



# E1 R2 Signaling for the Cisco AS5300 and Cisco AS5200 Access Servers

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## Feature History

Release	Modification
11.3(2)T	This feature was introduced.
12.2(2)XB1	This feature was implemented on the Cisco AS5850 platform.
12.2(11)T	This feature was integrated into Cisco IOS Release 12.2(11)T.

The following sections are provided:

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## Feature Overview

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

**Note**

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Only MICA modems support R2 functionality. Microcom modems do not support R2.

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## Benefits

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

## Related Documents

For additional software configuration information, see the following publications:

- *Dial Solutions Configuration Guide* (Cisco IOS Release 11.3)
- *Cisco AS5300 Universal Access Server Software Configuration Guide*
- *Cisco AS5200 Universal Access Server Software Configuration Guide*

## Supported Platforms

These access servers support this feature:

- Cisco AS5300
- Cisco AS5200
- Cisco AS5850

### Determining Platform Support Through Cisco Feature Navigator

Cisco IOS software is packaged in feature sets that support specific platforms. To get updated information regarding platform support for this feature, access Cisco Feature Navigator. Cisco Feature Navigator dynamically updates the list of supported platforms as new platform support is added for the feature.

Cisco Feature Navigator is a web-based tool that enables you to determine which Cisco IOS software images support a specific set of features and which features are supported in a specific Cisco IOS image. You can search by feature or release. Under the release section, you can compare releases side by side to display both the features unique to each software release and the features in common.

To access Cisco Feature Navigator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to [cco-locksmith@cisco.com](mailto:cco-locksmith@cisco.com). An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions at <http://www.cisco.com/register>.

Cisco Feature Navigator is updated regularly when major Cisco IOS software releases and technology releases occur. For the most current information, go to the Cisco Feature Navigator home page at the following URL:

<http://www.cisco.com/go/fn>

### Availability of Cisco IOS Software Images

Platform support for particular Cisco IOS software releases is dependent on the availability of the software images for those platforms. Software images for some platforms may be deferred, delayed, or changed without prior notice. For updated information about platform support and availability of software images for each Cisco IOS software release, refer to the online release notes or, if supported, Cisco Feature Navigator.

## Supported Standard MIBs and RFCs

### Standards

No new or modified standards are supported by this feature.

## MIBs

No new or modified MIBs are supported by this feature.

To obtain lists of supported MIBs by platform and Cisco IOS release, and to download MIB modules, go to the Cisco MIB website on Cisco.com at the following URL:

<http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>

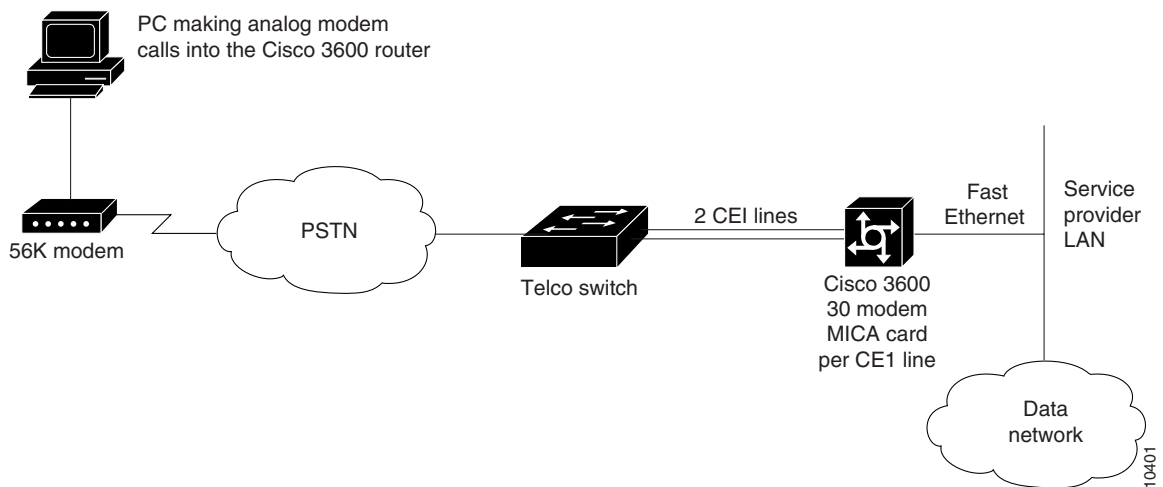
## RFCs

No new or modified RFCs are supported by this feature.

