

# isdn all-incoming-calls-v120

To configure an ISDN BRI or PRI interface to answer all incoming calls as V.120 when the terminal adapter uses V.120 signalling but does not send the Lower-Layer Compatibility field in Setup messages, use the **isdn all-incoming-calls-v120** command in interface configuration mode.

## isdn all-incoming-calls-v120

**Syntax Description** This command has no arguments or keywords.

**Defaults** By default, ISDN interfaces answer calls as synchronous serial with PPP encapsulation.

**Command Modes** Interface configuration

Command History	Release	Modification
	11.2	This command was introduced.

**Usage Guidelines** Use this command only when you want *all* incoming calls to be answered as V.120. If you want the interface to automatically detect whether the incoming call uses V.120 or PPP encapsulation, use the **autodetect encapsulation** command.

This command applies only when the incoming call originates on an asynchronous device and needs to terminate in an available vty on the router.

**Examples** The following partial example shows that BRI 0 is configured to answer all calls as V.120:

```
interface bri 0
 isdn all-incoming-calls-v120
```

Related Commands	Command	Description
	<b>autodetect encapsulation</b>	Enables automatic detection of the encapsulation types in operation over a point-to-point link to a specified serial or ISDN interface.

## isdn answer1, isdn answer2

To have 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, use the **isdn answer1** command in interface configuration mode. Use the **no** form of this command to remove the verification request.

```
isdn answer1 [called-party-number][:subaddress]
```

```
no isdn answer1 [called-party-number][:subaddress]
```

To have the router verify an *additional* called-party number or subaddress number in the incoming setup message for ISDN BRI calls, if the number is delivered by the switch, use the **isdn answer2** command in interface configuration mode. Use the **no** form of this command to remove this second verification request.

```
isdn answer2 [called-party-number][:subaddress]
```

```
no isdn answer2 [called-party-number][:subaddress]
```

### Syntax Description

<i>called-party-number</i>	(Optional) Telephone number of the called party. At least one value— <i>called-party-number</i> or <i>subaddress</i> —must be specified. The maximum number of digits for <i>called-party-number</i> is 50.
:	(Optional) Identifies the number that follows as a subaddress. Use the colon (:) when you configure both the called party number and the subaddress, or when you configure only the subaddress.
<i>subaddress</i>	(Optional) Subaddress number used for ISDN multipoint connections. At least one value— <i>called-party-number</i> or <i>subaddress</i> —must be specified. The maximum number of digits for <i>subaddress</i> is 50.

### Defaults

The router does not verify the called party or subaddress number.

### Command Modes

Interface configuration

### Command History

Release	Modification
10.3	This command was introduced.

### Usage Guidelines

If you do not specify the **isdn answer1** or **isdn answer2** command, all calls are processed or accepted. If you specify the **isdn answer1** or **isdn answer2** command, the router must verify the incoming called-party number and the subaddress before processing and/or accepting the call. The verification proceeds from right to left for the called-party number; it also proceeds from right to left for the subaddress number.

You can configure just the called-party number or just the subaddress. In such a case, only that part is verified. To configure a subaddress only, include the colon (:) before the subaddress number.

You can declare a digit a “don’t care” digit by configuring it as an *x* or *X*. In such a case, any incoming digit is allowed.

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**Examples**

In the following example, 5552222 is the called-party number and 1234 is the subaddress:

```
interface bri 0
  isdn answer1 5552222:1234
```

In the following example, only the subaddress is configured:

```
interface bri 0
  isdn answer1 :1234
```

# isdn autodetect

To enable the automatic detection of ISDN SPIDs and switch type, use the **isdn autodetect** command in interface configuration mode. Use the **no** form of this command to disable the automatic detection of ISDN SPIDs and switch type.

**isdn autodetect**

**no isdn autodetect**

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## Syntax Description

This command has no arguments or keywords.

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## Defaults

The automatic detection of ISDN SPIDs and switch type is disabled.

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## Command Modes

Interface configuration

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## Command History

Release	Modification
12.0(3)T	This command was introduced.

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## Usage Guidelines

This command applies to North America only. If you are outside of North America, you must use the **isdn switch-type** *switch-type* interface configuration command to specify the ISDN switch type.

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## Examples

The following example enables the automatic detection of ISDN SPIDs and switch type:

```
isdn autodetect
```

---

## Related Commands

Command	Description
<b>isdn spid1</b>	Defines the SPID number that has been assigned by the ISDN service provider for the B1 channel.
<b>isdn spid2</b>	Defines the additional SPID number that has been assigned by the ISDN service provider for the B1 channel.

# isdn bchan-number-order

To configure an ISDN PRI interface to make outgoing call selection in ascending or descending order, use the **isdn bchan-number-order** command in interface configuration mode. To restore the default (descending order), either use the **no** form of this command or simply reconfigure the interface with the new value.

**isdn bchan-number-order** {ascending | descending}

**no isdn bchan-number-order**

Syntax Description	ascending	Makes the outgoing B channel selection in ascending order as follows:
		<ul style="list-style-type: none"> <li>Channels 1 to 24 for a T1 controller</li> <li>Channels 1 to 31 for an E1 controller</li> </ul>
	descending	Makes the outgoing B channel selection in descending order as follows:
		<ul style="list-style-type: none"> <li>Channels 24 to 1 for a T1 controller</li> <li>Channels 31 to 1 for an E1 controller</li> </ul>

**Defaults** Descending

**Command Modes** Interface configuration

Command History	Release	Modification
	11.3T	This command was introduced.

**Usage Guidelines** This command instructs the router to select the lowest or highest available B channel starting at either channel B1 (ascending) or channel B23 for a T1 and channel B30 for an E1 (descending).

This command is for PRI configuration only.

**Examples** The following example configures the outgoing B channel order on a PRI interface to be in ascending order. The router will select the lowest available B channel beginning with channel B1.

```
interface serial15:10
 isdn bchan-number-order ascending
```

# isdn busy

To set a false busy signal on an ISDN B channel, use the **isdn busy** command in interface configuration mode. Use the **no** form of this command to remove this condition.

**isdn busy dsl** *number* **b\_channel** *number*

**no isdn busy dsl** *number* **b\_channel** *number*

## Syntax Description

<b>dsl</b> <i>number</i>	Digital subscriber loop (DSL) number.
<b>b_channel</b> <i>number</i>	B channel or range of B channels to be set with the busy signal. B channel numbers range from 1 to 24; 0 indicates the entire interface.

## Defaults

Disabled

## Command Modes

Interface configuration

## Command History

Release	Modification
12.0	This command was introduced.

## Usage Guidelines

This command gives the impression that a call is active when the channel is actually idle.

Use the **b\_channel 0** keywords to set a false busy signal on the entire interface.

Use the **show isdn** command with the **status** keyword to display the DSL number.

## Examples

The following example sets the entire PRI interface to a false busy signal; the DSL number was obtained using the **show isdn** command with the **status** keyword, and then used in the command:

```
isdn busy dsl 3 b_channel 0 state 1
```

The following example sets the false busy signal on B channel 11; the DSL number was obtained using the **show isdn** command with the **status** keyword, and then used in the command:

```
isdn busy dsl 3 b_channel 11 state 2
```

## Related Commands

Command	Description
<b>isdn service</b>	Takes an individual B channel or an entire PRI interface out of service or sets it to a different channel service state that is passed in to the switch.

# isdn call interface

To make an ISDN data call, use the **isdn call interface** command in privileged EXEC mode.

**isdn call interface** *interface-number dialing-string* [**speed 56** | **64**]

Syntax Description	
<i>interface-number</i>	Interface number.
<i>dialing-string</i>	Telephone number used for making ISDN data call.
<b>speed 56</b>	(Optional) Line speed (56 or 64 kbps) used for making ISDN data call.
<b>speed 64</b>	

**Defaults** The default B-channel speed is 64 kbps.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.0(3)T	This command was introduced.

**Usage Guidelines** You can use the **isdn call interface** command to test your DDR configuration. You can also use this command to verify the dialing string and speed without having to know the IP address of the remote router or without configuring a dialer map or string.

**Examples** The following example makes an ISDN data call through interface bri 0 to 555-1111 and at a line speed of 56 kbps:

```
isdn call interface bri 0 5551111 speed 56
```

Related Commands	Command	Description
	<b>isdn disconnect interface</b>	Disconnects an ISDN data call without bringing down the interface.

# isdn caller

To configure ISDN caller ID screening and optionally to enable ISDN caller ID callback for legacy dial-on-demand routing (DDR), use the **isdn caller** command in interface configuration mode. To disable this feature, use the **no** form of this command.

**isdn caller** *phone-number* [**callback**] [**exact**]

**no isdn caller** *phone-number* [**callback**] [**exact**]

## Syntax Description

<i>phone-number</i>	Remote telephone number for which to screen. Use the letter X to represent a single “don’t care” digit. The maximum length of each number is 25 digits.
<b>callback</b>	(Optional) Enables callback.
<b>exact</b>	(Optional) Performs matching on incoming telephone number exactly as entered.

## Defaults

Disabled

## Command Modes

Interface configuration

## Command History

Release	Modification
10.0	This command was introduced.
11.2 F	This command was implemented on additional Cisco router and access server platforms.
12.1	The <b>exact</b> keyword was added.

## Usage Guidelines

This command configures the router to accept calls from the specified number.



### Note

Caller ID screening requires a local switch or router that is capable of delivering the caller ID to the router. If you enable caller ID screening but do not have such a switch or router, no calls are allowed in. Caller ID screening is available on Cisco 7200 and 7500 series, Cisco 4000 series, Cisco 3000 series, and Cisco 2500 series routers that have one or more BRIs.

When the optional **callback** keyword is used and a call is received from one of the callback numbers, the initial call is rejected (hence, not subject to tolls) and a callback is initiated to that calling number.

When Xs are used in the callback number, dialer caller screening is based on a best match system that uses the *number* of Xs as a criterion. To make callback calls only to specified numbers or ranges of numbers but to accept any other incoming calls, make sure that the number of Xs in any configuration line that uses the **callback** keyword is less than the number of Xs in any configuration line that does not use the keyword.

For example, if you use at most four Xs in the configuration lines with the **callback** keyword, then to accept calls from other numbers use at least five Xs in a configuration line that does not use the keyword.

When a telephone number is entered *without* the **exact** keyword, the software compares each number going from right to left until matching numbers are detected. For example, if the *phone-number* argument is 4085551234, calls from telephone numbers 1234, 51234, 5551234, and 4085551234 would be accepted, but calls from telephone numbers 44 and 4155551234 would be rejected.

If you want to accept a telephone number *exactly* as it is configured, enter it with the **exact** keyword. For example, if the *phone-number* argument is 5551212 and the **exact** keyword is applied, only the telephone number 5551212 is accepted; calls from telephone numbers 408551212 and 51212 would be rejected.

The maximum length of each telephone number is 25 characters. There is no limit on the numbers you can specify per interface.

### Examples

The following example configures the router to accept a call containing the numbers 415 555-1234:

```
isdn caller 4155551234
```

The following example configures the router to accept a call only from telephone number 555-1234:

```
isdn caller 5551234 exact
```

In the above example, a call from telephone number 415 555-1234 would be rejected.

The following example configures the router to accept a call with telephone number containing 415 555-12 and any numbers in the last two positions:

```
isdn caller 41555512xx
```

In the following example, callback calls will be made only to numbers in the 555 and 556 exchanges, but any other telephone number can call in:

```
isdn caller 408555xxxx callback
isdn caller 408556xxxx callback
isdn caller xxxxxx
```

### Related Commands

Command	Description
<b>show dialer</b>	Displays general diagnostic information for interfaces configured for DDR.

# isdn calling-number

To configure an ISDN PRI or BRI interface to present the number of the device making the outgoing call, use the **isdn calling-number** command in interface configuration mode. Use the **no** form of this command to remove a previously configured calling number.

**isdn calling-number** *calling-number*

**no isdn calling-number**

<b>Syntax Description</b>	<i>calling-number</i> Number of the device making the outgoing call; only one entry is allowed.
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<b>Defaults</b>	No calling number is presented.
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<b>Command Modes</b>	Interface configuration
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	10.3	This command was introduced.

**Usage Guidelines**

An interface can have only one ISDN calling-number entry.

For ISDN BRI, this command is intended for use when the ISDN network offers TS014 tariffing, in which devices present the calling (billing) number.

For ISDN PRI, this command is intended for use when the network offers better pricing on calls in which devices present the calling number (that is, the billing number). The calling number information is included in the outgoing setup message.



**Note**

This command cannot be used with German 1TR6 ISDN BRI switches. It can be used with all other switches, including all ISDN PRI switches.

