E1 R2 Signaling for Voice over IP on the Cisco AS5300 Access Server

Feature Summary

The E1 R2 signaling feature adds E1 R2 signaling functionality to the Voice over IP voice network module (VNM) for the Cisco AS5300 access server. R2 signaling is an international signaling standard that is common to channelized E1 networks. However, there is no single signaling standard for R2. The ITU-T Q.400-Q.490 recommendation defines R2, but a number of countries and geographic regions implement R2 in entirely different ways. Cisco Systems addresses this challenge by supporting many localized implementations of R2 signaling in its Cisco IOS software.

Cisco Systems' E1 R2 signaling default is ITU, which supports the following countries: Denmark, Finland, Germany, Russia (ITU variant), Hong Kong (ITU variant), and South Africa (ITU variant). The expression "ITU variant" means there are multiple R2 signaling types in the specified country, but Cisco supports the ITU variant.

Cisco Systems also supports specific local variants of E1 R2 signaling in the following regions, countries, and corporations:

- Argentina
- Australia
- Brazil
- China
- Colombia
- Costa Rica
- East Europe (includes Croatia, Russia, and Slovak Republic)
- Ecuador ITU
- Ecuador LME
- Greece
- Guatemala
- Hong Kong (uses the China variant)
- Indonesia
- Israel
- Korea
- Malaysia
- Mexico (Telmex corporation)

- Mexico (Telnor corporation)
- New Zealand
- Paraguay
- Peru
- Philippines
- Saudi Arabia
- Singapore
- South Africa (Panaftel variant)
- Thailand
- Uruguay
- Venezuela
- Vietnam

Of these, the following local variants have been verified:

- Argentina
- Brazil
- China
- Mexico (Telmax)
- Singapore
- Thailand

Benefits

- R2 custom localization—R2 signaling is supported for a wide range of countries and geographical regions. Cisco is continually supporting E1 R2 signaling variants in new countries.
- Broader deployment of dial access and voice services—The flexibility of a high-density access server can be deployed in E1 networks.

Platforms

Cisco AS5300 access servers support this feature.

Prerequisites

Before you can configure your Cisco AS5300 to use Voice over IP, you must first:

- Establish a working IP network. For more information about configuring IP, refer to the "IP Overview," "Configuring IP Addressing," and "Configuring IP Services" chapters in the Cisco IOS 11.3 *Network Protocols Configuration Guide, Part 1*.
- Complete basic configuration for the Cisco AS5300. This includes, as a minimum, the following tasks:

  - Configure a host name and password for the Cisco AS5300
  - Configure the Ethernet 10BaseT/100BaseT interface of your Cisco AS5300 so that it can be recognized as a device on the Ethernet LAN
  - Configure the Cisco AS5300 E1 controller.

  For more information about any of the these configuration tasks, refer to the *Cisco AS5300 Universal Access Server Software Configuration Guide*.

- Install the VFC into the appropriate slot of your Cisco AS5300 access server. Each VFC can hold up to 5 digital signal processor modules (DSPMs), enabling processing for up to 30 B channels. For more information about the physical characteristics of the VFCs or DSPMs, or how to install them, refer to *Installing Voice over IP Feature Cards in Cisco AS5300 Universal Access Servers*, which came with your VFC.
- Configure Voice over IP on the Cisco AS5300. This includes the following tasks:
  - Integrate your dial plan and telephony network into your existing IP network topology.
  - Configure the Quality of Service (QoS) parameters to support real-time voice traffic. These QoS parameters include RSVP for voice, Multilink PPP with interleaving, RTP header compression, custom queuing, and weighted fair queuing.
  - Configure Frame Relay for Voice over IP, if needed for your network topology.
  - Configure voice port, number expansion, and VoIP and POTS dial-peer configuration parameters. Depending on the topology of your network, you might also need to configure IP precedence, RSVP, CODEC, and VAD parameters for the dial peers you define.

  For more information about configuring Voice over IP for the Cisco AS5300, refer to the *Voice over IP for the Cisco AS5300 Software Configuration Guide*.

Supported MIBs and RFCs

None.

Configuring E1 R2 Signaling

R2 signaling is channelized E1 signaling used in Europe, Asia, and South America. It is equivalent to channelized T1 signaling in North America. There are two types of R2 signaling: line signaling and interregister signaling. R2 line signaling includes R2 digital, R2 analog, and R2 pulse. R2 interregister signaling includes R2 compelled, R2 non-compelled, and R2 semi-compelled. These signaling types are configured using the **cas-group (controller e1)** command.

