

# E1 R2 Signaling Configuration and Troubleshooting

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## Introduction

This document offers the progressive command entries that are necessary in order to implement E1 R2 signaling. This document also offers troubleshooting information with **debug** commands.

**Note:** Before you use this document, it is recommended that you first read E1 R2 Signaling Theory.

## Prerequisites

### Requirements

Before you attempt this configuration, ensure that you meet these prerequisites:

- R2 signaling applies to E1 only.
- R2 signaling is not supported on the Cisco MC3810 router.
- In order to run R2 signaling on Cisco 2600/3600 series routers, this hardware is required:

VWIC-1MFT-E1 or VWIC-2MFT-E1 or VWIC-2MFT-E1-DI along with one of these voice density modules: NM-HDV (High Density Voice Network Module) or NM-HD-2VE (2-slot IP communications voice/fax network module) .

- Define the command **ds0-group** (or **cas-group**, based on the Cisco IOS® version) on the E1 controllers (AS5x00, Cisco 2600/3600 routers).
- Use the command **cas-custom** in order to customize the E1 R2 variants for different countries or regions.

## Components Used

The information in this document is based on this software and hardware version:

- Cisco AS5300 with Cisco IOS Software Release 12.0.7T

**Note:** E1 R2 signaling was introduced to the Cisco 2600/3600 series routers in Cisco IOS Software Releases 12.1.2XH and 12.1(3)T.

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

## Conventions

For more information on document conventions, refer to the Cisco Technical Tips Conventions.

## Configure

This section presents you with the information you can use in order to configure E1 R2.

**Note:** In order to find additional information on the commands this document uses, refer to the Command Lookup Tool (registered customers only) .

## AS5300: Cisco IOS – Voice Feature Card (VFC) Software Compatibility

Before you implement E1 R2 signaling in a Cisco AS5300 router, ensure that your version of Cisco IOS software is compatible with the Cisco VCware in the E1 module. In order to verify the Cisco IOS software compatibility, refer to the Cisco VCWare Compatibility Matrix for the Cisco AS5300. If the versions are incompatible, the digital signal processor (DSP) modules in the voice card do not load and voice signal processing does not occur.

Typically, if the version of Cisco VCWare is incompatible with the Cisco IOS software, you can enter the **show vfc slot\_number interface** command in order to see this as shown in this example.

```
eefje#show vfc 1 interface
Rx: in ptr 18, outptr 0
Tx: in ptr 14 outptr 14
0 in hw queue, 0 queue head , 0 queue tail
Hardware is VFC out-of-band channel
Interface : state RESET DSP instance (0x61048284)
dsp_number 0, Channel ID 0
TX outstanding 0, max TX outstanding 0
Received 18 packets, 1087 bytes, 0 giant packets
0 drops, 0 no buffers, 0 input errors
121 bytes output, 14 frames output
0 bounce errors 0

DSP module 1 is not installed
DSP module 2 is not installed
DSP module 3 is not installed
DSP module 4 is not installed
DSP module 5 is not installed
```

In the first example output of the **show vfc slot\_number interface** command, the DSP module number is not installed statements show that the versions are incompatible for that module number.

This second set of output is an example of the DSP modules that have the correct Cisco VCWare version loaded:

```
eefje#show vfc 1 interface
Rx: in ptr 24, outptr 0
TX: in ptr 15 outptr 15
0 in hw queue, 0 queue head , 0 queue tail
Hardware is VFC out-of-band channel
Interface : state RESET DSP instance (0x618C6088)
dsp_number 0, Channel ID 0
TX outstanding 0, max TX outstanding 0
Received 283288 packets, 15864278 bytes, 0 giant packets
0 drops, 0 no buffers, 0 input errors
1416459 bytes output, 141647 frames output
0 bounce errors 0

Slot 1, DSPM 1 (C542), DSP 1, Channel 1
State RESET, DSP instance (0x61914BDC)
TX outstanding 0, max TX outstanding 8
Received 0 packets, 0 bytes, 0 giant packets
0 drops, 0 no buffers, 0 input errors
0 bytes output, 0 frames output
0 bounce errors 0

Slot 1, DSPM 1 (C542), DSP 2, Channel 1
State RESET, DSP instance (0x6191510C)
TX outstanding 0, max TX outstanding 8
Received 0 packets, 0 bytes, 0 giant packets
0 drops, 0 no buffers, 0 input errors
0 bytes output, 0 frames output
0 bounce errors 0
```

In order to check the installed Cisco VCWare version, enter the command **show vfc slot\_number version veware**, as shown in this example:

```
eefje#show vfc 1 version veware
Voice Feature Card in Slot 1:

VCware Version : 4.10
ROM Monitor Version : 1.2
DSPware Version :
Technology : C542
```

**Note:** Make sure the Cisco VCWare technology version (c549 or c542) matches the installed VFC DSP technology (DSPM-542: single-density voice support or DSPM-549: high-density voice support).

## Configure E1 R2

Complete these steps in order to configure E1 R2:

1. Set up the controller E1 that connects to the private automatic branch exchange (PBX) or switch.  
Ensure that the framing and linecoding of the E1 are properly set.
2. For E1 framing, choose either **CRC** or **non-CRC**.
3. For E1 linecoding, choose either **HDB3** or **AMI**.
4. For the E1 clock source, choose either **internal** or **line**. Keep in mind that different PBXs have different requirements on the clock source.
5. Configure line signaling.
6. Configure interregister signaling.
7. Customize the configuration with the **cas-custom** command.

## Configure Line Signaling

Use this command sequence in order to define your line signaling.

```
eefje(config)#controller E1 0
eefje(config-controller)#ds0-group 1 timeslots 1-15 type ?
...
r2-analog          R2 ITU Q411
r2-digital         R2 ITU Q421
r2-pulse           R2 ITU Supplement 7
...
```

This is the command sequence for Cisco IOS Software Release 11.3.

```
eefje(config)#controller E1 0
eefje(config-controller)#cas-group 1 timeslot 1-15 type ?
...
```

**Note:** If you upgrade from Cisco IOS Software Release 11.3 to 12.0, the new command replaces the old one automatically.

## Configure Interregister Signaling

This command sequence example illustrates how to configure the different types of interregister signaling:

```
eefje(config)#controller E1 0
eefje(config-controller)#ds0-group 1 timeslots 1-15 type r2-digital ?
dtmf                DTMF tone signaling
r2-compelled        R2 Compelled Register Signaling
r2-non-compelled    R2 Non Compelled Register Signaling
r2-semi-compelled   R2 Semi Compelled Register Signaling
```

The Cisco implementation of R2 signaling has Dialed Number Identification Service (DNIS) support enabled by default. If you enable the Automatic Number Identification (ANI) option, the collection of DNIS information is still performed. Specification of the ANI option does not disable DNIS collection. DNIS is the number that is called. ANI is the number of the caller. For example, if you configure a router called A to call a router called B, then the DNIS number is assigned to router B and the ANI number is assigned to router A. ANI is similar to caller ID.

## E1 R2 Customization with the **cas-custom** Command

The subcommands under the command **cas-custom** are used in order to accommodate the country variants. They are also used in order to customize channel associated signaling (CAS) parameters. This command sequence illustrates how you can view all **cas-custom** command options.

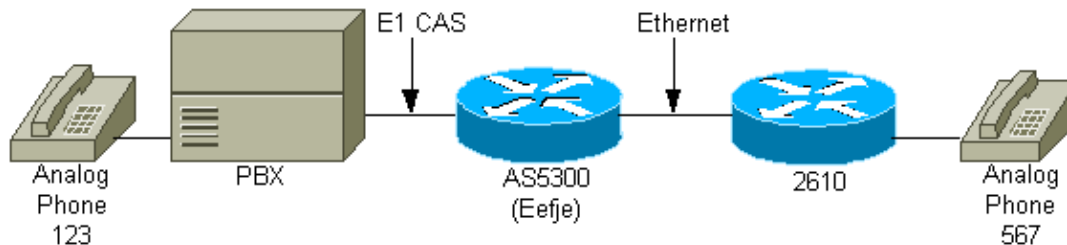
```
eefje(config)#controller E1 0
eefje(config-controller)#cas-custom 1
eefje(config-ctrl-cas)#?
CAS custom commands:
  ani-digits          Expected number of ANI digits
  ani-timeout         Timeout for ANI digits
  answer-guard-time   Wait Between Group-B Answer Signal And Line Answer
  answer-signal       Answer signal to be used
  caller-digits       Digits to be collected before requesting CallerID
  category            Category signal
  country             Country Name
  debounce-time       Debounce Timer
  default             Set a command to its defaults
  dnis-complete       Send I-15 after DNIS digits for dial-out
  dnis-digits         Expected number of DNIS digits
```

exit	Exit from cas custom mode
groupa-callerid-end	Send Group-A Caller ID End
invert-abcd	invert the ABCD bits before TX and after rx
ka	kA Signal
kd	KD Signal
metering	R2 network is sending metering signal
nc-congestion	Non Compelled Congestion signal
no	Negate a command or set its defaults
proceed-to-send	Suppress proceed-to-send signal for pulsed line signaling
release-ack	Send Release Acknowledgment to Clear Forward
release-guard-time	Release Guard Timer
request-category	DNIS Digits to be collected before requesting category
seizure-ack-time	Seizure to Acknowledge timer
unused-abcd	Unused ABCD bit values

For more information on the **cas-custom** command parameters, refer to E1 R2 Customization with the **cas-custom** command.

## Network Diagram

This document uses this network setup.



## Configurations

For the purpose of this document, these are the three different R2 configurations which are shown across the E1 interface:

- R2 Digital Non-compelled
- R2 Digital Semi-compelled
- R2 Digital Compelled ANI

The configurations have been modified in order to show only the information that this document discusses.

eefje Configured for R2 Digital Non-Compelled
<pre> hostname eefje ! controller E1 0   clock source line primary   dso-group 1 timeslots 1-15 type r2-digital r2-non-compelled   cas-custom 1  !--- For more information on these commands !--- refer to ds0-group   and cas-custom.  ! </pre>

```

voice-port 0:1
  cptone BE

!--- The cptone command is country specific. For more
!--- information on this command, refer to
cptone
.

!
dial-peer voice 123 pots
  destination-pattern 123
  direct-inward-dial
  port 0:1
  prefix 123
!
dial-peer voice 567 voip
  destination-pattern 567
  session target ipv4:2.0.0.2
!

```

### eefje Configured for R2 Digital Semi-Compelled

```

hostname eefje
!
controller E1 0
  clock source line primary
  ds0-group 1 timeslots 1-15 type r2-digital r2-semi-compelled
  cas-custom 1

!--- For more information on these commands
!--- refer to
ds0-group
  and
cas-custom
.

!
voice-port 0:1
  cptone BE

!--- The cptone command is country specific. For more
!--- information on this command, refer to
cptone
.

dial-peer voice 123 pots
  destination-pattern 123
  direct-inward-dial
  port 0:1
  prefix 123
!
dial-peer voice 567 voip
  destination-pattern 567
  session target ipv4:2.0.0.2
!

```

### eefje Configured for R2 Digital Compelled ANI

```

hostname eefje
! controller E1 0 clock source line primary ds0-group
1 timeslots 1-15 type r2-digital r2-compelled ani cas-custom 1

!--- For more information on these commands
!--- refer to
ds0-group

```

```

and
cas-custom
.

voice-port 0:1 cptone BE

!--- The cptone command is country specific. For more
!--- information on this command, refer to
cptone
.

dial-peer voice 123 pots destination-pattern 123 direct-inward-dial port
0:1 prefix 123
!
dial-peer voice 567 voip destination-pattern 567 session
target ipv4:2.0.0.2
!

```

## Verify

There is currently no verification procedure available for this configuration.

## Troubleshoot

This section provides information you can use to troubleshoot your configuration.

### Troubleshoot E1 R2 Failures

This is the troubleshooting information relevant to this configuration. Follow these instructions in order to troubleshoot your configuration.

1. Verify that controller E1 0 is up.

If it is down, check framing, line coding, clock source, alarms, replace the cable, reseal the card, and so forth . Use the E1 R2 Customization with the **cas-custom** Command document as a reference.

2. If you use an AS5300, check that the DSPs are correctly installed with the **show vfc slot number interface** command.
3. Configure direct inward dial (DID) on the plain old telephone service (POTS) peer, so that the received digits are used to choose an outgoing peer.
4. Specify **cptone** (**cptone** is specific for your country) on the voice-ports.

A **cptonecountry** command must be configured in order to match **cas-custom country** command. The **cptone** parameter sets the call progress tones for a particular country, and more importantly sets the encoding to a-law or u-law, which depends on the country. The default encoding for the US is u-law.

