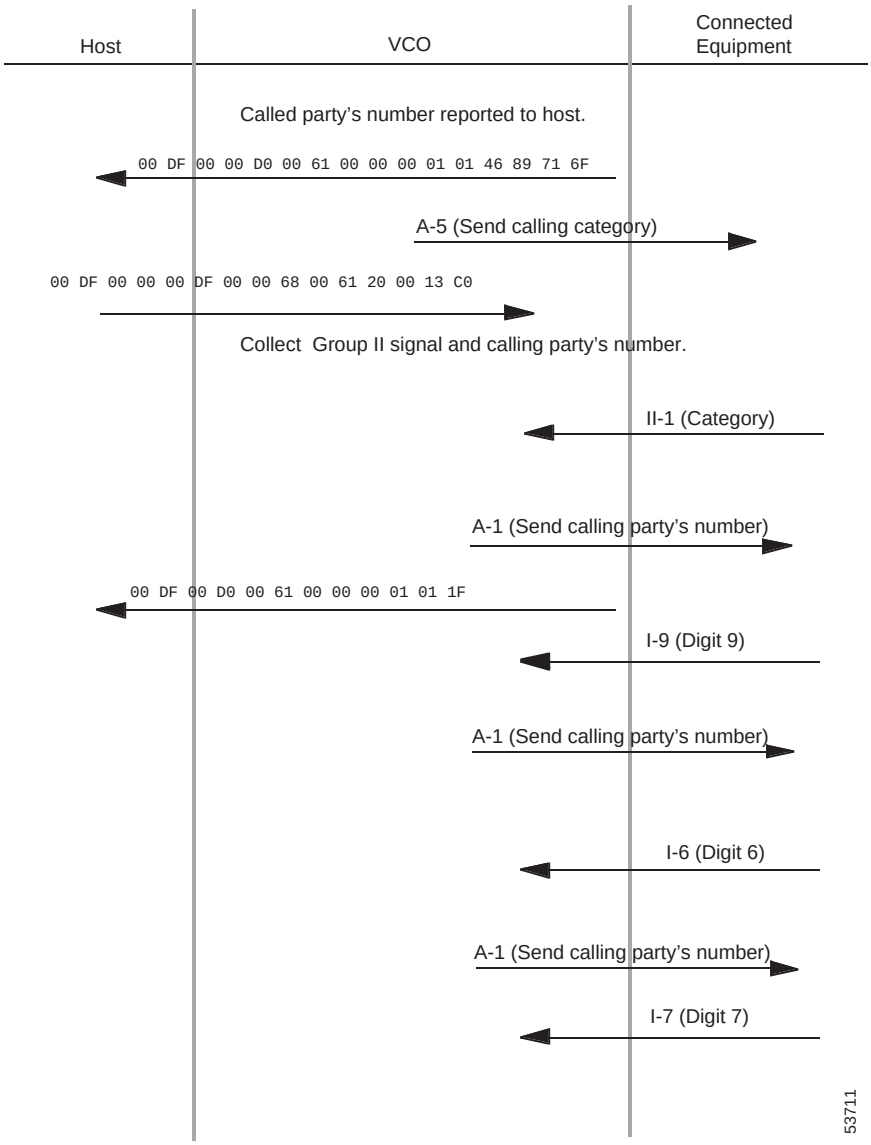


Figure 4-5 Processing Flow For Example #2, Part 2 of 3