Many countries and regions have their own E1 R2 variant specifications, which supplement the ITU-T Q.400-Q.490 recommendation for R2 signaling. Unique E1 R2 signaling parameters for specific countries and regions are set by entering the **cas-custom** *channel* command followed by the **country** *name* command.

Cisco's implementation of R2 signaling has DNIS support turned on by default. If you enable the **ani** option, the collection of DNIS information is still performed. Specifying the **ani** option does not disable DNIS collection. DNIS is the number being called. ANI is the caller's number. For example, if you are configuring router A to call router B, then the DNIS number is assigned to router B, the ANI number is assigned to router A. ANI is similar to Caller ID.

Configure E1 R2 Signaling

To configure E1 R2 signaling, use the following commands beginning in global configuration mode:

Step	Command	Purpose
1	**controller e1** *number*	Specify the E1 controller that you want to configure with R2 signaling.
2	**cas-group** *channel* **timeslots** *range* **type** {**r2-analog** | **r2-digital** | **r2-pulse**} [**dtmf** | **r2-compelled** [**ani**] | **r2-non-compelled** [**ani**] | **r2-semi-compelled** [**ani**]]	Configure R2 channel associated signaling on the E1 controller. For a complete description of the available R2 options, refer to the **cas-group (controller e1)** command in the Cisco IOS Release 12.0 *Dial Solutions Command Reference*.
3	**cas-custom** *channel*	Enter cas-custom mode. In this mode, you can localize E1 R2 signaling parameters, such as specific R2 country settings for Hong Kong. For the customization to take effect, the *channel* number used in the **cas-custom** command must match the *channel* number specified by the **cas-group** command.
4	**country** *name* **use-defaults**	Specify the local country, region, or corporation specification to use with R2 signaling. Replace the *name* variable with one of the supported country names. Cisco strongly recommends that you include the **use-defaults** option, which engages the default settings for a specific country. The default setting for all countries is ITU. See the **cas-custom** command in the Cisco IOS Release 12.0 *Dial Solutions Command Reference* for the list of supported countries, regions, and corporation specifications.
5	• **ani-digits** • **answer-signal** • **caller-digits** • **category** • **default** • **dnis-digits** • **invert-abcd** • **ka** • **kd** • **metering** • **nc-congestion** • **unused-abcd** • **request-category**	(Optional) Further customize the R2 signaling parameters. Some switch types require you to fine tune your R2 settings. Do not tamper with these commands unless you fully understand your switch's requirements. For nearly all network scenarios, the **country** *name* **use-defaults** command fully configures your country's local settings. You should not need to perform Step 5. See the **cas-custom** command in the Cisco IOS Release 12.0 *Dial Solutions Command Reference* for more information about each signaling command.

Step	Command	Purpose
6	**exit**	Exit interface configuration mode.
7	**voice-port** *controller-number:channel-number*	Enter voice port configuration mode for the specified voice port.
8	**cptone** *country-code*	Define the cptone code to set up the country-specific PCM encoding and tones. The PCM encoding type must match the country code defined by the **cas-custom** command.
9	**exit**	Exit voice-port configuration mode.
10	**exit**	Exit global configuration mode.

As mentioned in the previous configuration steps, the E1 R2 signaling type (whether ITU, ITU variant, or local variant as defined by the **cas-custom** command) needs to match the appropriate PCM encoding type as defined by the **cptone** command. For countries for which a cptone value has not yet been defined, you can try the following:

- If the country uses aLaw E1 R2 signaling, use the GB value for the **cptone** command.
- If the country uses uLaw E1 R2 signaling, use the US value for the **cptone** command.

For more information about configuring R2 signaling, refer to the Cisco IOS Release 12.0 *Dial Solutions Configuration Guide*.