5. Match line and register signaling provisions to the switch configuration.
6. Turn on some of the **debugs** shown in this document and study the outputs.
7. Check for communication between the router and PBX or switch:

- ◆ Is the line seized?
- ◆ Does the router receive/send digits?
- ◆ Find out which side clears the call.

If possible, use the latest Cisco IOS software releases available on Cisco.com.

## debug and show Commands

Certain **show** commands are supported by the Output Interpreter Tool (registered customers only) , which allows you to view an analysis of **show** command output.

**Note:** Before you issue **debug** commands, refer to the Important Information on Debug Commands.

**Note:** For Cisco IOS Software Release 12.0, use these **debugs**:

- **debug cas** – For line signaling.
- **debug csm voice** – For interregister signaling.
- **debug vtsp all** – In order to have the output of all messages (digits) exchanged between the PBX and the router.

For Cisco IOS Software Release IOS 11.3, use these commands:

- **modem-mgmt csm debug-rbs** – For line signaling (You need to specify **service internal** in config mode first.).
- **debug csm voice** – For interregister signaling.
- **debug vtsp all** – In order to have the output of all messages (digits) exchanged between the PBX and the router.

For the AS5400 and AS5350 platforms, use these debugs:

- **debug sigsm r2** – For interregister signaling
- **debug vtsp all** – In order to have the output of all messages (digits) exchanged between the PBX and the router.

## Sample Debug Output

Since there are three different configurations previously shown in this document, here are three different **debugs**:

### R2 Digital Non-compelled: Incoming Call to 567

In order to understand this **debug** output better, refer to E1 R2 Signaling Theory.

```
eefje#show debug
CAS:
  Channel Associated Signaling debugging is on
CSM Voice:
  Voice Call Switching Module debugging is on
  Voice Telephony session debugging is on
  Voice Telephony dsp debugging is on
  Voice Telephony error debugging is on
eefje#
eefje#
eefje#
Jan 6 10:41:28.677: from NEAT(0): (0/0): Rx SEIZURE (ABCD=0001)
Jan 6 10:41:28.717: VDEV_ALLOCATE: failed to allocate a device
Jan 6 10:41:28.717: VDEV_ALLOCATE: 1/28 is allocated
Jan 6 10:41:28.721: csm_vtsp_init_tdm (voice_vdev=0x620BF874)
Jan 6 10:41:28.721: csm_vtsp_init_tdm: dsprm_tdm_allocate: tdm slot 2,
dspm 1, dsp 5, dsp_channel 1
Jan 6 10:41:28.721: csm_vtsp_init_tdm: dsprm_tdm_allocate: tdm stream 5,
channel 3, bank 1, bp_channel 4, BP_stream 255
Jan 6 10:41:28.721: CSM_RX_CAS_EVENT_FROM_NEAT:(cid0018): EVENT_CALL_DIAL_IN
```

at slot 2 and port 16  
Jan 6 10:41:28.721: CSM\_PROC\_IDLE: CSM\_EVENT\_START\_DIGIT\_COLLECT at slot 2,  
port 16  
Jan 6 10:41:28.721: csm\_vtsp\_start\_digit\_collect (voice\_vdev=0x620BF874)  
Jan 6 10:41:28.721: Enter csm\_connect\_pri\_vdev function  
Jan 6 10:41:28.721: csm\_connect\_pri\_vdev:tdm\_allocate\_BP\_ts()call. BP TS allocated  
at BP\_stream0, BP\_Ch28,vdev\_common 0x6 20BF8E4  
Jan 6 10:41:28.721: to NEAT:(cid0018) EVENT\_CHANNEL\_LOCK for slot0 ctrl0 chan0  
Jan 6 10:41:28.721: vtsp\_do\_call\_setup\_ind  
Jan 6 10:41:28.721: vtsp\_do\_call\_setup\_ind: Call ID=65681, guid=61FAF610  
Jan 6 10:41:28.721: vtsp\_do\_call\_setup\_ind: type=0, under\_spec=0, name=, id0=0,  
id1=0, id2=0, calling=, called=  
Jan 6 10:41:28.721: vtsp\_do\_call\_setup\_ind: redirect DN = reason =  
0vtsp\_open\_voice\_and\_set\_params  
Jan 6 10:41:28.721: dsp\_close\_voice\_channel: [0:1:0] packet\_len=8 channel\_id  
=8529 packet\_id=75  
Jan 6 10:41:28.721: dsp\_open\_voice\_channel\_20: [0:1:0] packet\_Len=16 channel\_id  
=8529 packet\_id=74 alaw\_ulaw\_select=1 associated\_signaling\_channel=0 time\_slot=0  
serial\_port=0  
Jan 6 10:41:28.721: dsp\_encap\_config\_20: [0:1:0] packet\_Len=24 channel\_id=8529  
packet\_id=92 TransportProtocol 2 t\_ssrc=0x0 r\_ssrc=0x0 t\_vpxcc=0x0 r\_vpxcc=0x0  
Jan 6 10:41:28.721: dsp\_set\_payout: [0:1:0] packet\_Len=18 channel\_id=8529  
packet\_id=76 mode=1 initial=60 min=4 max=200 fax\_nom=300  
Jan 6 10:41:28.721: dsp\_echo\_canceller\_control: [0:1:0] packet\_Len=10  
channel\_id=8529 packet\_id=66 flags=0x0  
Jan 6 10:41:28.721: dsp\_set\_gains: [0:1:0] packet\_Len=12 channel\_id=8529  
packet\_id=91 in\_gain=0 out\_gain=0  
Jan 6 10:41:28.721: dsp\_vad\_enable: [0:1:0] packet\_Len=10 channel\_id=8529  
packet\_id=78 thresh=-38  
Jan 6 10:41:28.721: dsp\_voice\_mode: [0:1:0] packet\_Len=24 channel\_id=8529  
packet\_id=73 coding\_type=1 voice\_field\_size=80 V AD\_flag=0 echo\_length=64  
comfort\_noise=1 inband\_detect=1 digit\_relay=2  
AGC\_flag=0vtsp\_do\_r2\_start\_digit(): dsp\_dtmf\_mode()  
dsp\_dtmf\_mode(VTSP\_TONE\_R2\_MF\_FORWARD\_MODE)  
Jan 6 10:41:28.725: dsp\_dtmf\_mode: [0:1:0] packet\_Len=10 channel\_id=8529  
packet\_id=65 dtmf\_or\_mf=1vtsp\_do\_r2\_start\_digit():fsm\_push(vtsp\_r2\_state\_table)  
Jan 6 10:41:28.725: csm\_vtsp\_call\_setup\_resp (vdev\_info=0x620BF874,  
vtsp\_cdb=0x621C5F3C)  
Jan 6 10:41:28.725: csm\_vtsp\_call\_setup\_resp:vdev\_common BP TS allocatedat  
BP\_stream0,BP\_Ch28  
Jan 6 10:41:28.725: csm\_vtsp\_call\_setup\_resp:dst\_tdm\_chnl call. BP TS allocatedat  
stream 5, chan 3,BP\_stream 255, BP\_ch 4  
Jan 6 10:41:28.725: csm\_vtsp\_call\_setup\_resp:DST\_tdm\_chnl call. BP TS allocatedat  
stream 5, chan 3,BP\_stream 0, BP\_ch 28  
Jan 6 10:41:28.725: CSM\_PROC\_IC1\_COLLECT\_ADDR\_INFO: CSM\_EVENT\_MODEM\_OFFHOOK  
(DNIS=, ANI=) at slot 2, port 16  
Jan 6 10:41:28.725: R2 Incoming Voice(2/16): DSX (E1 0:0): STATE: R2\_IN\_IDLE R2  
**Got Event R2\_START**  
Jan 6 10:41:28.821: CSM\_RX\_CAS\_EVENT\_FROM\_NEAT:(0018):EVENT\_START\_RX\_TONE at slot 2  
and port 16  
Jan 6 10:41:28.821: from NEAT(0): (0/0): **TX SEIZURE\_ACK** (ABCD=1101)

*!--- Digit 5 is sent: Forward Signal Group I-5.*

Jan 6 10:41:29.233: vtsp\_process\_dsp\_message:  
**MSG\_TX\_DTMF\_DIGIT\_BEGIN: digit=5,**  
rtp\_timestamp=0x0CA95D43 dc\_digit\_up  
Jan 6 10:41:29.233: csm\_vtsp\_digit\_ready\_up (vtsp\_cdb=0x621C5F3C) received digit (5)  
Jan 6 10:41:29.233: CSM voice (2/16): Rcvd Digit detected(5)  
Jan 6 10:41:29.233: R2 Incoming Voice(2/16): DSX (E1 0:0):  
**STATE: R2\_IN\_COLLECT\_DNIS R2**  
Got Event 5  
Jan 6 10:41:29.365: vtsp\_process\_dsp\_message: MSG\_TX\_DTMF\_DIGIT\_OFF: digit=5,  
duration=8321dc\_digit  
Jan 6 10:41:29.365: csm\_vtsp\_digit\_ready (vtsp\_cdb=0x621C5F3C) received digit (5)  
Jan 6 10:41:29.365: CSM voice (2/16): Rcvd Digit detected(5)

Jan 6 10:41:29.365: R2 Incoming Voice(2/16): DSX (E1 0:0):  
**STATE:R2\_IN\_COLLECT\_DNIS R2**  
**Got Event R2\_TONE\_OFF**

*!--- Digit 6 is sent: Forward Signal Group I-6.*

Jan 6 10:41:29.593: vtsp\_process\_dsp\_message:  
**MSG\_TX\_DTMF\_DIGIT\_BEGIN: digit=6,**  
rtp\_timestamp=0x0CA95D43 dc\_digit\_up  
Jan 6 10:41:29.593: csm\_vtsp\_digit\_ready\_up (vtsp\_cdb=0x621C5F3C) received digit (6)  
Jan 6 10:41:29.593: CSM voice (2/16): Rcvd Digit detected(6)  
Jan 6 10:41:29.593: R2 Incoming Voice(2/16): DSX (E1 0:0):  
**STATE: R2\_IN\_COLLECT\_DNIS R2**  
Got Event 6  
Jan 6 10:41:29.725: vtsp\_process\_dsp\_message: **MSG\_TX\_DTMF\_DIGIT\_OFF: digit=6,**  
duration=8321dc\_digit  
Jan 6 10:41:29.725: csm\_vtsp\_digit\_ready (vtsp\_cdb=0x621C5F3C) received digit (6)  
Jan 6 10:41:29.725: CSM voice (2/16): Rcvd Digit detected(6)  
Jan 6 10:41:29.725: R2 Incoming Voice(2/16): DSX (E1 0:0):  
**STATE: R2\_IN\_COLLECT\_DNIS R2**  
**Got Event R2\_TONE\_OFF**

*!--- Digit 7 is sent: Forward Signal Group I-7.*

Jan 6 10:41:29.953: vtsp\_process\_dsp\_message: **MSG\_TX\_DTMF\_DIGIT\_BEGIN:**  
**digit=7, rtp\_timestamp=0x0CA95D43 dc\_digit\_up**  
Jan 6 10:41:29.953: csm\_vtsp\_digit\_ready\_up (vtsp\_cdb=0x621C5F3C)  
received digit (7)  
Jan 6 10:41:29.953: CSM voice (2/16): Rcvd Digit detected(7)  
Jan 6 10:41:29.953: R2 Incoming Voice(2/16): DSX (E1 0:0):  
**STATE:R2\_IN\_COLLECT\_DNIS R2**  
**Got Event 7**  
Jan 6 10:41:30.085: vtsp\_process\_dsp\_message: **MSG\_TX\_DTMF\_DIGIT\_OFF:**  
digit=7, duration=8321dc\_digit  
Jan 6 10:41:30.085: csm\_vtsp\_digit\_ready (vtsp\_cdb=0x621C5F3C)received digit (7)  
Jan 6 10:41:30.085: CSM voice (2/16): Rcvd Digit detected(7)  
Jan 6 10:41:30.085: R2 Incoming Voice(2/16): DSX (E1 0:0):  
**STATE: R2\_IN\_COLLECT\_DNIS R2**  
**Got Event R2\_TONE\_OFF**

*!--- Timeout: 3 seconds (default timer - AS5300 assumes DNIS is finished).*

Jan 6 10:41:32.953: R2 Incoming Voice(2/16): DSX (E1 0:0):  
**STATE: R2\_IN\_COLLECT\_DNIS R2**  
**Got Event R2\_TONE\_TIMER**

*!--- Send digit 6: Backward Signal Group B-6 (subscriber's line free-charge).*

Jan 6 10:41:32.953: vtsp\_r2\_generate\_digits: vdev\_common=0x620BF8E4,  
string=567dc\_dial()  
vtsp\_dial\_nopush **dsp\_dtmf\_dialing(): dial\_string = 6#**  
  