## Sample Network Topology

shows a sample network topology for using E1 R2 signaling with a Cisco AS5300. All four controllers on the access server are configured with R2 digital signaling. Additionally, localized R2 country settings are enabled on the access server. For a sample configuration, see the “[Configuration Examples](#)” section on page 8.

**Table 1** Service Provider using E1 R2 Signaling and a Cisco AS5300



## Configuring E1 R2 Signaling

R2 signalling is channelized E1 signalling 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 issuing 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.

## Configuring E1 R2 Signaling

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

Step	Command	Purpose
1	<b>controller e1</b> <i>number</i>	Specify the E1 controller that you want to configure with R2 signaling.
2	<b>cas-group</b> <i>channel timeslots range</i> <b>type</b> { <b>r2-analog</b>   <b>r2-digital</b>   <b>r2-pulse</b> } [ <b>dtmf</b>   <b>r2-compelled</b> [ <b>ani</b> ]   <b>r2-non-compelled</b> [ <b>ani</b> ]   <b>r2-semi-compelled</b> [ <b>ani</b> ]]	Configure R2 channel associated signaling on the E1 controller. For a complete description of the available R2 options, see the <a href="#">cas-group (controller e1)</a> command reference page.
3	<b>cas-custom</b> <i>channel</i>	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 <i>channel</i> number used in the <b>cas-custom</b> command must match the <i>channel</i> number specified by the <b>cas-group</b> command.

Step	Command	Purpose
4	<b>country name use-defaults</b>	<p>Specify the local country, region, or corporation specification to use with R2 signaling. Replace the <i>name</i> variable with one of the supported country names.</p> <p>Cisco strongly recommends that you include the <b>use-defaults</b> option, which engages the default settings for a specific country. The default setting for all countries is ITU.</p> <p>See the <a href="#">cas-custom</a> command reference page for the list of supported countries, regions, and corporation specifications.</p>
5	<ul style="list-style-type: none"> <li>• ani-digits</li> <li>• answer-signal</li> <li>• caller-digits</li> <li>• category</li> <li>• default</li> <li>• dnis-digits</li> <li>• invert-abcd</li> <li>• ka</li> <li>• kd</li> <li>• metering</li> <li>• nc-congestion</li> <li>• unused-abcd</li> <li>• request-category</li> </ul>	<p>(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.</p> <p>For nearly all network scenarios, the <b>country name use-defaults</b> command fully configures your country's local settings. You should not need to perform Step 5.</p> <p>See the <a href="#">cas-custom</a> command reference page for more information about each signaling command.</p>

For another E1 R2 configuration example, see the section “[Configuration Examples](#)” on page 8.

## Verifying E1 R2 Signaling

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.

```
Router# 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
```

- Enter the **show modem csm** command to view status for a specific modem:

```
Router# show modem csm 1/0
```

```
MODEM_INFO: slot 1, port 0, unit 0, tone r2-compelled, modem_mask=0x0000,
modem_port_offset=0
tty_hwidb=0x60E63E4C, modem_tty=0x60C16F04, oobp_info=0x00000000,
modem_pool=0x60BC60CC
modem_status(0x0002): VDEV_STATUS_ACTIVE_CALL.
csm_state(0x0205)=CSM_IC5_CONNECTED, csm_event_proc=0x600CFF70, current call thru CAS
line
invalid_event_count=0, wdt_timeout_count=0
wdt_timestamp_started is not activated
wait_for_dialing:False, wait_for_bchan:False
pri_chnl=TDM_PRI_STREAM(s0, u3, c7), modem_chnl=TDM_MODEM_STREAM(s1, c0)
dchan_idb_start_index=0, dchan_idb_index=0, call_id=0x0239, bchan_num=6
csm_event=CSM_EVENT_DSX0_CONNECTED, cause=0x0000
ring_no_answer=0, ic_failure=0, ic_complete=3
dial_failure=0, oc_failure=0, oc_complete=0
oc_busy=0, oc_no_dial_tone=0, oc_dial_timeout=0
remote_link_disc=2, stat_busyout=2, stat_modem_reset=0
oobp_failure=0
call_duration_started=00:04:56, call_duration_ended=00:00:00,
total_call_duration=00:01:43
The calling party phone number =
The called party phone number = 9993003
total_free_rbs_timeslot = 0, total_busy_rbs_timeslot = 0,
total_dynamic_busy_rbs_timeslot = 0, total_static_busy_rbs_timeslot = 0,
min_free_modem_threshold = 0
```