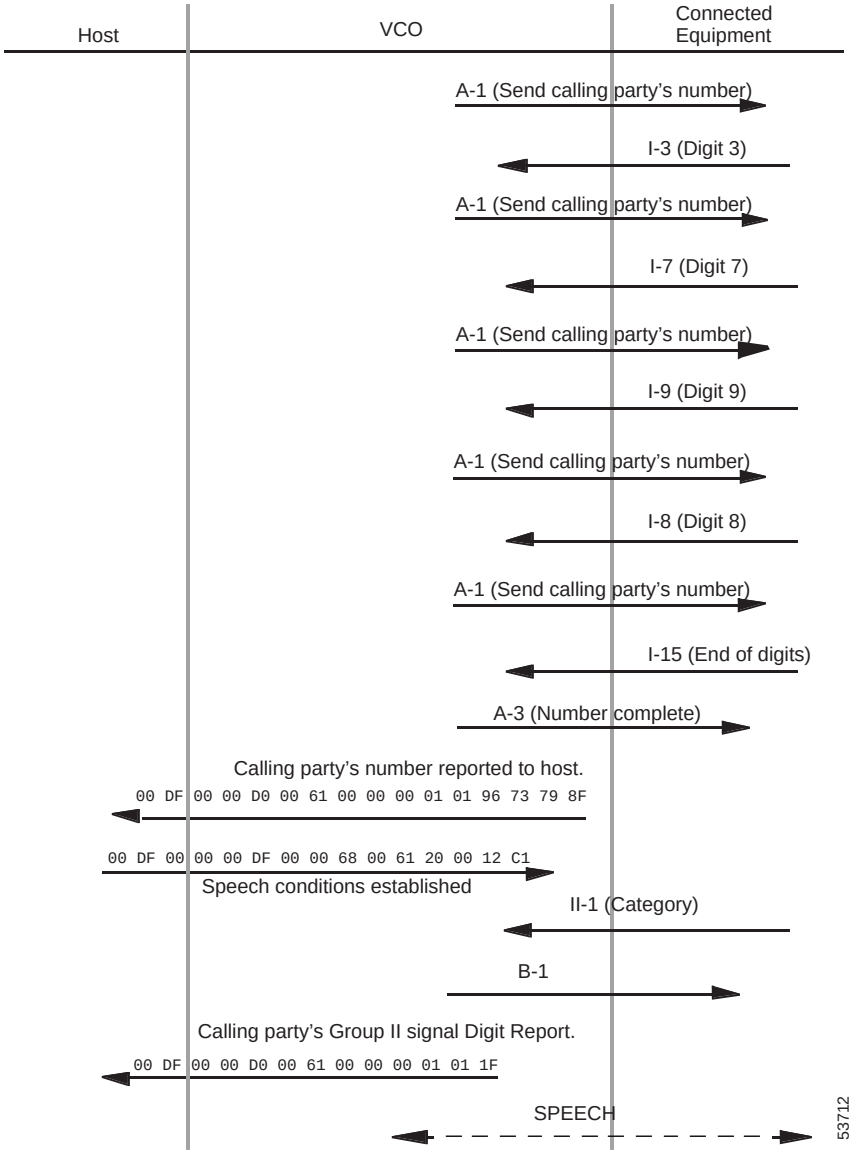
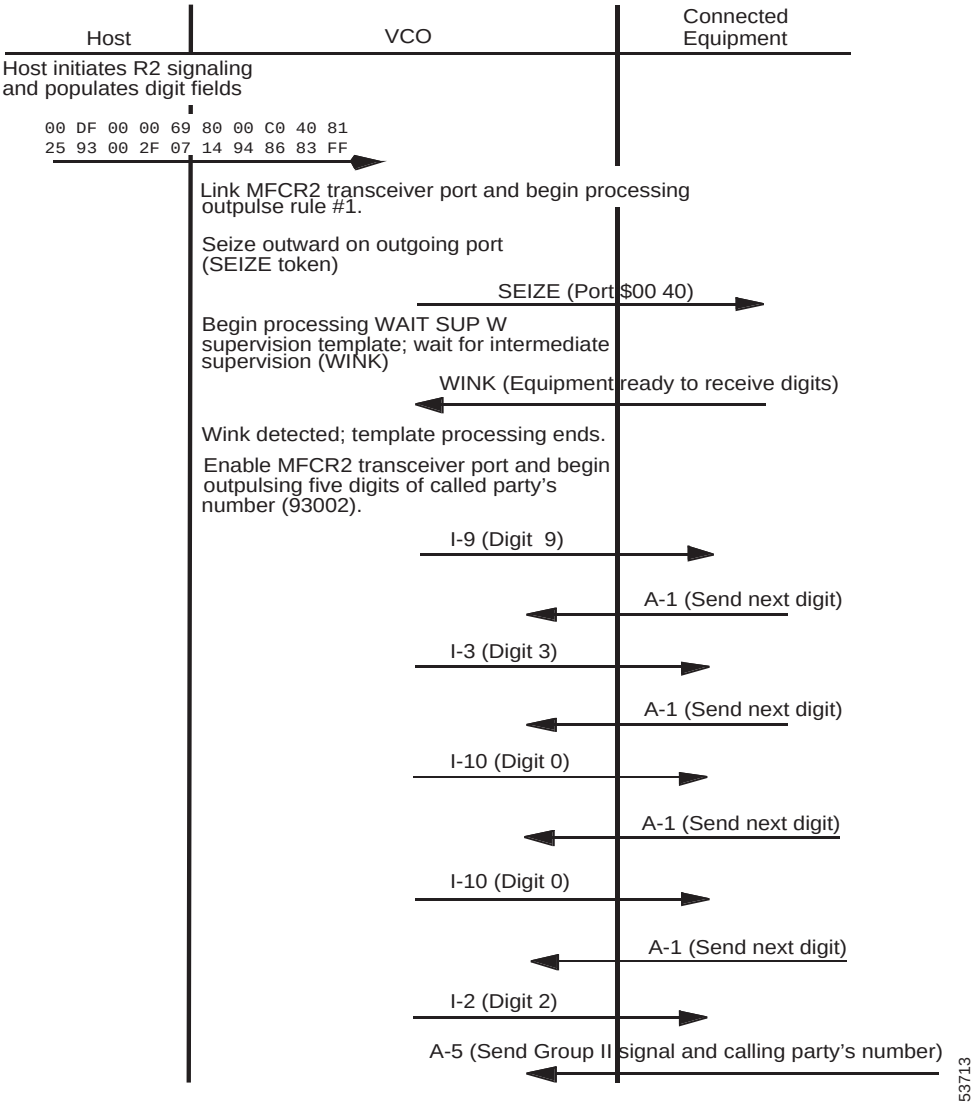