Jan 6 10:41:32.953: dsp\_dtmf\_dialing: [0:1:0] packet\_Len=36 channel\_id=8529  
packet\_id=90 string=6# digits=2, time\_on=150, time\_off=30  
Jan 6 10:41:32.953:& digit=e, components=2, freq\_of\_first=900,  
freq\_of\_second=780, amp\_of\_first=8192, amp\_of\_second=8192  
Jan 6 10:41:32.953: digit=o, components=2, freq\_of\_first=0,  
freq\_of\_second=0, amp\_of\_first=1, amp\_of\_second=1  
Jan 6 10:41:33.313: vtsp\_process\_dsp\_message:  
**MSG\_TX\_DIALING\_DONE dc\_dialing\_done()**  
Jan 6 10:41:33.313: R2 Incoming Voice(2/16): DSX (E1 0:0):  
**STATE:R2\_IN\_ANSWER\_PULSE R2**  
**Got Event R2\_DIGITS\_GENR2\_ALERTING**  
Jan 6 10:41:34.313: R2 Incoming Voice(2/16): DSX (E1 0:0):  
**STATE: R2\_IN\_ANSWER\_PULSE R2**  
**Got Event R2\_TONE\_TIMER**

```
Jan 6 10:41:34.313: R2_IN_IDLE:2 r2_in_connect called
Jan 6 10:41:34.313: CSM_PROC_IC1_COLLECT_ADDR_INFO:
  CSM_EVENT_ADDR_INFO_COLLECTED (DNIS=567, ANI=) at slot 2, port 16
Jan 6 10:41:34.313: vtsp_tsp_call_accept_check (sdb=0x61B8F0E0, calling_number=
  called_number=567): peer_tag=0
Jan 6 10:41:34.313: VDEV_ALLOCATE: failed to allocate a device
Jan 6 10:41:34.313: VDEV_ALLOCATE_ALMOST_READY: failed to allocate a non-idle modem
Jan 6 10:41:34.313: VDEV_ALLOCATE: failed to allocate a device
Jan 6 10:41:34.313: VDEV_ALLOCATE_ALMOST_READY: failed to allocate a non-idle modem
Jan 6 10:41:34.313: VDEV_ALLOCATE: failed to allocate a device
Jan 6 10:41:34.313: VDEV_ALLOCATE_ALMOST_READY: failed to allocate a non-idle modem
Jan 6 10:41:34.313: CSM_PROC_IC3_WAIT_FOR_RES_RESP: CSM_EVENT_RESOURCE_OK at slot 2,
  port 16
Jan 6 10:41:34.313: vtsp_ic_switch : (voice_vdev= 0x620BF874)
Jan 6 10:41:34.313: vtsp_tsp_call_switch_ind (cdb=0x621C5F3C, tsp_info=0x620BF874,
  calling_number= called_number=567 redir ect_number=):
peer_tag=123dc_switch: fsm_pop()
Jan 6 10:41:34.313: vtsp_do_call_setup_ind
Jan 6 10:41:34.313: vtsp_do_call_setup_ind: Call ID=65683, guid=61FAF610
Jan 6 10:41:34.313: vtsp_do_call_setup_ind: type=0, under_spec=0,
  name=ab^Lx, id0=1, id1=0, id2=0, calling=123, called=567
Jan 6 10:41:34.317: dsp_cp_tone_off: [] packet_Len=8 channel_id=8529 packet_id=71
Jan 6 10:41:34.317: dsp_idle_mode: [] packet_Len=8 channel_id=8529 packet_id=68
Jan 6 10:41:34.317: dsp_close_voice_channel: [] packet_Len=8 channel_id=8529
  packet_id=75
Jan 6 10:41:34.317: vtsp_timer_stop: 67475758
Jan 6 10:41:34.317: csm_vtsp_call_setup_resp (vdev_info=0x620BF874,
  vtsp_cdb=0x621C5F3C)
Jan 6 10:41:34.317: csm_vtsp_call_setup_resp:vdev_common
BP TS allocatedat BP_stream0,
  BP_Ch28
Jan 6 10:41:34.317: csm_vtsp_call_setup_resp:DST_tdm_chnl call. BP TS allocatedat
  stream 5, chan 3,BP_stream 0, BP_ch 28
Jan 6 10:41:34.317: csm_vtsp_call_setup_resp:DST_tdm_chnl call. BP TS allocatedat
  stream 5, chan 3,BP_stream 0, BP_ch 28vt sp_open_voice_and_set_params
Jan 6 10:41:34.317: dsp_close_voice_channel: [0:1 (54)] packet_Len=8 channel_id=8529
  packet_id=75
Jan 6 10:41:34.317: dsp_open_voice_channel_20: [0:1 (54)] packet_Len=16
  channel_id=8529
  packet_id=74 alaw_ulaw_select=1 associated_signaling_channel=0 time_slot=0
  serial_port=0
Jan 6 10:41:34.317: dsp_encap_config_20: [0:1 (54)] packet_Len=24 channel_id=8529
  packet_id=92 TransportProtocol 2 t_ssrc=0x0 r_ssrc=0x0 t_vpxcc=0x0 r_vpxcc=0x0
Jan 6 10:41:34.317: dsp_set_payout: [0:1 (54)] packet_Len=18 channel_id=8529
  packet_id=76 mode=1 initial=60 min=4 max=200 fax_nom=300
Jan 6 10:41:34.317: dsp_echo_canceller_control: [0:1 (54)] packet_Len=10
  channel_id=8529
  packet_id=66 flags=0x0
Jan 6 10:41:34.317: dsp_set_gains: [0:1 (54)] packet_Len=12
  channel_id=8529 packet_id=91
  in_gain=0 out_gain=0
Jan 6 10:41:34.317: dsp_vad_enable: [0:1 (54)] packet_Len=10
  channel_id=8529 packet_id=78
  thresh=-38act_proceeding
Jan 6 10:41:34.321: csm_vtsp_call_proceeding:DST_tdm_chnl call.
BP TS allocatedstream 5,
  chan 3,BP_stream 0, BP_ch 28act_alert
Jan 6 10:41:34.345: vtsp_ring_noan_timer_start: 67475761
Jan 6 10:41:34.345: csm_vtsp_call_alert (vtsp_cdb=0x621C5F3C)act_bridge act_caps_ind
Jan 6 10:41:34.589: act_caps_ind:Encap 1, Vad 2, Codec 0x4, CodecBytes 20,
  FaxRate 2, FaxBytes 20 SignalType 0
  DtmfRelay 1, Modem lact_caps_ack
Jan 6 10:41:34.589: dsp_idle_mode: [0:1 (54)] packet_Len=8
  channel_id=8529 packet_id=68
Jan 6 10:41:34.589: act_caps_ack: codec = 15, ret = 1
Jan 6 10:41:34.589: dsp_cp_tone_off: [0:1 (54)] packet_Len=8 channel_id=8529
```

```

packet_id=71
Jan 6 10:41:34.589: dsp_idle_mode: [0:1 (54)] packet_Len=8
channel_id=8529 packet_id=68
Jan 6 10:41:34.589: dsp_encap_config_20: [0:1 (54)] packet_Len=24 channel_id=8529
packet_id=92 TransportProtocol 2 t_ssrc=0x0 r_ssrc=0x0 t_vpxcc=0x0 r_vpxcc=0x0
Jan 6 10:41:34.589: dsp_voice_mode: [0:1 (54)] packet_Len=24 channel_id=8529
packet_id=73 coding_type=20 voice_field_size=20 VAD_flag=1 echo_length=64
comfort_noise=1 inband_detect=1 digit_relay=2 AGC_flag=0act_alert_connect
Jan 6 10:41:36.857: vtsp_ring_noan_timer_stop: 67476012
Jan 6 10:41:36.857: dsp_cp_tone_off: [0:1 (54)] packet_Len=8 channel_id=8529
packet_id=71
Jan 6 10:41:36.857: csm_vtsp_call_connect (vtsp_cdb=0x621C5F3C,
voice_vdev=0x620BF874)
Jan 6 10:41:36.857: CSM_IC5_WAIT_FOR_SWITCH_OVER: CSM_EVENT_MODEM_OFFHOOK
at slot 2, port 16
Jan 6 10:41:36.917: CSM_RX_CAS_EVENT_FROM_NEAT:(0018): EVENT_CHANNEL_CONNECTED
at slot 2 and port 16
Jan 6 10:41:36.917: CSM_PROC_IC6_WAIT_FOR_CONNECT: CSM_EVENT_DSX0_CONNECTED
at slot 2, port 16
Jan 6 10:41:36.921: from NEAT(0): (0/0): TX ANSWERED(ABCD=0101)
eefje#

```

## R2 Digital Semi-compelled: Incoming Call to 567

In order to understand this **debug output** better, refer to E1 R2 Signaling Theory.

```

eefje#show debug
CAS:
Channel Associated Signaling debugging is on
CSM Voice:
Voice Call Switching Module debugging is on
Voice Telephony session debugging is on
Voice Telephony dsp debugging is on
Voice Telephony error debugging is on
eefje#
eefje#
eefje#
Jan 6 09:53:42.389: from NEAT(0): (0/2): Rx SEIZURE(ABCD=0001)
Jan 6 09:53:42.433: VDEV_ALLOCATE: failed to allocate a device
Jan 6 09:53:42.433: VDEV_ALLOCATE: 1/27 is allocated
Jan 6 09:53:42.433: csm_vtsp_init_tdm (voice_vdev=0x620BF320)
Jan 6 09:53:42.433: csm_vtsp_init_tdm: dsprm_tdm_allocate: tdm slot 2, dsprm 1,
dsp 4, dsp_channel 4
Jan 6 09:53:42.433: csm_vtsp_init_tdm: dsprm_tdm_allocate: tdm stream 7, channel 0,
bank 4, BP_channel 3, BP_stream 255
Jan 6 09:53:42.433: CSM_RX_CAS_EVENT_FROM_NEAT:(cid0017): EVENT_CALL_DIAL_IN
at slot 2 and port 15
Jan 6 09:53:42.433: CSM_PROC_IDLE: CSM_EVENT_START_DIGIT_COLLECT
at slot 2, port 15
Jan 6 09:53:42.433: csm_vtsp_start_digit_collect (voice_vdev=0x620BF320)
Jan 6 09:53:42.433: Enter csm_connect_pri_vdev function
Jan 6 09:53:42.433: csm_connect_pri_vdev:tdm_allocate_BP_Ts()call. BP TS allocated
at BP_stream0, BP_Ch27,vdev_common 0x6 20BF390
Jan 6 09:53:42.433: to NEAT:(cid0017) EVENT_CHANNEL_LOCK for slot0 ctrl0 chan2
Jan 6 09:53:42.433: vtsp_do_call_setup_ind
Jan 6 09:53:42.433: vtsp_do_call_setup_ind: Call ID=65675, guid=61FAF610
Jan 6 09:53:42.433: vtsp_do_call_setup_ind: type=0, under_spec=0, name=, id0=0,
idl=0, id2=0, calling=, called=
Jan 6 09:53:42.433: vtsp_do_call_setup_ind: redirect DN = reason =
0vtsp_open_voice_and_set_params
Jan 6 09:53:42.433: dsp_close_voice_channel: [0:1:2] packet_Len=8 channel_id=8516
packet_id=75
Jan 6 09:53:42.433: dsp_open_voice_channel_20: [0:1:2] packet_Len=16
channel_id=8516
packet_id=74 alaw_ulaw_select=1 associated_signaling_channel=0