## Troubleshooting Tips

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

- Loose wires, splices, connectors, shorts, bridge taps, and grounds
- Backwards transmit and receive
- Mismatched framing types (for example, CRC-4 verses 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 the following:

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

If you are still having trouble, enable the modem management Call Switching Module (CSM) debug mode using the **debug modem csm** command.

This is the debug output for an incoming call:

```
Router# debug modem csm 1/0
```

```
*May 15 04:05:46.675: VDEV_ALLOCATE: slot 2 and port 39 is allocated.  
  
*May 15 04:05:46.675: CSM_RX_CAS_EVENT_FROM_NEAT:(04BF): EVENT_CALL_DIAL_IN at slot 2 and  
port 39  
  
*May 15 04:05:46.675: CSM_PROC_IDLE: CSM_EVENT_DSX0_CALL at slot 2, port 39  
  
*May 15 04:05:46.675: Mica Modem(2/39): Configure(0x0)  
*May 15 04:05:46.675: Mica Modem(2/39): Configure(0x3)  
*May 15 04:05:46.675: Mica Modem(2/39): Configure(0x6)  
*May 15 04:05:46.675: Mica Modem(2/39): Call Setup  
*May 15 04:05:46.891: Mica Modem(2/39): State Transition to Call Setup  
*May 15 04:05:46.891: Mica Modem(2/39): Went offhook  
*May 15 04:05:46.891: CSM_PROC_IC1_RING: CSM_EVENT_MODEM_OFFHOOK at slot 2, port 39  
.  
.  
.
```

When the E1 controller comes up, you will see the following messages:

```
%CONTROLLER-3-UPDOWN: Controller E1 0, changed state to up  
It also shows these messages for individual timeslots:  
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 1 is up  
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 2 is up  
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 3 is up  
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 4 is up  
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 5 is up  
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 6 is up  
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 7 is up  
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 8 is up  
.  
.  
.
```

## Configuration Examples

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.

---

**Step 1** Enter global configuration mode using the **configure terminal** command:

```
Router# configure terminal  
Enter configuration commands, one per line. End with CNTL/Z.
```

**Step 2** Specify the E1 controller that you want to configure with R2 signaling using the **controller e1 number** global configuration command. 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.

```
Router(config)# controller e1 2
```

**Step 3** Configure channel associated signaling with the **cas-group channel timeslots range type signal** command. The signaling type forwarded by the connecting telco switch must match the signaling configured on the Cisco AS5300. The Cisco IOS configuration options are **r2-analog**, **r2-digital**, or **r2-pulse**.

```
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
```

The following example specifies R2 ITU Q421 digital line signaling (**r2-digital**). This example also specifies R2 compelled register signalling and provisions the ANI ADDR option.

```
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
```



**Note**

For a description of the supported R2 signaling options, see the [cas-group \(controller e1\)](#) command reference page. The actual R2 channel associated signaling is configured on the 16th timeslot, which is the reason why the timeslot does not come up in the example output.

**Step 4**

Customize some of the E1 R2 signaling parameters with the **cas-custom** *channel* controller configuration command. This example specifies the default R2 settings for Argentina. See the [cas-custom](#) command reference page for a detailed description of these options.

```
Router(config-controller)# cas-custom 1
Router(config- -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

```

```

Router(config-ctrl-cas)# country ?
  argentina          Argentina
  australia          Australia
  brazil             Brazil
  china              China
  columbia           Columbia
  .
  .
  .
Router(config-ctrl-cas)# country argentina ?
  use-defaults      Use Country defaults
  <cr>

Router(config-ctrl-cas)# country argentina use-defaults

```



**Note**

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Cisco highly recommends that you specify your country's default settings. To display a list of supported countries, issue the **country ?** command. The default setting for all countries is ITU.