Verify the E1 R2 Signaling Configuration

To verify the E1 R2 signaling configuration:

- Enter the **show controller e1** command to view the status for all controllers, or enter the **show controller e1** *number* command to view the status for a particular controller. Make sure the status indicates the controller is up (line 2 in the following example) and no alarms (line 4 in the following example) or errors (lines 9 and 10 in the following example) have been reported.

```
5300# show controller e1 0
E1 0 is up.
  Applique type is Channelized E1 - balanced
  No alarms detected.
  Version info of Slot 0:  HW: 2, Firmware: 4, PLD Rev: 2

Manufacture Cookie is not programmed.

  Framing is CRC4, Line Code is HDB3, Clock Source is Line Primary.
  Data in current interval (785 seconds elapsed):
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
  Total Data (last 13 15 minute intervals):
     0 Line Code Violations, 0 Path Code Violations,
     0 Slip Secs, 12 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 12 Unavail Secs
```

- To check the robbed-bit signaling status of each channel, enter the **debug serial interface** command and the **show controller e1** command.

```
as5300#debug serial inter
 Serial network interface debugging is on

as5300#sh cont e1 0
E1 0 is up.
  Applique type is Channelized E1 - balanced
  No alarms detected.
  Version info of Slot 0: HW:2, Firmware:4, PLD Rev:0

Manufacture Cookie Info:
 EEPROM Type 0x0001, EEPROM Version 0x01, Board ID 0x43,
 Board Hardware Version 1.0, Item Number 73-2218-4,
 Board Revision A0, Serial Number 07805788,
 PLD/ISP Version 0.0, Manufacture Date 19-Feb-1998.

  Framing is NO-CRC4, Line Code is HDB3, Clock Source is Line Primary.
  Data in current interval (135 seconds elapsed):
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail
Secs
 Robbed bit signals state:
        timeslots       rxA rxB rxC rxD         txA txB txC txD

        1               0   0   0   1           0   1   0   1
        2               0   0   0   1           0   1   0   1
        3               0   0   0   1           0   1   0   1
        4               1   0   0   1           1   0   0   1
        5               1   0   0   1           1   0   0   1
        6               0   0   0   1           0   1   0   1
        7               1   0   0   1           1   0   0   1
        8               1   0   0   1           1   0   0   1
        9               1   0   0   1           1   0   0   1
        10              1   0   0   1           1   0   0   1
        11              0   0   0   1           0   1   0   1
        12              0   0   0   0           0   0   0   0
        13              1   0   0   1           1   0   0   1
        14              1   0   0   1           1   0   0   1
        15              1   0   0   1           1   0   0   1
        17              0   0   0   1           0   1   0   1
        18              1   0   0   1           1   0   0   1
        19              1   0   0   1           1   0   0   1
        20              0   0   0   1           0   1   0   1
        21              1   0   0   1           1   0   0   1
        22              1   0   0   1           1   0   0   1
        23              1   0   0   1           1   0   0   1
        24              0   0   0   1           0   1   0   1
        25              0   0   0   1           0   1   0   1
        26              0   0   0   1           0   1   0   1
        27              0   0   0   1           0   1   0   1
        28              0   0   0   0           0   0   0   0
        29              0   1   1   0           0   1   0   1
        30              0   1   0   1           0   0   0   1
        31              0   0   0   0           1   0   0   0
```

Tips

If the connection does not come up, check for the following:

- Loose wires, splices, connectors, shorts, bridge taps, and grounds
- Backward transmit and receive
- Mismatched framing types (for example, CRC-4 versus no-CRC-4)
- Transmit and receive pair separation (crosstalk)
- Faulty line cards or repeaters
- Noisy lines (for example, power and crosstalk)

If you see errors on the line or the line is going up and down, check for the following:

- Mismatched line codes (HDB3 versus AMI)
- Receive level
- Frame slips due to poor clocking plan