```

```

time_slot=1 serial_port=1
Jan 6 09:53:42.433: dsp_encap_config_20: [0:1:2] packet_Len=24 channel_id=8516
packet_id=92 TransportProtocol 2 t_ssrc=0x0 r_ssrc=0x0 t_vpxcc=0x0 r_vpxcc=0x0
Jan 6 09:53:42.433: dsp_set_payout: [0:1:2] packet_Len=18 channel_id=8516
packet_id=76 mode=1 initial=60 min=4 max=200 fax_nom=300
Jan 6 09:53:42.433: dsp_echo_canceller_control: [0:1:2]
packet_Len=10 channel_id=8516
packet_id=66 flags=0x0
Jan 6 09:53:42.437: dsp_set_gains:[0:1:2] packet_Len=12
channel_id=8516 packet_id=91
in_gain=0 out_gain=0
Jan 6 09:53:42.437: dsp_vad_enable: [0:1:2] packet_Len=10 channel_id=8516
packet_id=78 thresh=-38
Jan 6 09:53:42.437: dsp_voice_mode: [0:1:2] packet_Len=24 channel_id=8516
packet_id=73 coding_type=1 voice_field_size=80 VAD_flag=0 echo_length=64
comfort_noise=1 inband_detect=1 digit_relay=2 AGC_flag=0vtsp_do_r2_start_digit():
dsp_dtmf_mode() dsp_dtmf_mode(VTSP_TONE_R2_MF_FORWARD_MODE)
Jan 6 09:53:42.437: dsp_dtmf_mode: [0:1:2] packet_Len=10 channel_id=8516
packet_id=65 dtmf_or_mf=1vtsp_do_r2_start_digit(): fsm_push(vtsp_r2_state_table)
Jan 6 09:53:42.437: csm_vtsp_call_setup_resp (vdev_info=0x620BF320,
vtsp_cdb=0x621C5F3C)
Jan 6 09:53:42.437: csm_vtsp_call_setup_resp:vdev_common BP
TS allocatedat BP_stream0,
BP_Ch27
Jan 6 09:53:42.437: csm_vtsp_call_setup_resp:DST_tdm_chnl call. BP TS allocatedat
stream 7, chan 0,BP_stream 255, BP_ch 3
Jan 6 09:53:42.437: csm_vtsp_call_setup_resp:DST_tdm_chnl call. BP TS allocatedat
stream 7, chan 0,BP_stream 0, BP_ch 27
Jan 6 09:53:42.437: CSM_PROC_IC1_COLLECT_ADDR_INFO: CSM_EVENT_MODEM_OFFHOOK
(DNIS=, ANI=) at slot 2, port 15
Jan 6 09:53:42.437: R2 Incoming Voice(2/15): DSX (E1 0:2): STATE:R2_IN_IDLE R2
Got Event R2_START
Jan 6 09:53:42.533: CSM_RX_CAS_EVENT_FROM_NEAT:(0017):EVENT_START_RX_TONE
at slot 2 and port 15
Jan 6 09:53:42.533: from NEAT(0): (0/2): TX SEIZURE_ACK (ABCD=1101)

!--- Digit 5 is sent: Forward Signal Group I-5.

Jan 6 09:53:42.641: vtsp_process_dsp_message: MSG_TX_DTMF_DIGIT_BEGIN:
digit=5, rtp_timestamp=0x9330B42B dc_digit_up
Jan 6 09:53:42.641: csm_vtsp_digit_ready_up (vtsp_cdb=0x621C5F3C) received digit (5)
Jan 6 09:53:42.641: CSM voice (2/15): Rcvd Digit detected(5)
Jan 6 09:53:42.641: R2 Incoming Voice(2/15): DSX (E1 0:2):
STATE:R2_IN_COLLECT_DNIS R2
Got Event 5

!--- Digit 1 sent (pulse): Backward Signal Group A-1 (Send next digit)
!--- "#" this indicates that it is a pulse).

Jan 6 09:53:42.641: vtsp_r2_generate_digits: vdev_common=0x620BF390,
string=5dc_dial()
vtsp_dial_nopush dsp_dtmf_dialing(): dial_string = 1#

Jan 6 09:53:42.641: dsp_dtmf_dialing: [0:1:2] packet_Len=36 channel_id=8516
packet_id=90 string=1# digits=2, time_on=150, time_off=30
Jan 6 09:53:42.641: digit=`, components=2, freq_of_first=1020,
freq_of_second=1140,
amp_of_first=8192, amp_of_second=8192
Jan 6 09:53:42.641: digit=o, components=2, freq_of_first=0, freq_of_second=0,
amp_of_first=1, amp_of_second=1
Jan 6 09:53:42.741: vtsp_process_dsp_message: MSG_TX_DTMF_DIGIT_OFF: digit=5,
duration=8291dc_digit
Jan 6 09:53:42.741: csm_vtsp_digit_ready (vtsp_cdb=0x621C5F3C) received digit (5)
Jan 6 09:53:42.741: CSM voice (2/15): Rcvd Digit detected(5)
Jan 6 09:53:42.741: R2 Incoming Voice(2/15): DSX (E1 0:2):
STATE:R2_IN_COLLECT_DNIS R2

```

**Got Event R2\_TONE\_OFF**

*!--- Digit 6 is sent: Forward Signal Group I.*

Jan 6 09:53:42.881: vtsp\_process\_dsp\_message: MSG\_TX\_DTMF\_DIGIT\_BEGIN:  
digit=6, rtp\_timestamp=0x9330B42B dc\_digit\_up  
Jan 6 09:53:42.881: csm\_vtsp\_digit\_ready\_up (vtsp\_cdb=0x621C5F3C)received digit (6)  
Jan 6 09:53:42.881: CSM voice (2/15): Rcvd Digit detected(6)  
Jan 6 09:53:42.881: R2 Incoming Voice(2/15): DSX (E1 0:2):  
STATE:R2\_IN\_COLLECT\_DNIS R2  
**Got Event 6**

*!--- Digit 1 sent (pulse): Backward Signal Group A-1. (Send next digit.)*

Jan 6 09:53:42.881: vtsp\_r2\_generate\_digits: vdev\_common=0x620BF390,  
string=56dc\_dial()  
vtsp\_dial\_nopush **dsp\_dtmf\_dialing(): dial\_string = 1#**  
  
Jan 6 09:53:42.881: dsp\_dtmf\_dialing: [0:1:2] packet\_Len=36 channel\_id=8516  
packet\_id=90 string=1# digits=2, time\_on=150, time\_off=30  
Jan 6 09:53:42.881: digit=` , components=2, freq\_of\_first=1020,  
freq\_of\_second=1140,  
amp\_of\_first=8192, amp\_of\_second=8192  
Jan 6 09:53:42.881: digit=o, components=2, freq\_of\_first=0, freq\_of\_second=0,  
amp\_of\_first=1, amp\_of\_second=1  
Jan 6 09:53:42.981: vtsp\_process\_dsp\_message: MSG\_TX\_DTMF\_DIGIT\_OFF: digit=6,  
duration=8291dc\_digit  
Jan 6 09:53:42.981: csm\_vtsp\_digit\_ready (vtsp\_cdb=0x621C5F3C) received digit (6)  
Jan 6 09:53:42.981: CSM voice (2/15): Rcvd Digit detected(6)  
Jan 6 09:53:42.981: R2 Incoming Voice(2/15): DSX (E1 0:2):  
**STATE:R2\_IN\_COLLECT\_DNIS R2**  
**Got Event R2\_TONE\_OFF**

*!--- Digit 7 is sent: Forward Signal Group I-7.*

Jan 6 09:53:43.121: vtsp\_process\_dsp\_message: **MSG\_TX\_DTMF\_DIGIT\_BEGIN:**  
**digit=7**, rtp\_timestamp=0x9330B42B dc\_digit\_up  
Jan 6 09:53:43.121: csm\_vtsp\_digit\_ready\_up (vtsp\_cdb=0x621C5F3C)received digit (7)  
Jan 6 09:53:43.121: CSM voice (2/15): Rcvd Digit detected(7)  
Jan 6 09:53:43.121: R2 Incoming Voice(2/15): DSX (E1 0:2):  
STATE:R2\_IN\_COLLECT\_DNIS R2  
**Got Event 7**

*!--- Send digit 1 (pulse): Backward Signal Group A-1.*

Jan 6 09:53:43.121: vtsp\_r2\_generate\_digits: vdev\_common=0x620BF390,  
string=567dc\_dial()  
vtsp\_dial\_nopush **dsp\_dtmf\_dialing(): dial\_string = 1#**  
  
Jan 6 09:53:43.121: dsp\_dtmf\_dialing: [0:1:2] packet\_Len=36 channel\_id=8516  
packet\_id=90 string=1# digits=2, time\_on=150, time\_off=30  
Jan 6 09:53:43.121: digit=` , components=2, freq\_of\_first=1020,  
freq\_of\_second=1140,  
amp\_of\_first=8192, amp\_of\_second=8192  
Jan 6 09:53:43.121: digit=o, components=2, freq\_of\_first=0, freq\_of\_second=0,  
amp\_of\_first=1, amp\_of\_second=1  
Jan 6 09:53:43.221: vtsp\_process\_dsp\_message: MSG\_TX\_DTMF\_DIGIT\_OFF: digit=7,  
duration=8291dc\_digit  
Jan 6 09:53:43.221: csm\_vtsp\_digit\_ready (vtsp\_cdb=0x621C5F3C) received digit (7)  
Jan 6 09:53:43.221: CSM voice (2/15): Rcvd Digit detected(7)  
Jan 6 09:53:43.221: R2 Incoming Voice(2/15): DSX (E1 0:2):  
**STATE:R2\_IN\_COLLECT\_DNIS R2**  
**Got Event R2\_TONE\_OFF**  
Jan 6 09:53:43.489: vtsp\_process\_dsp\_message: MSG\_TX\_DIALING\_DONEdc\_dialing\_done()

*!--- Timeout is 3 seconds.*

Jan 6 09:53:46.121: R2 Incoming Voice(2/15): DSX (E1 0:2):

**STATE:R2\_IN\_COLLECT\_DNIS R2**

**Got Event R2\_TONE\_TIMER**

*!--- Digit 3 sent(pulse): Backward Signal Group A-3.*

*!--- (Address-complete, changeover to reception of Group-B signals).*

Jan 6 09:53:46.121: vtsp\_r2\_generate\_digits: vdev\_common=0x620BF390,  
string=567dc\_dial()

vtsp\_dial\_nopush dsp\_dtmf\_dialing(): dial\_string = 3#

Jan 6 09:53:46.121: dsp\_dtmf\_dialing: [0:1:2] packet\_Len=36 channel\_id=8516  
packet\_id=90 string=3# digits=2, time\_on=150, time\_off=30

Jan 6 09:53:46.121: digit=b, components=2, freq\_of\_first=1020,  
freq\_of\_second=900,

amp\_of\_first=8192, amp\_of\_second=8192

Jan 6 09:53:46.121: digit=o, components=2, freq\_of\_first=0,  
freq\_of\_second=0, amp\_of\_first=1, amp\_of\_second=1

*!--- Digit 1 is sent: Forward Signal Group II-1*

*!--- (subscriber without priority).*

Jan 6 09:53:46.361: vtsp\_process\_dsp\_message: **MSG\_TX\_DTMF\_DIGIT\_BEGIN:**

**digit=1**, rtp\_timestamp=0x9330B42B dc\_digit\_up

Jan 6 09:53:46.361: csm\_vtsp\_digit\_ready\_up (vtsp\_cdb=0x621C5F3C)

received digit (1)

Jan 6 09:53:46.361: CSM voice (2/15): Rcvd Digit detected(1)

Jan 6 09:53:46.361: R2 Incoming Voice(2/15): DSX (E1 0:2):

**STATE:R2\_IN\_CATEGORY R2**

**Got Event 1**

Jan 6 09:53:46.361: r2\_comp\_category:R2\_ALERTING

*!--- Digit 6 sent (pulse): Backward Signal Group B-6*

*!--- (the subscriber line free of charge).*

Jan 6 09:53:46.361: vtsp\_r2\_generate\_digits: vdev\_common=0x620BF390,  
string=567dc\_dial()

vtsp\_dial\_nopush **dsp\_dtmf\_dialing(): dial\_string = 6#**

Jan 6 09:53:46.361: dsp\_dtmf\_dialing: [0:1:2] packet\_Len=36 channel\_id=8516  
packet\_id=90 string=6# digits=2, time\_on=150, time\_off=30

Jan 6 09:53:46.361: digit=e, components=2, freq\_of\_first=900,  
freq\_of\_second=780,

amp\_of\_first=8192, amp\_of\_second=8192

Jan 6 09:53:46.361: digit=o, components=2, freq\_of\_first=0, freq\_of\_second=0,  
amp\_of\_first=1, amp\_of\_second=1

Jan 6 09:53:46.461: vtsp\_process\_dsp\_message: MSG\_TX\_DTMF\_DIGIT\_OFF:digit=1,  
duration=8291dc\_digit

Jan 6 09:53:46.461: csm\_vtsp\_digit\_ready (vtsp\_cdb=0x621C5F3C)received digit (1)

Jan 6 09:53:46.461: CSM voice (2/15): Rcvd Digit detected(1)

Jan 6 09:53:46.461: R2 Incoming Voice(2/15): DSX (E1 0:2): **STATE:R2\_IN\_COMPLETE R2**

**Got Event R2\_TONE\_OFF**

Jan 6 09:53:46.729: vtsp\_process\_dsp\_message: MSG\_TX\_DIALING\_DONEdc\_dialing\_done()

Jan 6 09:53:47.461: R2 Incoming Voice(2/15): DSX (E1 0:2):