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## Command Reference

This section documents new and modified commands. All other commands used with this feature are documented in the Cisco IOS Release 11.3 command references.

- [cas-custom](#)
- [cas-group \(controller e1\)](#)

# 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

<i>channel</i>	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 <b>cas-group</b> command.
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## DefaultsDefault

No customized signaling parameters are set. If you do not specify a country name using the **country** *name* command, which is described in [Table 2](#), ITU is the selected default signal.

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## Command Modes

Controller configuration

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## Command History

Release	Modification
11.2 P	This command was introduced.
12.2(2)XB1	This command was implemented on the Cisco AS5850.
12.2(11)T	This command was integrated into Cisco IOS Release 12.2(11)T.

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## Usage Guidelines

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. See [Example 1](#).

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 2](#). This additional keyword ensures that all the local country settings are correctly enabled. For example, issue the **country greece use-defaults** command. If the **use-defaults** option is not specified, generic ITU will be the default setting for all countries. See [Example 2](#).

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 2](#): **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, issue the **country name use-defaults** command. To return a country back to the ITU standard, issue the **default country name use-defaults** command. See [Example 3](#) and [Example 4](#).



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

[Table 2](#) 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 effected.

**Table 2 Available Commands in Cas-Custom Mode**

Command	Purpose
<b>ani-digits</b> <i>min number max number</i>	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 <b>min number</b> . Replace the <i>number</i> variable with a value between 0 and 64. The maximum number of collected digits is set by <b>max number</b> . Replace the <i>number</i> variable with a value between 5 and 64. By default, ANI digits are not collected, which is the ITU standard.
<b>answer-signal</b> { <i>group-a</i>   <i>group-b</i> } <i>number</i>	Answer signal to be used. You can specify the group A signal or the group B signal. The signal <i>number</i> can be 1 to 15. Default is group-b 6, which is the ITU default.
<b>caller-digits</b> <i>number</i>	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.
<b>category</b> <i>number</i>	Specifies the category type of the incoming call, which is mapped to a group signal <i>number</i> . Signal numbers from 1 to 15 are available. Default is 1, which is the ITU default.

**Table 2 Available Commands in Cas-Custom Mode (Continued)**

Command	Purpose
<b>country</b> <i>name</i> <b>use-defaults</b>	<p>Specifies the local country, regional, and some corporation settings for R2 signaling. Replace the <i>name</i> variable with one of the following supported country names. Cisco strongly recommends that you include the <b>use-defaults</b> option, which enables the default settings for a specific country. Default country setting is ITU.</p> <ul style="list-style-type: none"> <li>• <b>argentina use-defaults</b></li> <li>• <b>australia use-defaults</b></li> <li>• brazil use-defaults</li> <li>• china use-defaults</li> <li>• columbia use-defaults</li> <li>• costarica use-defaults</li> <li>• easteurope use-defaults</li> </ul> <p>The <b>easteurope</b> option supports Croatia, Russia, and the Slovak Republic.</p> <ul style="list-style-type: none"> <li>• ecuador-itu use-defaults</li> <li>• ecuador-lme use-defaults</li> <li>• greece use-defaults</li> <li>• guatemala use-defaults</li> <li>• hongkong-china use-defaults</li> </ul> <p>The Hong Kong options uses the China variant.</p> <ul style="list-style-type: none"> <li>• indonesia use-defaults</li> <li>• israel use-defaults</li> <li>• itu</li> </ul> <p>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).</p> <p>The expression “ITU variant” means that there are multiple R2 signaling types deployed in the specified country, but Cisco supports the ITU variant.</p> <ul style="list-style-type: none"> <li>• korea use-defaults</li> <li>• malaysia use-defaults</li> <li>• newzealand use-defaults</li> </ul>