**Examples**

The following example first configures the T1 interface, then configures the D channel interface to present the billing number 4233570925 when it makes outgoing calls:

```
controller t1 1/1
  framing esf
  linecode b8zs
  pri-group timeslots 1-23
  isdn switchtype primary-4ess
!
interface serial 1/1:23
  ip address 7.1.1.1 255.255.255.0
  encapsulation ppp
  isdn calling-number 4233570925
  dialer map ip 7.1.1.2 name dallas 14193460913
```

In the following example, the ISDN BRI interface is configured to present the number 5551212 when it makes outgoing calls:

```
interface bri 0
 isdn calling-number 5551212
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>interface dialer</b>	Configures a BRI interface and enters interface configuration mode.
<b>interface serial</b>	Specifies a serial interface created on a channelized E1 or channelized T1 controller (for ISDN PRI, CAS, or robbed bit signalling).

## isdn conference-code

To activate three-way call conferencing, use the **isdn conference-code** command in interface configuration mode. Use the **no** form of this command to disable three-way call conferencing.

**isdn conference-code** *range*

**no isdn conference-code**

Syntax Description	<i>range</i>	Number from 0 to 999 (ISDN conference code).
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Defaults	The default code is 60.
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Command Modes	Interface configuration
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Command History	Release	Modification
	12.0(3)T	This command was introduced.

Usage Guidelines	Use this command if your ISDN line is connected to an NI1 or a Nortel DMS-100 Custom switch. Your telephone service provider should provide an ISDN conference code when you order three-way call conferencing.
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Examples	The following example specifies 61 as the ISDN conference code: <pre>isdn conference-code 61</pre>
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# isdn disconnect-cause

To send a specific ISDN cause code to the switch, use the **isdn disconnect-cause** command in interface configuration mode. Use the **no** form of the command to return to the default condition.

**isdn disconnect-cause** { *cause-code-number* | **busy** | **not-available** }

**no isdn disconnect-cause**

Syntax Description	
<i>cause-code-number</i>	Sends a cause code number (submitted as integer 1 through 127) to the switch.
<b>busy</b>	Sends the USER BUSY code to the switch.
<b>not-available</b>	Sends the CHANNEL-NOT-AVAILABLE code to the switch.

**Defaults** The default condition is no cause code override. If the **isdn disconnect-cause** command is not configured, the default cause codes of the application are sent.

**Command Modes** Interface configuration

Command History	Release	Modification
	12.0(5)T	This command was introduced, and is a replacement for the <b>isdn modem-busy-cause</b> command.

**Usage Guidelines** The **isdn disconnect-cause** command overrides specific cause codes such as modem availability and resource pooling that are sent to the switch by ISDN applications. When the **isdn disconnect-cause** command is implemented, the configured cause codes are sent to the switch; otherwise, the default cause codes of the application are sent.

ISDN protocol errors will still be reflected in the cause code and not be overridden.

**Examples** The following example sends the CHANNEL-NOT-AVAILABLE code to the ISDN switch:

```
interface serial0:20
 isdn disconnect-cause not-available
```

# isdn disconnect interface

To disconnect an ISDN data call without bringing down the interface, use the **isdn disconnect interface** command in privileged EXEC mode.

**isdn disconnect interface** *interface* { **b1** | **b2** | **all** }

Syntax Description	<i>interface</i>	Interface type and number, such as bri 0.
	<b>b1</b>	B channel 1.
	<b>b2</b>	B channel 2.
	<b>all</b>	B channels 1 and 2.

**Defaults** A default interface is not defined.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.0(3)T	This command was introduced.

**Usage Guidelines** You can use the **isdn disconnect interface** command to disconnect any ongoing data calls placed manually or caused by DDR.

**Examples** The following example disconnects an ISDN data call through interface bri 0 and B channel 1:

```
isdn disconnect interface bri 0 b1
```

Related Commands	Command	Description
	<b>isdn call interface</b>	Makes an ISDN data call.

# isdn fast-rollover-delay

To control the timing between successive dial attempts, use the **isdn fast-rollover-delay** interface configuration command. To remove or change a value, use the **no** form of this command.

**isdn fast-rollover-delay** *seconds*

**no isdn fast-rollover-delay**

<b>Syntax Description</b>	<i>seconds</i> Number of seconds between dial attempts.				
<b>Defaults</b>	No default timer.				
<b>Command Modes</b>	Interface configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>11.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	11.1	This command was introduced.
Release	Modification				
11.1	This command was introduced.				

**Usage Guidelines** This command provides a timer separate from the dialer wait-for-carrier timer to control the amount of time that elapses before calls are redialed. This delay is provided to allow the old call to be torn down completely before the new call is attempted.

The **isdn fast-rollover-delay** command is necessary on some ISDN switches because the new call may be attempted before the old call is completely torn down. This causes the second call or the call back to fail.

Use this command when *all* the following conditions are true:

- A BRI has two phone numbers configured, one for each B-channel.
- You are dialing into this BRI.
- You have a dialer map or dialer string for each phone number.
- The first call succeeds but the second call continuously fails.

When these conditions occur, set the **isdn fast-rollover-delay** command to 5 seconds and try again. 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.

When the **isdn fast-rollover-delay** command is configured on a client requesting callback, the callback client first confirms whether or not the callback server has placed a call back to the callback client before dialing any subsequent numbers.

**Examples**

The following partial example sets the fast-rollover delay that is suggested when all the conditions specified above are true:

```
isdn fast-rollover-delay 5
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>dialer map</b>	Configures a serial interface or ISDN interface to call one or multiple sites or to receive calls from multiple sites.
<b>dialer wait-for-carrier-time (map-class dialer configuration)</b>	Specifies the length of time to wait for a carrier when dialing out to the dial string associated with a specified map class.
<b>ppp callback (DDR)</b>	Enables a dialer interface that is not a DTR interface to function either as a callback client that requests callback or as a callback server that accepts callback requests.

# isdn flip-chan-flag

To invert the value of the extend bit (0x80) in the last octet of the channel ID information element, use the **isdn flip-chan-flag** command in interface configuration mode. To restore the default setting, use the **no** form of this command.

**isdn flip-chan-flag**

**no isdn flip-chan-flag**

---

**Syntax Description** This command has no arguments or keywords.

---

**Defaults** The last octet of the channel ID information element is not inverted.

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**Command Modes** Interface configuration

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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	11.3	This command was introduced.

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**Usage Guidelines** Use this command if you use a primary-DMS 100 switch type to ensure compatibility with a Setup or Call Proceeding message containing a channel ID information element. This command can be used only with ISDN PRI.

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**Examples** The following example configures the router to invert the extended bit in the last octet of the channel ID information element:

```
isdn flip-chan-flag
```

## isdn incoming-voice

To route all incoming voice calls to the modem and determine how they will be treated, use the **isdn incoming-voice** command in interface configuration mode. Use the **no** form of this command to disable the setting or return to the default.

```
isdn incoming-voice { voice | data [56 | 64] | modem [56 | 64] }
```

```
no isdn incoming-voice { voice | data [56 | 64] | modem [56 | 64] }
```

### Syntax Description

<b>voice</b>	Specifies that incoming voice calls bypass the modems and be handled as a voice call.
<b>data</b>	Specifies that incoming voice calls bypass the modems and be handled as digital data. If this keyword is selected, you can specify a B-channel bandwidth of either <b>56</b> kbps or <b>64</b> kbps. If no argument is entered, the default value is 64.
<b>modem</b>	Specifies that incoming voice calls are passed over to the digital modems, where they negotiate the appropriate modem connection with the far-end modem. If this keyword is selected, you can specify a B-channel bandwidth of either <b>56</b> kbps or <b>64</b> kbps. If no argument is entered, the default value is 64.

### Defaults

**isdn incoming-voice data 64**

### Command Modes

Interface configuration

### Command History

Release	Modification
11.1	This command was introduced for ISDN PRI interfaces.
11.1AA and 12.0(2)XC	This command was introduced for ISDN BRI interfaces.
11.2	This command was enhanced for channelized T1.
11.3NA	This command was migrated to Release 11.3NA.
12.0(3)T	This command was migrated to Release 12.0(3)T.

### Usage Guidelines

Unless you specify otherwise, all calls received by the router and characterized as voice calls are treated as normal ISDN calls, which are handled as digital data and not passed over to the modem. Ordinarily, a data device ignores incoming voice calls, but the tariff structure for data and voice calls might make it less expensive to do “data over voice” calls.

If you use the **voice** keyword, incoming ISDN voice calls will be treated as voice calls and handled by either a modem or a voice DSP as directed by CSM.

If the default value is configured and the bearer capability of the incoming call is **voice**, the call will be rejected.

To answer incoming voice calls at a configured rate (overriding the incoming data rate in the call), use the **data** keyword.

To establish speedier connections for analog calls to the router, use the **isdn incoming-voice** command with the **modem** keyword to have voice calls routed through digital modems (as pulse-code modulated analog data) instead of being treated as digital data.

Configure this command on each D channel in the access server or router. Incoming circuit-switched data calls are not affected by this command.

**Note**

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Use the **isdn incoming-voice modem** command only when you are using ISDN. You must use this command to carry voice over a modem when using ISDN PRI.

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**Examples**

The following example designates incoming ISDN voice calls to be treated as voice calls:

```
interface 10
 isdn incoming-voice voice
```

The following example for channelized T1 configures the D channel (hence, all B channels) to answer all incoming voice calls at 56 kbps:

```
interface serial 0:23
 isdn incoming-voice data 56
```

The following example routes all incoming voice calls through the modem as analog data:

```
interface BRI 0/0
 isdn incoming-voice modem
```

The following example enables incoming and outgoing ISDN calls to route to the modems using the D-channel serial interface:

```
interface serial 0:23
 isdn incoming-voice modem
```

# isdn layer1-emulate

To configure the Layer 1 operation of a BRI voice port as clock master (NT) or slave (TE), use the **isdn layer1-emulate** command in interface configuration mode. Use the **no** form of this command to restore the default (user).

**isdn layer1-emulate** {user | network}

**no isdn layer1-emulate**

## Syntax Description

<b>user</b>	Physical interface operation in clock slave mode (as TE).
<b>network</b>	Physical interface operation in clock master mode (as NT).

## Defaults

Layer 1 port operation is as user (TE functionality as clock slave).

## Command Modes

Interface configuration

## Command History

Release	Modification
12.0(3)XG	This command was introduced.

## Usage Guidelines

If you use the **no isdn layer1-emulate network** command, the physical layer port operation defaults to user.

## Examples

The following example configures the layer 1 operation of a BRI voice port as QSIG clock slave (TE):

```
configure terminal
  interface bri 1
    isdn layer1-emulate user
```

## Related Commands

Command	Description
<b>isdn protocol-emulate</b>	Configures the Layer 2 and Layer 3 port protocol of a BRI voice port or a PRI interface to emulate NT (network) or TE (user) functionality.
<b>network-clock-priority</b>	Specifies the clock-recovery priority for the BRI voice ports in a BVM.

# isdn leased-line bri

To configure an ISDN BRI for leased-line service at 128 kbps, use the **isdn leased-line bri** command in global configuration mode. Use the **no** form of the command to remove the configuration.

**isdn leased-line bri** *number* [**128**]

**no isdn leased-line bri** *number* [**128**]

<b>Syntax Description</b>	<i>number</i>	BRI interface number.
	<b>128</b>	(Optional) Aggregates two B channels into a single pipe at a speed of 128 kbps.
<b>Defaults</b>	Disabled	
<b>Command Modes</b>	Global configuration	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	11.2F	This command was introduced.
<b>Usage Guidelines</b>	<p>Use this command to aggregate two B channels into a single pipe at a speed of 128 kbps. This service is available only for ISDN BRI.</p> <p>When you use an ISDN BRI interface for access over leased lines, configure the ISDN BRI as a synchronous serial interface. Do not configure ISDN calling and called numbers.</p>	
<b>Examples</b>	<p>The following example configures the BRI 0 interface for leased-line access at 128 kbps in Japan. Because of the leased-line—not dialed—environment, configuration of ISDN called and calling numbers is not needed and not used. The BRI 0 interface is henceforth treated as a synchronous serial interface, with the default HDLC encapsulation.</p> <pre>isdn leased-line bri 0 128</pre>	
	<p>The following example configures the BRI 0 interface for PPP encapsulation:</p> <pre>interface bri 0  ip address 1.1.1.2 255.255.255.0  encapsulation ppp  bandwidth 128</pre>	
<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>isdn switch-type (BRI)</b>	Specifies the central office switch type on the ISDN BRI interface.

# isdn map

To override the default ISDN type and plan generated by the router with custom values, use the **isdn map** command in interface configuration mode. Use the **no** form of this command to revert to the default ISDN type and plan.

```
isdn map {address address | regex | plan plan | type type}
```

```
no isdn map {address address | regex | plan plan | type type}
```

## Syntax Description

<b>address</b> <i>address</i>	Specifies the address map, which can be to either the calling or called number.
<i>regex</i>	Specifies a regular expression for pattern matching.
<b>plan</b> <i>plan</i>	Specifies the ISDN numbering plan.
<b>type</b> <i>type</i>	Specifies the ISDN number type.