Configuration Example

The following example configures R2 signaling and customizes R2 parameters on controller E1 2 of a Cisco AS5300. In most cases, the same R2 signaling type is configured on each E1 controller.

```
! Specify the E1 controller that you want to configure with R2 signaling. A controller
! informs the access server how to distribute or provision individual timeslots for a
! connected channelized E1 line. You must configure one E1 controller for each E1 line.
! Configure channel associated signaling. The signaling type forwarded by the
! connecting telco switch must match the signaling configured on the Cisco AS5300.
! The country code is ITU by default.
!
controller E1 0
 framing NO-CRC4
 cas-group 0 timeslots 1-15,17-31 type r2-digital r2-compelled ani
 cas-custom 0
!
controller E1 1
 framing NO-CRC4
 clock source line primary
 cas-group 0 timeslots 1-15,17-31 type r2-digital r2-compelled
!
! Customize some of the E1 R2 signaling parameters with the cas-custom channel
! controller configuration command. This example specifies the default R2 settings for
! Brazil.
!
 cas-custom 0
  country brazil use-defaults
  metering
  category 2
  answer-signal group-b 1
!
controller E1 2
!
controller E1 3
!
! Configure voice port parameters. Be sure that the cptone command value is compatable
! with the country code defined by the cas-custom command. In this example, because
! ITU has no specific cptone value defined and uses aLaw E1 R2 signaling, the GB
! cptone command value is used.
```

```
!
voice-port 0:0
 cptone GB
!
voice-port 1:0
 cptone BR
 description Brasil Tone
!
! Define the parameters associated with the VoIP dial peer.
!
dial-peer voice 101 voip
 destination-pattern +500..
 session target ipv4:172.14.25.1
!
! Define the parameters associated POTS dial peer.
!
dial-peer voice 8221 pots
 destination-pattern 011822...
 direct-inward-dial
 port 0:0
!
! Configure LAN interfaces.
!
interface Ethernet0
 ip address 172.13.103.33 255.255.0.0
 no ip directed-broadcast
 no ip mroute-cache
 load-interval 30
 no cdp enable
!
interface FastEthernet0
 ip address 173.14.25.100 255.255.0.0
 no ip directed-broadcast
 bandwidth 1000000
 load-interval 30
 duplex full
 hold-queue 75 in
!
no ip classless
ip route 223.255.254.253 255.255.255.255 Ethernet0
!
!
line con 0
 exec-timeout 0 0
 logging synchronous level all
 transport input none
 escape-character BREAK
line aux 0
 rotary 1
 transport preferred none
 transport input all
 flowcontrol hardware
line vty 0 4
 exec-timeout 60 0
 password lab
 login
!
end
```

Note Cisco strongly recommends that you specify your country's default settings. To display a list of supported countries, enter the **country ?** command under the **cas-custom** command. The default setting for all countries is ITU.

Command Reference

This section documents new and modified commands associated with E1 R2 signaling for Voice over IP on the Cisco AS5300. All other commands used with this feature are documented in the Cisco IOS Release 12.0 command references.

- **cas-custom**
- **cas-group (controller e1)**
- **cptone**

cas-custom

To customize E1 R2 signaling parameters for a particular E1 channel group on a channelized E1 line, use the **cas-custom** controller configuration command. Use the **no** form of this command to disable the signaling customization.

cas-custom *channel*
no cas-custom *channel*

Syntax Description

channel	Specifies a single channel group number, which can be between 0 and 30. This channel group number must match the channel number specified in the **cas-group** command.

Default

No customized signaling parameters are set. If you do not specify a country name using the **country** *name* command, which is described in Table 1, ITU is the selected default signal.

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.2 P.

The customization parameters set by the **cas-custom** *channel* command are applied to the same channel group number used in the **cas-group** *channel* **timeslots** *range* **type** *signal* command. These channel group numbers must match. Otherwise, the customized features specified by the **cas-custom** command will not be applied to the **cas-group** command's configuration. The signaling customization will not take effect.

However, you will not need to configure or set more than one channel group number per E1 line in most cases. Though rarely used, it is possible to split a single E1 (timeslots 1 to 31) into two groups (for example, 1 to 15 on group 1 and timeslots 17 to 31 in group 2).

Cisco strongly recommends that you use the **use-defaults** option when specifying a particular country type. See the **country** *name* command in Table 1. This additional keyword ensures that all the local country settings are correctly enabled. For example, enter the **country greece use-defaults** command. If the **use-defaults** option is not specified, generic ITU will be the default setting for all countries.

You can configure the system to deviate from a country's default settings as defined by Cisco. To do this, choose from the following list of commands described in Table 1: **ani-digits min** *number* **max** *number*, **answer-signal** {**group-a** | **group-b**} *number*, **caller-digits** *number*, **category** *number*, **dnis-digits min** *number* **max** *number*, **invert-abcd**, **ka** *number*, **kd** *number*, **metering**, **nc-congestion**, and **unused-abcd** *value*. To return a country back to its country-specific default settings, enter the **country** *name* **use-defaults** command. To return a country back to the ITU standard, enter the **default country** *name* **use-defaults** command.

