



# Cisco ISDN BRI S/T Network Interface Modules Software Configuration Guide

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This document provides an overview of the software features and configuration information for Cisco ISDN BRI S/T Network Interface Modules (NIMs) on the Cisco 4000 Series Integrated Services Router.

For further information on the Cisco ISDN BRI S/T NIMs faceplates and LED descriptions, see [Connect Cisco ISDN BRI S/T Network Interface Modules to a Network](#).

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For hardware technical descriptions and for information about installing the router interfaces, refer to the appropriate hardware installation and maintenance publication for your particular product.

To identify the hardware platform or software image information associated with a feature, use the Feature Navigator on Cisco.com to search for information about the feature or refer to the software release notes for a specific release.

For a complete description of the BRI commands in this document, refer to the *Cisco IOS Dial Technologies Command Reference*. To locate documentation of other commands that appear in this document, use the command reference master index or search online.

## ISDN Overview

ISDN BRI provides two bearer (B) channels, each capable of transferring voice or data at 64 kbps, and one 16 kbps data (D) signaling channel, which is used by the telephone network to carry instructions about how to handle each of the B channels. ISDN BRI (also referred to as 2 B + D) provides a maximum transmission speed of 128 kbps, but many users use only half the available bandwidth.

## Request BRI Line and Switch Configuration from a Telco Service Provider

Before configuring ISDN BRI on your Cisco router, you must order a correctly configured ISDN line from your telecommunications service provider. This process varies from provider to provider on a national and international basis. However, some general guidelines follow:

- Ask for two channels to be called by one number.
- Ask for delivery of calling line identification. Providers sometimes call this CLI or automatic number identification (ANI).
- If the router will be the only device attached to the BRI, ask for point-to-point service and a data-only line.
- If the router will be attached to an ISDN bus (to which other ISDN devices might be attached), ask for point-to-multipoint service (subaddressing is required) and a voice-and-data line.

When you order ISDN service for switches used in North America, request the BRI switch configuration attributes specified in [Table 1](#).

**Table 1** North American ISDN BRI Switch Type Configuration Information

Switch Type	Configuration
5ESS Custom BRI	<p><b>For Data Only</b></p> <p>2 B channels for data. Point to point. Terminal type = E. 1 directory number (DN) assigned by service provider. MTERM = 1. Request delivery of calling line ID on Centrex lines. Set speed for ISDN calls to 56 kbps outside local exchange.</p> <p><b>For Voice and Data</b></p> <p>(Use these values only if you have an ISDN telephone connected.) 2 B channels for voice or data. Multipoint. Terminal type = D. 2 directory numbers assigned by service provider. 2 SPIDs required; assigned by service provider. MTERM = 2. Number of call appearances = 1. Display = No. Ringing/idle call appearances = idle. Autohold = no. Onetouch = no. Request delivery of calling line ID on Centrex lines. Set speed for ISDN calls to 56 kbps outside local exchange. Directory number 1 can hunt to directory number 2.</p>
5ESS National ISDN (NI) BRI	<p>Terminal type = A. 2 B channels for voice and data. 2 directory numbers assigned by service provider. 2 SPIDs required; assigned by service provider. Set speed for ISDN calls to 56 kbps outside local exchange. Directory number 1 can hunt to directory number 2.</p>

## Interface Configuration

The Cisco IOS software also provides custom features for configuring the ISDN BRI interface that provide such capability as call screening, called party number verification, ISDN default cause code override, and for European and Australian customers, Dialed Number Identification Service (DNIS)-plus-ISDN-subaddress binding to allow multiple binds between a dialer profile and an ISDN B channel.

### Interface Configuration Options

To place calls on an ISDN interface, you must configure it with dial-on-demand routing (DDR). For configuration information about ISDN using DDR, see the “Dial-on-Demand Routing Configuration” part of this publication. ISDN Cause Codes

A cause code is an information element (IE) that indicates why an ISDN call failed or was otherwise disconnected. When the originating gateway receives a Release Complete message, it generates a tone corresponding to the cause code in the message.

[Table 2](#) lists the default cause codes that the VoIP (Voice over IP) gateway sends to the switch when a call fails at the gateway, and the corresponding tones that it generates.