## Defaults

The default is the ISDN type and plan generated by the router.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.0(6)T	This command was introduced.

## Usage Guidelines

This function can be configured on a per-number basis or on numbers that match regular expression patterns.

## Examples

The following example overrides any plan and type used for any ISDN calls with a called or calling number exactly matching 123:

```
int serial1:23
  isdn map address 123 plan isdn type unknown
```

The following example overrides any plan and type used for ISDN calls with a called or calling number that begins with the numerals 12:

```
int serial1:23
  isdn map address 12.* plan data type subscriber
```

The following example matches any number ending with the number 7:

```
int serial1:23
  isdn map address .*7 plan data type subscriber
```

## isdn modem-busy-cause

The **isdn modem-busy-cause** command is replaced by the **isdn disconnect-cause** command. See the **isdn disconnect-cause** command for more information.

# isdn negotiate-bchan

To enable the router to accept a B channel that is different from the B channel requested in the outgoing call setup message, use the **isdn negotiate-bchan** interface configuration command. To restore the default condition, use the **no** form of this command.

**isdn negotiate-bchan**

**no isdn negotiate-bchan**

## Syntax Description

This command has no arguments or keywords.

## Defaults

B-channel negotiation is not enabled. Most PRI switch types set the default channel ID to Exclusive in the setup message.

## Command Modes

Interface configuration

## Command History

Release	Modification
11.3	This command was introduced.

## Usage Guidelines

The **isdn negotiate-bchan** command enables the router to negotiate the B channel by setting the channel ID information element to Preferred in the setup message. If this command is not configured, the channel ID is set to the default of the switch, which is usually Exclusive. Exclusive means that only the requested B channel is accepted; if the requested B channel is not available, the call is cleared.

The **isdn negotiate-bchan** command is supported for all PRI switch types.

## Examples

The following example enables an alternate B channel for serial interface 0:23:

```
interface serial0:23
 isdn negotiate-bchan
```

## Related Commands

Command	Description
<b>isdn bchan-number-order</b>	Configures an ISDN PRI interface to make outgoing call selection in ascending or descending order.
<b>isdn switch-type (PRI)</b>	Specifies the central office switch type on the ISDN PRI interface.

# isdn not-end-to-end

To override the speed that the network reports it will use to deliver the call data, use the **isdn not-end-to-end** command in interface configuration mode. Use the **no** form of this command to disable the configured end-to-end speed.

```
isdn not-end-to-end {56 | 64}
```

```
no isdn not-end-to-end
```

Syntax Description	56	Answers all voice calls at 56 kbps.
	64	Answers all voice calls at 64 kbps.

**Defaults** The default line speed is 64 kbps.

**Command Modes** Interface configuration

Command History	Release	Modification
	10.3	This command was introduced.

## Usage Guidelines



### Note

The **isdn not-end-to-end** command is valid only when an incoming Layer 3 Setup message contains a Progress Information Element in the message. The command is validated on a call-by-call basis, depending upon the message.

This command might be needed to handle incoming calls properly. Although a call might originate at a speed of 56 kbps, the network or internetworking networks might improperly deliver the call to the user at a speed of 64 kbps. This creates a speed mismatch and causes the data to be garbled. Enabling this command makes the router look more closely at the information elements of the incoming call to determine a speed.

A speed mismatch can occur when the source and destination ISDN ports do not belong to the same network.

**Examples** The following example sets the line speed for incoming calls to 56 kbps:

```
isdn not-end-to-end 56
```

## isdn nsf-service

To configure Network Specific Facilities (NSF) on an ISDN PRI for outgoing calls configured as voice calls, use the **isdn nsf-service** command. Use the **no** form of this command to remove NSF on an ISDN PRI.

```
isdn nsf-service {megacom | sdn}
```

```
no isdn nsf-service {megacom | sdn}
```

### Syntax Description

<b>megacom</b>	Dial voice calls using AT&T Megacom NSF.
<b>sdn</b>	Dial voice calls using AT&T SDN NSF.

### Defaults

Disabled

### Command Modes

Interface configuration

### Command History

Release	Modification
11.3(5)T	This command was introduced.

### Usage Guidelines

This command is used specifically on a PRI (channelized T1) to request NSF services supported on AT&T 4ESS (**primary-4ess**) switch types only.

### Examples

The following example sets outgoing voice calls to use AT&T SDN NSF:

```
int s0:23
 isdn-nsf-service sdn
```

### Related Commands

Command	Description
<b>dialer map</b>	Configures a serial interface or ISDN interface to call one or multiple sites or to receive calls from multiple sites.
<b>dialer voice-call</b>	Configures the dialer map class for an NSF dialing plan to support outgoing voice calls.
<b>map-class dialer</b>	Defines a class of shared configuration parameters associated with the dialer map command for outgoing calls from an ISDN interface and for PPP callback.

# isdn outgoing-voice

To set information transfer capability on outgoing calls for all switch types, use the **isdn outgoing-voice** command. Use the **no** form of this command to revert to the default state.

```
isdn outgoing-voice {info-transfer-capability {3.1kHz-audio | speech}}
```

```
no isdn outgoing-voice
```

Syntax Description	Command	Description
	<b>info-transfer-capability</b>	Specifies information transfer capability for voice calls.
	<b>3.1kHz-audio</b>	Sets capability to 3.1kHz audio.
	<b>speech</b>	Sets capability to speech.

**Defaults** No information transfer capability set.

**Command Modes** Interface configuration

Command History	Release	Modification
	11.3	This command was introduced.

**Usage Guidelines** This command is used on outgoing voice calls only, and sets standard information transfer capability.

**Examples** The following example sets information transfer capability on outgoing voice calls to speech:

```
int s0:23
  isdn outgoing-voice info-transfer-capability speech
```

Related Commands	Command	Description
	<b>isdn incoming-voice</b>	Routes all incoming ISDN calls to the modem, and treats voice calls as analog data, or allows digital data calls to bypass the modems.

# isdn overlap-receiving

To specify if the ISDN interface does Overlap Receiving, use the **isdn overlap-receiving** command. Use the **no** form of this command to remove this capability.

**isdn overlap-receiving**

**no isdn overlap-receiving**

---

**Syntax Description** This command has no arguments or keywords.

---

**Defaults** Overlap Receiving not enabled.

---

**Command Modes** Interface configuration

---

Command History	Release	Modification
	12.1	This command was introduced.

---



---

**Examples** The following example shows how to specify Overlap Receiving on the ISDN interface:

```
int s0:23
  isdn overlap-receiving
```

---

Related Commands	Command	Description
	<b>isdn service</b>	Takes an individual B channel or an entire PRI interface out of service or sets it to a different channel service state that is passed in to the switch.

---

# isdn protocol-emulate

To configure the Layer 2 and Layer 3 port protocol of a BRI voice port or a PRI interface to emulate NT (network) or TE (user) functionality, use the **isdn protocol-emulate** command in interface configuration mode. Use the **no** form of this command to restore the default (user).

**isdn protocol-emulate** {user | network}

**no isdn protocol-emulate**

Syntax Description	user	Layer 2 and Layer 3 port protocol operation as TE (port functions as QSIG slave).
	network	Layer 2 and Layer 3 port protocol operation as NT (port functions as QSIG master).

**Defaults** Port functions as Q.SIG slave.

**Command Modes** Interface configuration

Command History	Release	Modification
	12.0(3)XG	This command was introduced on the Cisco 2600 and 3600 series and on the Cisco MC3810 router platforms.

**Usage Guidelines** You can use this command to configure the Cisco AS5300 PRI interface to serve as either the primary Q.SIG slave or the primary Q.SIG master. To disable Q.SIG signalling, use the **no** form of this command.

If you use the **no isdn protocol-emulate** command, the Layer 2 and Layer 3 protocol emulation defaults to user.

**Examples** The following example configures the layer 2 and layer 3 function of T1 PRI interface 23 to act as the Q.SIG master (NT):

```
interface serial 1:23
 isdn protocol-emulate network
```

The following example configures the layer 2 and layer 3 function of a BRI voice port to operate as Q.SIG slave (TE):

```
interface bri 1
 isdn protocol-emulate user
```

The following example configures the layer 2 and layer 3 function of an E1 PRI interface to operate as Q.SIG slave (TE):

```
interface serial 1:15
 isdn protocol-emulate user
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>isdn switch type (PRI)</b>	Specifies the central office switch type on the ISDN PRI interface.
<b>network-clock-priority</b>	Specifies the clock-recovery priority for the BRI voice ports in a BVM.
<b>pri-group nec-fusion</b>	Configures your NEC PBX to support FCCS
<b>show cdapi</b>	Displays the CDAPI.
<b>show rawmsg</b>	Displays the raw messages owned by the required component.

# isdn rlm-group

To specify the RLM group number that ISDN will start using, use the **isdn rlm-group** command in interface configuration mode. Use the **no** form of this command to disable this function.

**isdn rlm-group** *number*

**no isdn rlm-group** *number*

<b>Syntax Description</b>	<i>number</i>	The number of the RLM group, from 0 to 5.
---------------------------	---------------	-------------------------------------------

<b>Defaults</b>	Disabled
-----------------	----------

<b>Command Modes</b>	Interface configuration
----------------------	-------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.0(2)T	This command was introduced.

<b>Usage Guidelines</b>	The <b>isdn rlm-group</b> command allows Redundant Link Manager (RLM) to be used as a way of transporting the D-channel information (signalling) over Ethernet
-------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------

<b>Examples</b>	The following example defines RLM group 1:
-----------------	--------------------------------------------

```
interface Serial0:23
 ip address 7.0.0.1 255.0.0.0
 encapsulation ppp
 dialer map ip 7.0.0.2 name hawaii 1111111
 dialer load-threshold 1 either
 dialer-group 1
 isdn switch-type primary-ni
 isdn incoming-voice modem
 isdn rlm-group 1
 ppp authentication chap
 ppp multilink
 hold-queue 75 in
!
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>clear interface</b>	Resets the hardware logic on an interface.
	<b>clear rlm group</b>	Clears all RLM group time stamps to zero.
	<b>interface</b>	Defines the IP addresses of the server, configures an interface type, and enters interface configuration mode.
	<b>link source weight</b>	missing description

<b>Command</b>	<b>Description</b>
<b>protocol rlm port</b>	Reconfigures the port number for the basic RLM connection for the whole rlm-group.
<b>retry keepalive</b>	Allows consecutive keepalive failures a certain amount of time before the link is declared down.
<b>server (RLM)</b>	Defines the IP addresses of the server.
<b>show rlm group statistics</b>	Displays the network latency of the RLM group.
<b>show rlm group status</b>	Displays the status of the RLM group.
<b>show rlm group timer</b>	Displays the current RLM group timer values.
<b>shutdown (RLM)</b>	Shuts down all of the links under the RLM group.
<b>timer</b>	Overwrites the default setting of timeout values.

# isdn send-alerting

To specify that an Alerting message be sent before a Connect message when making ISDN calls, use the **isdn send-alerting** command in interface configuration mode. Use the **no** form of this command to disable the Alerting information element.

**isdn send-alerting**

**no isdn send-alerting**

**Syntax Description** This command has no arguments and keywords.

**Defaults** This command is disabled by default.

**Command Modes** Interface configuration

Command History	Release	Modification
	11.3	This command was introduced.

**Usage Guidelines** Some switches may want an Alerting message to be sent by the router before sending a Connect message. This is usually seen in a voice and data type of network.

**Examples** In the following example, the **isdn send-alerting** command applies to an ISDN BRI interface:

```
interface BRI0
description connected to PBX 61886
ip address 172.1.1.1 255.255.255.0
encapsulation ppp
isdn send-alerting
isdn sending-complete
dialer idle-timeout 20
dialer map ip 172.1.1.2 name rudder 61884
dialer map ip 172.1.1.3 name bosun 61885
dialer-group 1
ppp authentication chap
```

Related Commands	Command	Description
	<b>isdn sending-complete</b>	Specifies that the Sending Complete IE is included in the outgoing Setup message.

# isdn sending-complete

To specify that the Sending Complete information element (IE) is included in the outgoing Setup message, use the **isdn sending-complete** command in interface configuration mode. Use the **no** form of this command to disable the Sending Complete information element.

**isdn sending-complete**

**no isdn sending-complete**

**Syntax Description** This command has no arguments and keywords.

**Defaults** This command is disabled by default.

**Command Modes** Interface configuration

Command History	Release	Modification
	11.2	This command was introduced.

**Usage Guidelines** The Sending Complete IE tells the switch that all the digits and information necessary for the call are contained in this Setup message.