Note Only integrated MICA modems support E1 R2 signaling on Cisco access servers.

Table 1 shows a list of command options in cas-custom mode, which is used to customize R2 signaling settings. Some switches require you to fine tune your R2 settings. Do not tamper with these commands unless you understand exactly how your switch will be affected.

Table 1 Available Commands in Cas-Custom Mode

Command	Purpose
ani-digits min *number* **max** *number*	Requested number of ANI digits for each call. All calls that do not match the minimum and maximum settings that you specify will be dropped. The minimum number of collected digits is set by **min** *number*. Replace the *number* variable with a value between 0 and 64. The maximum number of collected digits is set by **max** *number*. Replace the *number* variable with a value between 5 and 64. By default, ANI digits are not collected, which is the ITU standard.
answer-signal {**group-a** | **group-b**} *number*	Answer signal to be used. You can specify the group A signal or the group B signal. The signal *number* can be 1 to 15. Default is group-b 6, which is the ITU default.
caller-digits *number*	Specifies the number of digits the access server needs to collect before it requests ANI or CallerID information. The digits can be from 1 to 10. Default is 1, which is the ITU default.
category *number*	Specifies the category type of the incoming call, which is mapped to a group signal *number*. Signal numbers from 1 to 15 are available. Default is 1, which is the ITU default.
country *name* **use-defaults**	Specifies the local country, regional, and some corporation settings for R2 signaling. Replace the *name* variable with one of the following supported country names. Cisco strongly recommends that you include the **use-defaults** option, which enables the default settings for a specific country. Default country setting is ITU. • **argentina use-defaults** • **australia use-defaults** • **brazil use-defaults** • **china use-defaults** • **columbia use-defaults** • **costarica use-defaults** • **easteurope use-defaults** The **easteurope** option supports Croatia, Russia, and the Slovak Republic. • **ecuador-itu use-defaults** • **ecuador-lme use-defaults** • **greece use-defaults** • **guatemala use-defaults** • **hongkong-china use-defaults** The Hong Kong option uses the China variant.

Table 1 Available Commands in Cas-Custom Mode (continued)

Command	Purpose
	• **indonesia use-defaults** • **israel use-defaults** • **itu** ITU is the signaling default. ITU provides support for the following list of countries: Denmark, Finland, Germany, Russia (ITU variant), Hong Kong (ITU variant), and South Africa (ITU variant). The expression "ITU variant" means that there are multiple R2 signaling types deployed in the specified country, but Cisco supports the ITU variant. • **korea use-defaults** • **malaysia use-defaults** • **newzealand use-defaults** • **paraguay use-defaults** • **peru use-defaults** • **philippines use-defaults** • **saudiarabia use-defaults** • **singapore use-defaults** • **southafrica-panaftel use-defaults** The South Africa option uses the Panaftel variant. • **telmex use-defaults** • **telnor use-defaults** The Telemex and Telnor corporations are supported for Mexico. • **thailand use-defaults** • **uruguay use-defaults** • **venezuela use-defaults** • **vietnam use-defaults**
default	Sets a command to its default setting.
dnis-digits min *number* **max** *number*	Requested number of DNIS digits for each call. All calls that do not match the minimum and maximum settings that you specify will be dropped. The minimum number of collected digits is set by **min** *number*. Replace the *number* variable with a value between 0 and 64. The maximum number of collected digits is set by **max** *number*. Replace the *number* variable with a value between 5 and 64. By default, DNIS digits are not collected, which is the ITU standard.
exit	Takes you out of cas custom mode.
invert-abcd	Inverts the ABCD bits before tx and after rx. This feature is disabled by default, which is the ITU default.
ka *number*	Specifies the KA signal code. You can choose 1 to 15. Default is 0, which is the ITU default.
kd *number*	Specifies the KD signal code. You can choose 1 to 15. Default is 0, which is the ITU default.

Table 1 Available Commands in Cas-Custom Mode (continued)

Command	Purpose
metering	Specifies sending a metering pulse when the access server is making an outgoing call. Metering is turned off by default, which is the ITU default.
nc-congestion	Specifies the noncompelled congestion signal. This signal is sent to the central office when the access server is congested and cannot accept the call. The default is B4, which is the ITU default.
no	Negates a command or sets its defaults.
request-category	DNIS digits to be collected before requesting category. A category specifies different priority levels for different calls within R2, such as data calls versus voice calls. This information is primarily used for the switches that forward the calls to the NAS. For example, India needs the category requested after the first DNIS digit.
unused-abcd *value*	Specifies unused ABCD bit values, which can have a 0 or 1 bit value. This feature is disabled by default, which is the ITU default.