**Table 2** Cause Codes Generated by the Cisco VoIP Gateway

Cause Code	Description	Explanation	Tone
1	Unallocated (unassigned) number	The ISDN number is not assigned to any destination equipment.	Reorder
3	No route to destination	The call was routed through an intermediate network that does not serve the destination address.	Reorder
16	Normal call clearing	Normal call clearing has occurred.	Dial
17	User busy	The called system acknowledged the connection request but was unable to accept the call because all B channels were in use.	Busy
19	No answer from user (user alerted)	The destination responded to the connection request but failed to complete the connection within the prescribed time. The problem is at the remote end of the connection.	Reorder
28	Invalid number format	The connection could not be established because the destination address was presented in an unrecognizable format or because the destination address was incomplete.	Reorder
34	No circuit/channel available	The connection could not be established because no appropriate channel was available to take the call.	Reorder

Although the VoIP gateway generates the cause codes listed in [Table 2](#) by default, there are commands introduced in previous Cisco IOS releases that can override these defaults, allowing the gateway to send different cause codes to the switch. The following commands override the default cause codes:

- **isdn disconnect-cause**—Sends the specified cause code to the switch when a call is disconnected.

- **isdn network-failure-cause**—Sends the specified cause code to the switch when a call fails because of internal network failures.
- **isdn voice-call-failure**—Sends the specified cause code to the switch when an inbound voice call fails with no specific cause code.

When you implement these commands, the configured cause codes are sent to the switch; otherwise, the default cause codes of the voice application are sent. For a complete description of these commands, refer to the *Cisco IOS Dial Technologies Command Reference*.

## How to Configure ISDN BRI

To configure ISDN lines and interfaces, perform the tasks in the following sections:

- [Configure the ISDN BRI Switch](#) (Required)
- [Specify Interface Characteristics for an ISDN BRI](#) (As required)
- [Configure ISDN Semipermanent Connections](#) (As required)
- [Configure ISDN BRI for Leased-Line Service](#) (As required)

See the sections “[Monitor and Maintain ISDN Interfaces](#)” and “[Troubleshoot ISDN Interfaces](#)” later in this document for tips on maintaining your network. See the section “[Configuration Examples for ISDN BRI](#)” at the end of this document for configuration examples.

For information on ISDN Backup, refer to *Cisco IOS Dial Technologies Configuration Guide*.

## Configure the ISDN BRI Switch

To configure the ISDN switch type, perform the following task:

- [Configure the Switch Type](#) (Required)

Also see to the “[Multiple ISDN Switch Types Feature](#)” section for information about configuring multiple switch types.

## Configure the Switch Type

To configure the switch type, use the following command in global configuration mode:

Command	Purpose
Router(config)# <b>isdn switch-type</b> <i>switch-type</i>	Selects the service provider switch type; see <a href="#">Table 1</a> for switch types.

The section “[Global ISDN and BRI Interface Switch Type Example](#)” later in this document provides an example of configuring the ISDN BRI switch.

[Table 3](#) lists the ISDN BRI service provider switch types.

**Table 3** ISDN Service Provider BRI Switch Types

Switch Type Keywords	Description/Use	Central Office (CO) Switch Type?
<b>Voice/PBX Systems</b>		
<b>basic-qsig</b>	PINX (PBX) switch with QSIG signaling per Q.931	
<b>Australia, Europe, and UK</b>		
<b>basic-1tr6</b>	German 1TR6 ISDN switch	Yes
<b>basic-net3</b>	NET3 ISDN BRI for Norway NET3, Australia NET3, and New Zealand NET3 switches; covers ETSI-compliant Euro-ISDN E-DSS1 signaling system	Yes
<b>Japan</b>		
<b>ntt</b>	Japanese NTT ISDN BRI switch	
<b>North America</b>		
<b>basic-5ess</b>	Lucent (AT&T) basic rate 5ESS switch	Yes

## Multiple ISDN Switch Types Feature

The Cisco IOS software provides an enhanced Multiple ISDN Switch Types feature that allows you to apply an ISDN switch type to a specific ISDN interface and configure more than one ISDN switch type per router. This feature allows both ISDN BRI and ISDN PRI to run simultaneously on platforms that support both interface types.