**Table 2 Available Commands in Cas-Custom Mode (Continued)**

Command	Purpose
	<ul style="list-style-type: none"> <li>paraguay use-defaults</li> <li>peru use-defaults</li> <li>philippines use-defaults</li> <li>saudi-arabia use-defaults</li> <li>singapore use-defaults</li> <li>south-africa-panaf-tel use-defaults</li> </ul> <p>The South Africa option uses the Panaf-tel variant.</p> <ul style="list-style-type: none"> <li>telmex use-defaults</li> <li>telnor use-defaults</li> </ul> <p>The Telemex and Telnor corporations are supported for Mexico.</p> <ul style="list-style-type: none"> <li>thailand use-defaults</li> <li>uruguay use-defaults</li> <li>venezuela use-defaults</li> <li>vietnam use-defaults</li> </ul>
<b>default</b>	Sets a command to its default setting.
<b>dnis-digits</b> <i>min number max number</i>	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 <b>min number</b> . Replace the <i>number</i> variable with a value between 0 and 64. The maximum number of collected digits is set by <b>max number</b> . Replace the <i>number</i> variable with a value between 5 and 64. By default, DNIS digits are not collected, which is the ITU standard.
<b>exit</b>	Takes you out of cas custom mode.
<b>invert-abcd</b>	Inverts the ABCD bits before tx and after rx. This feature is disabled by default, which is the ITU default.
<b>ka</b> <i>number</i>	Specifies the KA signal code. You can choose 1 to 15. Default is 0, which is the ITU default.
<b>kd</b> <i>number</i>	Specifies the KD signal code. You can choose 1 to 15. Default is 0, which is the ITU default.
<b>metering</b>	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.
<b>nc-congestion</b>	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.
<b>no</b>	Negates a command or sets its defaults.

**Table 2 Available Commands in Cas-Custom Mode (Continued)**

Command	Purpose
<b>request-category</b>	DNIS digits to be collected before requesting category. A category specifies different priority levels for different calls within R2, such as data calls verses 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.
<b>unused-abcd value</b>	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.

**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 2](#). 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 Commands

Command	Purpose
<b>cas-group</b> (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

<i>channel</i>	Specifies a single channel group number. Replace the <i>channel</i> variable with a number between 0 and 30.
<i>timeslots range</i>	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.
<i>type signal</i>	<p>Specifies the type of channel associated signaling. Configure the signal type that your central office uses. Replace the <i>signal</i> variable with one of the following signal types:</p> <ul style="list-style-type: none"><li>• <b>e&amp;m-fgb [dtmf [dnis]   mf [dnis]]</b>—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.</li><li>• <b>e&amp;m-fgd</b>—Specifies ear and mouth channel signaling with feature group D support, which includes the wink start protocol.</li><li>• <b>e&amp;m-immediate-start</b>—Specifies ear and mouth channel signaling with immediate start support.</li><li>• <b>fxs-ground-start</b>—Specifies Foreign Exchange Station ground start signaling support.</li><li>• <b>fxs-loop-start</b>— Specifies Foreign Exchange Station loopstart signaling support.</li><li>• <b>p7</b>— Specifies the P7 switch type.</li><li>• <b>sas-ground-start</b>—Specifies Special Access Station ground start signaling support.</li><li>• <b>sas-loop-start</b>—Specifies Special Access Station loopstart signaling support.</li><li>• <b>r2-analog [dtmf   r2-compelled [ani]   r2-non-compelled [ani]   r2-semi-compelled [ani]]</b></li><li>• <b>r2-digital [dtmf   r2-compelled [ani]   r2-non-compelled [ani]   r2-semi-compelled [ani]]</b></li><li>• <b>r2-pulse [dtmf   r2-compelled [ani]   r2-non-compelled [ani]   r2-semi-compelled [ani]]</b></li></ul>

---

**type signal** (continued) 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.

---

#### Defaults

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

---

#### Command Modes

Controller configuration

---

#### Usage Guidelines

This command first appeared in Cisco IOS Release 11.2 P.

Support for the Cisco AS5850 universal gateway was added in the Cisco IOS Release 12.2.(2)XB1.

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 setup 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
```