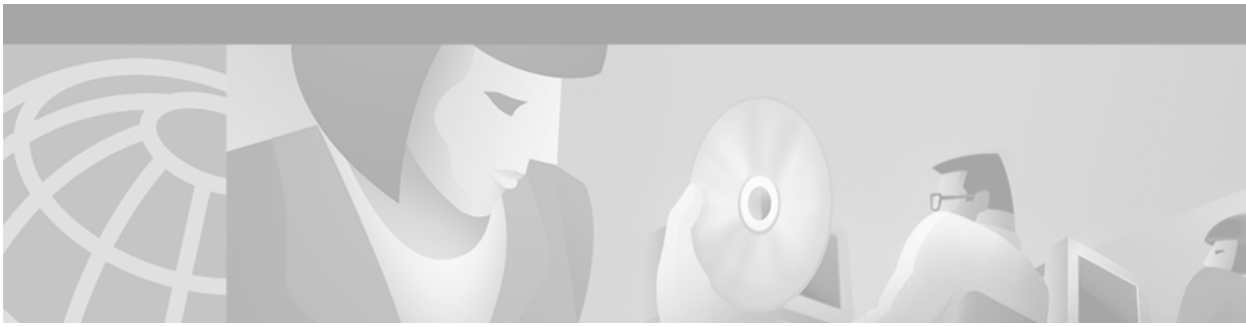

Preface

Objective

The Finland country feature package supports the tone plan described in Chapter 3, “Finland Tone Plan.”

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

- VCO/4K operating with system software V5.x FSR00 PUN00 and higher
- VCO/20 operating with system software V4.0 FSR00 PUN00 and higher
- VCO/80 operating with system software V3.3 FSR00 PUN00 and higher
- SDS-1000 operating with system software V3.3 FSR00 PUN00 and higher
- SDS-500 operating with system software V3.3 FSR00 PUN00 and higher

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 description in Chapter 3, “Finland Tone Plan” to verify that this is the country feature package that you ordered.

Audience

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

Document Organization

This document is organized as follows:

Chapter 1, “System Requirements” lists the system requirements for running the Finland 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 (PCM) 2-bit line signaling transmitted and received by E1 digital interface cards.

Chapter 3, “Finland Tone Plan” details the modifications to the Digital Tone Generator (DTG or DTG-2) and Call Progress Analyzer (CPA), and SPC-CPA service circuits to support the supervision tones specific to the Finland telephone network.

Chapter 4, “R2 Signaling Examples” provides examples of R2 signaling used in the Finland telephone network.

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 Finland Supplement* provides important information about running the Finland 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.

Refer to the following specifications for information on network signaling requirements:

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

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

http://www.cisco.com

Technical Assistance Center

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

Contacting TAC by Using the Cisco TAC Website

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

http://www.cisco.com/tac

P3 and P4 level problems are defined as follows:

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

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

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

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

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

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

Contacting TAC by Telephone

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

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

P1 and P2 level problems are defined as follows:

- P1—Your production network is down, causing a critical impact to business operations if service is not recovered quickly. No workaround is available.
- P2—Your production network is severely degraded, affecting significant aspects of your business operations. No workaround is available.

CHAPTER 1

System Requirements

Installation and Configuration

This chapter lists system requirements for using the Finland country feature package on SDS and VCO platforms operating with system software V3.x through V5.x. These requirements are categorized by hardware, firmware, and software.

The Finland country feature package consists of the following components:

- Digital Tone Generator (DTG) card or DTG-2 card
- Call Progress Analyzer (CPA) or Service Platform (SPC) cards, software-configured for CPA (displayed as SPC-CPA)
- SPC card software-configured for DTMF (displayed as SPC-DTMF)
- Diskette for the CPA and SPC cards 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. Use either the SPC or the CPA card (but not both) if your system requires CPA service circuit functionality.

Hardware Requirements

Refer to the *Cisco VCO/4K Tone Plan Release Notes* for information on the A-law and Mu-law rules and timing rules governing the hardware configurations of cards with jumpers/dual in-line packages (DIP) switches, 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 on system firmware requirements particular to the Finland country feature package.

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

Software Requirements

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

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

Call Progress Analyzer and Service Platform Card Downloads

Your country feature package includes a 3.5-inch diskette which contains the POST_P24 directory. The POSTP_24 directory contains the following Call Progress Analyzer (CPA) and Service Platform Card (SPC) download files:

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

Copy the diskette's contents to your system's C:/BOOT directory. You must be using system software V5.1 FSR00 PUN24, or higher, in conjunction with the POST_P24 directory.

If you are using system software V5.1 FSR00 PUN23 or lower, copy only the cpa.dwn file to the C:/BOOT directory.

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

Caution Always wear a wrist strap when installing software and handling system components to prevent damage to the components and loss of data.

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 or not it is for a new installation, or for an 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* as you complete the installation procedure.

Loading the Software onto Cards—New Installations

To load files from the hard disk to cards in 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 CPA (displayed as Call Progress Analyzer) or the SPC (displayed as either SPC-CPA or SPC-DTMF) to the database.

Step 2 Insert your card, either the CPA or the SPC, into the appropriate slot. The card automatically runs internal diagnostics. One of two results follow, dependent upon which card you have inserted.

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

- For the CPA, the LEDs display the transition from off (all LEDs unlighted) to on (the red and yellow unlighted and the green lighted).
- For the SPC, the LED matrix display transitions from off (all LEDs unlighted) to on (the LED matrix lights the letters S, P, and C one at a time repeatedly; the lower right LED changes from unlighted to lighted repeatedly).

Step 3 Use the C command to activate the card from the Card Maintenance screen. The card takes the download.

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

The service circuit spans are active, as can be seen from the Card Maintenance screen.

Step 4 Verify that the FRM225, FRM226, FRM241, and FRM242 messages appear in your log file, to ensure that the card has taken the download.

For the SPC, verify two additional messages in the log file—"Begin downloading spec file C:/boot/xxx.xxx" and "End downloading spec file C:/boot/xxx.xxx". The CPA does not have these, or any other, additional log file messages.

Step 5 Create a resource group for the CPA or 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 in 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 either the CPA card or the SPC service circuits out of service (OOS).

If you have a CPA, unseat it, wait 15 seconds, and then insert the card into its slot.

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

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

Step 3 Verify that the following messages appear in the log file to ensure that the card has taken the download. The messages you need to verify are dependent upon which card type you are using.

- For the CPA: FRM225, FRM226, FRM241, and FRM242.

- For the SPC: “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 that are used with the Finland 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 considerations pertain to the following Database Administration menu 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

To optimize outgoing call system performance, group E1 span outgoing ports into one or more resource groups.