**STATE:R2\_IN\_WAIT\_GUARD R2**

**Got Event R2\_TONE\_TIMER**

Jan 6 09:53:47.461: R2\_IN\_IDLE:2 r2\_in\_connect called

Jan 6 09:53:47.461: CSM\_PROC\_IC1\_COLLECT\_ADDR\_INFO: CSM\_EVENT\_ADDR\_INFO\_COLLECTED  
(DNIS=567, ANI=) at slot 2, port 15

Jan 6 09:53:47.461: vtsp\_tsp\_call\_accept\_check (sdb=0x61B8F0E0,calling\_number=  
called\_number=567): peer\_tag=0

Jan 6 09:53:47.461: VDEV\_ALLOCATE: failed to allocate a device

Jan 6 09:53:47.461: VDEV\_ALLOCATE\_ALMOST\_READY: failed to allocate a non-idle modem

Jan 6 09:53:47.461: VDEV\_ALLOCATE: failed to allocate a device

Jan 6 09:53:47.461: VDEV\_ALLOCATE\_ALMOST\_READY: failed to allocate a non-idle modem

Jan 6 09:53:47.461: VDEV\_ALLOCATE: failed to allocate a device

Jan 6 09:53:47.461: VDEV\_ALLOCATE\_ALMOST\_READY: failed to allocate a non-idle modem  
Jan 6 09:53:47.461: CSM\_PROC\_IC3\_WAIT\_FOR\_RES\_RESP: CSM\_EVENT\_RESOURCE\_OK at slot 2,  
port 15  
Jan 6 09:53:47.461: vtsp\_IC\_switch : (voice\_vdev= 0x620BF320)  
Jan 6 09:53:47.461: vtsp\_tsp\_call\_switch\_ind (cdb=0x621C5F3C,tsp\_info=0x620BF320,  
calling\_number= called\_number=567 redirect\_number=):  
peer\_tag=123dc\_switch: fsm\_pop()  
Jan 6 09:53:47.461: vtsp\_do\_call\_setup\_ind  
Jan 6 09:53:47.461: vtsp\_do\_call\_setup\_ind: Call ID=65677, guid=61FAF610  
Jan 6 09:53:47.461: vtsp\_do\_call\_setup\_ind: type=0, under\_spec=0, name=AB^Lo, id0=3,  
id1=0, id2=0, calling=123, called=567  
Jan 6 09:53:47.465: dsp\_cp\_tone\_off: [] packet\_Len=8 channel\_id=8516 packet\_id=71  
Jan 6 09:53:47.465: dsp\_idle\_mode: [] packet\_Len=8 channel\_id=8516 packet\_id=68  
Jan 6 09:53:47.465: dsp\_close\_voice\_channel: [] packet\_Len=8 channel\_id=8516  
packet\_id=75  
Jan 6 09:53:47.465: vtsp\_timer\_stop: 67189073  
Jan 6 09:53:47.465: csm\_vtsp\_call\_setup\_resp (vdev\_info=0x620BF320,  
vtsp\_cdb=0x621C5F3C)  
Jan 6 09:53:47.465: csm\_vtsp\_call\_setup\_resp:vdev\_common  
BP TS allocatedat BP\_stream0,  
BP\_Ch27  
Jan 6 09:53:47.465: csm\_vtsp\_call\_setup\_resp:DST\_tdm\_chnl call. BP TS allocatedat  
stream 7, chan 0,BP\_stream 0, BP\_ch 27  
Jan 6 09:53:47.465: csm\_vtsp\_call\_setup\_resp:DST\_tdm\_chnl call. BP TS allocatedat  
stream 7, chan 0,BP\_stream 0, BP\_ch 27vtsp\_open\_voice\_and\_set\_params  
Jan 6 09:53:47.465: dsp\_close\_voice\_channel: [0:1 (52)] packet\_Len=8 channel\_id=8516  
packet\_id=75  
Jan 6 09:53:47.465: dsp\_open\_voice\_channel\_20: [0:1 (52)]  
packet\_Len=16 channel\_id=8516  
packet\_id=74 alaw\_ulaw\_select=1 associated\_signaling\_channel=0  
time\_slot=1 serial\_port=1  
Jan 6 09:53:47.465: dsp\_encap\_config\_20: [0:1 (52)] packet\_Len=24  
channel\_id=8516  
packet\_id=92 TransportProtocol 2 t\_ssrc=0x0 r\_ssrc=0x0 t\_vpxcc=0x0 r\_vpxcc=0x0  
Jan 6 09:53:47.465: dsp\_set\_payout: [0:1 (52)] packet\_Len=18 channel\_id=8516  
packet\_id=76 mode=1 initial=60 min=4 max=200 fax\_nom=300  
Jan 6 09:53:47.465: dsp\_echo\_canceller\_control: [0:1 (52)] packet\_Len=10  
channel\_id=8516  
packet\_id=66 flags=0x0  
Jan 6 09:53:47.465: dsp\_set\_gains: [0:1 (52)] packet\_Len=12 channel\_id=8516  
packet\_id=91 in\_gain=0 out\_gain=0  
Jan 6 09:53:47.465: dsp\_vad\_enable: [0:1 (52)] packet\_Len=10 channel\_id=8516  
packet\_id=78 thresh=-38act\_proceeding  
Jan 6 09:53:47.469: csm\_vtsp\_call\_proceeding:DST\_tdm\_chnl call. BP TS  
allocatedstream 7,  
chan 0,BP\_stream 0, BP\_ch 27act\_alert  
Jan 6 09:53:47.493: vtsp\_ring\_noan\_timer\_start: 67189076  
Jan 6 09:53:47.493: csm\_vtsp\_call\_alert (vtsp\_cdb=0x621C5F3C)  
act\_bridge act\_caps\_ind  
Jan 6 09:53:47.737: act\_caps\_ind:Encap 1, Vad 2, Codec 0x4, CodecBytes 20,  
FaxRate 2, FaxBytes 20 SignalType 0  
DtmfRelay 1, Modem lact\_caps\_ack  
Jan 6 09:53:47.737: dsp\_idle\_mode: [0:1 (52)] packet\_Len=8 channel\_id=8516  
packet\_id=68  
Jan 6 09:53:47.737: act\_caps\_ack: codec = 15, ret = 1  
Jan 6 09:53:47.737: dsp\_cp\_tone\_off: [0:1 (52)] packet\_Len=8 channel\_id=8516  
packet\_id=71  
Jan 6 09:53:47.737: dsp\_idle\_mode: [0:1 (52)] packet\_Len=8 channel\_id=8516  
packet\_id=68  
Jan 6 09:53:47.737: dsp\_encap\_config\_20: [0:1 (52)] packet\_Len=24 channel\_id=8516  
packet\_id=92 TransportProtocol 2 t\_ssrc=0x0 r\_ssrc=0x0 t\_vpxcc=0x0 r\_vpxcc=0x0  
Jan 6 09:53:47.737: dsp\_voice\_mode: [0:1 (52)] packet\_Len=24 channel\_id=8516  
packet\_id=73 coding\_type=20 voice\_field\_size= 20 VAD\_flag=1 echo\_length=64  
comfort\_noise=1 inband\_detect=1 digit\_relay=2 AGC\_flag=0act\_alert\_connect  
Jan 6 09:53:49.461: vtsp\_ring\_noan\_timer\_stop: 67189273  
Jan 6 09:53:49.461: dsp\_cp\_tone\_off: [0:1 (52)] packet\_Len=8 channel\_id=8516

```

packet_id=71
Jan 6 09:53:49.461: csm_vtsp_call_connect (vtsp_cdb=0x621C5F3C,
voice_vdev=0x620BF320)
Jan 6 09:53:49.461: CSM_IC5_WAIT_FOR_SWITCH_OVER: CSM_EVENT_MODEM_OFFHOOK
at slot 2, port 15
Jan 6 09:53:49.617: CSM_RX_CAS_EVENT_FROM_NEAT:(0017): EVENT_CHANNEL_CONNECTED
at slot 2 and port 15
Jan 6 09:53:49.617: CSM_PROC_IC6_WAIT_FOR_CONNECT: CSM_EVENT_DSX0_CONNECTED
at slot 2, port 15
Jan 6 09:53:49.621: from NEAT(0): (0/2): TX ANSWERED(ABCD=0101)
eefje#
eefje#

```

## R2 Digital Compelled ANI: Incoming Call to 567

In order to understand this **debug** output better, refer to E1 R2 Signaling Theory.

```

eefje#debug csm voice
Voice Call Switching Module debugging is on
eefje#debug cas
Channel Associated Signaling debugging is on
Jan 7 10:00:02.907: from NEAT(0): debug-cas is on
Jan 7 10:00:02.907: from NEAT(0): special debug-cas is offg vtsp all
Voice telephony call control all debugging is on
eefje#
eefje#
Jan 7 10:00:23.883: from NEAT(0): (0/8): Rx SEIZURE (ABCD=0001)
Jan 7 10:00:23.927: VDEV_ALLOCATE: failed to allocate a device
Jan 7 10:00:23.927: VDEV_ALLOCATE: 1/2 is allocated
Jan 7 10:00:23.927: csm_vtsp_init_tdm (voice_vdev=0x61F19688)
Jan 7 10:00:23.927: csm_vtsp_init_tdm: dsprm_tdm_allocate: tdm slot 1,
dspm 3, dsp 4,
dsp_channel 1
Jan 7 10:00:23.927: csm_vtsp_init_tdm: dsprm_tdm_allocate: tdm stream 5,
channel 13,
bank 0, BP_channel 15, BP_stream 255
Jan 7 10:00:23.927: CSM_RX_CAS_EVENT_FROM_NEAT:(cid0007):
EVENT_CALL_DIAL_IN at slot 1
and port 60
Jan 7 10:00:23.927: CSM_PROC_IDLE: CSM_EVENT_START_DIGIT_COLLECT at slot 1, port 60
Jan 7 10:00:23.927: csm_vtsp_start_digit_collect (voice_vdev=0x61F19688)
Jan 7 10:00:23.927: Enter csm_connect_pri_vdev function
Jan 7 10:00:23.927: csm_connect_pri_vdev:tdm_allocate_BP_Ts() call. BP
TS allocated at BP_stream0, BP_Ch8,vdev_common 0x6205E5F8
Jan 7 10:00:23.927: to NEAT:(cid0007) EVENT_CHANNEL_LOCK for slot0 ctrl0 chan8
Jan 7 10:00:23.927: vtsp_do_call_setup_ind
Jan 7 10:00:23.927: vtsp_do_call_setup_ind: Call ID=65579, guid=62031A88
Jan 7 10:00:23.927: vtsp_do_call_setup_ind: type=0, under_spec=0,
name=, id0=0, id1=0,id2=0, calling=, called=
Jan 7 10:00:23.927: vtsp_do_call_setup_ind: redirect DN = reason =
0vtsp_do_r2_start_digit(): fsm_push(vtsp_r2_state_table)

Jan 7 10:00:23.927: csm_vtsp_call_setup_resp (vdev_info=0x61F19688,
vtsp_cdb=0x61B5BFF8)
Jan 7 10:00:23.927: csm_vtsp_call_setup_resp:vdev_common
BP TS allocatedat BP_stream0,
BP_Ch8
Jan 7 10:00:23.927: csm_vtsp_call_setup_resp:DST_tdm_chnl call.
BP TS allocatedat stream
5, chan 13,BP_stream 255, BP_ch 15
Jan 7 10:00:23.927: csm_vtsp_call_setup_resp:DST_tdm_chnl call.
BP TS allocatedat stream
5, chan 13,BP_stream 0, BP_ch 8
Jan 7 10:00:23.927: CSM_PROC_IC1_COLLECT_ADDR_INFO: CSM_EVENT_MODEM_OFFHOOK
(DNIS=, ANI=) at slot 1, port 60