## Specify Interface Characteristics for an ISDN BRI

Perform the tasks in the following sections to set interface characteristics for an ISDN BRI, whether it is the only BRI in a router or is one of many. Each of the BRI's can be configured separately.

- [Specify the Interface](#) (Required)
- [Configure CLI Screening](#) (As Required)
- [Configure Encapsulation on ISDN BRI](#) (Required)
- [Configure Network Addressing](#) (Required)
- [Configure TEI Negotiation Timing](#) (Optional)
- [Configure Called Party Number Verification](#) (Optional)
- [Configure ISDN Calling Number Identification](#) (Optional)
- [Configure the Line Speed for Calls Not ISDN End to End](#) (Optional)
- [Configure a Fast Rollover Delay](#) (Optional)
- [Override ISDN Application Default Cause Codes](#) (Optional)
- [Configure Inclusion of the Sending Complete Information Element](#) (Optional)
- [Configure DNIS-plus-ISDN-Subaddress Binding](#) (Optional)
- [Configure ISDN Semipermanent Connections](#) (Optional)

## Specify the Interface

To specify an ISDN BRI and enter interface configuration mode, use the following command beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# <b>interface bri</b> <i>slot/subslot/port:0</i>	Specifies the interface and begins interface configuration mode.

## Specify ISDN SPIDs

Some service providers use SPIDs to define the services subscribed to by the ISDN device that is accessing the ISDN service provider. The service provider assigns the ISDN device one or more SPIDs when you first subscribe to the service. If you are using a service provider that requires SPIDs, your ISDN device cannot place or receive calls until it sends a valid, assigned SPID to the service provider when accessing the switch to initialize the connection.

Currently, only the DMS-100 and NI switch types require SPIDs. The AT&T 5ESS switch type may support a SPID, but we recommend that you set up that ISDN service without SPIDs. In addition, SPIDs have significance at the local access ISDN interface only. Remote routers never receive the SPID.

A SPID is usually a seven-digit telephone number with some optional numbers. However, service providers may use different numbering schemes. For the DMS-100 switch type, two SPIDs are assigned, one for each B channel.

To define the SPIDs and the local directory number (LDN) on the router, use the following commands in interface configuration mode as needed:

Command	Purpose
Router(config-if)# <b>isdn spid1</b> <i>spid-number</i> [ <i>ldn</i> ]	Specifies a SPID and local directory number for the B1 channel.
Router(config-if)# <b>isdn spid2</b> <i>spid-number</i> [ <i>ldn</i> ]	Specifies a SPID and local directory number for the B2 channel.

The LDN is optional but might be necessary if the router is to answer calls made to the second directory number.

## Configure Encapsulation on ISDN BRI

Each ISDN B channel is treated as a synchronous serial line, and the default serial encapsulation is HDLC. The Dynamic Multiple Encapsulations feature allows incoming calls over ISDN to be assigned an encapsulation type such as HDLC and PPP.

To configure encapsulation, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# <b>encapsulation</b> [ <b>ppp</b>   <b>HDLC</b> ]	Configures encapsulation type.

## Verify the Dynamic Multiple Encapsulations Feature

To verify dialer interfaces configured for binding and see statistics on each physical interface bound to the dialer interface, use the **show interfaces EXEC** command.

The following example shows that the output under the B channel keeps all hardware counts that are not displayed under any logical or virtual access interface. The line in the report that states “Interface is bound to Dialer100 (Encapsulation PPP)” indicates that this B interface is bound to the dialer 100 interface and the encapsulation running over this connection is PPP, which is the encapsulation configured on the Dialer interface and inherited by the B channel.

```
Router# show interfaces bri0/1/0:2
BRI0/1/0:2 is up, line protocol is up
  Hardware is NIM-2BRI-S/T
  MTU 1492 bytes, BW 64 Kbit/sec, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation PPP, LCP Open
  Open: IPCP, loopback not set
  Keepalive set (10 sec)
  DTR is pulsed for 1 seconds on reset
  Time to interface disconnect: idle 00:01:51
  Interface is bound to Di100 (Encapsulation PPP)
  Last input 00:00:02, output 00:00:02, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/375/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    84 packets input, 2078 bytes, 0 no buffer
    Received 0 broadcasts (0 IP multicasts)
    0 runs, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    85 packets output, 2188 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 unknown protocol drops
    0 output buffer failures, 0 output buffers swapped out
    20 carrier transitions
```

Any protocol configuration and states should be displayed from the dialer 100 interface.