Inpulse Rule and Outpulse Rule Screen

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

Answer Supervision Template Screen

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

Maintenance

Special considerations pertain to the following Maintenance screen.

Card Maintenance Screen

Use the Card Maintenance screen to add, delete, or change the card/port status for E1 spans. When you add an E1 span 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 to use port 17 as a bearer port. Use E1-31B firmware on E1 cards 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 and span 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), the Service Platform Card-Dual Tone Multifrequency (SPC-DTMF) card or DTMF Receiver Card (DRC), and a Digital Tone Generator (DTG) channel. The system compares the signals sent by the DRC with the signals received by the SPC-DTMF or DRC 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 DRC and SPC-DTMF 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 PCM 2-bit signaling codes transmitted and received by E1 digital interface cards.

Forward and Backward Signaling Tones

Table 2-1 through Table 2-4 provide R2 signaling information based on ITU-T Q.441 as it applies specifically to the Finnish telephone network.

Table 2-1 R2 Signaling Group I Forward Signals

Number	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	Centralized answering service address
12	G-I-12	1500 + 1980 Hz	Request not accepted
13	G-I-13	1620 + 1980 Hz	Address of test equipment
14	G-I-14	1749 + 1980 Hz	Spare for telecommunications administration
15	G-I-15	1860 + 1980 Hz	End of identification

Table 2-2 R2 Signaling Group B Backward Signals

Number	Designation	Frequencies	Digit Meaning
1	G-II-1	1380 + 1500 Hz	Ordinary subscriber (national)
2	G-II-2	1380 + 1620 Hz	Subscriber with priority (national)
3	G-II-3	1500 + 1620 Hz	Test equipment (national)
4	G-II-4	1380 + 1740 Hz	Payphone (national)
5	G-II-5	1500 + 1740 Hz	Operator (national)
6	G-II-6	1620 + 1740 Hz	Data subscriber (national)
7	G-II-7	1380 + 1860 Hz	Ordinary subscriber (international)
8	G-II-8	1500 + 1860 Hz	Data subscriber (international)
9	G-II-9	1620 + 1860 Hz	Subscriber with priority (international)
10	G-II-10	1740 + 1860 Hz	Operator with forward transfer facility (international)
11	G-II-11	1380 + 1980 Hz	Redirected call
12	G-II-12	1500 + 1980 Hz	Spare for national use
13	G-II-13	1620 + 1980 Hz	Digital connectivity required
14	G-II-14	1740 + 1980 Hz	Spare for national use
15	G-II-15	1860 + 1980 Hz	Spare for national use

Table 2-3 R2 Signaling Group A Backward Signals

Number	Designation	Frequencies	Meaning
1	A-1	1140 + 1020 Hz	Send next digit *(n+1)*
2	A-2	1140 + 900 Hz	Send last but 1 digit (n-1)
3	A-3	1020 + 900 Hz	Change over to reception of Group B signals
4	A-4	1140 + 780 Hz	Congestion in the national network
5	A-5	1020 + 780 Hz	Send category
6	A-6	900 + 780 Hz	Set up speech conditions
7	A-7	1140 + 660 Hz	Send last but 2 digits (n-2)
8	A-8	1020 + 660 Hz	Send last but 3 digits (n-3)
9	A-9	900 + 660 Hz	Send calling party’s number
10	A-10	780 + 660 Hz	Spare for tele administrations use
11	A-11	1140 + 540 Hz	Not used in national network
12	A-12	1020 + 540 Hz	Not used in national network
13	A-13	900 + 540 Hz	Not used in national network
14	A-14	780 + 540 Hz	Not used in national network
15	A-15	660 + 540 Hz	Not used in national network

Table 2-4 R2 Signaling Group B Backward Signals

Number	Designation	Frequencies	Meaning
1	B-1	1140 + 1020 Hz	Subscriber line free, malicious call identification
2	B-2	1140 + 900 Hz	Send special information tone
3	B-3	1020 + 900 Hz	Subscriber line busy
4	B-4	1140 + 780 Hz	Congestion
5	B-5	1020 + 780 Hz	Unallocated number
6	B-6	900 + 780 Hz	Subscriber line free, charge
7	B-7	1140 + 660 Hz	Spare
8	B-8	1020 + 660 Hz	Subscriber line out of order
9	B-9	900 + 660 Hz	Route call to centralized answering service position in incoming numbering area
10	B-10	780 + 660 Hz	Subscriber number changed
11	B-11	1140 + 540 Hz	Not used in national network
12	B-12	1020 + 540 Hz	Not used in national network
13	B-13	900 + 540 Hz	Not used in national network
14	B-14	780 + 540 Hz	Not used in national network
15	B-15	660 + 540 Hz	Not used in national network

Table 2-5 R2 Pulse Code Modulation Line Signaling

Forward		Backward		
A*f*	B*f*	A*b*	B*b*	Meaning
1	0	1	0	Idle
0	0	1	0	Seizing
0	0	1	1	Seizing acknowledgment
0	0	0	1	Answer
0	0	1	0	Metering[1]
0	0	1	1	Clear back
0	0	0	0	Forced release
1	0	1	1	Clear forward
1	0	0	1	
1	0	0	0	
1	0	1	1	Blocking
0	1	1	1	Operator's signal[2]

1. Backward signals A*b* and B*b* Metering are150 ms pulses.
2. The beginning state for signal B*f* of Operator's signal is interpreted as a trunk-offering-start signal. The end state is interpreted as a trunk-offering-release signal. When connected to older equipment, channel 16 can also use trunk-offering signal in accordance with older requirements (i.e., 150 ms pulse on Af).

CHAPTER 3

Finland Tone Plan

This chapter details the modifications to the Digital Tone Generator (DTG or DTG-2) and Call Progress Analyzer (CPA), and SPC-CPA service circuits to support the supervision tones specific to the Finland 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, and two conference tones, in the Finland network.

Table 3-1 Finland Digital Tone Generator Supervision Tones

Tone	Frequency (Hz)	Amplitude (dBm)	Cadence	Detected by CPA?
Dial	425	–10	Continuous	Yes
Ring	425	–10	1.0 second on, 4.0 seconds off, REPEATED	Yes
Busy	425	–10	0.3 second on, 0.3 second off, REPEATED	Yes
Reorder[1]	425	–9	150 milliseconds on, 150 milliseconds off, REPEATED	Yes

Table 3-1 Finland Digital Tone Generator Supervision Tones (continued)

Tone	Frequency (Hz)	Amplitude (dBm)	Cadence	Detected by CPA?
SIT[1]	950 1400 1800	–9 –9 –9	300 milliseconds on, 300 milliseconds off, 300 milliseconds on, 1.0 second off, REPEATED	Yes
Intrusion	425	–10	200 milliseconds on, 300 milliseconds off, 200 milliseconds on, 1.3 seconds off, REPEATED	No
Warn	1400	–10	400 milliseconds on, 14.6 seconds off REPEATED	No
Waiting	900	–13	650 milliseconds on, 350 milliseconds off, 30 milliseconds on, REPEATED	No
		–10	1.3 seconds on, 2.8 seconds off, REPEATED	
Special Dial	425	–10	650 milliseconds on, 650 milliseconds off, REPEATED	No
Fax[2]	1100	—	2 seconds on	Yes

1. Available in the tone library, but not used in the Finland tone plan.
2. The fax tone is detected only; it is not generated.