Some switches in some countries want a Sending Complete information element to be included in the outgoing Setup message to indicate that the entire number is included. The Sending Complete IE is required in Hong Kong and Taiwan, and the **isdn sending-complete** command forces it to be sent.

**Examples** In the following example, the **isdn sending-complete** command applies to an ISDN BRI interface:

```
interface BRI0
  description connected to PBX 61886
  ip address 172.1.1.1 255.255.255.0
  encapsulation ppp
  isdn sending-complete
  dialer idle-timeout 20
  dialer map ip 172.1.1.2 name rudder 61884
  dialer map ip 172.1.1.3 name bosun 61885
  dialer-group 1
  ppp authentication chap
```

The following example enables sending complete IE information on a serial interface:

```
interface serial 0:15
description connected to PBX 61886
ip address 7.1.1.1 255.255.255.0
encapsulation ppp
isdn sending-complete
dialer idle-timeout 20
dialer map ip 7.1.1.2 name rudder 61884
dialer map ip 7.1.1.3 name goodie 61885
dialer-group 1
ppp authentication chap
```

---

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>isdn send-alerting</b>	Specifies that an Alerting message be sent before a Complete message when making ISDN calls.

---

# isdn service

To take an individual B channel or an entire PRI interface out of service or set it to a different channel service state that is passed in to the switch, use the **isdn service** command in interface configuration mode. Use the **no** form of the command to remove the configuration.

**isdn service dsl** *number* **b\_channel** *number* **state** *state-value*

**no isdn service dsl** *number* **b\_channel** *number* **state** *state-value*

## Syntax Description

<b>dsl</b> <i>number</i>	Digital subscriber loop number; displayed with the <b>show isdn status</b> command.
<b>b_channel</b> <i>number</i>	B channel or range of B channels to be set with the passed-in state value. The <b>b_channel 0</b> keyword sets the entire PRI interface to a specified state value. B channel numbers range from 1 to 24.
<b>state</b> <i>state-value</i>	Desired channel service state to be set on the channels. The following channel service state values are supported: <b>0</b> —In service <b>1</b> —Maintenance <b>2</b> —Out of service

## Defaults

Disabled

## Command Modes

Interface configuration

## Command History

Release	Modification
11.3	This command was introduced.

## Usage Guidelines

This command is used to configure the ISDN Non-Facility Associated Signalling (NFAS) feature on Cisco routers.

Use the **b\_channel 0** keyword to set the entire PRI interface to the specified state value.

Use the **show isdn status** command to display the digital subscriber loop (DSL) number. Use the **show isdn** command with the **service** keyword to display the service states that were set by the **isdn service** command.

## Examples

The following example sets the entire PRI interface to maintenance state; the DSL number was obtained using the **show isdn** command with the **status** keyword, and then used in the command:

```
isdn service dsl 3 b_channel 0 state 1
```

The following example puts B channel 11 out of service; the DSL number was obtained using the **show isdn** command with the **status** keyword, and then used in the command:

```
isdn service dsl 3 b_channel 11 state 2
```

---

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show isdn</b>	Displays the information about memory, Layer 2 and Layer 3 timers, and the status of PRI channels.

---

## isdn spid1, isdn spid2

To associate up to three ISDN local directory numbers (LDNs) provided by your telephone service provider to the first service profile identifier (SPID), use the **isdn spid1** command in interface configuration mode. Use the **no** form of this command to disable the specified SPID, thereby preventing access to the switch.

```
isdn spid1 spid-number ldn [ldn] [ldn]
```

```
no isdn spid1 spid-number ldn [ldn] [ldn]
```

To associate up to three ISDN LDNs provided by your telephone service provider to the second service SPID, use the **isdn spid2** command in interface configuration mode. Use the **no** form of this command to disable the specified SPID, thereby preventing access to the switch.

```
isdn spid2 spid-number ldn [ldn] [ldn]
```

```
no isdn spid2 spid-number ldn [ldn] [ldn]
```

### Syntax Description

<i>spid-number</i>	Number identifying the service to which you have subscribed. This value is assigned by the ISDN service provider and is usually a 10-digit telephone number with additional digits such as 4085552220101.
<i>ldn</i>	(Optional) ISDN LDN, which is a 7-digit number assigned by the service provider. You can optionally specify a second and third LDN.

### Defaults

A default SPID number and ISDN local directory numbers are not defined.

### Command Modes

Interface configuration

### Command History

Release	Modification
10.3	This command was introduced.
12.0(3)T	This command was enhanced with the option of associating the SPID with up to three LDNs.

### Usage Guidelines

This command applies only to North America and is required for DMS-100 and National ISDN switches. Typically, DMS-100 and National ISDN switch implementations using BRI interfaces with SPIDS require two TEIs, two SPIDS, and two phone numbers. If you want to take advantage of both B channels, it is advised you configure the router with the LDN value after the SPID.

**Note**

Some DMS-100 and National ISDN switch installations may be configured as a “hunt group” whereby all calls are initially forwarded to the primary number. Under these circumstances, you should not configure the LDN. You can determine this by enabling the **debug isdn q931** command. If the endpoint identifier (EID) information element is delivered in the incoming setup message, then the switch is addressing the TEIs with the EID, instead of the LDN.

If you want the SPID to be automatically detected, you can specify 0 for the *spid-number* argument.

The ISDN switch checks for the LDN to determine whether both channels can be used to transmit and receive data. If there is not an LDN present, then only the B1 channel can be used for full-duplex communication. However, the B2 channel can still be used to make outgoing calls.

If you include the local directory number in the **no** form of this command, access to the switch is permitted, but the other B channel may not be able to receive incoming calls.

**Examples**

The following example defines, on the router, a SPID and LDN for the B1 channel:

```
isdn spid1 41555512130101 5551213
```

The following example shows how to specify that the SPID should be automatically detected, that the primary ISDN local directory number is 4085551111, and that the secondary number is 4085552222:

```
isdn spid1 0 4085551111 4085552222
```

The following example defines, on the router, a SPID and LDN for the B2 channel:

```
isdn spid2 41555512140101 5551214
```

The following example specifies that the SPID should be automatically detected, that the primary ISDN local directory number is 4085551111, and that the secondary number is 4085552222:

```
isdn spid2 0 4085551111 4085552222
```

**Related Commands**

Command	Description
<b>isdn autodetect</b>	Enables the automatic detection of ISDN SPIDs and switch type.

## isdn switch-type (BRI)

To specify the central office switch type on the ISDN interface, use the **isdn switch-type** command in global or interface configuration mode. To remove an ISDN switch type, use the **no** form of this command.

**isdn switch-type** *switch-type*

**no isdn switch-type** *switch-type*

### Syntax Description

*switch-type* ISDN service provider switch type. Table 10 in the “Usage Guidelines” section lists the supported switch types.

### Defaults

No ISDN switch type is specified.

### Command Modes

Global configuration or interface configuration



#### Note

This command can be entered in either global configuration or interface configuration mode. When entered in global configuration mode, the **basic-qsig** switch type command specifies that the Cisco MC3810 use QSIG signalling on all BRI interfaces; when entered in interface configuration mode, the command specifies that an individual BRI voice interface use QSIG signalling. The interface configuration mode setting overrides the global configuration setting on individual interfaces.

### Command History

Release	Modification
9.21	This command was introduced as a global command.
11.3T	This command was introduced as an interface command.
12.0(3)XG	The <b>basic-qsig</b> and <b>primary-qsig</b> switch type options were added to support BRI QSIG voice signalling.

### Usage Guidelines

For the Cisco AS5300 access server, you have the choice of configuring the **isdn-switch-type** command to support Q.SIG in either global configuration mode or interface configuration mode. When entered in global configuration mode, the setting applies to the entire Cisco AS5300 access server. When entered in interface configuration mode, the setting applies only to the T1/E1 interface specified. The interface configuration mode setting overrides the global configuration setting.

For example, if you have a Q.SIG connection on one line as well as on the PRI port, you can configure the ISDN switch type in one of the following combinations:

- Set the global **isdn-switch-type** command to support Q.SIG and set the interface **isdn-switch-type** command for **interface serial 0:23** to a PRI setting such as 5ess.
- Set the global **isdn-switch-type** command to support PRI 5ess and set the interface **isdn-switch-type** command for **interface serial 1:23** to support Q.SIG.

- Configure the global **isdn-switch-type** command to another setting (such as switch type VN3), set the interface **isdn-switch-type** command for **interface serial 0:23** to a PRI setting, and set the interface **isdn-switch-type** command for **interface serial 1:23** to support Q.SIG.

For the Cisco MC3810 router, if you are using different Cisco MC3810 BRI port interfaces with different ISDN switch types, you can use global and interface commands in any combination, as long as you remember that interface commands always override a global command.

For example, if you have a BRI QSIG switch interface on BRI voice ports 1, 2, 3 and 4, but a BRI 5ess switch interface on BRI backup port 0, you can configure the ISDN switch types in any of the following combinations:

- Enter the **isdn switch-type basic-qsig** command in global configuration mode, and enter the **isdn switch-type bri-5ess** command on interface 0.
- Enter the **isdn switch-type bri-5ess** command in global configuration mode, and enter the **isdn switch-type basic-qsig** command on interfaces 1, 2, 3, and 4 individually.
- Enter the **isdn switch-type bri-5ess** command on interface 0, and enter the **isdn switch-type basic-qsig** command on interfaces 1, 2, 3, and 4 individually.

If you use the **no isdn switch-type** command in global configuration mode, any switch type that was originally entered in global configuration mode is cancelled; however, any switch type originally entered on an interface is not affected. If you use the **no isdn switch-type** command in interface configuration mode, any switch type configuration on the interface is cancelled.

**Note**


---

In the Cisco MC3810, ISDN BRI voice ports support *only* switch type **basic-qsig**; ISDN BRI backup ports support all other listed switch types, but *not* **basic-qsig**.

---

**Note**


---

The dial-peer **codec** command must be configured before any calls can be placed over the connection to the PINX. The default codec type is G729a.

---

If you are using the Multiple ISDN Switch Types feature to apply ISDN switch types to different interfaces, refer to the chapter “Setting Up Basic ISDN Service” in the *Cisco IOS Dial Services Configuration Guide: Terminal Services* for additional details.

The Cisco IOS command parser accepts the following switch types: basic-nwnet3, vn2, and basic-net3; however, when viewing the NVRAM configuration, the basic-net3 or vn3 switch types are displayed, respectively.

To remove an ISDN switch type from an ISDN interface, specify the **no isdn switch-type** *switch-type* command.

Table 10 lists supported BRI switch types by geographic area.

**Table 10** ISDN Service Provider BRI Switch Types

Keywords by Area	Switch Type
<b>All countries</b>	
<b>none</b>	No switch defined
<b>basic-qsig</b>	PINX (PBX) switches with QSIG signalling per Q.931
<b>primary-qsig</b>	Supports QSIG signalling per Q.931
<b>Australia and Europe</b>	
<b>basic-1tr6</b>	German 1TR6 ISDN switches
<b>basic-net3</b>	NET3 ISDN, Norway NET3, Australian NET3, and New Zealand NET3 switches (covers the Euro-ISDN E-DSS1 signalling system and is ETSI-compliant)
<b>vn3</b>	French VN3 and VN4 ISDN BRI switches
<b>Japan</b>	
<b>ntt</b>	Japanese NTT ISDN switches
<b>North America</b>	
<b>basic-5ess</b>	AT&T basic rate switches
<b>basic-dms100</b>	Northern Telecom DMS-100 basic rate switches
<b>basic-ni</b>	National ISDN switches

**Examples**

The following example configures the French VN3 ISDN switch type:

```
isdn switch-type vn3
```

The following example uses the Multiple ISDN Switch Types feature and shows use of the global ISDN switch type **basic-ni** keyword (formerly **basic-ni1**) and the **basic-net3** interface-level switch type keyword. ISDN switch type **basic-net3** is applied to BRI interface 0 and overrides the global switch setting.

```
isdn switch-type basic-ni
!
interface BRI0
 isdn switch-type basic-net3
```

The following example configures the Cisco MC3810 router to use BRI QSIG signalling for all of its BRI voice ports:

```
isdn switch-type basic-qsig
```

The following example configures the Cisco MC3810 to use BRI QSIG signalling for BRI voice port 1. On port 1, this setting overrides any different signalling set in the previous example.

```
interface bri 1
 isdn switch-type basic-qsig
```

The following example configures the Cisco AS5300 to support Q.SIG signalling:

```
isdn switch-type primary-qsig
```

# isdn switch-type (PRI)

To specify the central office switch type on the ISDN interface, or to configure the Cisco MC3810 PRI interface to support QSIG signalling, use the **isdn switch-type** global and command in interface configuration mode. Use the **no** form of this command to disable the switch or QSIG signalling on the ISDN interface.