Figure 4-6 Processing Flow For Example #2, Part 3 of 3



Example #3—Outgoing Call

Example #3 describes R2 digit outpulsing on an E1 circuit at port address $00 40. This scenario involves both host command and outpulse rule processing. The host initiates the outpulsing using an Outgoing Port Control ($69) command that populates the digit fields and specifies the outpulse rule to execute (refer to the *Cisco VCO/4K Standard Programming Reference* or the *Cisco VCO/4K Extended Programming Reference* for a command description).

The outpulse rule performs the following actions.

- Seizes out on the E1 trunk at port address $00 40 and waits for a wink signal (executing the WAIT SUP W preconfigured answer supervision template documented in the *Cisco VCO/4K System Administrator's Guide*).
- Outpulses five digits of the called party number (stored in Field 1) after wink signal is detected. The system responds to A-1 (send next digit) signals that request each new digit.
- Outpulses the Group II signal and calling party number stored in the ANI field when an A-6 digit is received.
- Outpulses the Group II signal digit specified in the rules OP CAT token in response to an A-3.

This rule is shown below.

RULE #1

- REP END
- SEIZE
- WAIT SUP W
- OP MFCR2
- OP ANI
- OP CAT 5
- OP FIELD 1

At the end of this example, the system establishes speech conditions with the connected equipment (network register) and generates an Outgoing Port Change of State ($DA) report to the host indicating the final backward digit. The processing flow for this example is shown in Figure 4-7 through Figure 4-9.

Refer to the *Cisco VCO/4K System Administrator's Guide* for more information about OP MFCR2, OP ANI, OP FIELD [xx], and OP CAT [xx] outpulse rule tokens.