Tone Detection

CPA processing is modified to support the Finland 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 Finland country feature package.

Table 3-2 Answer Supervision Template Screen Terminology for Finland

Answer Supervision Template Event and Tone Names	Finland Tone Names
Dial	Dial
Ring	Ring
Busy	Busy
Reorder	Reorder
SIT	SIT
Pager Cue	Fax
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
ISUP Tone	Not applicable
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, and the 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	Dec Value	Hex Value	Port Address
Beep	—	0	00	None
Quiet (PCM idle pattern 01010100)	—	1	01	04C0
1 kHz Test Tone	0 dBm	2	02	04C1
Dial	**–10 dBm**	**3**	**03**	**04C2**
380 Hz Digit Trip	–10 dBm	4	04	04C3
425 Hz	–10 dBm	5	05	04C4
480 Hz High Tone	–17 dBm	6	06	04C5
1400 Hz	–10 dBm	7	07	04C6
1000 Hz @max CODEC output	—	8	08	04C7
950 Hz	–13 dBm	9	09	04C8
404 Hz Test Tone	0 dBm	10	0A	04C9
1004 Hz Test Tone	0 dBm	11	0B	04CA
2804 Hz	0 dBm	12	0C	04CB
380 Hz	–10 dBm	13	0D	04CC
1760 Hz	–10 dBm	14	0E	04CD
Digital Test Pattern	—	15	0F	04CE
425 Hz	–10 dBm	16	10	04CF
Ring	**–10 dBm**	**17**	**11**	**04D0**
Busy	**–10 dBm**	**18**	**12**	**04D1**
Reorder	**–9 dBm**	**19**	**13**	**04D2**
380 Hz	–10 dBm	20	14	04D3
Reserved	—	21	15	04D4
Intrusion	**–10 dBm**	**22**	**16**	**04D5**
Warning	**–10 dBm**	**23**	**17**	**04D6**
Wait	**–13 dBm** **–10 dBm**	**24**	**18**	**04D7**
PBX Internal	–10 dBm	25	19	04D8
SIT	**–9 dBm**	**26**	**1A**	**04D9**
Special Dial	**–10 dBm**	**27**	**1B**	**04DA**
Reserved	—	28	1C	04DB
Reserved	—	29	1D	04DC
Reserved	—	30	1E	04DD
Reserved	—	31	1F	04DE
Reserved	—	32	20	04DF
DTMF digit 0 (steady)	–9/–11 dBm/freq	33	21	04E0

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

Tone	Output Level	Dec Value	Hex Value	Port Address
DTMF digit 1 (steady)	–9/–11 dBm/freq	34	22	04E1
DTMF digit 2 (steady)	–9/–11 dBm/freq	35	23	04E2
DTMF digit 3 (steady)	–9/–11 dBm/freq	36	24	04E3
DTMF digit 4 (steady)	–9/–11 dBm/freq	37	25	04E4
DTMF digit 5 (steady)	–9/–11 dBm/freq	38	26	04E5
DTMF digit 6 (steady)	–9/–11 dBm/freq	39	27	04E6
DTMF digit 7 (steady)	–9/–11 dBm/freq	40	28	04E7
DTMF digit 8 (steady)	–9/–11 dBm/freq	41	29	04E8
DTMF digit 9 (steady)	–9/–11 dBm/freq	42	2A	04E9
DTMF digit A (steady)	–9/–11 dBm/freq	43	2B	04EA
DTMF digit B (steady)	–9/–11 dBm/freq	44	2C	04EB
DTMF digit C (steady)	–9/–11 dBm/freq	45	2D	04EC
DTMF digit D (steady)	–9/–11 dBm/freq	46	2E	04ED
DTMF digit * (steady)	–9/–11 dBm/freq	47	2F	04EE
DTMF digit # (steady)	–9/–11 dBm/freq	48	30	04EF
MF digit 0 (steady) (1300 + 1500 Hz)	–7 dBm/freq	49	31	04F0
MF digit 1 (steady) (700 + 900 Hz)	–7 dBm/freq	50	32	04F1
MF digit 2 (steady) (700 + 1100 Hz)	–7 dBm/freq	51	33	04F2
MF digit 3 (steady) (900 + 1100 Hz)	–7 dBm/freq	52	34	04F3
MF digit 4 (steady) (700 + 1300 Hz)	–7 dBm/freq	53	35	04F4
MF digit 5 (steady) (900 + 1300 Hz)	–7 dBm/freq	54	36	04F5
MF digit 6 (steady) (1100 + 1300 Hz)	–7 dBm/freq	55	37	04F6
MF digit 7 (steady) (700 + 1500 Hz)	–7 dBm/freq	56	38	04F7
MF digit 8 (steady) (900 + 1500 Hz)	–7 dBm/freq	57	39	04F8
MF digit 9 (steady) (1100 + 1500 Hz)	–7 dBm/freq	58	3A	04F9
MF digit KP (steady) (1100 + 1700 Hz)	–7 dBm/freq	59	3B	04FA
MF digit ST (steady (1500 + 1700 Hz)	–7 dBm/freq	60	3C	04FB
MF digit ST3P (700 + 1700 Hz)	–7 dBm/freq	61	3D	04FC
MF digit STP (900 + 1700 Hz)	–7 dBm/freq	62	3E	04FD
MF digit ST2P (1300 + 1700 Hz)	–7 dBm/freq	63	3F	04FE

CHAPTER 4

R2 Signaling Examples

The examples in this chapter provide demonstrations 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); a third example describes R2 digit outpulsing on outgoing trunks (calls originating at the VCO). 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 and host, and between the VCO and connected equipment (network registers). Direction of the information flow is indicated by arrows under the message data.

Example 1—Incoming Call Using Inpulse Rules

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

The inpulse rule performs the following tasks:

- Collects an unspecified number of called party number digits and stores it 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 VCO sends an A-5 (send calling category) digit.
- Collects the calling party category (1 digit) and stores it in Field 2. After the digit is received, the VCO sends another A-9 (send calling subscriber's identity) digit.
- Collects the calling party number (7 digits) and stores it in the ANI field. A-9 (send calling subscriber's identity) signals prompt the network register for each new digit. When an I-15 digit is received, the VCO sends an A-6 (set up speech conditions) digit.