```

Jan 7 10:00:23.931: R2 Incoming Voice(1/60): DSX (E1 0:8): STATE: R2\_IN\_IDLE  
R2 Got Event R2\_START  
Jan 7 10:00:24.027: CSM\_RX\_CAS\_EVENT\_FROM\_NEAT:(0007): EVENT\_START\_RX\_TONE  
at slot 1 and port 60  
Jan 7 10:00:24.027: from NEAT(0): (0/8): **TX SEIZURE\_ACK**  
(ABCD=1101)dc\_init\_dsp  
vtsp\_open\_voice\_and\_set\_params  
Jan 7 10:00:24.151: dsp\_close\_voice\_channel: [0:1:8] packet\_Len=8 channel\_id=4929  
packet\_id=75  
Jan 7 10:00:24.151: dsp\_open\_voice\_channel\_20: [0:1:8] packet\_Len=16  
channel\_id=4929  
packet\_id=74 alaw\_ulaw\_select=1 associated\_signaling\_channel=0  
time\_slot=0 serial\_port=0  
Jan 7 10:00:24.151: dsp\_encap\_config\_20: [0:1:8] packet\_Len=24 channel\_id=4929  
packet\_id=92 TransportProtocol 2 t\_ssrc=0x0 r\_ssrc=0x0 t\_vpxcc=0x0 r\_vpxcc=0x0  
Jan 7 10:00:24.151: dsp\_set\_payout: [0:1:8] packet\_Len=18 channel\_id=4929  
packet\_id=76 mode=1 initial=60 min=4 max=200 fax\_nom=300  
Jan 7 10:00:24.151: dsp\_echo\_canceller\_control: [0:1:8]  
packet\_Len=10 channel\_id=4929  
packet\_id=66 flags=0x0  
Jan 7 10:00:24.151: dsp\_set\_gains: [0:1:8] packet\_Len=12  
channel\_id=4929 packet\_id=91  
in\_gain=0 out\_gain=0  
Jan 7 10:00:24.151: dsp\_vad\_enable: [0:1:8] packet\_Len=10  
channel\_id=4929 packet\_id=78  
thresh=-38  
Jan 7 10:00:24.151: dsp\_voice\_mode: [0:1:8] packet\_Len=24  
channel\_id=4929 packet\_id=73  
coding\_type=1 voice\_field\_size=80 VAD\_flag=0 echo\_length=64  
comfort\_noise=1  
inband\_detect=1 digit\_relay=2 AGC\_flag=0dsp\_dtmf\_mode  
(VTSP\_TONE\_R2\_MF\_FORWARD\_MODE)  
  
Jan 7 10:00:24.151: dsp\_dtmf\_mode: [0:1:8] packet\_Len=10 channel\_id=4929  
packet\_id=65dtmf\_or\_mf=1  
  
*!--- Digit 5 is sent: Forward Signal Group I-5 (First DNIS digit).*  
  
Jan 7 10:00:24.203: vtsp\_process\_dsp\_message: **MSG\_TX\_DTMF\_DIGIT\_BEGIN: digit=5,**  
rtsp\_timestamp=0x04030000 dc\_digit\_up  
Jan 7 10:00:24.203: csm\_vtsp\_digit\_ready\_up (vtsp\_cdb=0x61B5BFF8)received digit (5)  
Jan 7 10:00:24.203: CSM voice (1/60): Rcvd Digit detected(5)  
Jan 7 10:00:24.203: R2 Incoming Voice(1/60): DSX (E1 0:8):  
**STATE:R2\_IN\_PRE\_CALLERID R2**  
**Got Event 5**  
  
*!--- Send Backward Signal Group A-5 (caller category request).*  
  
Jan 7 10:00:24.203: vtsp\_r2\_generate\_digits: vdev\_common=0x6205E5F8,  
string=5dc\_dial()vtsp\_dial\_nopush **dsp\_dtmf\_dialing(): dial\_string = 5**  
Jan 7 10:00:24.203: dsp\_dtmf\_dialing: [0:1:8] packet\_Len=24  
channel\_id=4929packet\_id=90  
string=5 digits=1, time\_on=65435, time\_off=30  
Jan 7 10:00:24.203: digit=, components=2, freq\_of\_first=1020,  
freq\_of\_second=780,  
amp\_of\_first=8192, amp\_of\_second=8192  
Jan 7 10:00:24.303: vtsp\_process\_dsp\_message: MSG\_TX\_DTMF\_DIGIT\_OFF:digit=5,  
duration=30dc\_digit  
Jan 7 10:00:24.303: csm\_vtsp\_digit\_ready (vtsp\_cdb=0x61B5BFF8) received digit (5)  
Jan 7 10:00:24.303: CSM voice (1/60): Rcvd Digit detected(5)  
Jan 7 10:00:24.303: R2 Incoming Voice(1/60): DSX (E1 0:8):  
**STATE:R2\_IN\_CALLERID R2**  
**Got Event R2\_TONE\_OFF**  
  
Jan 7 10:00:24.303: vtsp\_r2\_generate\_digits: vdev\_common=0x6205E5F8,

```
string=5dc_dial()
vtsp_dial_nopush dsp_dtmf_dialing(): dial_string = #
Jan 7 10:00:24.303: dsp_dtmf_dialing: [0:1:8] packet_Len=24 channel_id=4929
packet_id=90 string=# digits=1, time_on=150, time_off=30
Jan 7 10:00:24.303: digit=, components=2, freq_of_first=0, freq_of_second=0,
amp_of_first=1, amp_of_second=1

!--- Caller Category Forward Signal Group II-1 is sent.

Jan 7 10:00:24.403: vtsp_process_dsp_message: MSG_TX_DTMF_DIGIT_BEGIN: digit=1,
rtp_timestamp=0x001E0010 dc_digit_up
Jan 7 10:00:24.403: csm_vtsp_digit_ready_up (vtsp_cdb=0x61B5BFF8)received
digit (1)
Jan 7 10:00:24.403: CSM voice (1/60): Rcvd Digit detected(1)
Jan 7 10:00:24.403: R2 Incoming Voice(1/60): DSX (E1 0:8): STATE:R2_IN_CALLERID R2
Got Event 1

!--- Send Backward Signal Group A-5 (Caller ID request).

Jan 7 10:00:24.403: vtsp_r2_generate_digits: vdev_common=0x6205E5F8,
string=5dc_dial()
vtsp_dial_nopush dsp_dtmf_dialing(): dial_string = 5
Jan 7 10:00:24.403: dsp_dtmf_dialing: [0:1:8] packet_Len=24
channel_id=4929 packet_id=90
string=5 digits=1, time_on=65435, time_off=30
Jan 7 10:00:24.403: digit=, components=2, freq_of_first=1020, freq_of_second=780,
amp_of_first=8192, amp_of_second=8192
Jan 7 10:00:24.503: vtsp_process_dsp_message: MSG_TX_DTMF_DIGIT_OFF: digit=1,
duration=30dc_digit
Jan 7 10:00:24.503: csm_vtsp_digit_ready (vtsp_cdb=0x61B5BFF8) received digit (1)
Jan 7 10:00:24.503: CSM voice (1/60): Rcvd Digit detected(1)
Jan 7 10:00:24.503: R2 Incoming Voice(1/60): DSX (E1 0:8):
STATE:R2_IN_CALLERID R2
Got Event R2_TONE_OFF
Jan 7 10:00:24.503: vtsp_r2_generate_digits: vdev_common=0x6205E5F8,
string=5dc_dial()
vtsp_dial_nopush dsp_dtmf_dialing(): dial_string = #
Jan 7 10:00:24.503: dsp_dtmf_dialing: [0:1:8] packet_Len=24
channel_id=4929 packet_id=90
string=# digits=1, time_on=150, time_off=30
Jan 7 10:00:24.503: digit=, components=2, freq_of_first=0, freq_of_second=0,
amp_of_first=1, amp_of_second=1

!--- First ANI digit is sent: Forward Signal Group I-1.

Jan 7 10:00:24.603: vtsp_process_dsp_message: MSG_TX_DTMF_DIGIT_BEGIN:
digit=1, rtp_timestamp=0x001E0010 dc_digit_up
Jan 7 10:00:24.603: csm_vtsp_digit_ready_up (vtsp_cdb=0x61B5BFF8) received digit (1)
Jan 7 10:00:24.603: CSM voice (1/60): Rcvd Digit detected(1)
Jan 7 10:00:24.603: R2 Incoming Voice(1/60): DSX (E1 0:8):
STATE:R2_IN_CALLERID R2
Got Event 1

!--- Send Backward Signal Group A-5 (Caller ID request).

Jan 7 10:00:24.603: vtsp_r2_generate_digits: vdev_common=0x6205E5F8,
string=5dc_dial()vtsp_dial_nopush dsp_dtmf_dialing(): dial_string = 5

Jan 7 10:00:24.603: dsp_dtmf_dialing: [0:1:8] packet_Len=24
channel_id=4929 packet_id=90
string=5 digits=1, time_on=65435, time_off=30
Jan 7 10:00:24.603: digit=, components=2, freq_of_first=1020,
freq_of_second=780,
amp_of_first=8192, amp_of_second=8192
Jan 7 10:00:24.703: vtsp_process_dsp_message: MSG_TX_DTMF_DIGIT_OFF: digit=1,
duration=30dc_digit
```

Jan 7 10:00:24.703: csm\_vtsp\_digit\_ready (vtsp\_cdb=0x61B5BFF8) received digit (1)  
Jan 7 10:00:24.703: CSM voice (1/60): Rcvd Digit detected(1)  
Jan 7 10:00:24.703: R2 Incoming Voice(1/60): DSX (E1 0:8):  
**STATE:R2\_IN\_CALLERID R2**  
**Got Event R2\_TONE\_OFF**  
Jan 7 10:00:24.703: vtsp\_r2\_generate\_digits: vdev\_common=0x6205E5F8,  
string=5dc\_dial()vtsp\_dial\_nopush dsp\_dtmf\_dialing(): dial\_string = #  
Jan 7 10:00:24.703: dsp\_dtmf\_dialing: [0:1:8] packet\_Len=24  
channel\_id=4929 packet\_id=90  
string=# digits=1, time\_on=150, time\_off=30  
Jan 7 10:00:24.703: digit=, components=2, freq\_of\_first=0, freq\_of\_second=0,  
amp\_of\_first=1, amp\_of\_second=1  
  
*!--- Second ANI digit is sent: Forward Signal Group I-2.*

Jan 7 10:00:24.803: vtsp\_process\_dsp\_message:  
**MSG\_TX\_DTMF\_DIGIT\_BEGIN:digit=2,**  
rtp\_timestamp=0x001E0010 dc\_digit\_up  
Jan 7 10:00:24.803: csm\_vtsp\_digit\_ready\_up (vtsp\_cdb=0x61B5BFF8)  
received digit (2)  
Jan 7 10:00:24.803: CSM voice (1/60): Rcvd Digit detected(2)  
Jan 7 10:00:24.803: R2 Incoming Voice(1/60): DSX (E1 0:8):  
**STATE:R2\_IN\_CALLERID R2**  
**Got Event 2**

*!--- Send Backward Signal Group A-5 (Caller ID request).*

Jan 7 10:00:24.803: vtsp\_r2\_generate\_digits: vdev\_common=0x6205E5F8,  
string=5dc\_dial()vtsp\_dial\_nopush **dsp\_dtmf\_dialing(): dial\_string = 5**  
  
Jan 7 10:00:24.803: dsp\_dtmf\_dialing: [0:1:8] packet\_Len=24  
channel\_id=4929packet\_id=90  
string=5 digits=1, time\_on=65435, time\_off=30  
Jan 7 10:00:24.803: digit=, components=2, freq\_of\_first=1020,  
freq\_of\_second=780,  
amp\_of\_first=8192, amp\_of\_second=8192  
Jan 7 10:00:24.903: vtsp\_process\_dsp\_message: MSG\_TX\_DTMF\_DIGIT\_OFF: digit=2,  
duration=30dc\_digit  
Jan 7 10:00:24.903: csm\_vtsp\_digit\_ready (vtsp\_cdb=0x61B5BFF8) received digit (2)  
Jan 7 10:00:24.903: CSM voice (1/60): Rcvd Digit detected(2)  
Jan 7 10:00:24.903: R2 Incoming Voice(1/60): DSX (E1 0:8):  
**STATE:R2\_IN\_CALLERID**  
**R2 Got Event R2\_TONE\_OFF**  
Jan 7 10:00:24.903: vtsp\_r2\_generate\_digits: vdev\_common=0x6205E5F8,  
string=5dc\_dial()vtsp\_dial\_nopush dsp\_dtmf\_dialing(): dial\_string = #  
Jan 7 10:00:24.903: dsp\_dtmf\_dialing: [0:1:8] packet\_Len=24  
channel\_id=4929 packet\_id=90  
string=# digits=1, time\_on=150, time\_off=30  
Jan 7 10:00:24.903: digit=, components=2, freq\_of\_first=0,  
freq\_of\_second=0,  
amp\_of\_first=1, amp\_of\_second=1

*!--- Third ANI digit is sent: Forward Signal Group I-3.*

Jan 7 10:00:25.003: vtsp\_process\_dsp\_message:  
**MSG\_TX\_DTMF\_DIGIT\_BEGIN: digit=3,**  
rtp\_timestamp=0x001E0010 dc\_digit\_up  
Jan 7 10:00:25.003: csm\_vtsp\_digit\_ready\_up (vtsp\_cdb=0x61B5BFF8)  
received digit (3)  
Jan 7 10:00:25.003: CSM voice (1/60): Rcvd Digit detected(3)  
Jan 7 10:00:25.003: R2 Incoming Voice(1/60): DSX (E1 0:8):  
**STATE:R2\_IN\_CALLERID R2**  
**Got Event 3**