Examples

Example 1

The following example displays the available signaling parameters after you enter cas-custom mode. Notice that the same channel group 1 is specified in the **cas-group** command and the **cas-custom** command.

```
router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z
router(config)# controller e1 1
router(config-controller) cas-group 1 timeslots 1-31 type r2-digital r2-compelled
router(config-controller) cas-custom 1
router(config-ctrl-cas)# ?
CAS custom commands:
  ani-digits        Expected number of ANI digits
  answer-signal     Answer signal to be used
  caller-digits     Digits to be collected before requesting CallerID
  category          Category signal
  country           Country Name
  default           Set a command to its defaults
  dnis-digits       Expected number of DNIS digits
  exit              Exit from cas custom mode
  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
  request-category  DNIS digits to be collected before requesting category
  unused-abcd       Unused ABCD bit values
```

Example 2

You can localize your R2 configuration for a specific country. Don't forget to include the **use-defaults** option as described in Table 1. For example, use the **country argentina use-defaults** command for a R2 scenario in Argentina.

```
router(config-ctrl-cas)# country ?
  argentina             Argentina
  australia             Australia
  brazil                Brazil
  china                 China
  columbia              Columbia
  costarica             Costa Rica
  easteurope            East Europe
  ecuador-itu           Ecuador ITU
  ecuador-lme           Ecuador LME
  greece                Greece
  guatemala             Guatemala
  hongkong-china        Hong Kong (China variant)
  indonesia             Indonesia
  israel                Israel
  itu                   ITU
  korea                 Korea
  malaysia              Malaysia
  newzealand            New Zealand
  paraguay              Paraguay
  peru                  Peru
  philippines           Philippines
  saudiarabia           Saudi Arabia
  singapore             Singapore
  southafrica-panaftel  South Africa Panaftel
  telmex                Telmex
  telnor                Telnor
  thailand              Thailand
  uruguay               Uruguay
  venezuela             Venezuela
  vietnam               Vietnam

router(config-ctrl-cas)# country argentina ?
  use-defaults   Use Country defaults
  <cr>

router(config-ctrl-cas)# country argentina use-defaults
```

Example 3

The following example customizes the signaling for channel group 1. The configuration collects 3 digits before it requests ANI information for analog calls received on a Cisco AS5300 in Argentina.

```
router(config-controller)# cas-custom 1
router(config-ctrl-cas)# country argentina use-defaults
router(config-ctrl-cas)# caller-digits 3
router(config-controller)# ^z
router(config)#
```

Example 4

Because cas-custom mode gives you the flexibility to customize R2 parameters, the margin for user error increases. Therefore, the Cisco IOS software enables you to return a country back to its default R2 settings using the **use-defaults** option. The following example begins by bringing up Argentina's default settings, changing a few customization parameters, then returning the Argentina R2 setting back to its original state.

```
router(config-ctrl-cas)# country argentina use-defaults
router(config-ctrl-cas)# caller-digits 3
router(config-ctrl-cas)# unused-abcd 1
router(config-ctrl-cas)# metering
router(config-ctrl-cas)# country argentina use-defaults
```

Related Command

cas-group (controller E1)

cas-group (controller e1)

To configure channel associated signaling on an E1 controller, use the **cas-group** controller configuration command. Use the **no** form of this command to disable channel associated signaling for one or more timeslots.

cas-group *channel* **timeslots** *range* **type** *signal*
no cas-group *channel* **timeslots** *range* **type** *signal*