At the end of this example, the VCO 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, Figure 4-2, and Figure 4-3. In this example, the default inpulse rule for the incoming circuit was defined as Inpulse Rule #1 (shown below).

Inpulse Rule #1

- REP EACH
- MFCR2
- END CHAR1 5
- CLR CHAR1 1
- DIGITS 0
- IP FIELD
- END CHAR1 9
- CLR CHAR1 5
- DIGITS 1
- IP FIELD 2
- END CHAR1 6
- CLR CHAR1 9
- IP ANI 12

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

Figure 4-1 Example 1 Call Flow (Part 1 of 3)

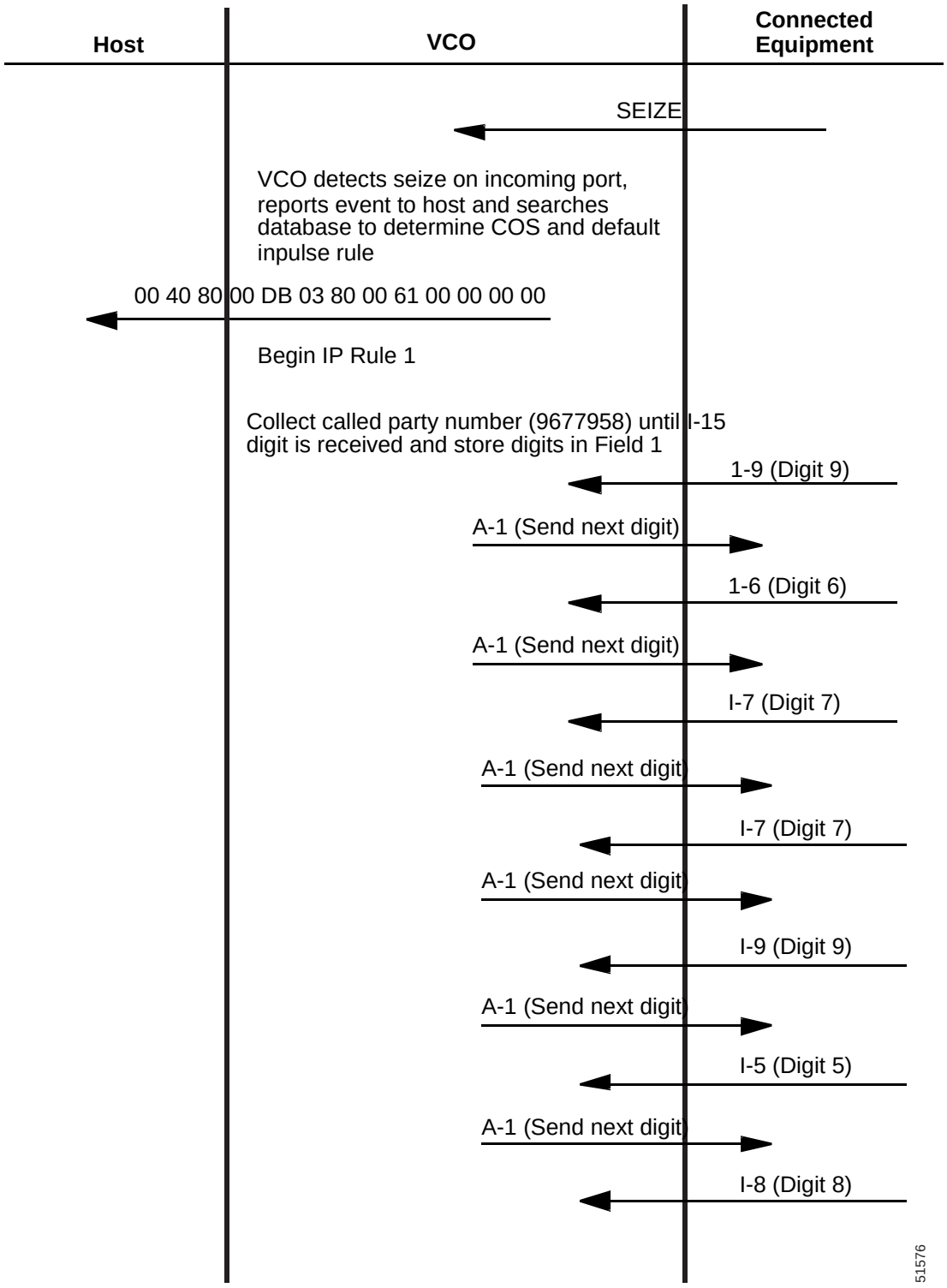


Figure 4-2 Example 1 Call Flow (Part 2 of 3)