**isdn switch-type** *switch-type*

**no isdn switch-type** *switch-type*

<b>Syntax Description</b>	<i>switch-type</i>	Service provider switch type; see Table 11 for a list of supported switches.
---------------------------	--------------------	------------------------------------------------------------------------------

<b>Defaults</b>	The switch type defaults to <b>none</b> , which disables the switch on the ISDN interface.
-----------------	--------------------------------------------------------------------------------------------

<b>Command Modes</b>	Global configuration mode or interface configuration mode
----------------------	-----------------------------------------------------------



**Note**

This command can be entered in either global configuration mode or in interface configuration mode. When entered in global configuration mode, the setting applies to the entire Cisco MC3810. When entered in interface configuration mode, the setting applies only to the T1/E1 interface specified. The interface configuration mode setting overrides the global configuration setting.

Command History	Release	Modification
	9.21	This command was introduced as a global command.
	11.3T	This command was introduced as an interface command.
	12.0(2)T	The <b>primary-qsig-slave</b> and <b>primary-qsig master</b> switch type options were added to support PRI QSIG signalling.

<b>Usage Guidelines</b>	You have a choice of configuring the <b>isdn-switch-type</b> command to support QSIG at either the global configuration level or at the interface configuration level. For example, if you have a QSIG connection on one line as well as on the BRI port, you can configure the ISDN switch type in one of the following combinations:
-------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

- Set the global **isdn-switch-type** command to support QSIG, and set the interface **isdn-switch-type** command for the **interface bri 0** command to a BRI setting such as 5ess.
- Set the global **isdn-switch-type** command to support BRI 5ess, and set the interface **isdn-switch-type** command for the **interface serial 1:23** command to support QSIG.
- Configure the global **isdn-switch-type** command to another setting (such as switch type VN3), and then set the interface **isdn-switch-type** command for the **interface bri 0** command to a BRI setting, and set the interface **isdn-switch-type** command for the **interface serial 1:23** command to support QSIG.

The voice-port **codec** command must be configured before any calls can be placed over the connection to the PINX. The default codec type is G729a.

To disable the switch on the ISDN interface, specify the **isdn switch-type none** command.

Table 11 lists supported PRI switch types by geographic area.

**Note**

If you are using the Multiple ISDN Switch Types feature to apply the ISDN switch types to different interfaces, refer to the chapter “Setting Up Basic ISDN Service” in the *Cisco IOS Dial Services Configuration Guide: Terminal Services* publication for additional details.

**Table 11 ISDN Service Provider PRI Switch Types**

Keywords by Area	Switch Type
<b>none</b>	No switch defined.
<b>Australia and Europe</b>	
<b>primary-net5</b>	European, Australian, New Zealand, and Asian ISDN PRI switches (covers the Euro-ISDN E-DSS1 signalling system and is ETSI-compliant).
<b>Japan</b>	
<b>primary-ntt</b>	Japanese ISDN PRI switches.
<b>North America</b>	
<b>primary-4ess</b>	AT&T 4ESS switch type for the North America.
<b>primary-5ess</b>	AT&T 5ESS switch type for the North America.
<b>primary-dms100</b>	NT DMS-100 switch type for the North America.
<b>primary-ni</b>	National ISDN switch type.
<b>primary-qsig-slave</b>	Specifies the Cisco MC3810 router or the interface to act as the primary QSIG slave when the PINX is the primary QSIG master.
<b>primary-qsig-master</b>	Specifies the Cisco MC3810 router or the interface to act as the primary QSIG slave when the PINX is the primary QSIG master.

**Note**

Cisco IOS command parser accepts the following switch types: basic-nwnet3, vn2, and basic-net3; however, when viewing the NVRAM configuration, the basic-net3 or vn3 switch types are displayed respectively.

**Examples**

The following example configures the Cisco MC3810 to act as the QSIG master:

```
isdn switch-type primary-qsig-master
```

The following example configures T1 interface 23 on the Cisco MC3810 to act as the QSIG master:

```
interface serial 1:23
 isdn switch-type primary-qsig-master
```

The following example configures the French VN3 ISDN switch type:

```
isdn switch-type vn3
```

The following example demonstrates the Multiple ISDN Switch Type Feature. The global ISDN switch type setting is basic-net3. The PRI interface (channelized T1 controller), is configured to use the **isdn switch-type primary-net5** command and BRI interface 0 is configured for the **isdn switch-type basic-ni** command (formerly **isdn switch-type basic-ni1**).

```
isdn switch-type basic-net3
!
interface serial0:23
 isdn switch-type primary-net5
 ip address 172.21.24.85 255.255.255.0
!
interface BRI0
 isdn switch-type basic-ni
```

The following example configures T1 interface 23 on the Cisco AS5300 to support Q.SIG signalling:

```
interface serial 1:23
 isdn switch-type primary-qsig
```

#### Related Commands

Command	Description
<b>isdn protocol-emulate</b>	Configures the Layer 2 and Layer 3 port protocol of a BRI voice port or a PRI interface to emulate NT (network) or TE (user) functionality.
<b>pri-group nec-fusion</b>	Configures your NEC PBX to support FCCS
<b>show cdapi</b>	Displays the CDAPI.
<b>show rawmsg</b>	Displays the raw messages owned by the required component.

# isdn tei-negotiation

To configure when Layer 2 becomes active and ISDN terminal endpoint identifier (TEI) negotiation occurs, use the **isdn tei-negotiation** interface configuration and global configuration command. Use the **no** form of this command to remove TEI negotiation from an interface.

**isdn tei-negotiation** [**first-call** | **powerup**]

**no isdn tei-negotiation**

## Syntax Description

<b>first-call</b>	(Optional) ISDN TEI negotiation should occur when the first ISDN call is placed or received.
<b>powerup</b>	(Optional) ISDN TEI negotiation should occur when the router is powered on.

## Defaults

The **powerup** state is the default condition.

## Command Modes

Global and interface configuration

## Command History

Release	Modification
9.21	This command was introduced.
11.3T	This command first appeared as an interface command.

## Usage Guidelines

This command is for BRI configuration only.

This command is useful for switches that may deactivate Layers 1 and 2 when there are no active calls or primary DMS-100 switches which activate TEI when the first ISDN call is placed or received.

## Examples

The following example applies the **isdn tei negotiation first-call** command to BRI interface 0. BRI interface 1 will use the **isdn tei negotiation powerup** command, which is the default setting. Defaults settings do not appear in the router configuration.

```
isdn switch-type basic-net
!
interface bri0
 ! Configure the ISDN switch type on this interface and set TEI negotiation to
 ! first-call
 isdn switch-type basic-ni
 isdn tei-negotiation first-call
 ! BRI interface 1 uses the default TEI negotiation value
interface bri1
```

# isdn transfer-code

To activate call transferring, use the **isdn transfer-code** command in interface configuration mode. Use the **no** form of this command to disable call transferring.

**isdn transfer-code** *range*

**no isdn transfer-code**

---

<b>Syntax Description</b>	<i>range</i>	Number from 0 to 999 (ISDN transfer code).
---------------------------	--------------	--------------------------------------------

---

---

<b>Defaults</b>	The default code is 61.
-----------------	-------------------------

---

<b>Command Modes</b>	Interface configuration
----------------------	-------------------------

---

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.0(3)T	This command was introduced.

---

---

<b>Usage Guidelines</b>	Use this command if your ISDN line is connected to a NI1 or a Nortel DMS-100 Custom switch. Your telephone service provider should issue an ISDN transfer code when you order call transferring.
-------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

---

<b>Examples</b>	The following example specifies 62 as the ISDN transfer code:
-----------------	---------------------------------------------------------------

```
isdn transfer-code 62
```

# isdn twait-disable

To delay a National ISDN BRI switch a random time before activating the Layer 2 interface when the switch starts up, use the **isdn twait-disable** command in interface configuration mode.

## isdn twait-disable

---

**Syntax Description** This command has no arguments and keywords.

---

**Defaults** This command is enabled by default.

---

**Command Modes** Interface configuration

---

Command History	Release	Modification
	11.3	This command was introduced.

---

---

**Usage Guidelines** The random-length delay set by this command prevents mass power failures from causing the network ISDN switches to be overwhelmed when power returns and all the devices startup at the same time. The random delay is in the range 1 to 300 seconds.

---

**Examples** The following example configures a random wait period after a power failure:

```
isdn twait-disable
```

# isdn voice-priority

To control the priority of data and voice calls for the telephones, fax machines, and modems connected to the router telephone ports, use the **isdn voice-priority** command in interface configuration mode. Use the **no** form of this command to disable a specified ISDN voice priority setting and to use the default setting.

**isdn voice-priority** *local-directory-number* {**in** | **out**} {**always** | **conditional** | **off**}

**no isdn voice-priority** *local-directory-number*

Syntax Description	
<i>local-directory-number</i>	Local ISDN directory number assigned by your telephone service provider.
<b>in</b>	Incoming voice call.
<b>out</b>	Outgoing voice call.
<b>always</b>	Always bump a data call for a voice call.
<b>conditional</b>	Bump a data call only if there is more than one call to the same destination.
<b>off</b>	Never bump a data call for a voice call.

**Defaults** A data call is never bumped for an incoming or outgoing voice call.

**Command Modes** Interface configuration

Command History	Release	Modification
	12.0(3)T	This command was introduced.

**Usage Guidelines** If an ISDN circuit endpoint is busy with a data call or calls and either a voice call comes in (incoming) or you attempt to place a voice call (outgoing), the data call is handled according to the setting of **isdn voice-priority** command.

If you are in North America and have multiple ISDN directory numbers associated with a SPID, the outgoing voice priority that you set for any of these directory numbers applies to the other directory numbers. For example, if you enter the following commands, the outgoing voice priority for all directory numbers specified in the **isdn spid1** command is set to conditional:

```
isdn spid1 0 4085551111 4085552222 4085553333
isdn voice-priority 5551111 out conditional
```

The setting of the **pots dialing-method** command affects when you hear a busy signal in the following situation:

- A data call cannot be bumped.
- You are trying to make an outgoing call.

If the setting is **overlap**, you hear a busy signal when you pick up the handset. If the setting is **enblock**, you initially hear a dial tone and then a busy signal.

---

**Examples**

The following example specifies that a data call for the specified ISDN directory number never be bumped for an incoming or an outgoing voice call:

```
isdn voice-priority 5551111 in off
isdn voice-priority 5551111 out off
```

---

**Related Commands**

Command	Description
<b>isdn spid1</b>	Defines the SPID number that has been assigned by the ISDN service provider for the B1 channel.
<b>isdn spid2</b>	Defines the additional SPID number that has been assigned by the ISDN service provider for the B1 channel.
<b>pots dialing-method</b>	Specifies how the Cisco 800 series router collects and sends digits dialed on your connected telephones, fax machines, or modems.

# isdn x25 dchannel

To create a configurable interface for X.25 traffic over the ISDN D channel, use the **isdn x25 dchannel** command in interface configuration mode. Use the **no** form of this command to remove the interface.

**isdn x25 dchannel**

**no isdn x25 dchannel**

**Syntax Description** This command has no arguments or keywords.

**Defaults** Disabled

**Command Modes** Interface configuration

Command History	Release	Modification
	11.2F	This command was introduced.

**Usage Guidelines** This command creates a new, configurable interface, which can be specified as **interface brix:0** in commands, where *x* is the original BRI interface number.

For example, on a Cisco 4500 router with an MBRI, if the **isdn x25 dchannel** command is configured on **bri5**, the new interface is **bri5:0** and can be used for configuring the other parameters for X.25 over the D channel. These parameters include the addresses, the map statements, and others.

To display the new interface, use the **more system:running-config** command.

**Examples** The following example creates interface **bri 1:0** and configures it for X.25 over the ISDN D channel. This example uses dynamic TEIs, not a static TEI.

```
interface bri1
  isdn x25 dchannel
!
interface bri1:0
  ip address 10.1.1.2 255.255.255.0
  x25 address 31107000000100
  x25 htc 1
  x25 suppress-calling-address
  x25 facility window-size 2 2
  x25 facility packet-size 256 256
  x25 facility throughput 9600 9600
  x25 map ip 10.1.1.3 31107000000200
  x25 map ip 10.1.1.4 31107000000800
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>initiate-to</b>	Configures a BRI interface and enters interface configuration mode.

# isdn x25 static-tei

To configure a static ISDN Layer 2 terminal endpoint identifier (TEI) for X.25 over the ISDN D channel, use the **isdn x25 static-tei** command in interface configuration mode. Use the **no** form of this command if dynamic TEIs will be used on the interface that is to carry X.25 traffic over the D channel.

**isdn x25 static-tei** *tei-number*

**no isdn x25 static-tei** *tei-number*

<b>Syntax Description</b>	<i>tei-number</i> Terminal endpoint identifier, in the range 0 to 63.
---------------------------	-----------------------------------------------------------------------

<b>Defaults</b>	Disabled
-----------------	----------

<b>Command Modes</b>	Interface configuration
----------------------	-------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	11.2F	This command was introduced.

<b>Usage Guidelines</b>	<p>This command applies to ISDN BRI interfaces only. Only one static TEI is allowed per BRI interface. If a second static TEI is configured, the first static TEI is overwritten.</p> <p>Some switches require a static TEI be used for X.25 over the ISDN D channel.</p> <p>When the <b>isdn x25 dchannel</b> command is invoked without the <b>isdn x25 static-tei</b> command, a dynamic TEI is chosen.</p>
-------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**Examples**      The following example creates static TEI 8 on the X.25-over-ISDN-D channel:

```
interface bri0
  isdn x25 dchannel
  isdn x25 static-tei 8
```

Because the **isdn x25 static-tei** command is missing, the following example configuration sets dynamic TEIs for the ISDN channel:

```
interface bri0
  isdn x25 dchannel
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>initiate-to</b>	Configures a BRI interface and enters interface configuration mode.
	<b>isdn x25 dchannel</b>	Creates a configurable interface for X.25 traffic over the ISDN D channel.