## Configure Network Addressing

The steps in this section support the primary goals of network addressing:

- Define which packets are *interesting* and will thus cause the router to make an outgoing call.
- Define the remote host where the calls are going.
- Specify whether broadcast messages will be sent.
- Specify the dialing string to use in the call.

Intermediate steps that use shared argument values tie the host identification and dial string to the interesting packets to be sent to that host.

To configure network addressing, use the following commands beginning in interface configuration mode:

	Command	Purpose
<b>Step 1</b>	Router(config-if)# <b>dialer map</b> protocol next-hop-address name hostname speed [56   64] dial-string[:isdn-subaddress]	(Most locations) Configures a serial interface or ISDN interface to call one or multiple sites or to receive calls from multiple sites.
	or	or
	Router(config-if)# <b>dialer map</b> protocol next-hop-address name hostname spc [speed 56   64] [broadcast] dial-string[:isdn-subaddress]	(Germany) Uses the command keyword that enables ISDN semipermanent connections.
<b>Step 2</b>	Router(config-if)# <b>dialer-group</b> group-number	Assigns the interface to a dialer group to control access to the interface.
<b>Step 3</b>	Router(config-if)# <b>exit</b>	Exits to global configuration mode.
<b>Step 4</b>	Router(config)# <b>dialer-list</b> dialer-group protocol protocol-name {permit   deny   list access-list-number   access-group}	Defines a dial-on-demand routing (DDR) dialer list for dialing by protocol or by a combination of a protocol and an access list.
<b>Step 5</b>	Router(config)# <b>access-list</b> access-list-number {deny   permit} protocol source address source-mask destination destination-mask	Defines an access list permitting or denying access to specified protocols, sources, or destinations. Permitted packets cause the router to place a call to the destination protocol address.

German networks allow semipermanent connections between customer routers with BRIs and the 1TR6 basic rate switches in the exchange. Semipermanent connections are less expensive than leased lines.

**Note**

The access list reference in [Step 5](#) of this task is an example of the **access-list** commands allowed by different protocols. Some protocols might require a different command form or might require multiple commands.

## Configure TEI Negotiation Timing

You can configure ISDN TEI negotiation on individual ISDN interfaces. TEI negotiation is useful for switches that may deactivate Layers 1 or 2 when there are no active calls. Typically, this setting is used for ISDN service offerings in Europe and connections to DMS-100 switches that are designed to initiate TEI negotiation.

By default, TEI negotiation occurs when the router is powered up. The TEI negotiation value configured on an interface overrides the default or global TEI value. For example, if you configure **isdn tei first-call** globally and **isdn tei powerup** on BRI interface 0, then TEI negotiation **powerup** is the value applied to BRI interface 0. It is not necessary to configure TEI negotiation unless you wish to override the default value (**isdn tei powerup**).

To apply TEI negotiation to a specific BRI interface, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# <b>isdn tei</b> [first-call   powerup]	Determines when ISDN TEI negotiation occurs.



## Configure CLI Screening

CLI screening adds a level of security by allowing you to screen incoming calls. You can verify that the calling line ID is from an expected origin. CLI screening requires a local switch that is capable of delivering the CLI to the router.

To configure CLI screening, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# <b>isdn caller</b> <i>number</i>	Configures caller ID screening.



### Note

If caller ID screening is configured and the local switch does not deliver caller IDs, the router rejects all calls.



### Note

In earlier releases of the Cisco IOS software, ISDN accepted all synchronous calls and performed some minimal CLI screening before accepting or rejecting a call. Beginning with Cisco IOS Release 12.1 software, DDR provides a separate process that screens for the profile of the caller. The new screening process also checks that enough resources are available to accept the call and that the call conforms to predetermined rules. When the call is found acceptable, the screening process searches for a matching profile for the caller. The call is accepted only when there is a matching profile.