Figure 4-7 Processing Flow For Example #3, Part 1 of 3

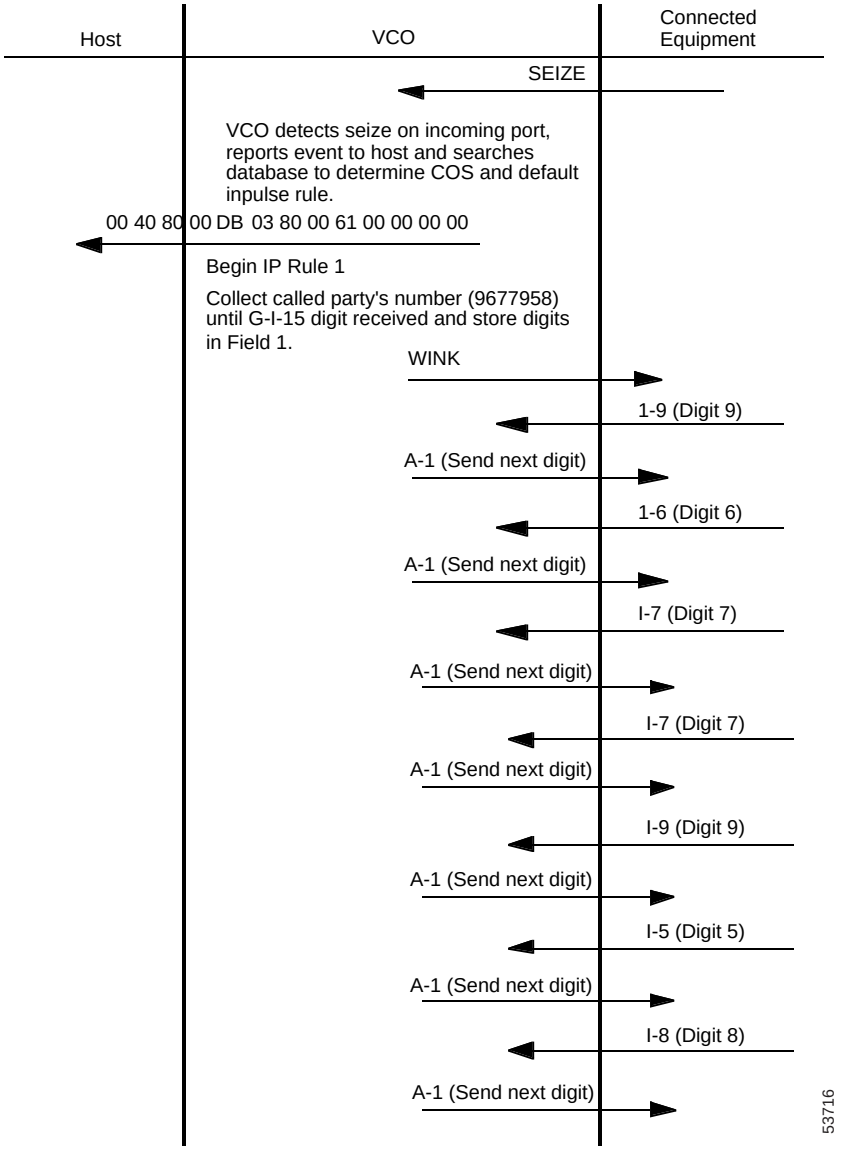


Figure 4-8 Processing Flow For Example #3, Part 2 of 3