*!--- Send Backward Signal Group A-5 (Caller ID request).*

Jan 7 10:00:25.003: vtsp\_r2\_generate\_digits: vdev\_common=0x6205E5F8,  
string=5dc\_dial()vtsp\_dial\_nopush dsp\_dtmf\_dialing(): dial\_string = 5

Jan 7 10:00:25.003: dsp\_dtmf\_dialing: [0:1:8] packet\_Len=24  
channel\_id=4929 packet\_id=90  
string=5 digits=1, time\_on=65435, time\_off=30  
Jan 7 10:00:25.003: digit=, components=2, freq\_of\_first=1020,  
freq\_of\_second=780,  
amp\_of\_first=8192, amp\_of\_second=8192

Jan 7 10:00:25.103: vtsp\_process\_dsp\_message: MSG\_TX\_DTMF\_DIGIT\_OFF:digit=3,  
duration=30dc\_digit

Jan 7 10:00:25.103: csm\_vtsp\_digit\_ready (vtsp\_cdb=0x61B5BFF8) received digit (3)  
Jan 7 10:00:25.103: CSM voice (1/60): Rcvd Digit detected(3)  
Jan 7 10:00:25.103: R2 Incoming Voice(1/60): DSX (E1 0:8):  
**STATE:R2\_IN\_CALLERID R2**  
Got Event R2\_TONE\_OFF

Jan 7 10:00:25.103: vtsp\_r2\_generate\_digits: vdev\_common=0x6205E5F8,  
string=5dc\_dial()vtsp\_dial\_nopush dsp\_dtmf\_dialing(): dial\_string = #  
Jan 7 10:00:25.103: dsp\_dtmf\_dialing: [0:1:8] packet\_Len=24  
channel\_id=4929 packet\_id=90  
string=# digits=1, time\_on=150, time\_off=30  
Jan 7 10:00:25.103: digit=, components=2, freq\_of\_first=0,  
freq\_of\_second=0,  
amp\_of\_first=1, amp\_of\_second=1

*!--- Digit 15 is sent: Forward Signal Group I-15 (end of ANI digit).*

Jan 7 10:00:25.203: vtsp\_process\_dsp\_message: MSG\_TX\_DTMF\_DIGIT\_BEGIN:  
digit=15,  
rtp\_timestamp=0x001E0010 dc\_digit\_up

Jan 7 10:00:25.203: csm\_vtsp\_digit\_ready\_up (vtsp\_cdb=0x61B5BFF8)  
received digit (\*)  
Jan 7 10:00:25.203: CSM voice (1/60): Rcvd Digit detected(\*)  
Jan 7 10:00:25.203: R2 Incoming Voice(1/60): DSX (E1 0:8):  
**STATE:R2\_IN\_CALLERID R2**  
Got Event 15

*!--- Send Backward Signal Group A-1 (next DNIS digit).*

Jan 7 10:00:25.203: vtsp\_r2\_generate\_digits: vdev\_common=0x6205E5F8,  
string=5dc\_dial()vtsp\_dial\_nopush dsp\_dtmf\_dialing(): dial\_string = 1  
Jan 7 10:00:25.203: dsp\_dtmf\_dialing: [0:1:8] packet\_Len=24  
channel\_id=4929 packet\_id=90  
string=1 digits=1, time\_on=65435, time\_off=30  
Jan 7 10:00:25.203: digit=, components=2, freq\_of\_first=1020,  
freq\_of\_second=1140,  
amp\_of\_first=8192, amp\_of\_second=8192

Jan 7 10:00:25.303: vtsp\_process\_dsp\_message:  
MSG\_TX\_DTMF\_DIGIT\_OFF: digit=15,  
duration=30dc\_digit

Jan 7 10:00:25.303: csm\_vtsp\_digit\_ready (vtsp\_cdb=0x61B5BFF8) received digit (\*)  
Jan 7 10:00:25.303: CSM voice (1/60): Rcvd Digit detected(\*)  
Jan 7 10:00:25.303: R2 Incoming Voice(1/60): DSX (E1 0:8):  
**STATE:R2\_IN\_COLLECT\_DNIS R2**  
Got Event R2\_TONE\_OFF

Jan 7 10:00:25.303: vtsp\_r2\_generate\_digits: vdev\_common=0x6205E5F8,  
string=5dc\_dial()vtsp\_dial\_nopush dsp\_dtmf\_dialing(): dial\_string = #  
Jan 7 10:00:25.303: dsp\_dtmf\_dialing: [0:1:8] packet\_Len=24 channel\_id=4929  
packet\_id=90 string=# digits=1, time\_on=150, time\_off=30  
Jan 7 10:00:25.303: digit=, components=2, freq\_of\_first=0, freq\_of\_second=0,  
amp\_of\_first=1, amp\_of\_second=1

*!--- Second DNIS digit is sent: Forward Signal Group I-6.*

Jan 7 10:00:25.391: vtsp\_process\_dsp\_message: MSG\_TX\_DTMF\_DIGIT\_BEGIN: digit=6,  
rtp\_timestamp=0x001E0010 dc\_digit\_up

Jan 7 10:00:25.391: csm\_vtsp\_digit\_ready\_up (vtsp\_cdb=0x61B5BFF8)  
received digit (6)  
Jan 7 10:00:25.391: CSM voice (1/60): Rcvd Digit detected(6)  
Jan 7 10:00:25.391: R2 Incoming Voice(1/60): DSX (E1 0:8):  
STATE:R2\_IN\_COLLECT\_DNIS  
**R2 Got Event 6**

*!--- Send Backward Signal Group A-1.*

Jan 7 10:00:25.391: vtsp\_r2\_generate\_digits: vdev\_common=0x6205E5F8,  
string=56dc\_dial()  
vtsp\_dial\_nopush **dsp\_dtmf\_dialing(): dial\_string = 1**

Jan 7 10:00:25.391: dsp\_dtmf\_dialing: [0:1:8] packet\_Len=24  
channel\_id=4929 packet\_id=90  
string=1 digits=1, time\_on=65435, time\_off=30  
Jan 7 10:00:25.391: digit=, components=2, freq\_of\_first=1020,  
freq\_of\_second=1140,  
amp\_of\_first=8192, amp\_of\_second=8192

Jan 7 10:00:25.491: vtsp\_process\_dsp\_message: MSG\_TX\_DTMF\_DIGIT\_OFF:digit=6,  
duration=30dc\_digit

Jan 7 10:00:25.491: csm\_vtsp\_digit\_ready (vtsp\_cdb=0x61B5BFF8) received digit (6)  
Jan 7 10:00:25.491: CSM voice (1/60): Rcvd Digit detected(6)  
Jan 7 10:00:25.491: R2 Incoming Voice(1/60): DSX (E1 0:8):  
**STATE: R2\_IN\_COLLECT\_DNIS R2**

**Got Event R2\_TONE\_OFF**

Jan 7 10:00:25.491: vtsp\_r2\_generate\_digits: vdev\_common=0x6205E5F8,  
string=56dc\_dial() vtsp\_dial\_nopush dsp\_dtmf\_dialing(): dial\_string = #  
Jan 7 10:00:25.491: dsp\_dtmf\_dialing: [0:1:8] packet\_Len=24  
channel\_id=4929 packet\_id=90

string=# digits=1, time\_on=150, time\_off=30  
Jan 7 10:00:25.491: digit=, components=2, freq\_of\_first=0,  
freq\_of\_second=0,  
amp\_of\_first=1, amp\_of\_second=1

*!--- Third DNIS digit is sent: Forward Signal Group I-7.*

Jan 7 10:00:25.583: vtsp\_process\_dsp\_message:

**MSG\_TX\_DTMF\_DIGIT\_BEGIN: digit=7,**

rtp\_timestamp=0x001E0010 dc\_digit\_up

Jan 7 10:00:25.583: csm\_vtsp\_digit\_ready\_up (vtsp\_cdb=0x61B5BFF8)  
received digit (7)

Jan 7 10:00:25.583: CSM voice (1/60): Rcvd Digit detected(7)  
Jan 7 10:00:25.583: R2 Incoming Voice(1/60): DSX (E1 0:8):

**STATE:R2\_IN\_COLLECT\_DNIS R2**

**Got Event 7**

*!--- Send Backward Signal Group A-1.*

Jan 7 10:00:25.583: vtsp\_r2\_generate\_digits: vdev\_common=0x6205E5F8,  
string=567dc\_dial()vtsp\_dial\_nopush **dsp\_dtmf\_dialing(): dial\_string = 1**

Jan 7 10:00:25.583: dsp\_dtmf\_dialing: [0:1:8] packet\_Len=24  
channel\_id=4929 packet\_id=90  
string=1 digits=1, time\_on=65435, time\_off=30  
Jan 7 10:00:25.583: digit=, components=2, freq\_of\_first=1020,  
freq\_of\_second=1140,  
amp\_of\_first=8192, amp\_of\_second=8192

Jan 7 10:00:25.683: vtsp\_process\_dsp\_message: MSG\_TX\_DTMF\_DIGIT\_OFF: digit=7,  
duration=30dc\_digit

Jan 7 10:00:25.683: csm\_vtsp\_digit\_ready (vtsp\_cdb=0x61B5BFF8)  
received digit (7)

Jan 7 10:00:25.683: CSM voice (1/60): Rcvd Digit detected(7)  
Jan 7 10:00:25.683: R2 Incoming Voice(1/60): DSX (E1 0:8):

**STATE:R2\_IN\_COLLECT\_DNIS R2**

**Got Event R2\_TONE\_OFF**

Jan 7 10:00:25.683: vtsp\_r2\_generate\_digits: vdev\_common=0x6205E5F8,  
string=567dc\_dial()vtsp\_dial\_nopush dsp\_dtmf\_dialing(): dial\_string = #  
Jan 7 10:00:25.683: dsp\_dtmf\_dialing: [0:1:8] packet\_Len=24  
channel\_id=4929 packet\_id=90  
string=# digits=1, time\_on=150, time\_off=30  
Jan 7 10:00:25.683: digit=, components=2, freq\_of\_first=0,  
freq\_of\_second=0,  
amp\_of\_first=1, amp\_of\_second=1  
Jan 7 10:00:25.835: vtsp\_process\_dsp\_message: MSG\_TX\_DIALING\_DONEdc\_dialing\_done()

*!--- Timeout is 3 seconds.*

Jan 7 10:00:28.583: R2 Incoming Voice(1/60): DSX (E1 0:8):  
**STATE:R2\_IN\_COLLECT\_DNIS R2**  
**Got Event R2\_TONE\_TIMER**

*!--- Send Backward Signal Group A-3: address-complete, changeover  
!--- to reception of group-B signal.*

Jan 7 10:00:28.583: vtsp\_r2\_generate\_digits: vdev\_common=0x6205E5F8,  
string=567dc\_dial()vtsp\_dial\_nopush dsp\_dtmf\_dialing(): dial\_string = 3#  
Jan 7 10:00:28.583: **dsp\_dtmf\_dialing: [0:1:8] packet\_Len=36**  
**channel\_id=4929 packet\_id=90**  
string=3# digits=2, time\_on=150, time\_off=30  
Jan 7 10:00:28.583: digit=, components=2, freq\_of\_first=1020,  
freq\_of\_second=900,  
amp\_of\_first=8192, amp\_of\_second=8192  
Jan 7 10:00:28.583: digit=, components=2, freq\_of\_first=0, freq\_of\_second=0,  
amp\_of\_first=1, amp\_of\_second=1