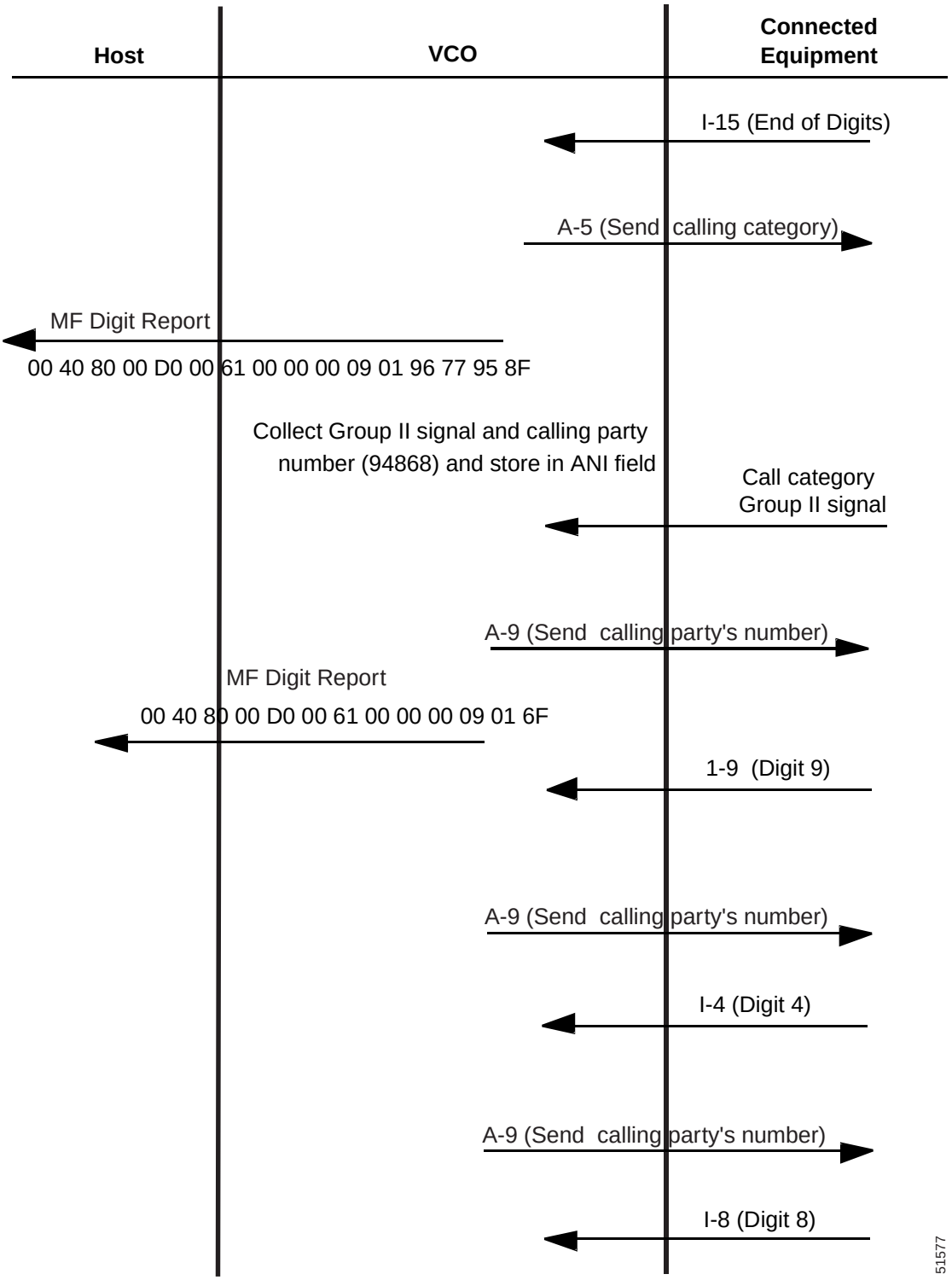
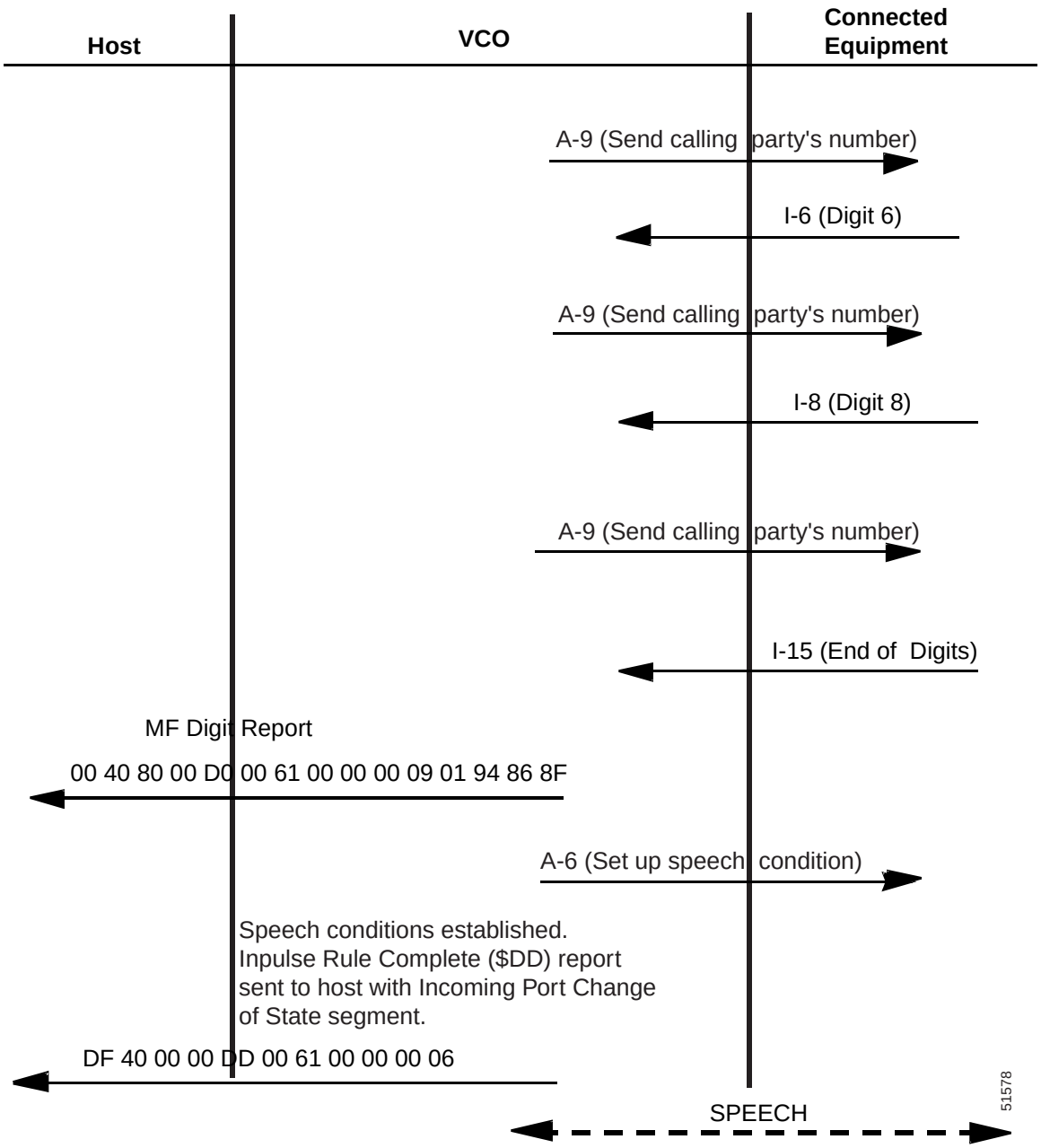


Figure 4-3 Example 1 Call Flow (Part 3 of 3)



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:

- Collects an unspecified number of called party number digits until I-15 digit is received, then sends an A-5 (send calling category) digit.
- Collects the calling party category (1 digit) and then requests the calling subscriber's identity by sending another A-9 (send calling party's number) digit.
- Collects an unspecified number of calling party number digits until I-15 digit is received, then sends an A-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 VCO establishes speech conditions with the connected equipment (network register). The processing flow for this example is shown in Figure 4-4, Figure 4-5, and Figure 4-6.