Syntax Description

channel	Specifies a single channel group number. Replace the *channel* variable with a number between 0 and 30.
timeslots *range*	Specifies a timeslot range, which can be from 1 to 31. You can specify a timeslot range (for example, 1-31), individual timeslots separated by commas (for example 1, 3, 5), or a combination of the two (for example, 1-14, 15, 17-31). The 16th time slot is reserved for out-of-band signaling.
type *signal*	Specifies the type of channel associated signaling. Configure the signal type that your central office uses. Replace the *signal* variable with one of the following signal types: • **e&m-fgb** [**dtmf** [**dnis**] | **mf** [**dnis**]]—Specifies ear and mouth channel signaling with feature group B support, which includes the wink start protocol. The optional signal tones are DTMF and MF with the option of provisioning DNIS. • **e&m-fgd**—Specifies ear and mouth channel signaling with feature group D support, which includes the wink start protocol. • **e&m-immediate-start**—Specifies ear and mouth channel signaling with immediate start support. • **fxs-ground-start**—Specifies Foreign Exchange Station ground start signaling support. • **fxs-loop-start**— Specifies Foreign Exchange Station loopstart signaling support. • **p7**— Specifies the P7 switch type. • **sas-ground-start**—Specifies Special Access Station ground start signaling support. • **sas-loop-start**—Specifies Special Access Station loopstart signaling support. • **r2-analog** [**dtmf** | **r2-compelled** [**ani**] | **r2-non-compelled** [**ani**] | **r2-semi-compelled** [**ani**]] • **r2-digital** [**dtmf** | **r2-compelled** [**ani**] | **r2-non-compelled** [**ani**] | **r2-semi-compelled** [**ani**]] • **r2-pulse** [**dtmf** | **r2-compelled** [**ani**] | **r2-non-compelled** [**ani**] | **r2-semi-compelled** [**ani**]]

The following descriptions are provided for the previous three R2 syntax bullets:

r2-analog—Specifies R2 ITU Q411 analog line signaling, which reflects the on/off switching of a tone in frequency-division multiplexing circuits (before TDM circuits were created). The tone is used for line signaling.

r2-digital—Specifies R2 ITU Q421 digital line signaling, which is the most common signaling configuration. The A and B bits are used for line signaling.

r2-pulse—Specifies R2 ITU supplement 7 pulse line signaling, which is a transmitted pulse that indicates a change in the line state.

dtmf—Specifies the DTMF tone signaling.

r2-compelled [**ani**]—Specifies R2 compelled register signaling. You can also specify provisioning the ANI addr option.

r2-non-compelled [**ani**]—Specifies R2 noncompelled register signaling.

r2-semi-compelled [**ani**]—Specifies R2 semicompelled register signaling.

Default

No channel associated signaling is configured on the controller. All R2 signaling types have DNIS turned on by default.

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.2 P.

Use this command to configure support for incoming and outgoing call signals (such as on-hook and off-hook) on each E1 controller.

If you specify the timeslot range 1-31, the system software automatically uses the 16th timeslot to transmit the channel associated signaling.

The signaling you configure on the access server must match the signaling used by the central office. For example if the central office switch is forwarding R2 analog signaling to a Cisco AS5300, then the access server's E1 controller must also be configured for R2 analog signaling (**r2-analog**).

All R2 signaling options have DNIS support turned on by default. If you enable the **ani** option, the collection of DNIS information is still performed. Specifying the **ani** option does not disable DNIS. DNIS is the number being called. ANI is the caller's number. For example, if you are configuring router A to call router B, then the DNIS number is router B, the ANI number is router A. ANI is very similar to Caller ID.

To customize the R2 signaling parameters, refer to the **cas-custom** controller configuration command. When you enable the **cas-group** command, the **cas-custom** command is automatically set up to be polled for configuration information. However, unless you enable or turn on specific features with the **cas-custom** command, the cas-custom feature has an empty set of signaling parameters.

Note Only integrated MICA modems support E1 R2 signaling on Cisco access servers.

DNIS is automatically collected for modem pools and R2 tone signaling. You do not need to specify the collection of DNIS information with the **cas-group** command. However, if you are using non-R2 tone signaling, the system must be manually configured to collect DNIS information. For non-R2 cas signaling, DNIS collection is done only for E&M-fgb.

Examples

In most cases, you will configure the same channel associated signaling on each E1 controller. The following examples configure signaling and customized parameters on controller E1 2 using the **cas-group** and **cas-custom** controller configuration commands.

