CHAPTER 4

R2 Signaling Examples

This chapter provides examples of R2 signaling performed with 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 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 and host, and between the VCO 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 Q.440 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 circuit in response to one of the following backward signals:
  - Change over to the reception of Group B and Group C 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, and Group C tones. Group C tones acknowledge Group II, Group A and Group B 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. Transmission starts again from the top of OP FIELD [xx] in response to an A-2 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 second A-6 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 A-3 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 tones A-3 and 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-6, A-4, or A-5 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 E1 circuit at port address $00 61. A Mexico 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 the last digit is received, the VCO sends an A-6 (send calling party digits).
- Collects the Group II signal and calling party's number and stores it in the ANI number field. C-1 signals (send next number) prompt the network register for each new digit. After the digits are received, the VCO 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 VCO sends a B-1 (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 to Figure 4-3. In this example, the Mexico specific inpulse rule for the incoming circuit has been defined as inpulse rule #1 (shown below).

Inpulse Rule #1

- REP EACH
- MFCR2
- END CHAR1 6
- CLR CHAR1 1
- DIGITS 0
- IP FIELD 1
- END CHAR1 3
- CLR CHAR1 1
- IP ANI 0
- END CHAR1 1
- CLR CHAR1 1
- 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

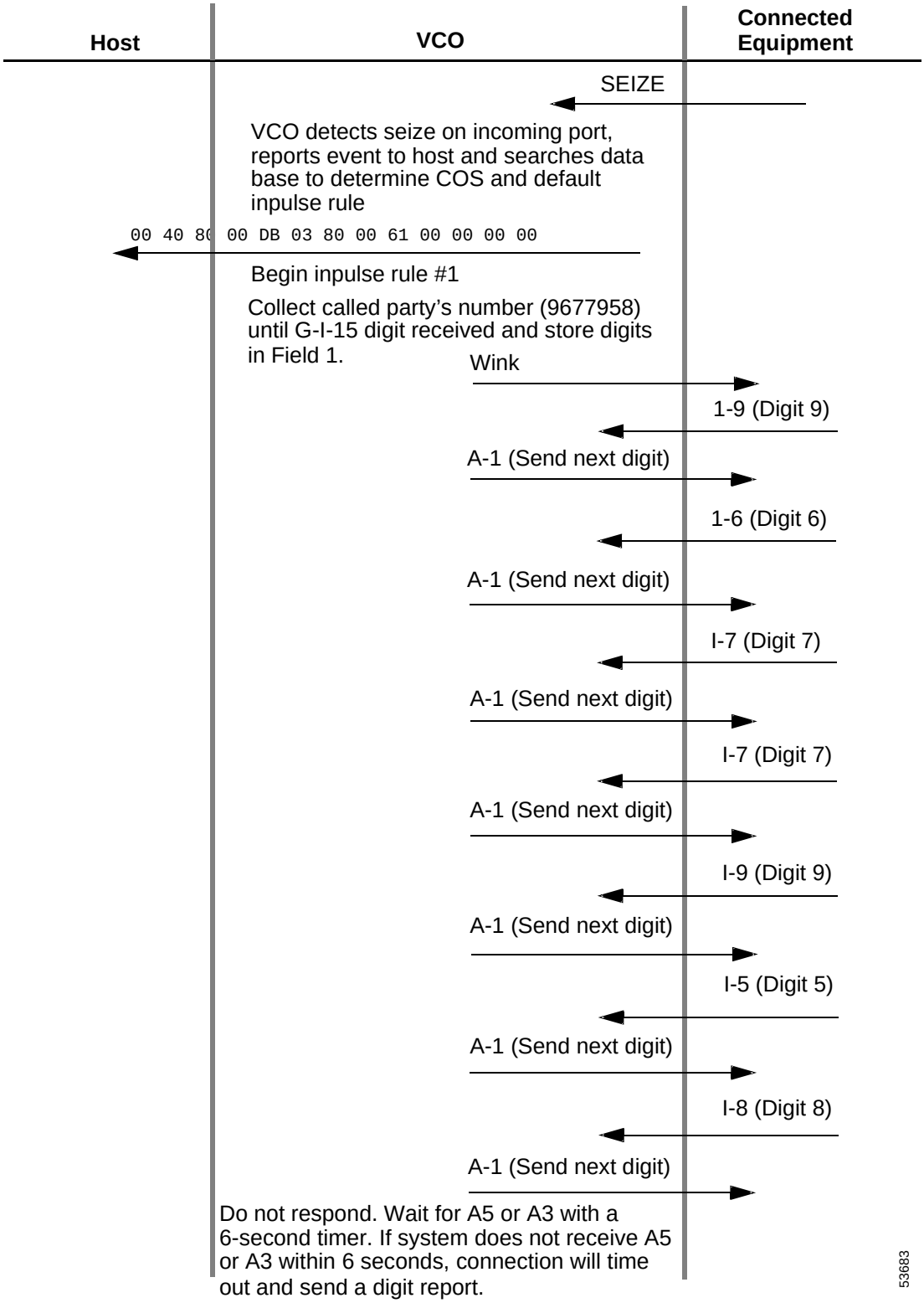


Figure 4-2 Processing Flow for Example #1, Part 2 of 3

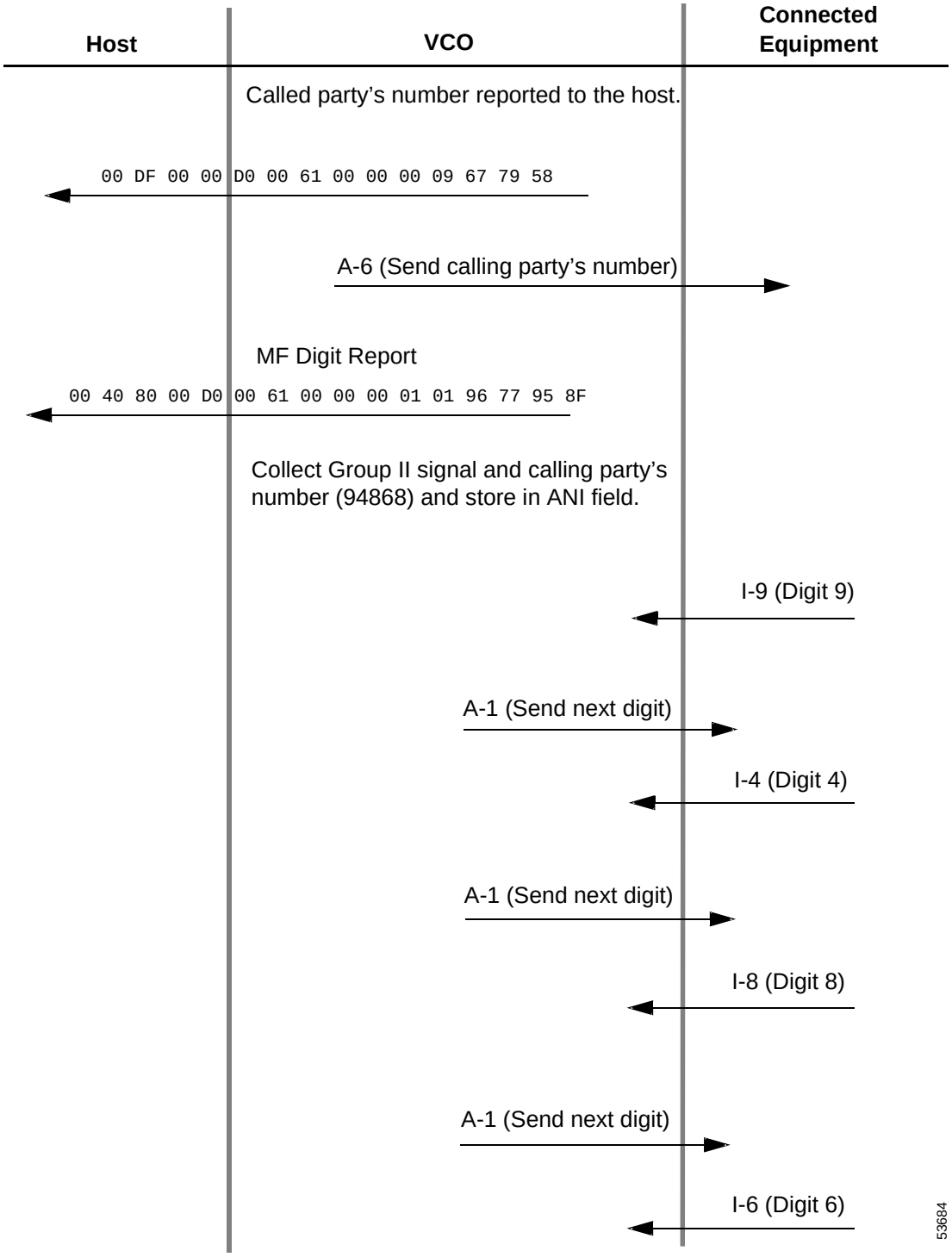
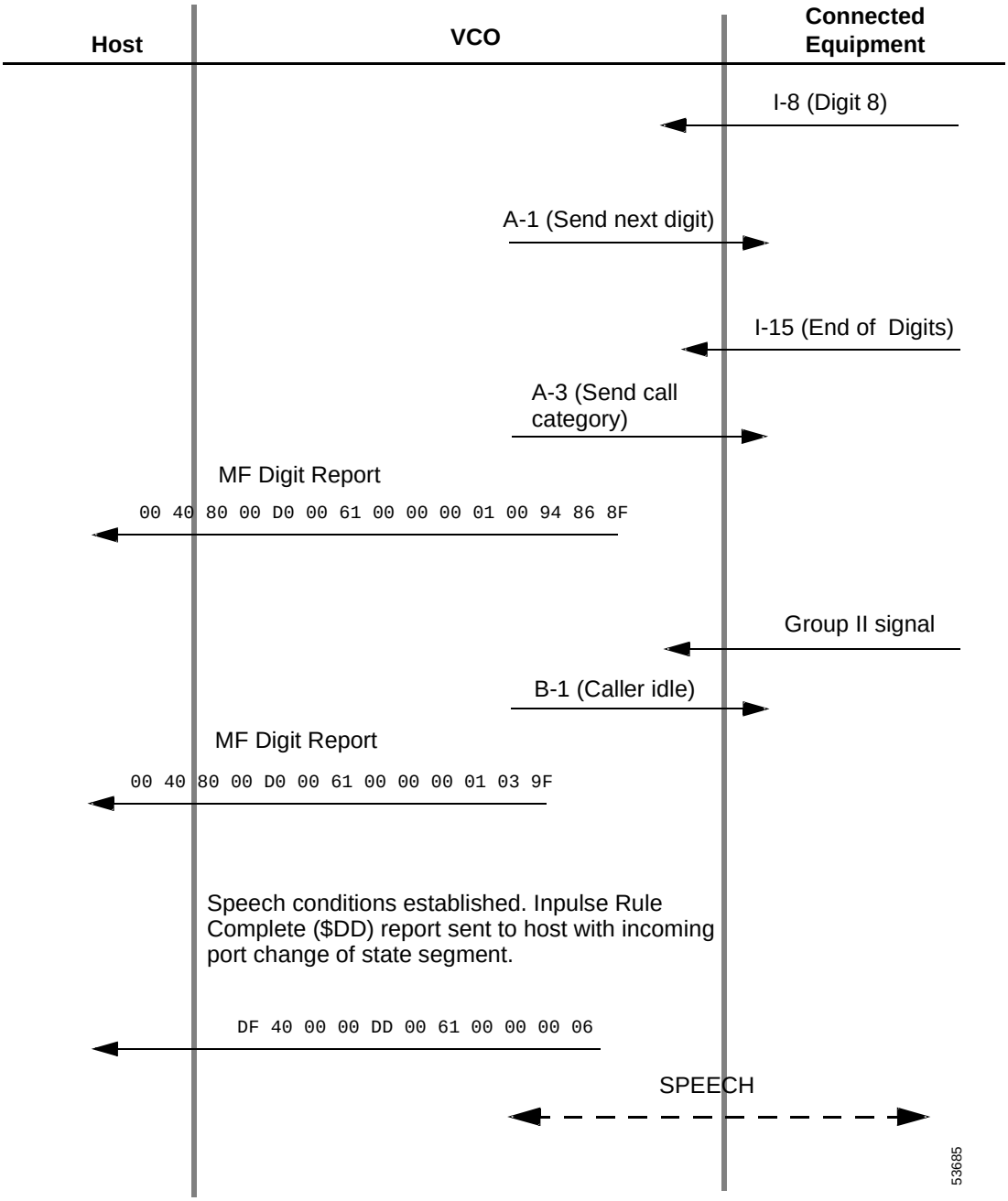