Figure 4-4 Example 2 Call Flow (Part 1 of 3)

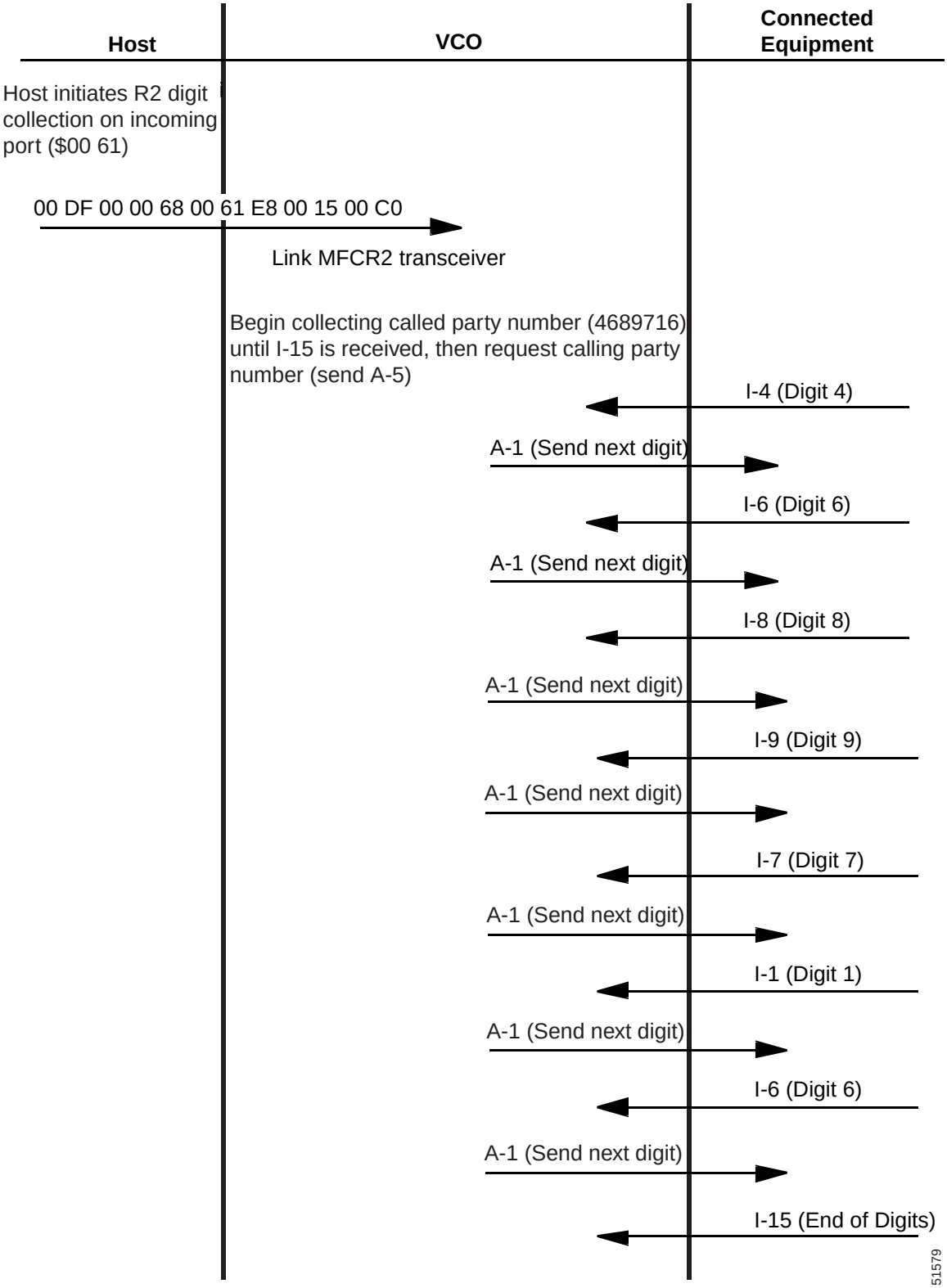


Figure 4-5 Example 2 Call Flow (Part 2 of 3)