## Configure Called Party Number Verification

When multiple devices are attached to an ISDN BRI, you can ensure that only a single device answers an incoming call by verifying the number or subaddress in the incoming call against the configured number or subaddress or both of the device.

You can specify that the router verify a called-party number or subaddress number in the incoming setup message for ISDN BRI calls, if the number is delivered by the switch. You can do so by configuring the number that is allowed. To configure verification, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# <b>isdn answer1</b> [ <i>called-party-number</i> ][: <i>subaddress</i> ]	Specifies that the router verify a called-party number or subaddress number in the incoming setup message.

Verifying the called-party number ensures that only the desired router responds to an incoming call. If you want to allow an additional number for the router, you can configure it, too.

To configure a second number to be allowed, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# <b>isdn answer2</b> [ <i>called-party-number</i> ][: <i>subaddress</i> ]	Specifies that the router verify a second called-party number or subaddress number in the incoming setup message.

## Configure ISDN Calling Number Identification

A router with an ISDN BRI interface might need to supply the ISDN network with a billing number for outgoing calls. Some networks offer better pricing on calls in which the number is presented. When configured, this information is included in the outgoing call Setup message.

To configure the interface to identify the billing number, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# <b>isdn calling-number</b> <i>calling-number</i>	Specifies the calling party number.

This command can be used with all switch types except German 1TR6 ISDN BRI switches.

## Configure the Line Speed for Calls Not ISDN End to End

When calls are made at 56 kbps but delivered by the ISDN network at 64 kbps, the incoming data can be corrupted. However, on ISDN calls, if the receiving side is informed that the call is not an ISDN call from end to end, it can set the line speed for the incoming call.

To set the speed for incoming calls recognized as not ISDN end to end, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# <b>isdn not-end-to-end</b> {56   64}	Sets the speed to be used for incoming calls recognized as not ISDN end to end.

## Configure a Fast Rollover Delay

Sometimes a router attempts to dial a call on an ISDN B channel before a previous call is completely torn down. The fast rollover fails because the second call is made to a different number before the B channel is released from the unsuccessful call. This failure might occur in the following ISDN configurations:

- The two B channels of the BRI are not configured as a hunt group, but have separate numbers defined.
- The B channel is not released by the ISDN switch until after Release Complete signal is processed.

You need to configure this delay if a BRI on a remote peer has two phone numbers configured one for each B channel you are dialing into this BRI, you have a dialer map for each phone number, and the first call succeeds but a second call fails with no channel available.

To configure a fast rollover delay, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# <b>isdn fast-rollover-delay</b> <i>seconds</i>	Defines a fast rollover delay.

A delay of 5 seconds should cover most cases. Configure sufficient delay to make sure the ISDN RELEASE\_COMPLETE message has been sent or received before making the fast rollover call. Use the **debug isdn q931** command to display this information. This pattern of failed second calls is a rare occurrence.

## Override ISDN Application Default Cause Codes

The ISDN Cause Code Override function is useful for overriding the default cause code of ISDN applications. When this feature is implemented, the configured cause code is sent to the switch; otherwise, default cause codes of the application are sent.

To configure ISDN cause code overrides, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# <b>isdn disconnect-cause</b> { <i>cause-code-number</i>   <b>busy</b>   <b>not-available</b> }	Specifies the ISDN cause code to send to the switch.

### ISDN Cause Code Override Configuration Example

The following example sends a BUSY cause code to the switch when an application fails to complete the call:

```
interface bri0/1/0:0
  isdn disconnect-cause busy
```

### Verify ISDN Cause Code Override

To verify that the ISDN Cause Code Override feature is operating correctly, enter the **debug q931** command. The **debug q931** command displays a report of any configuration irregularities.

## Configure Inclusion of the Sending Complete Information Element

In some geographic locations, such as Hong Kong and Taiwan, ISDN switches require that the Sending Complete information element be included in the outgoing Setup message to indicate that the entire number is included. This information element is generally not required in other locations.