Figure 4-3 Processing Flow for Example #1, Part 3 of 3



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, then send an A-6 to get the Group II signal.
- Collect the Group II signal followed by an unspecified number of calling party 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-1 (line free with charge/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 to Figure 4-6.

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

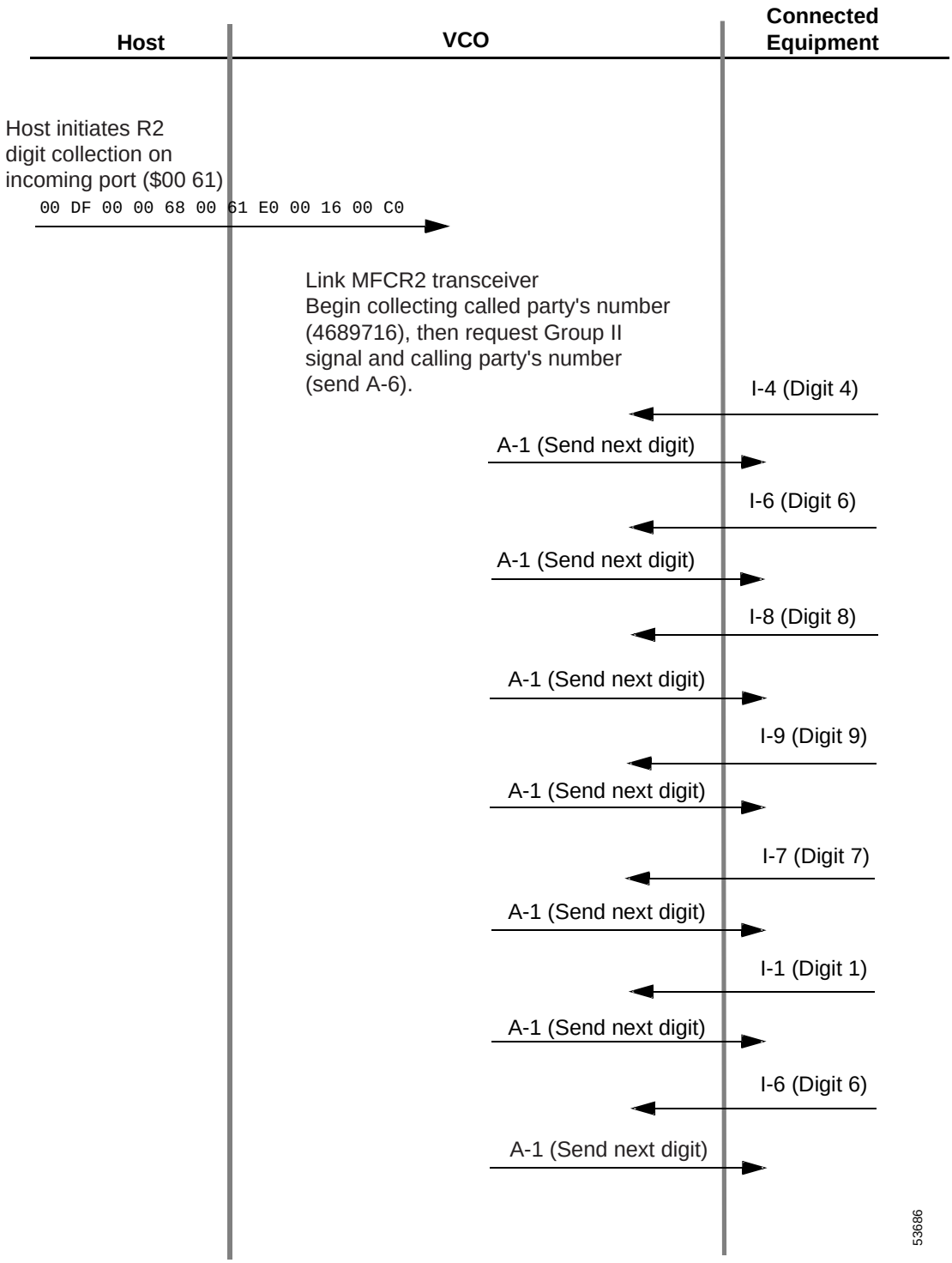


Figure 4-5 Processing Flow for Example #2, Part 2 of 3

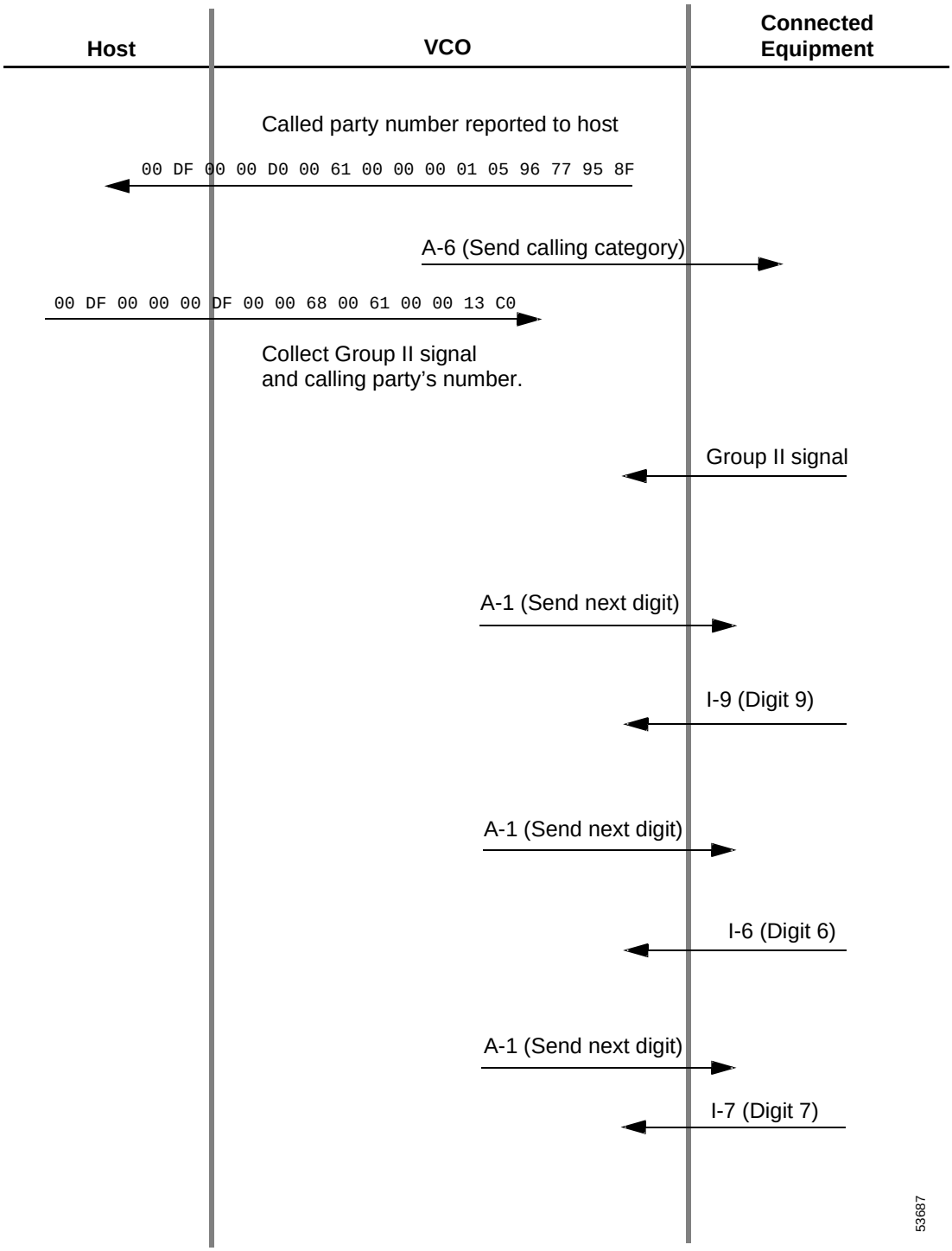