# keymap

To define specific characteristics of keyboard mappings, use the **keymap** command in global configuration mode. Use the **no** form of this command to remove the named keymap from the current image of the configuration file.

**keymap** *keymap-name keymap-entry*

**no keymap** *keymap-name*

## Syntax Description

*keymap-name* Name of the file containing the keyboard mappings. The name can be up to 32 characters long and must be unique.

*keymap-entry* Commands that define the keymap.

## Defaults

VT100 keyboard emulation

## Command Modes

Global configuration

## Command History

Release	Modification
10.0	This command was introduced.

## Usage Guidelines

The **keymap** command maps individual keys on a non-3270 keyboard to perform the function defined for the 3270 keyboard. Use the **show keymap EXEC** command to test for the availability of a keymap.

The guidelines for creating a keymap file follow.

Do not name a ttycap entry filename default or the Cisco IOS software will adopt the newly defined entry as the default.

### The Keymap Entry Structure

A keymap is a keyboard map file. A keymap consists of an entry for a keyboard. The first part of a keymap lists the names of the keyboards that use that entry. These names will often be the same as in the ttycaps (terminal emulation) file, and often the terminals from various ttycap entries will use the same keymap entry. For example, both 925 and 925vb (for 925 with visual bells) terminals would probably use the same keymap entry. There are other circumstances in which it is necessary to specify a keyboard name as the name of the entry (for example, if a user requires a custom key layout).

After the names, which are separated by vertical bars (|), comes a left brace ({), the text that forms the definitions, and a right brace (}), as follows:

```
ciscodefault{
clear = '^z';\
flinp = '^x';\
enter = '^m';\
delete = '^d' | '^?';\
synch = '^r';\
ebcdic_xx='string'
reshow = '^v';\
```

```

eeof = '^e';\
tab = '^i';\
htab = '^b';\
nl = '^n';\
left = '^h';\
right = '^l';\
up = '^k';\
down = '^j';\
einp = '^w';\
reset = '^t';\
ferase = '^u';\
insrt = '\E';\
pa1 = '^p1'; pa2 = '^p2'; pa3 = '^p3';\
pfk1 = '\E1'; pfk2 = '\E2'; pfk3 = '\E3'; pfk4 = '\E4';\
pfk5 = '\E5'; pfk6 = '\E6'; pfk7 = '\E7'; pfk8 = '\E8';\
pfk9 = '\E9'; pfk10 = '\E0'; pfk11 = '\E-'; pfk12 = '\E=';\
pfk13 = '\E!'; pfk14 = '\E@'; pfk15 = '\E#'; pfk16 = '\E$';\
pfk17 = '\E%'; pfk18 = '\E'; pfk19 = '\E&'; pfk20 = '\E*';\
pfk21 = '\E('; pfk22 = '\E)'; pfk23 = '\E_'; pfk24 = '\E+';\
}

```

Each definition consists of a reserved keyword, which identifies the 3270 function, followed by an equal sign (=), followed by the various ways to generate this particular function, followed by a semicolon (;), as follows:

```
pa1 = '^p1'; pa2 = '^p2'; pa3 = '^p3';\
```

Each alternative way to generate the function is a sequence of ASCII characters enclosed inside single quotes ('); the alternatives are separated by vertical bars (|), as follows:

```
delete = '^d' | '^?';\
```

Inside the single quotes, a few characters are special. A caret (^) specifies that the next character is a control (Ctrl) character. The two-character string caret-a (^a) represents Ctrl-a. The caret-A sequence (^A) generates the same code as caret-a (^a). To generate Delete (or DEL), enter the caret-question mark (^?) sequence.


**Note**

The Ctrl-caret combination (Ctrl-^), used to generate a hexadecimal 1E, is represented as two caret symbols in sequence (^ ^)—not as a caret-backslash-caret combination (^ \ ^).

In addition to the caret, a letter can be preceded by a backslash (\). Because this has little effect for most characters, its use is usually not recommended. In the case of a single quote ('), the backslash prevents that single quote from terminating the string. In the case of a caret (^), the backslash prevents the caret from having its special meaning. To include the backslash in the string, place two backslashes (\\) in the keymap. Table 12 lists other supported special characters.

**Table 12** Special Characters Supported by TN3270 Keymap Capability

Character	Description
\E	Escape character
\n	Newline
\t	Tab
\r	Carriage return

It is not necessary for each character in a string to be enclosed within single quotes. For example, `\E\E\E` means three escape characters.

To enter a keymap, provide a unique name for it and explicitly define all special keys you intend to include in it within curly brackets. Also, except for the last line, each line must be terminated with a backslash symbol (`\`). The last line ends with the closing curly brackets (`}`) symbol and an end-of-line character.

### Keymap Restrictions

When emulating IBM-style 3270 terminals, a mapping must be performed between sequences of keys pressed at a user's (ASCII) keyboard and the keys available on a 3270-type keyboard. For example, a 3270-type keyboard has a key labeled EEOF that erases the contents of the current field from the location of the cursor to the end. To accomplish this function, the terminal user and a program emulating a 3270-type keyboard must agree on what keys will be typed to invoke the function. The requirements for these sequences follow:

- The first character of the sequence must be outside of the standard ASCII printable characters.
- No sequence can be a complete subset of another sequence (although sequences can share partial elements).

Following are examples of acceptable keymap entries:

```
pfk1 = '\E1';
pfk2 = '\E2';
```

Following are examples of unacceptable keymap entries:

```
pfk1 = '\E1';
pfk11 = '\E11';
```

In the acceptable example, the keymap entry for `pfk1` is not completely included in the keymap entry for `pfk2`. By contrast, in the unacceptable, or conflicting keymap pair, the sequence used to represent `pfk1` is a complete subset of the sequence used to represent `pfk11`. Refer to the keymap entry provided later in this section for an example of how various keys can be represented to avoid this kind of conflict.

Table 13 lists 3270 key names that are supported in this keymap. Note that some of the keys do not really exist on a 3270-type keyboard. An unsupported function will cause the Cisco IOS software to send a (possibly visual) bell sequence to the user's terminal.

**Table 13 3270 Key Names Supported by Defaults Keymap**

3270 Key Name	Functional Description
LPRT <sup>1</sup>	Local print
DP	Duplicate character
FM	Field mark character
CURSEL	Cursor select
CENTSIGN	EBCDIC cent sign
RESHOW	Redisplay the screen
EINP	Erase input
EEOF	Erase end of field
DELETE	Delete character
INSRT	Toggle insert mode

**Table 13 3270 Key Names Supported by Defaults Keymap (continued)**

<b>3270 Key Name</b>	<b>Functional Description</b>
TAB	Field tab
BTAB	Field back tab
COLTAB	Column tab
COLBAK	Column back tab
INDENT	Indent one tab stop
UNDENT	Undent one tab stop
NL	New line
HOME	Home the cursor
UP	Up cursor
DOWN	Down cursor
RIGHT	Right cursor
LEFT	Left cursor
SETTAB	Set a column tab
DELTAB	Delete a column tab
SETMRG	Set left margin
SETHOM	Set home position
CLRTAB	Clear all column tabs
APLON <sup>1</sup>	Apl on
APLOFF <sup>1</sup>	Apl off
APLEND <sup>1</sup>	Treat input as ASCII
PCON <sup>1</sup>	Xon/xoff on
PCOFF <sup>1</sup>	Xon/xoff off
DISC <sup>1</sup>	Disconnect (suspend)
INIT <sup>1</sup>	New terminal type
ALTK <sup>1</sup>	Alternate keyboard dvorak
FLINP	Flush input
ERASE	Erase last character
WERASE <sup>1</sup>	Erase last word
FERASE	Erase field
SYNCH	We are in synch with the user
RESET	Reset key-unlock keyboard
MASTER_RESET	Reset, unlock and redisplay
XOFF <sup>1</sup>	Please hold output
XON <sup>1</sup>	Please give me output
WORDTAB <sup>1</sup>	Tab to beginning of next word
WORDBACKTAB <sup>1</sup>	Tab to beginning of current/last word

**Table 13 3270 Key Names Supported by Defaults Keymap (continued)**

<b>3270 Key Name</b>	<b>Functional Description</b>
WORDEND <sup>1</sup>	Tab to end of current/next word
FIELDEND <sup>1</sup>	Tab to last nonblank of current/next unprotected (writable) field
PA1	Program attention 1
PA2	Program attention 2
PA3	Program attention 3
CLEAR	Local clear of the 3270 screen
TREQ	Test request
ENTER	Enter key
PFK1 to PFK30	Program function key 1 program function key 30
ATTN	Attention
SYSREQ	System request

1. Not supported by Cisco's TN3270 implementation.

Table 14 illustrates the proper keys used to emulate each 3270 function when using default key mappings.

**Table 14 Keys Used to Emulate Each 3270 Function with Defaults Keymap**

<b>Key Types</b>	<b>IBM 3270 Key</b>	<b>Defaults Keys</b>
Cursor movement keys	New Line	Ctrl-n or Home
	Tab	Ctrl-i
	Back Tab	Ctrl-b
	Back Tab	Ctrl-b
	Cursor Left	Ctrl-h
	Cursor Right	Ctrl-l
	Cursor Up	Ctrl-k
	Cursor Down	Ctrl-j or LINE FEED
Edit control keys	Delete Char	Ctrl-d or RUB
	Erase EOF	Ctrl-e
	Erase Input	Ctrl-w
	Insert Mode	ESC-Space <sup>1</sup>
	End Insert	ESC-Space

**Table 14** Keys Used to Emulate Each 3270 Function with Defaults Keymap (continued)

Key Types	IBM 3270 Key	Defaults Keys
Program function keys	PF1	ESC 1
	PF2	ESC 2
	...	...
	PF10	ESC 0
	PF11	ESC -
	PF12	ESC =
	PF13	ESC !
	PF14	ESC @
	...	...
	PF24	ESC +
Program attention keys	PA1	Ctrl-p 1
	PA2	Ctrl-p 2
	PA3	Ctrl-p 3
Local control keys	Reset After Error	Ctrl-r
	Purge Input Buffer	Ctrl-x
	Keyboard Unlock	Ctrl-t
	Redisplay Screen	Ctrl-v
Other keys	Enter	Return
	Clear	Ctrl-z
	Erase current field	Ctrl-u

1. ESC refers to the Escape key.

### Examples

The following example is the default entry used by the TN3270 emulation software when it is unable to locate a valid keymap in the active configuration image. Table 13 lists the key names supported by the default Cisco TN3270 keymap.

```
ciscodefault{
clear = '^z';\
flinp = '^x';\
enter = '^m';\
delete = '^d' | '^?';\
synch = '^r';\
reshow = '^v';\
ebcdic_xx='string'
eof = '^e';\
tab = '^i';\
btab = '^b';\
nl = '^n';\
left = '^h';\
right = '^l';\
up = '^k';\
down = '^j';\
einp = '^w';\
```

```

reset = '^t';\
ferase = '^u';\
insrt = '\E ';\
pa1 = '^p1'; pa2 = '^p2'; pa3 = '^p3';\
pfk1 = '\E1'; pfk2 = '\E2'; pfk3 = '\E3'; pfk4 = '\E4';\
pfk5 = '\E5'; pfk6 = '\E6'; pfk7 = '\E7'; pfk8 = '\E8';\
pfk9 = '\E9'; pfk10 = '\E0'; pfk11 = '\E-'; pfk12 = '\E=';\
pfk13 = '\E!'; pfk14 = '\E@'; pfk15 = '\E#'; pfk16 = '\E$';\
pfk17 = '\E%'; pfk18 = '\E'; pfk19 = '\E&'; pfk20 = '\E*';\
pfk21 = '\E('; pfk22 = '\E)'; pfk23 = '\E_'; pfk24 = '\E+';\
}

```

The following keymap statement maps the “|” character to send EBCDIC 0x6A:

```
ebcdic_6f='|'
```

#### Related Commands

Command	Description
<b>keymap-type</b>	Specifies the keyboard map for a terminal connected to the line.
<b>show keymap</b>	Tests the availability of a keymap after a connection on a router takes place.
<b>terminal-type</b>	Specifies the type of terminal connected to a line.