The actual channel associated signaling is configured on the 16th timeslot, which is the reason why this timeslot does not come up in the following output.

```
router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
router(config)# controller e1 2
router(config-controller)# cas-group 1 timeslots 1-31 type r2-digital r2-compelled ani
router(config-controller)#
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 1 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 2 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 3 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 4 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 5 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 6 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 7 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 8 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 9 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 10 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 11 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 12 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 13 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 14 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 15 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 17 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 18 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 19 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 20 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 21 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 22 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 23 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 24 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 25 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 26 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 27 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 28 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 29 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 30 is up
%DSX0-5-RBSLINEUP: RBS of controller 0 timeslot 31 is up
```

The following example shows all the supported E1 signaling types on a Cisco AS5300:

```
router(config-controller)# cas-group 1 timeslots 1-31 type ?
  e&m-fgb              E & M Type II FGB
  e&m-fgd              E & M Type II FGD
  e&m-immediate-start  E & M Immediate Start
  fxs-ground-start     FXS Ground Start
  fxs-loop-start       FXS Loop Start
  p7                   P7 Switch
  r2-analog            R2 ITU Q411
  r2-digital           R2 ITU Q421
  r2-pulse             R2 ITU Supplement 7
  sas-ground-start     SAS Ground Start
  sas-loop-start       SAS Loop Start

router(config-controller)# cas-group 1 timeslots 1-31 type r2-analog ?
  dtmf               DTMF tone signalling
  r2-compelled       R2 Compelled Register Signalling
  r2-non-compelled   R2 Non Compelled Register Signalling
  r2-semi-compelled  R2 Semi Compelled Register Signalling
  <cr>
```

R2 signaling parameters can be customized with the **cas-custom** controller configuration command:

```
router(config-controller)# cas-custom 1
router(config-ctrl-cas)# ?
CAS custom commands:
  caller-digits  Digits to be collected before requesting CallerID
  category       Category signal
  country        Country Name
  default        Set a command to its defaults
  exit           Exit from cas custom mode
  invert-abcd    invert the ABCD bits before tx and after rx
  metering       R2 network is sending metering signal
  nc-congestion  Non Compelled Congestion signal
  no             Negate a command or set its defaults
```

Related Command

cas-custom

cptone

To specify a regional analog voice interface-related tone, ring, and cadence setting, use the **cptone** voice-port configuration command. Use the **no** form of this command to disable the selected tone.

cptone *locale*
no cptone *locale*

Syntax Description

locale — Keyword specifying an analog voice interface-related, default tone, ring, and cadence settings for a specified country.

Valid entries are listed in Table 2.

Table 2 Cptone Command Entries

Cptone Command Entry	Country
ar	Argentina
au	Australia
at	Austria
be	Belgium
br	Brazil
ca	Canada
cn	China
co	Colombia
cz	Czech Republic
dk	Denmark
fi	Finland
fr	France
de	Germany
gr	Greece
hk	Hong Kong
hu	Hungary
is	Iceland
in	India
id	Indonesia
ie	Ireland
il	Israel
it	Italy
jp	Japan
kr	Korea Republic
lu	Luxembourg
my	Malaysia
mx	Mexico

Table 2 Cptone Command Entries (continued)

Cptone Command Entry	Country
nl	Netherlands
nz	New Zealand
no	Norway
pe	Peru
ph	Philippines
pl	Poland
pt	Portugal
ru	Russian Federation
sg	Singapore
sk	Slovakia
si	Slovenia
za	South Africa
es	Spain
se	Sweden
ch	Switzerland
tw	Taiwan
th	Thailand
tr	Turkey
gb	Great Britain
us	Unites States
ve	Venezuela

Default

us

Command Mode

Voice-port configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.3(1)T.

The **cptone** command only affects the tones generated at the local interface. It does not affect any information passed to the remote end of a connection, or any tones generated at the remote end of a connection.

If your device is configured to support E1 R2 signaling, the E1 R2 signaling type (whether ITU, ITU variant, or local variant as defined by the **cas-custom** command) needs to match the appropriate PCM encoding type as defined by the **cptone** command. For countries for which a **cptone** value has not yet been defined, you can try the following:

- If the country uses aLaw E1 R2 signaling, use the GB value for the **cptone** command.
- If the country uses uLaw E1 R2 signaling, use the US value for the **cptone** command.

Examples

The following example configures Brazil as the call progress tone locale on the Cisco AS5300:

```
voice-port 1:0
 cptone BR
 description Brasil Tone
```

What to Do Next

For additional software configuration information, see the following publications:

- *Dial Solutions Configuration Guide* (Cisco IOS Release 12.0)
- *Cisco AS5300 Universal Access Server Software Configuration Guide*
- *Cisco AS5200 Universal Access Server Software Configuration Guide*