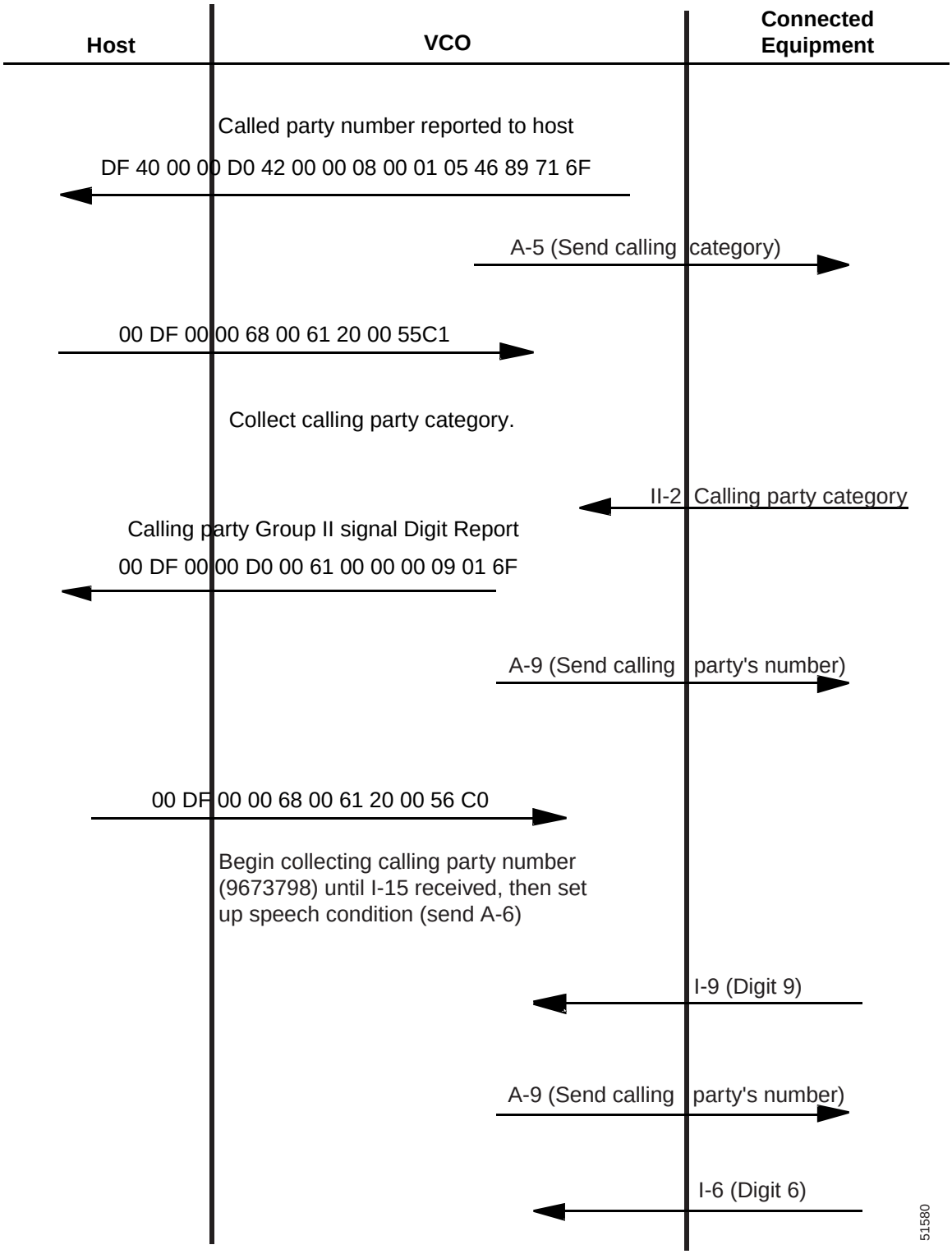
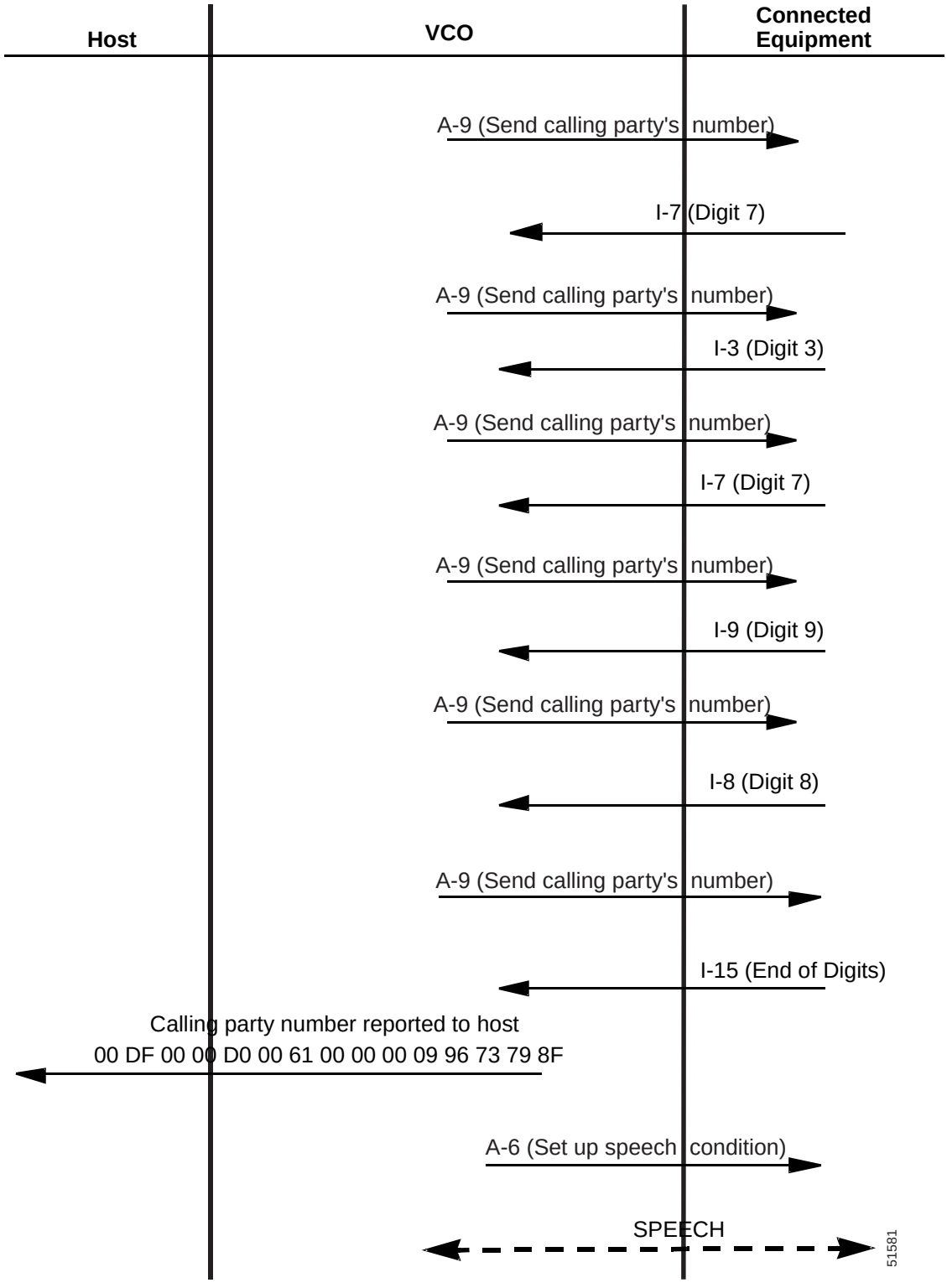


Figure 4-6 Example 2 Call Flow Part 3 of 3)



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* and 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 the first three digits of the called party number (stored in Field 1) after wink signal is detected. The VCO responds to A-1 (send next digit) signals that request each new digit.
- Outpulses the calling party category specified in the rule when an A-5 (send calling category) digit is received.
- Outpulses the calling party number stored in the ANI field when an A-9 (send calling subscriber's identity) digit is received. The VCO responds to A-9 signals that request each new digit.

This rule is shown below.

Outpulse Rule #1

- REP END
- SEIZE
- WAIT SUP W
- OP MFCR2
- OP ANI
- OP CAT 6
- OP FIELD 1

At the end of this example, the VCO 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, Figure 4-8, and 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 Example 3 Call Flow (Part 1 of 3)