# keymap-type

To specify the keyboard map for a terminal connected to the line, use the **keymap-type** command in line configuration mode. Use the **no** form of this command to reset the keyboard type for the line to the default.

**keymap-type** *keymap-name*

**no keymap-type**

<b>Syntax Description</b>	<i>keymap-name</i>	Name of a keymap defined within the configuration file of the router. The TN3270 terminal-type negotiations use the specified keymap type when setting up a connection with the remote host.
---------------------------	--------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

<b>Defaults</b>	VT100
-----------------	-------

<b>Command Modes</b>	Line configuration
----------------------	--------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	10.0	This command was introduced.

**Usage Guidelines**

This command must follow the corresponding **keymap** global configuration entry in the configuration file. The TN3270 terminal-type negotiations use the specified keymap type when setting up a connection with the remote host.

Setting the keyboard to a different keymap requires that a keymap be defined with the Cisco IOS software's configuration either by obtaining a configuration file over the network that includes the keymap definition or by defining the keyboard mapping using the **keymap** global configuration command.

Use the command **show keymap EXEC** to test for the availability of a keymap.

**Examples**

The following example sets the keyboard mapping to a keymap named vt100map:

```
line 3
 keymap-type vt100map
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>l2f</b>	Specifies a connection to a particular LAT node that offers LAT services.
	<b>ignore-mid-sequence</b>	
	<b>show keymap</b>	Tests the availability of a keymap after a connection on a router takes place.
	<b>ttycap</b>	Defines characteristics of a terminal emulation file.

# l2f ignore-mid-sequence

To ignore multiplex ID (MID) sequence numbers for sessions in an Layer 2 Forwarding (L2F) tunnel, use the **l2f ignore-mid-sequence** command in VPDN group configuration mode. To remove the ability to ignore MID sequencing, use the **no** form of this command.

**l2f ignore-mid-sequence**

**no l2f ignore-mid-sequence**

**Syntax Description** This command has no arguments or keywords.

**Defaults** MID sequence number ignoring is disabled.

**Command Modes** VPDN group configuration

## Command History

Release	Modification
11.3(5)AA	This command was introduced.
12.0(1)T	This command was migrated to Release 12.0(1)T.

## Usage Guidelines

This command applies only to L2F initiated tunnels and control packets for initial LCP tunnel negotiation.

This command is not required for Cisco-to-Cisco, LAC-to-LNS tunnel endpoints, and is only required if MID sequence numbering is not supported by a third-party hardware vendor.

## Examples

The following example ignores MID sequencing for L2F sessions between a Cisco router and a non-Cisco hardware device, which does not support MID sequencing:

```
l2f ignore-mid-sequence
```

# l2tp drop out-of-order

To instruct L2TP access concentrator (LAC) or L2TP Network Server (LNS) using Layer 2 Tunneling Protocol (L2TP) to drop packets that are received out of order, use the **l2tp drop out-of-order** command in VPDN group configuration mode. To disable dropping of out-of-sequence packets, use the **no** form of this command

**l2tp drop out-of-order**

**no l2tp drop out-of-order**

---

**Syntax Description** This command has no arguments or keywords.

---

**Defaults** Disabled

---

**Command Modes** VPDN group configuration

---

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	11.3(5)AA	This command was introduced.
	12.0(1)T	This command was migrated to Release 12.0(1)T.

---

---

**Usage Guidelines** This command is valid only for tunnels where sequencing is enabled.

---

**Examples** The following example causes the LAC or LNS to drop any packets that are received out of order:

```
l2tp drop out-of-order
```

# l2tp flow-control backoff-queuesize

To define the maximum number of packets that can be queued locally for a session when a peer's receive window is full, use the **l2tp flow-control backoff-queuesize** command in VPDN group configuration mode. To change the value of the queue size—simply reenter the command with the new queue size value. To remove a manually configured flow-control backoff value, use the **no** form of this command.

**l2tp flow-control backoff-queuesize** *queuesize*

**no l2tp flow-control backoff-queuesize** *queuesize*

## Syntax Description

<i>queuesize</i>	Sets the queue size limit on a LAC or LNS so that when the remote peer's receive window is full, the LAC or LNS delays sending additional packets.
------------------	----------------------------------------------------------------------------------------------------------------------------------------------------

## Defaults

L2TP flow control backoff queueing is enabled and uses a default value of 25.

## Command Modes

VPDN group configuration

## Command History

Release	Modification
11.3(5)AA	This command was introduced.
12.0(1)T	This command was migrated to Release 12.0(1)T.

## Usage Guidelines

This command is used for congestion control. This command will not appear as a valid option if the **l2tp flow-control receive-window** command is disabled, or the value is set to zero (for sequencing only).

## Examples

The following example uses the **l2tp flow-control receive-window** command option to 8, which in turn enables the **l2tp flow-control backoff-queuesize** command option. When the remote peer's receive window is full, the maximum number packets that can be queued locally for an L2TP session is 35.

```
l2tp flow-control receive-window 8
l2tp flow-control backoff-queuesize 35
```

## Related Commands

Command	Description
<b>l2tp flow-control maximum-ato</b>	Defines the maximum adaptive timeout for congestion control.
<b>l2tp flow-control receive-window</b>	Defines the receive window on a LAC or LNS and enables either device to send sequence numbers.

# l2tp flow-control maximum-ato

To define the maximum adaptive timeout for congestion control, use the **l2tp flow-control maximum-ato** command in VPDN group configuration mode. To reset the timeout to a new value, simply reenter the command with the new value. To remove a manually configured timeout value, use the **no** form of this command.

**l2tp flow-control maximum-ato** *milliseconds*

**no l2tp flow-control maximum-ato** *milliseconds*

<b>Syntax Description</b>	<i>milliseconds</i> The wait time period, in milliseconds, before the LAC or LNS probes its remote peer's receive-window to resume sending packets.
---------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------

<b>Defaults</b>	2000 milliseconds
-----------------	-------------------

<b>Command Modes</b>	VPDN group configuration
----------------------	--------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	11.3(5)AA	This command was introduced.
	12.0(1)T	This command was migrated to Release 12.0(1)T.

<b>Usage Guidelines</b>	This command is used for congestion control between the LAC and LNS. This command will not appear as a valid option if the <b>l2tp flow-control receive-window</b> command is disabled or set to zero.
-------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

<b>Examples</b>	The following example forces the LAC or LNS to wait 4000 milliseconds before attempting to probe the remote peer's receive status window again:
-----------------	-------------------------------------------------------------------------------------------------------------------------------------------------

```
l2tp flow-control maximum-ato 4000
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>l2tp flow-control backoff-queuesize</b>	Defines the maximum number of packets that can be queued locally for a session when the receive window of a peer is full.
	<b>l2tp flow-control receive-window</b>	Defines the receive window on a LAC or LNS and enables either device to send sequence numbers.

# I2tp flow-control receive-window

To define the receive window on a LAC or Layer 2 Tunneling Protocol (LNS) and enable either device to send sequence numbers, use the **i2tp flow-control receive-window** command in VPDN group configuration mode. Use the **no** form of this command to remove a flow-control receive-window value and disable sequencing.

**i2tp flow-control receive-window** *window-size*

**no i2tp flow-control receive-window** *window-size*

<b>Syntax Description</b>	<i>window-size</i>	The number of packets that can be received by the remote end device before backoff queueing occurs.
---------------------------	--------------------	-----------------------------------------------------------------------------------------------------

**Defaults** Receive window and sequence numbers are disabled.

**Command Modes** VPDN group configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	11.3(5)AA	This command was introduced.
	12.0(1)T	This command was migrated to Release 12.0(1)T.

**Usage Guidelines** If the receive-window value is set to zero, then sequence numbers are not sent, and congestion control is not enabled. Data zero length body (ZLB) acknowledgments are not sent when congestion control is disabled. If the receive-window value is greater than zero, then congestion control is enabled, and the value that is configured is sent to the L2TP receive window attribute value pair (AVP).

Using the **i2tp flow-control receive-window** command with a value greater than zero allows you to configure the following L2TP (optional) commands:

- **i2tp flow-control maximum-ato**
- **i2tp flow-control backoff-queuesize**

If the **i2tp flow-control receive-window** command is not enabled or the value is set to zero, then the **i2tp flow-control maximum-ato** and **i2tp flow-control backoff-queuesize** commands will not appear as configurable options by the command parser.

**Examples** The following example configures a receive window value of 25 to be communicated to the remote peer and subsequently enables the configuration of the **i2tp flow-control maximum-ato** and **i2tp flow-control backoff-queuesize** commands.

```
i2tp flow-control receive-window 10
i2tp flow-control maximum-ato 15
i2tp flow-control backoff-queuesize 35
```

Related Commands	Command	Description
	<b>l2tp flow-control backoff-queuesize</b>	Defines the maximum number of packets that can be queued locally for a session when the receive window of a peer is full.
	<b>l2tp flow-control maximum-ato</b>	Defines the maximum adaptive timeout for congestion control.

# I2tp flow-control static-rtt

To define a static round-trip time for congestion control, use the **I2tp flow-control static-rtt** command in VPDN group configuration mode. To apply a different value, simply reenter the command with the new value. To disable a static round-trip time, use the **no** form of this command.

**I2tp flow-control static-rtt** *round-trip-time*

**no I2tp flow-control static-rtt** *round-trip-time*

## Syntax Description

*round-trip-time* Sets the static round-trip time in milliseconds.

## Defaults

Disabled; adaptive timeouts are used.

## Command Modes

VPDN group configuration

## Command History

Release	Modification
11.3(5)AA	This command was introduced.
12.0(1)T	This command was migrated to Release 12.0(1)T.

## Usage Guidelines

If the LAC/LNS is configured to use a static round-trip time, then adaptive time-outs (ATO) are calculated on the fixed round-trip time value configured using the **I2tp flow-control static-rtt** command. If the device is not configured with the **I2tp flow-control static-rtt** command, then flow control is automatically calculated based on packet send and receive times.

## Examples

The following example sets a static round-trip delay of 15000 milliseconds, which in turn disables adaptive timeouts:

```
I2tp flow-control static-rtt 2500
```



### Note

You must have the **I2tp-flow control receive-window** command enabled with a value greater than zero in order to use the **I2tp flow-control maximum-ato** command.

## Related Commands

Command	Description
<b>I2tp flow-control backoff-queuesize</b>	Defines the maximum number of packets that can be queued locally for a session when the receive window of a peer is full.
<b>I2tp flow-control maximum-ato</b>	Defines the maximum adaptive timeout for congestion control.
<b>I2tp flow-control receive-window</b>	Defines the receive window on a LAC or LNS and enables either device to send sequence numbers.

# l2tp hidden

To enable Layer 2 Tunneling Protocol (L2TP) attribute-value (AV) pair hiding, which encrypts the AV pair “value,” use the **l2tp hidden** command in VPDN group configuration mode. To disable L2TP AV pair value hiding, use the **no** form of this command.

**l2tp hidden**

**no l2tp hidden**

**Syntax Description** This command has no arguments or keywords.

**Defaults** L2TP AVP hiding is disabled.

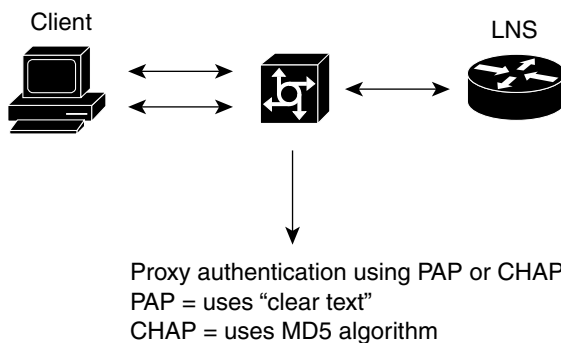
**Command Modes** VPDN group configuration

Command History	Release	Modification
	11.3(5)AA	This command was introduced.
	12.0(1)T	This command was migrated to Release 12.0(1)T.

**Usage Guidelines** This command is useful for additional security if PPP is using PAP or proxy authentication between the LAC and LNS. When AV pair hiding is enabled, then the L2TP hiding algorithm is executed, and sensitive passwords that are used between the L2TP AV pairs are encrypted during PAP or proxy authentication. This command is not required if one-time PAP password authentication is used.

In Figure 1, the client initiates a PPP session with the LAC, and tunnel authentication begins. The LAC in turn exchanges authentication requests with the LNS. Upon successful authentication between the LAC and LNS, a tunnel is created. Proxy authentication is done by the LAC, using either PAP or CHAP. Since PAP username and password information is exchanged between devices in clear-text, it is beneficial to use the **l2tp hidden** command where L2TP AV pair values are encrypted.