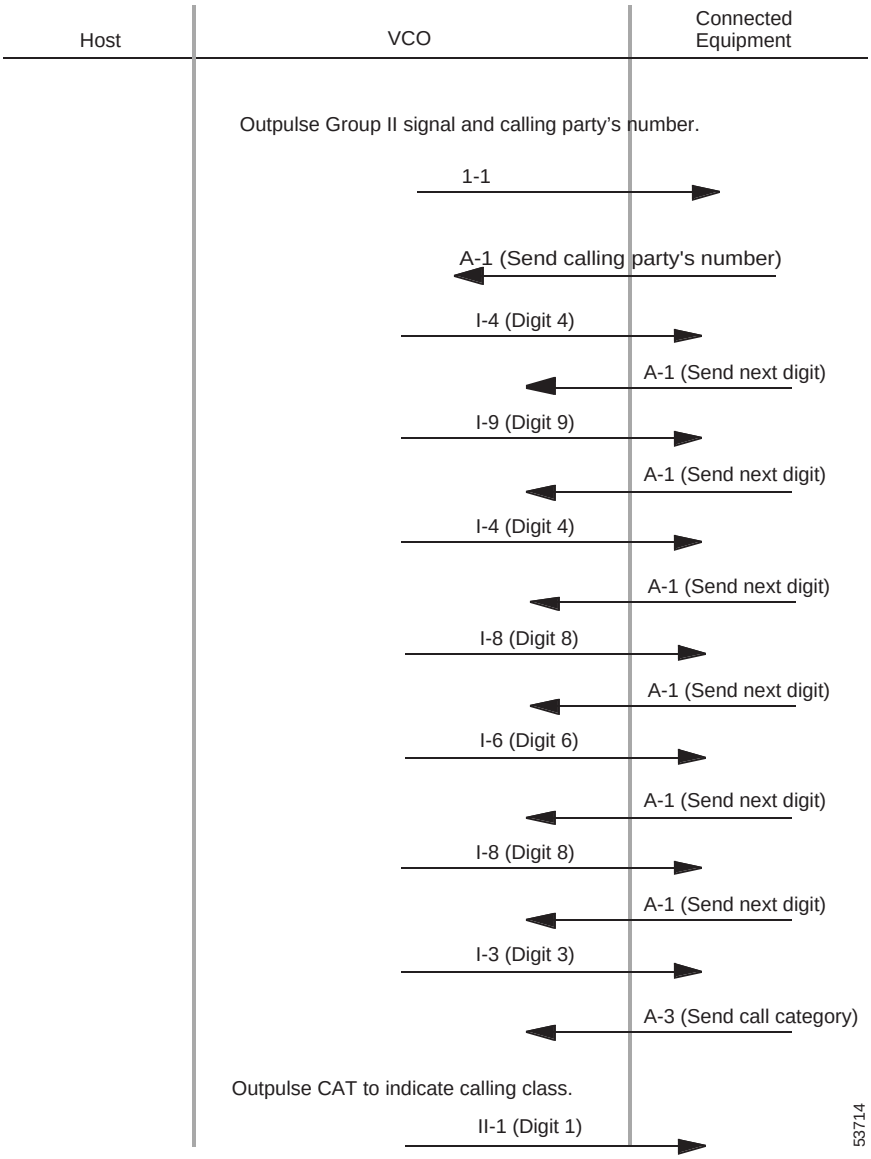
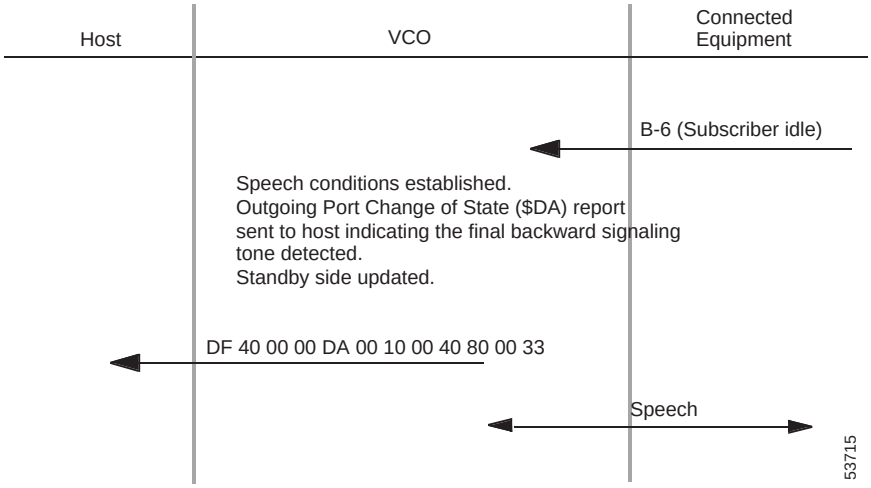



Figure 4-9 Processing Flow For Example #3, Part 3 of 3