*!--- Forward Signal Group II-1 is sent: subscriber without priority.*

Jan 7 10:00:28.831: vtsp\_process\_dsp\_message: MSG\_TX\_DTMF\_DIGIT\_BEGIN: digit=1,  
rtp\_timestamp=0x001E0003 dc\_digit\_up  
Jan 7 10:00:28.831: csm\_vtsp\_digit\_ready\_up (vtsp\_cdb=0x61B5BFF8)  
received digit (1)  
Jan 7 10:00:28.831: CSM voice (1/60): Rcvd Digit detected(1)  
Jan 7 10:00:28.831: R2 Incoming Voice(1/60): DSX (E1 0:8):  
**STATE:R2\_IN\_CATEGORY R2**  
**Got Event 1**  
Jan 7 10:00:28.831: CSM\_PROC\_IC1\_COLLECT\_ADDR\_INFO:  
CSM\_EVENT\_ADDR\_INFO\_COLLECTED  
(DNIS=567, ANI=123) at slot 1, port 60  
Jan 7 10:00:28.831: vtsp\_tsp\_call\_accept\_check (sdb=0x61DADEE0,  
calling\_number=123  
called\_number=567): peer\_tag=0  
Jan 7 10:00:28.835: VDEV\_ALLOCATE: failed to allocate a device  
Jan 7 10:00:28.835: VDEV\_ALLOCATE\_ALMOST\_READY: failed to allocate  
a non-idle modem  
Jan 7 10:00:28.835: VDEV\_ALLOCATE: failed to allocate a device  
Jan 7 10:00:28.835: VDEV\_ALLOCATE\_ALMOST\_READY: failed to allocate  
a non-idle modem  
Jan 7 10:00:28.835: VDEV\_ALLOCATE: failed to allocate a device  
Jan 7 10:00:28.835: VDEV\_ALLOCATE\_ALMOST\_READY: failed to allocate  
a non-idle modem  
Jan 7 10:00:28.835: CSM\_PROC\_IC3\_WAIT\_FOR\_RES\_RESP: CSM\_EVENT\_RESOURCE\_OK  
at slot 1,  
port 60  
Jan 7 10:00:28.835: vtsp\_IC\_switch : (voice\_vdev= 0x61F19688)  
Jan 7 10:00:28.835: vtsp\_tsp\_call\_switch\_ind (cdb=0x61B5BFF8,  
tsp\_info=0x61F19688,  
calling\_number=123 called\_number=567 redirect\_number=):  
peer\_tag=123dc\_switch: fsm\_pop()  
Jan 7 10:00:28.835: vtsp\_do\_call\_setup\_ind  
Jan 7 10:00:28.835: vtsp\_do\_call\_setup\_ind: Call ID=65581,  
guid=62031A88

```
Jan 7 10:00:28.835: vtsp_do_call_setup_ind: type=0, under_spec=0,
name=b`, id0=9,
  id1=0, id2=0, calling=123, called=567
Jan 7 10:00:28.835: dsp_cp_tone_off: [] packet_Len=8 channel_id=4929
packet_id=71
Jan 7 10:00:28.835: dsp_idle_mode: [] packet_Len=8 channel_id=4929
packet_id=68
Jan 7 10:00:28.835: dsp_close_voice_channel: [] packet_Len=8
channel_id=4929 packet_id=75
Jan 7 10:00:28.835: vtsp_timer_stop: 7063006
Jan 7 10:00:28.839: csm_vtsp_call_setup_resp (vdev_info=0x61F19688,
vtsp_cdb=0x61B5BFF8)
Jan 7 10:00:28.839: csm_vtsp_call_setup_resp:vdev_common BP TS
allocatedat BP_stream0,
  BP_Ch8
Jan 7 10:00:28.839: csm_vtsp_call_setup_resp:DST_tdm_chnl call.
BP TS allocatedat stream 5, chan 13,BP_stream 0, BP_ch 8
Jan 7 10:00:28.839: csm_vtsp_call_setup_resp:DST_tdm_chnl call.
BP TS allocatedat stream 5, chan 13,BP_stream 0, BP_ch
8vtsp_open_voice_and_set_params
Jan 7 10:00:28.839: dsp_close_voice_channel: [0:1 (17)]
packet_Len=8 channel_id=4929
  packet_id=75
Jan 7 10:00:28.839: dsp_open_voice_channel_20: [0:1 (17)] packet_Len=16
channel_id=4929
  packet_id=74 alaw_ulaw_select=1 associated_signaling_channel=0
time_slot=0 serial_port=0
Jan 7 10:00:28.839: dsp_encap_config_20: [0:1 (17)] packet_Len=24
channel_id=4929
  packet_id=92 TransportProtocol 2 t_ssrc=0x0 r_ssrc=0x0t_vpxcc=0x0
r_vpxcc=0x0
Jan 7 10:00:28.839: dsp_set_payout: [0:1 (17)] packet_Len=18
channel_id=4929 packet_id=76 mode=1 initial=60 min=4 max=200 fax_nom=300
Jan 7 10:00:28.839: dsp_echo_canceller_control: [0:1 (17)]
packet_Len=10 channel_id=4929
  packet_id=66 flags=0x0
Jan 7 10:00:28.839: dsp_set_gains: [0:1 (17)] packet_Len=12
channel_id=4929 packet_id=91
  in_gain=0 out_gain=0
Jan 7 10:00:28.839: dsp_vad_enable: [0:1 (17)] packet_Len=10
channel_id=4929 packet_id=78
  thresh=-38act_proceeding
Jan 7 10:00:28.839: csm_vtsp_call_proceeding:DST_tdm_chnl call.
BP TS allocatedstream 5,
  chan 13,BP_stream 0, BP_ch 8act_alert
Jan 7 10:00:28.867: vtsp_ring_noan_timer_start: 7063009
Jan 7 10:00:28.867: csm_vtsp_call_alert (vtsp_cdb=0x61B5BFF8)
Jan 7 10:00:28.867: csm_vtsp_call_alert: CSM_EVENT_ALERTING_RECEIVED
Jan 7 10:00:28.867: CSM_IC5_WAIT_FOR_SWITCH_OVER: at slot 1, port 60
Jan 7 10:00:28.867: CSM_EVENT_ALERTING_RECEIVED:
Jan 7 10:00:28.867: calling alerting_start_event
```

```
!--- Note: For modems, Backward Signal
!--- Group B-6 (subscriber's line free, charge)
!--- is sent immediately.
!--- For voice, it is delayed until alerting is received.
!--- Notice that "R2_REJECT" is printed instead of R2_ALERTING.
!--- This printing issue is solved in Cisco IOS Software Release 12.1T.
```

```
Jan 7 10:00:28.867: R2 Incoming Voice(1/60): DSX (E1 0:8):
STATE:R2_IN_IDLE R2
Got Event R2_REJECT
Jan 7 10:00:28.867: R2_ALERTING: r2_comp_idle
Jan 7 10:00:28.867: vtsp_r2_generate_digits: vdev_common=0x6205E5F8,
string=567act_bridge
Jan 7 10:00:28.867: dsp_voice_mode: [0:1 (17)] packet_Len=24
```

channel\_id=4929 packet\_id=73  
coding\_type=1 voice\_field\_size=80 VAD\_flag=0 echo\_length=64  
comfort\_noise=1  
inband\_detect=1 digit\_relay=2 AGC\_flag=0dsp\_dtmf\_mode  
(VTSP\_TONE\_R2\_MF\_FORWARD\_MODE)

*!--- Answer signal (B-6) is sent after alerting is received.  
!--- Send Backward Signal Group B6 signal (Subscriber's line free, charge).*

Jan 7 10:00:28.871: dsp\_dtmf\_mode: [0:1 (17)] packet\_Len=10  
channel\_id=4929 packet\_id=65  
dtmf\_or\_mf=1vtsp\_r2\_dial vtsp\_r2\_dial(): fsm\_push(vtsp\_r2\_state\_table)  
**dsp\_dtmf\_dialing(): dial\_string = 6**

Jan 7 10:00:28.871: dsp\_dtmf\_dialing: [0:1 (17)] packet\_Len=24  
channel\_id=4929

packet\_id=90 string=6 digits=1, time\_on=65435, time\_off=30  
Jan 7 10:00:28.871: digit=, components=2, freq\_of\_first=900,  
freq\_of\_second=780,  
amp\_of\_first=8192, amp\_of\_second=8192

Jan 7 10:00:28.923: vtsp\_process\_dsp\_message: MSG\_TX\_DTMF\_DIGIT\_BEGIN: digit=1,  
rtp\_timestamp=0x001E0006 dc\_digit\_up

Jan 7 10:00:28.923: csm\_vtsp\_digit\_ready\_up (vtsp\_cdb=0x61B5BFF8)  
received digit (1)

Jan 7 10:00:28.923: CSM voice (1/60): Rcvd Digit detected(1)

Jan 7 10:00:28.923: R2 Incoming Voice(1/60): DSX (E1 0:8):

**STATE: R2\_IN\_COMPLETE**

R2 Got Event 1

Jan 7 10:00:28.971: vtsp\_process\_dsp\_message: MSG\_TX\_DTMF\_DIGIT\_OFF: digit=1,  
duration=30dc\_digit

Jan 7 10:00:28.971: csm\_vtsp\_digit\_ready (vtsp\_cdb=0x61B5BFF8)  
received digit (1)

Jan 7 10:00:28.971: CSM voice (1/60): Rcvd Digit detected(1)

Jan 7 10:00:28.971: R2 Incoming Voice(1/60): DSX (E1 0:8):

**STATE: R2\_IN\_COMPLETE R2**

**Got Event R2\_TONE\_OFF**

Jan 7 10:00:28.971: vtsp\_r2\_generate\_digits: vdev\_common=0x6205E5F8,  
string=567dc\_dial()

vtsp\_dial\_nopush dsp\_dtmf\_dialing(): dial\_string = #

Jan 7 10:00:28.971: dsp\_dtmf\_dialing: [0:1 (17)] packet\_Len=24  
channel\_id=4929

packet\_id=90 string=# digits=1, time\_on=150, time\_off=30

Jan 7 10:00:28.975: digit=, components=2, freq\_of\_first=0,  
freq\_of\_second=0,

amp\_of\_first=1, amp\_of\_second=1ds\_dialing\_defaultsds\_dialing\_default

Jan 7 10:00:29.127: vtsp\_process\_dsp\_message:

MSG\_TX\_DIALING\_DONEdc\_dialing\_done()

Jan 7 10:00:29.971: R2 Incoming Voice(1/60): DSX (E1 0:8):

**STATE: R2\_IN\_WAIT\_GUARD R2**

**Got Event R2\_TONE\_TIMER**

Jan 7 10:00:29.971: R2\_IN\_IDLE:2 r2\_in\_connect called

Jan 7 10:00:29.971: R2\_IN\_CONNECT: call end dial

Jan 7 10:00:29.971: pop the dial state machine

Jan 7 10:00:29.971: vtsp\_r2\_end\_dial: vdev\_common=0x6205E5F8,  
string=567ds\_end\_dial():

fsm\_pop() act\_caps\_ind

Jan 7 10:00:29.971: act\_caps\_ind:Encap 1, Vad 2, Codec 0x4,  
CodecBytes 20, FaxRate 2,

FaxBytes 20 SignalType 0 DtmfRelay 1, Modem 1act\_caps\_ack

Jan 7 10:00:29.971: dsp\_idle\_mode: [0:1 (17)] packet\_Len=8

channel\_id=4929 packet\_id=68

Jan 7 10:00:29.971: act\_caps\_ack: codec = 15, ret = 1

Jan 7 10:00:29.971: dsp\_cp\_tone\_off: [0:1 (17)] packet\_Len=8

channel\_id=4929 packet\_id=71

Jan 7 10:00:29.971: dsp\_idle\_mode: [0:1 (17)] packet\_Len=8

channel\_id=4929 packet\_id=68

```
Jan 7 10:00:29.971: dsp_encap_config_20: [0:1 (17)] packet_Len=24
channel_id=4929
  packet_id=92 TransportProtocol 2 t_ssrc=0x0 r_ssrc=0x0 t_vpxcc=0x0
r_vpxcc=0x0
Jan 7 10:00:29.971: dsp_voice_mode: [0:1 (17)] packet_Len=24
channel_id=4929 packet_id=73
  coding_type=19 voice_field_size=20 VAD_flag=1 echo_length=64
comfort_noise=1
  inband_detect=1 digit_relay=2 AGC_flag=0act_alert_connect
Jan 7 10:00:30.255: vtsp_ring_noan_timer_stop: 7063148
Jan 7 10:00:30.255: dsp_cp_tone_off: [0:1 (17)] packet_Len=8
channel_id=4929 packet_id=71
Jan 7 10:00:30.255: csm_vtsp_call_connect (vtsp_cdb=0x61B5BFF8,
voice_vdev=0x61F19688)
Jan 7 10:00:30.255: CSM_IC5_WAIT_FOR_SWITCH_OVER:
CSM_EVENT_MODEM_OFFHOOK at slot 1,
  port 60
Jan 7 10:00:30.607: CSM_RX_CAS_EVENT_FROM_NEAT:(0007):
EVENT_CHANNEL_CONNECTED at slot 1
  and port 60
Jan 7 10:00:30.607: CSM_PROC_IC6_WAIT_FOR_CONNECT:
CSM_EVENT_DSX0_CONNECTED at slot 1,
  port 60
Jan 7 10:00:30.607: from NEAT(0): (0/8): TX ANSWERED (ABCD=0101)
eefje#
```

## Related Information

- **E1 R2 Signaling for Voice over IP on the Cisco AS5300 Access Server**
- **E1 R2 Signaling for the Cisco 3620 and 3640 Series Routers**
- **E1 R2 Customization with the cas-custom Command**
- **E1 R2 and Channel-Associated Signaling Configuration**
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