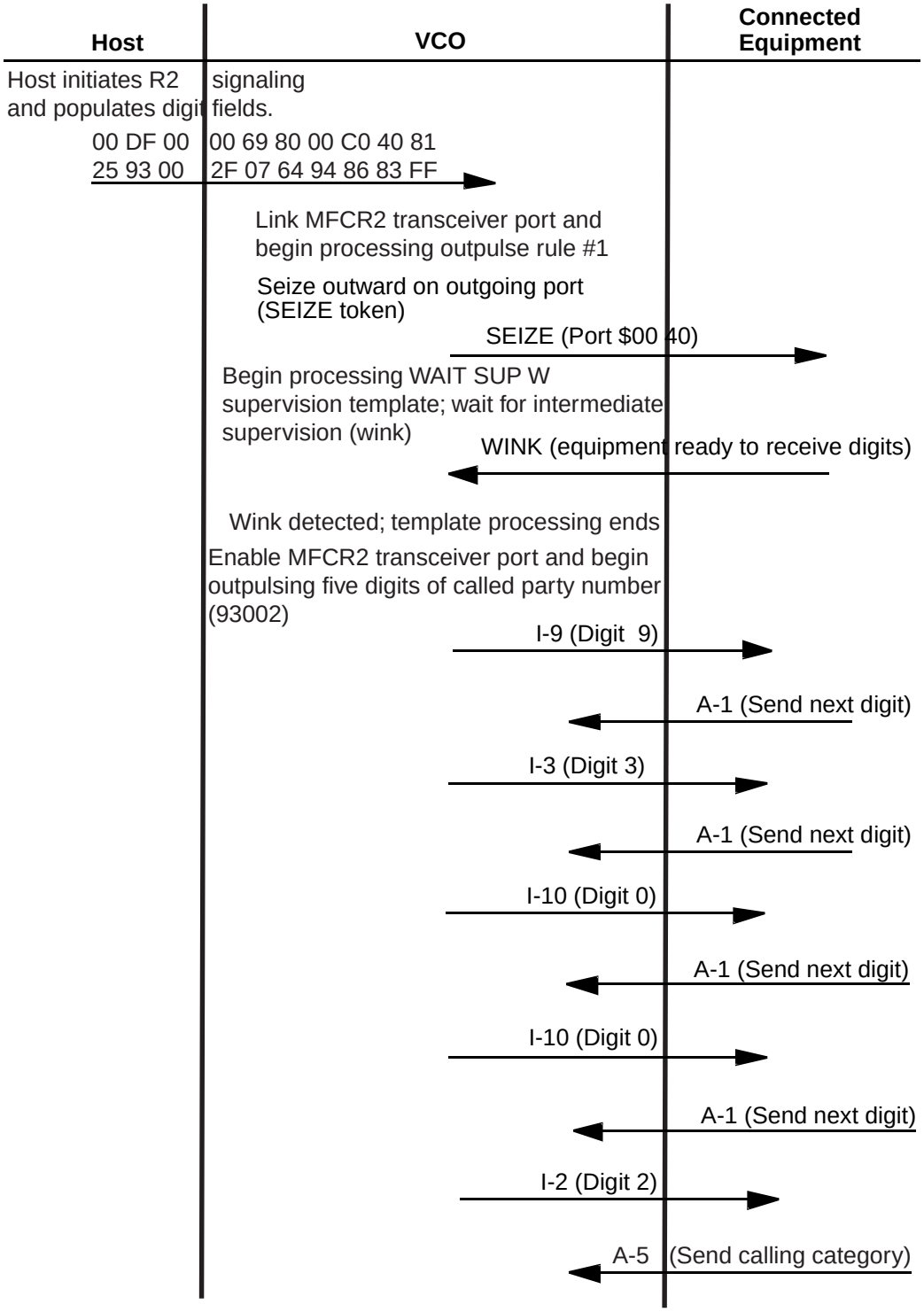


Figure 4-8 Example 3 Call Flow (Part 2 of 3)

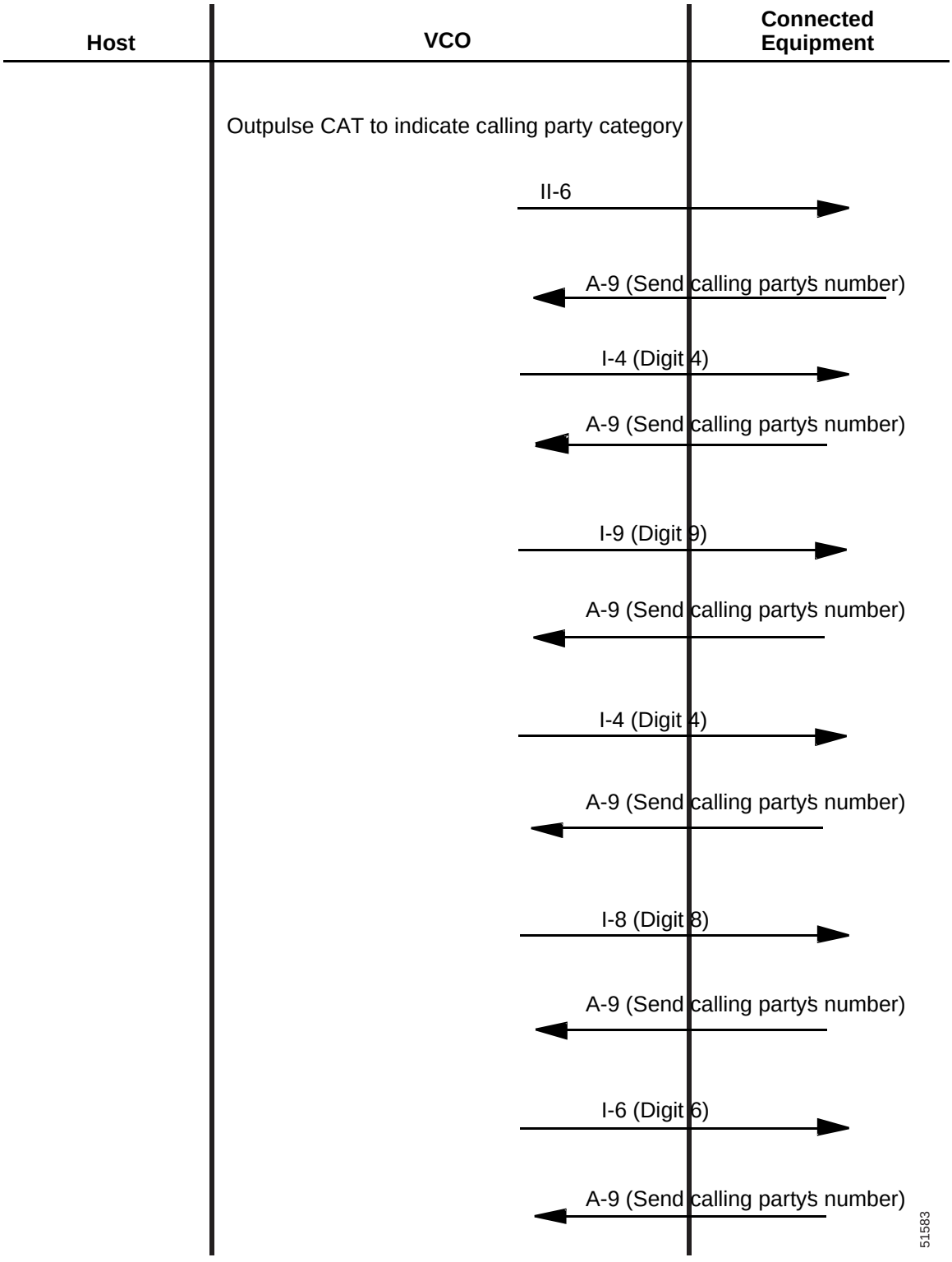


Figure 4-9 Example 3 Call Flow (Part 3 of 3)