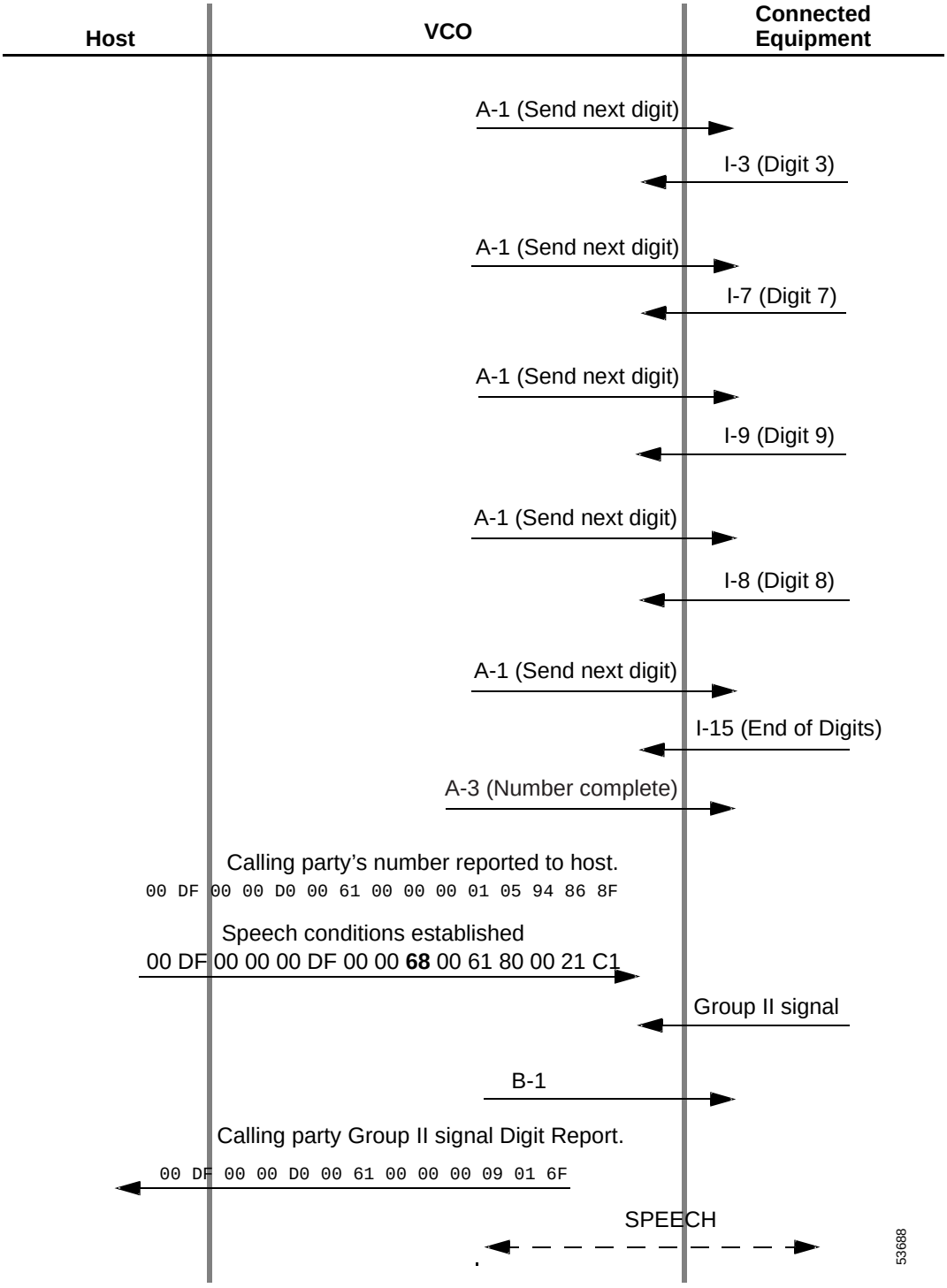


Figure 4-6 Processing Flow for Example #2, Part 3 of 3



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's 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 Group II signal and calling party's 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.