To configure the interface to include the Sending Complete information element in the outgoing call Setup message, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# <b>isdn sending-complete</b>	Includes the Sending Complete information element in the outgoing call Setup message.

## Configure DNIS-plus-ISDN-Subaddress Binding

To configure DNIS-plus-ISDN-subaddress binding, use the following command in global configuration mode:

Command	Purpose
Router(config)# <b>dialer called</b> <i>DNIS:subaddress</i>	Binds a DNIS to an ISDN subaddress.

**Note**

This command allows multiple binds between a dialer profile and an ISDN B channel. The configuration requires an ISDN subaddress, which is used in Europe and Australia.

See the section [“DNIS-plus-ISDN-Subaddress Binding Example”](#) later in this document for a configuration example.

## Configure ISDN Semipermanent Connections

German networks allow semipermanent connections between customer routers with BRI interfaces and the 1TR6 basic rate switches in the exchange. Australian networks allow semipermanent connections between ISDN PRI interfaces and the TS-014 primary rate switches in the exchange. Semipermanent connections are offered at better pricing than leased lines.

Configuring BRI interfaces for semipermanent connection requires only that you use a keyword that indicates semipermanent connections when you are setting up network addressing as described in the previous section of this document.

To configure a BRI for semipermanent connections, follow this procedure:

- 
- Step 1** Set up the ISDN lines and ports as described in the sections [“Configure the ISDN BRI Switch”](#) and [“Specify Interface Characteristics for an ISDN BRI”](#).
- Step 2** Configure DDR on a selected interface, as described in the [“Dial-on-Demand Routing Configuration”](#) part of this publication.
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To begin DDR network addressing, use the following command in interface configuration mode

Command	Purpose
<pre>Router(config-if)# dialer map protocol next-hop-address name hostname spc [speed 56   64] [broadcast] dial-string[:isdn-subaddress]</pre>	<p>Defines the remote recipient’s protocol address, host name, and dialing string; indicates semipermanent connections; optionally, provides the ISDN subaddress; and sets the dialer speed to 56 or 64 kbps, as needed.</p>

## Configure ISDN BRI for Leased-Line Service

To configure ISDN BRI for leased line service, perform the tasks in one of the following sections as needed and available:

- [Configure Leased-Line Service at Normal Speeds](#) (Available in Japan and Germany)
- [Configure Leased-Line Service at 128 Kbps](#) (Available only in Japan)

**Note**

Once an ISDN BRI interface is configured for access over leased lines, it is no longer a dialer interface, and signaling over the D channel no longer applies. Although the interface is called **interface bri n**, it is configured as a synchronous serial interface having the default High-Level Data Link (HDLC) encapsulation. However, the Cisco IOS commands that set the physical characteristics of a serial interface (such as the pulse time) do not apply to this interface.

## Configure Leased-Line Service at Normal Speeds

This service is offered in Japan and Germany and no call setup or teardown is involved. Data is placed on the ISDN interface similar to the way data is placed on a leased line connected to a serial port.

To configure the BRI to use the ISDN connection as a leased-line service, use the following commands in global configuration mode:

	Command	Purpose
Step 1	Router(config)# <b>isdn switch-type</b> <i>switch-type</i>	Configures the BRI switch type, as specified by the local service provider.
Step 2	Router(config)# <b>isdn leased-line bri</b> <i>slot/subslot/port:0</i>	Specifies the BRI interface number.

To disable leased-line service if you no longer want to support it on a specified ISDN BRI, use the following command in global configuration mode:

Command	Purpose
Router(config)# <b>no isdn leased-line bri</b> <i>slot/subslot/port:0</i>	Removes leased line configuration from a specified ISDN BRI interface.

## Configure Leased-Line Service at 128 Kbps

The Cisco IOS software supports leased-line service at 128 kbps via ISDN BRI. This service combines two B channels into a single pipe. This feature requires one or more ISDN BRI hardware interfaces that support channel aggregation and service provider support for ISDN channel aggregation at 128 kbps. When this software first became available, service providers offered support for ISDN channel aggregation at 128 kbps only in Japan.



### Note

This feature is not supported on the Cisco 2500 series router because its BRI hardware does not support channel aggregation.

To enable leased-line service at 128 kbps on a specified ISDN BRI, use the following commands in global configuration mode:

	Command	Purpose
Step 1	Router(config)# <b>isdn switch-type</b> <i>switch-type</i>	Selects the service provider switch type.
Step 2	Router(config)# <b>isdn leased-line bri</b> <i>slot/subslot/port:0 128</i>	Configures a specified BRI for access over leased lines.

To remove the leased-line service configuration from a specified ISDN BRI, use the following command in global configuration mode:

Command	Purpose
Router(config)# <b>no isdn leased-line bri</b> <i>slot/subslot/port:0</i>	Removes leased-line configuration from a specified ISDN BRI interface.

## Monitor and Maintain ISDN Interfaces

To monitor and maintain ISDN interfaces, use the following commands in EXEC mode as needed:

Command	Purpose
Router> <b>show interfaces bri</b> <i>number</i>  <b>Cisco 7200 series routers only</b>	Displays information about the physical attributes of the ISDN BRI B and D channels.
Router> <b>show interfaces bri</b> <i>slot/subslot/port</i>	
Router> <b>show controllers bri</b> <i>number</i>  <b>Cisco 7200 series routers only</b>	Displays protocol information about the ISDN B and D channels.
Router> <b>show controllers bri</b> <i>slot/subslot/port</i>	
Router> <b>show isdn</b> { <b>active</b>   <b>history</b>   <b>memory</b>   <b>status</b>   <b>timers</b> }	Displays information about calls, history, memory, status, and Layer 2 and Layer 3 timers.
Router> <b>show dialer interface bri</b> <i>slot/subslot/port:0</i>	Obtains general diagnostic information about the specified interface.

## Troubleshoot ISDN Interfaces

To test the ISDN configuration of the router, use the following commands in EXEC mode as needed:

Command	Purpose
Router# <b>show controllers bri</b> <i>slot/subslot/port:0</i>	Checks Layer 1 (physical layer) of the BRI.
Router# <b>debug q921</b>	Checks Layer 2 (data link layer).
Router# <b>debug isdn events</b> Router# <b>debug q931</b> Router# <b>debug dialer</b> Router# <b>show dialer</b>	Checks Layer 3 (network layer).

## Configuration Examples for ISDN BRI

This section provides the following ISDN BRI configuration examples:

- [Global ISDN and BRI Interface Switch Type Example](#)
- [BRI Connected to a PBX Example](#)
- [Multilink PPP on a BRI Interface Example](#)
- [Dialer Rotary Groups Example](#)
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- [Multilink PPP on a BRI Interface Example](#)
- [Voice over ISDN Examples](#)
- [DNIS-plus-ISDN-Subaddress Binding Example](#)
- [ISDN BRI Leased-Line Configuration Example](#)

## Global ISDN and BRI Interface Switch Type Example

The following example shows a global National ISDN switch type (keyword **basic-ni**) and an interface-level NET3 ISDN switch type (keyword **basic-net3**). The **basic-net3** keyword is applied to BRI interface 0 and overrides the global switch setting.

```
isdn switch-type basic-ni
!
interface BRI0/1/0:0
  isdn switch-type basic-net3
```

## BRI Connected to a PBX Example

The following example provides a simple partial configuration of a BRI interface that is connected to a PBX. This interface is connected to a switch that uses SPID numbers.

```
interface BRI0/1/0:0
  description connected to pbx line 61885
  encapsulation ppp
  isdn spid1 123
  dialer rotary-group 1
  dialer-group 1
interface Dialer1
  ip address 10.1.1.3 255.255.255.0
  encapsulation ppp
  dialer in-band
  dialer map ip 10.1.1.1 name mutter 61886
  dialer map ip 10.1.1.2 name rudder 61884
  dialer map ip 10.1.1.4 name flutter 61888
  dialer-group 1
  ppp authentication chap
```