Outpulse Rule #1

- REP END
- SEIZE
- WAIT SUP W
- OP MFCR2
- OP ANI
- OP CAT 2
- 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 to 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

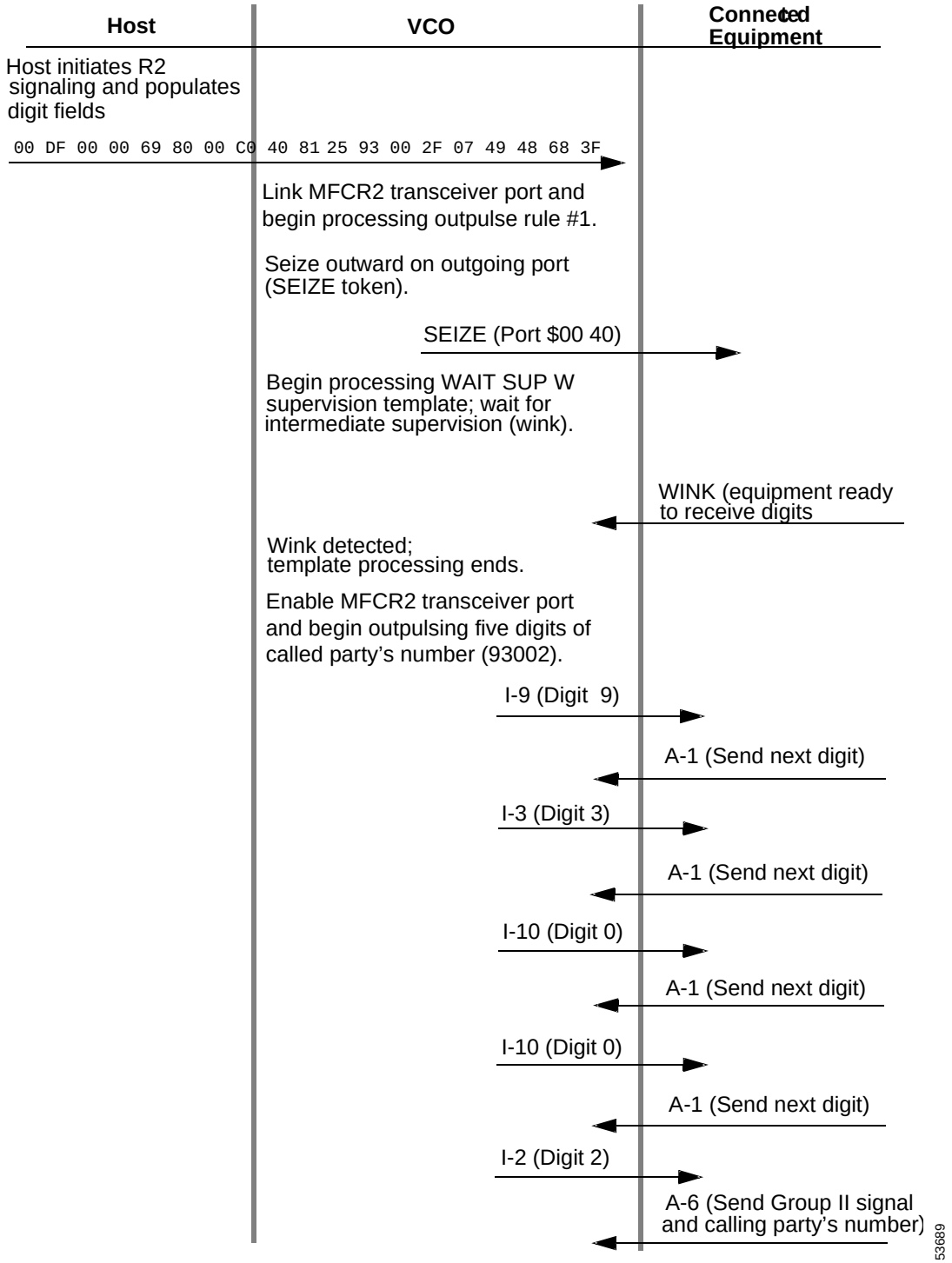


Figure 4-8 Processing Flow for Example #3, Part 2 of 3

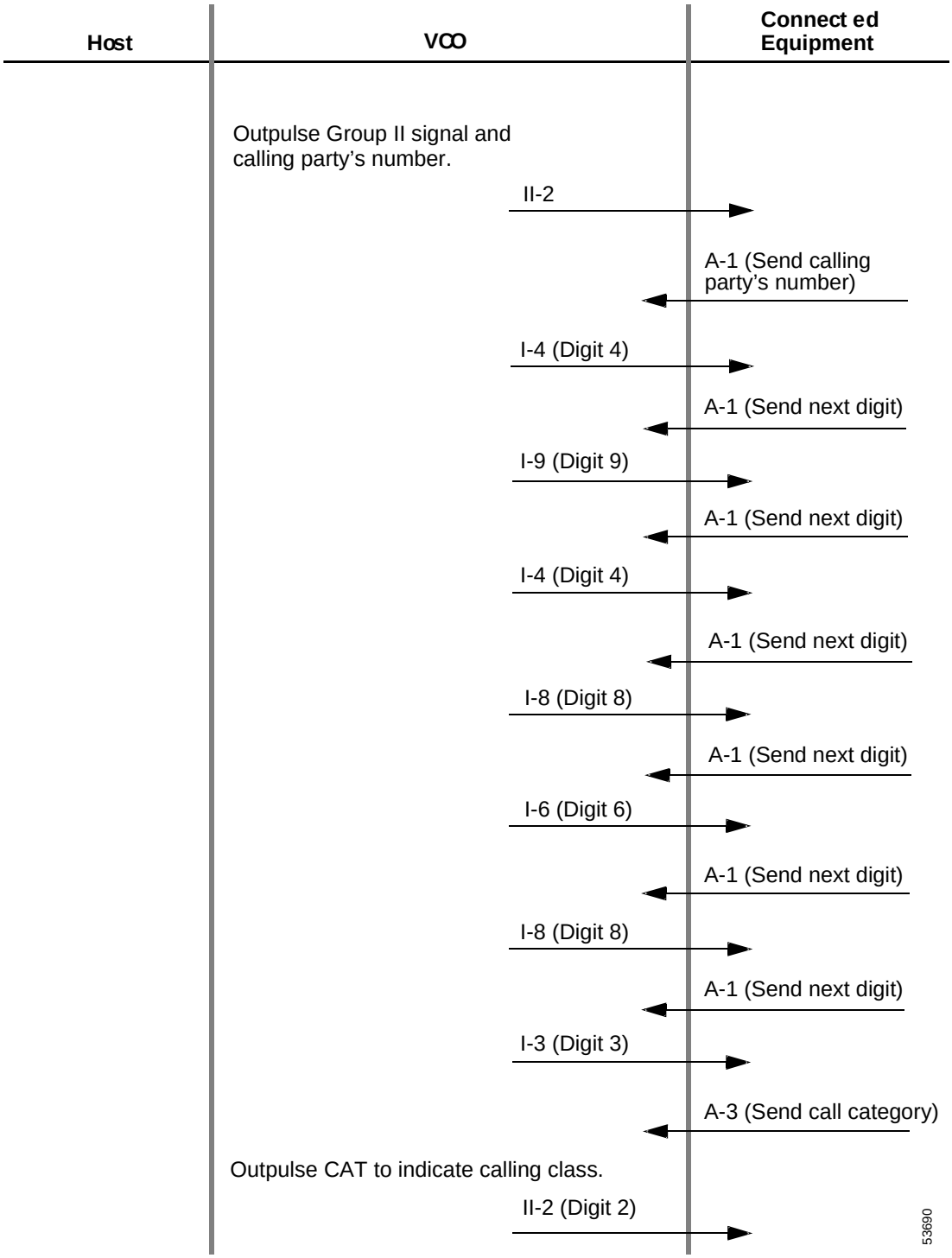


Figure 4-9 Processing Flow for Example #3, Part 3 of 3