## Multilink PPP on a BRI Interface Example

The following example enables Multilink PPP on BRI 0/1/0:0:

```
interface BRI0/1/0:0
  description connected to pbx line 61885
  encapsulation ppp
  isdn spid1 123
  dialer rotary-group 1
  dialer-group 1
interface Dialer1
  ip address 10.1.1.3 255.255.255.0
  encapsulation ppp
  dialer in-band
  dialer map ip 10.1.1.1 name mutter 61886
  dialer map ip 10.1.1.2 name rudder 61884
  dialer map ip 10.1.1.4 name flutter 61888
  dialer-group 1
  ppp authentication chap
  ppp multilink
```

## Dialer Rotary Groups Example

The following example configures BRI interfaces to connect into a rotary group (using the **dialer-group** command) and then configures a dialer interface for that dialer group. This configuration permits IP packets to trigger calls.

```
interface BRI 0/1/0:0
  no ip address
  encapsulation ppp
  dialer rotary-group 1
  dialer-group 1
interface BRI 0/1/1:0
  no ip address
  encapsulation ppp
  dialer rotary-group 1
  dialer-group 1
interface BRI 0/1/2:0
  no ip address
  encapsulation ppp
  dialer rotary-group 1
  dialer-group 1
interface BRI 0/1/3:0
  no ip address
  encapsulation ppp
  dialer rotary-group 1
  dialer-group 1
interface Dialer 1
  description Dialer group controlling the BRIs
  dialer in-band
  ip address 10.1.1.1 255.255.255.0
  encapsulation ppp
  dialer map ip 10.1.1.2 name angus 14802616900
  dialer-group 1
  ppp authentication chap

dialer-list 1 protocol ip permit
```

## Voice over ISDN Examples

The following example allows incoming voice calls to be answered on BRI 0/1/0:0:

```
interface BRI0/1/0:0
  description Allows incoming voice calls to be answered on BRI
  encapsulation ppp
  isdn incoming-voice data
  dialer rotary-group 1
  dialer-group 1
interface Dialer1
  ip address 10.1.1.1 255.255.255.0
  encapsulation ppp
  dialer in-band
  dialer map ip 10.1.1.2 name starstruck 14038182344
  dialer-group 1
  ppp authentication chap
```

The following example allows outgoing voice calls on BRI0/1/1:0:

```
interface BRI0/1/1:0
  description Allows incoming voice calls to be answered on BRI
  encapsulation ppp
  dialer rotary-group 1
```



```
dialer-group 1
interface Dialer1
  ip address 10.1.1.1 255.255.255.0
  encapsulation ppp
  dialer in-band
  dialer map ip 10.1.1.2 name angus class calltype 19091238877
  dialer-group 1
  ppp authentication chap
map-class dialer calltype
  dialer voice-call
```

For more configuration examples of voice calls over ISDN, refer to the *Cisco IOS Voice, Video, and Fax Configuration Guide*.

## DNIS-plus-ISDN-Subaddress Binding Example

The following example configures a dialer profile for a receiver with DNIS 12345 and ISDN subaddress 6789:

```
dialer called 12345:6789
```

## ISDN BRI Leased-Line Configuration Example

The following example configures the BRI 0/1/0:0 interface for leased-line access at 128 kbps. Because of the leased-line-not dialed-environment, configuration of ISDN called and calling numbers are not needed and not used. The BRI 0/1/0:0 interface is henceforth treated as a synchronous serial interface, with the default HDLC encapsulation.

```
isdn leased-line bri 0 0/1/0:0 128
```

The ip address is configured on the D-channel in the case of 128 kbps leased-line. The following example configures the BRI 0/1/0:0 interface for PPP encapsulation:

```
interface bri 0/1/0:0
  ip address 10.1.1.2 255.255.255.0
  encapsulation ppp
  bandwidth 128
```

The following example configures the BRI 0/1/0:0 interface for leased-line access at 64 kbps:

```
isdn leased-line bri 0 0/1/0:0
```

The ip address is configured on the B-channel in the case of 64 kbps leased-line. The following example configures the BRI 0/1/0:1 and 0/1/0:2 interface for PPP encapsulation:

```
interface bri 0/1/0:1
  ip address 10.1.1.2 255.255.255.0
  bandwidth 64
interface bri 0/1/0:2
  ip address 10.1.2.2 255.255.255.0
  bandwidth 64
```