**Figure 1 LAC-LNS Proxy Authentication**



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---

**Examples**

The following example encrypts the AV pair value exchanged between the LAC and LNS:

```
l2tp hidden
```

# l2tp ip tos reflect

To configure a Virtual Private Dialup Network (VPDN) group to preserve the ToS field of L2TP-tunneled IP packets, use the **l2tp ip tos reflect** command in VPDN group configuration mode. To specify a ToS field of zero for tunneled packets, use the **no** form of this command.

**l2tp ip tos reflect**

**no l2tp ip tos reflect**

**Syntax Description** This command has no arguments or keywords.

**Defaults** Disabled

**Command Modes** VPDN group configuration

Command History	Release	Modification
	12.0(5)T	This command was introduced.

**Usage Guidelines** The **l2tp ip tos reflect** command can only be configured on LNS VPDN groups (VPDN groups that are configured to accept dial-in and/or request dialout sessions).

**Examples** The following example shows an LNS configured to preserve IP TOS for L2TP dial-in sessions:

```
vpdn-group 1
  accept-dialin
  protocol l2tp
  virtual-template 1
  terminate-from hostname althea
  local name bertha
  l2tp ip tos reflect
```

The following examples shows an LNS configured to preserve IP TOS for L2TP dialout sessions:

```
vpdn-group 1
  request-dialout
  protocol l2tp
  pool-member 1
  initiate-to ip 172.29.49.94
  l2tp ip tos reflect
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>request dialin</b>	Configures a VPDN group to request L2F or L2TP tunnels to a home gateway and creates a request-dialin VPDN subgroup.
<b>request dialout</b>	Enables an LNS to request VPDN dial-out calls by using L2TP.

# l2tp ip udp checksum

To enable IP User Data Protocol (UDP) checksums on Layer 2 Tunneling Protocol (L2TP) payload packets, use the **l2tp ip udp checksum** command in VPDN group configuration mode. Use the **no** form of this command to disable IP UDP checksums.

**l2tp ip udp checksum**

**no l2tp ip udp checksum**

**Syntax Description** This command has no arguments or keywords.

**Defaults** Disabled

**Command Modes** VPDN group configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	11.3(5)AA	This command was introduced.
	12.0(1)T	This command was migrated to Release 12.0(1)T.

**Usage Guidelines** Enabling IP UDP checksum packets causes the switching path to revert to process-level switching, which results in slower performance.

**Examples** The following example enables IP UDP checksums on L2TP payload packets:

```
l2tp ip udp checksum
```

# l2tp tunnel authentication

To enable Layer 2 Tunneling Protocol (L2TP) tunnel authentication, use the **l2tp tunnel authentication** command in VPDN group configuration mode. Use the **no** form of this command to disable L2TP tunnel authentication.

**l2tp tunnel authentication**

**no l2tp tunnel authentication**

**Syntax Description** This command has no arguments or keywords.

**Defaults** Enabled

**Command Modes** VPDN group configuration

## Command History

Release	Modification
11.3(5)AA	This command was introduced.
12.0(1)T	This command was migrated to Release 12.0(1)T.

## Examples

The following example enables L2TP tunnel authentication:

```
l2tp tunnel authentication
```



### Note

L2TP tunnel authentication is enabled by default. Therefore, there is no need to enable this command unless it was previously disabled.

# l2tp tunnel hello

To set the number of seconds between sending hello keepalive packets for a Layer 2 Tunneling Protocol (L2TP) tunnel, use the **l2tp tunnel hello** command. To change the tunnel hello value, simply reenter the command with the new value. To disable the sending of hello keepalive packets, use the **no** form of this command.

**l2tp tunnel hello** *hello-interval*

**no l2tp tunnel hello** *hello-interval*

---

<b>Syntax Description</b>	<i>hello-interval</i> The interval, in seconds, that the LAC and LNS wait before sending the next L2TP tunnel keepalive packet.
---------------------------	---------------------------------------------------------------------------------------------------------------------------------

---

---

<b>Defaults</b>	60 seconds
-----------------	------------

---

---

<b>Command Modes</b>	VPDN group configuration
----------------------	--------------------------

---

---

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	11.3(5)AA	This command was introduced.
	12.0(1)T	This command was migrated to Release 12.0(1)T.

---

---

<b>Usage Guidelines</b>	The L2TP tunnel keepalive timers do not have use the same value on both sides of the tunnel. For example, a LAC can use a keepalive value of 30 seconds, and an LNS can use the default value of 60 seconds.
-------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

---

---

<b>Examples</b>	The following example sets the L2TP tunnel hello value to 90 seconds: <pre>l2tp tunnel hello 90</pre>
-----------------	----------------------------------------------------------------------------------------------------------

---

# l2tp tunnel password

To set the password that the router will use to authenticate the tunnel, use the **l2tp tunnel password** command in VPDN group configuration mode. To remove a previously configured password, use the **no** form of this command.

**l2tp tunnel password** *password*

**no l2tp tunnel password** *password*

## Syntax Description

<b>password</b>	Identifies the password that the router will use for tunnel authentication.
-----------------	-----------------------------------------------------------------------------

## Defaults

Disabled. If the **l2tp tunnel password** is not configured, the local name password is used. If no local name password is configured, the hostname password is used.

## Command Modes

VPDN group configuration

## Command History

Release	Modification
11.3(5)AA	This command was introduced.
12.0(1)T	This command was migrated to Release 12.0(1)T.

## Usage Guidelines

The password defined with the **l2tp tunnel password** command is also used for attribute-value (AV) pair hiding.

The password hierarchy sequence that is used for tunnel identification and, subsequently, tunnel authentication is as follows:

- An L2TP tunnel password is used first (defined by the **l2tp tunnel password** command).
- If no L2TP tunnel password exists, the password associated with the local name is used.
- If a local name password does not exist, the password associated with the host name is used.

The **username** command is used to define the passwords associated with the local name and the host name.

## Examples

The following example configures the tunnel password, dustie, which will be used to authenticate the tunnel between local and remote peer:

```
l2tp tunnel password dustie
```

## Related Commands

Command	Description
<b>hostname</b>	Specifies or modifies the host name for the network server.
<b>local name</b>	Specifies a local host name that the tunnel will use to identify itself.

<b>Command</b>	<b>Description</b>
<b>l2tp hidden</b>	Enables L2TP AV pair hiding, which encrypts the AV pair value.
<b>username</b>	Establishes a username-based authentication system, such as PPP CHAP and PAP.

# lat

To connect to a local-area transport (LAT) host, use the **lat** EXEC command.

**lat** *name* [**node** *nodename* | **port** *portname* | **/debug**]

## Syntax Description

<i>name</i>	LAT-learned service name.
<b>node</b> <i>nodename</i>	(Optional) Specifies a connection to a particular LAT node that offers a service. If you do not include the node name option, the node with the highest rating offering the service is used. Use the <b>show lat nodes</b> EXEC command to display information about all known LAT nodes.
<b>port</b> <i>portname</i>	(Optional) Specifies a destination LAT port name. This keyword is ignored in most time-sharing systems, but is used by routers and network access servers offering <i>reverse LAT</i> services. Reverse LAT involves connecting to one router from another, so that the target router runs the host portion of the protocol. Enter the port name in the format of the remote system as the <i>portname</i> argument.
<b>/debug</b>	(Optional) Enables a switch to display parameter changes and other special messages.

## Command Modes

EXEC

## Command History

Release	Modification
11.0	This command was introduced.

## Usage Guidelines

After entering the **lat** command, you can quit the connection by pressing Ctrl-C, or complete the connection by entering the password for a given service.

You can have several concurrent LAT sessions open and switch back and forth between them. To open a subsequent session, first enter the escape sequence (**Ctrl-Shift-6** then x [**Ctrl^x**] by default) to suspend the current session. Then open a new session.

To list the available LAT services, use the **show lat services** EXEC command.

You can temporarily define the list of services to which you or another user can connect. To do so, use the **terminal lat out-group** command to define the group code lists used for connections from specific lines.

To exit a session, simply log off the remote system. Then terminate an active LAT session by entering the **exit** command.

If your preferred transport is set to **lat**, you can use the **connect** command in place of the **lat** command. Refer to the chapter “Configuring Terminal Operating Characteristics for Dial-In Sessions” in the *Cisco IOS Dial Services Configuration Guide: Terminal Services* for more information about configuring a preferred transport type. When your preferred transport is set to **none** or to another protocol, you must use the **lat** command to connect to a LAT host.

**Examples**

The following example establishes a LAT connection from the router named Router\_A to host eng2:

```
Router_A> lat eng2
Trying ENG2...Open
      ENG2 - VAX/VMS V5.2
Username: JSmith
Password:
      Welcome to VAX/VMS version V5.2 on node ENG2
      Last interactive login on Friday, 1-APR-1994 19:46
```

The system informs you of its progress by displaying the messages “Trying <system>...” and then “Open.” If the connection attempt is not successful, you receive a failure message.

The following example establishes a LAT connection from the router named Router\_B to something named our-modems and specifies port 24, which is a special modem:

```
Router_B> lat our-modems port 24
```

The following example establishes a LAT connection from the router named Router\_C to something named our-modems and specifies a node named eng:

```
Router_C> lat our-modems node eng
```

The following example uses the LAT session debugging capability:

```
Router_D> lat Eng2 /debug
Trying ENG2...Open
      ENG2 - VAX/VMS V5.2
Username: JSmith
Password:
      Welcome to VAX/VMS version V5.2 on node ENG2
      Last interactive login on Tuesday, 5-APR-1994 19:02
[Set Flow out off, Flow in on, Format 8:none, Speed 9600/9600]
[Set Flow out off, Flow in on, Format 8:none, Speed 9600/9600]
$ set ter/speed=2400
[Set Flow out off, Flow in on, Format 8:none, Speed 2400/2400]
```

A variety of LAT events are reported, including all requests by the remote system to set local line parameters. The messages within brackets ([ ]) are the messages produced by the remote system setting line characteristics to operating system defaults.

**Related Commands**

Command	Description
<b>ip alias</b>	Assigns an IP address to the service provided on a TCP port.
<b>show lat services</b>	Displays information about learned LAT services in the Cisco IOS software.
<b>template</b>	Temporarily defines the list of services to which you or another user can connect.

# lat access-list

To specify access conditions to nodes on the local-area transport (LAT) network, use the **lat access-list** command in global configuration mode. Use the **no** form of this command to remove a specified access list number.

**lat access-list** *number* {**permit** | **deny**} *nodename*

**no lat access-list** *number*

## Syntax Description

<i>number</i>	Specifies a number between 1 and 199 assigned to the line using the <b>access-class</b> line configuration command.
<b>permit</b>	Allows any matching node name to access the line.
<b>deny</b>	Denies access to any matching node name.
<i>nodename</i>	Specifies the name of the LAT node, with or without regular expression pattern matching characters, with which to compare for access. The UNIX-style regular expression characters allow for pattern matching of characters and character strings in the node name.

## Defaults

No access conditions defined

## Command Modes

Global configuration

## Command History

Release	Modification
10.0	This command was introduced.

## Usage Guidelines

Regular expressions are case sensitive. Because LAT node names are always in all capital letters, make sure you use only all capital-letter regular expressions.

Table 15 and Table 16 summarize pattern and character matching symbols and their use. A more complete description of the pattern matching characters is found in the “Regular Expressions” appendix later in this publication.

**Table 15** *Pattern Matching*

Character	Description
\0	Replaces the entire original address.
\1..9	Replaces the strings that match the first through ninth parenthesized part of X.121 address.
*	Matches 0 or more sequences of the regular expressions.
+	Matches 1 or more sequences of the regular expressions.
?	Matches the regular expression of the null string.

**Table 16 Character Matching**

Character	Description
<code>^</code>	Matches the null string at the beginning of the input string.
<code>\$</code>	Matches the null string at the end of the input string.
<code>\char</code>	Matches <i>char</i> .
<code>.</code>	Matches any single character.

**Examples**

The following example permits all packets destined for any LAT node named WHEEL:

```
lat access-list 1 permit WHEEL
```

The following example denies all packets destined for any LAT node name beginning with the BLDG1-prefix:

```
lat access-list 2 deny ^BLDG1-
```

**Related Commands**

Command	Description
<code>accept dialin</code>	Defines access list restrictions on incoming and outgoing connections.

# lat enabled

To enable local-area transport (LAT), use the **lat enabled** command in interface configuration mode. Use the **no** form of this command to disable LAT.

**lat enabled**

**no lat enabled**

---

**Syntax Description** This command has no arguments or keywords.

---

**Defaults** Enabled

---

**Command Modes** Interface configuration

---

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	10.0	This command was introduced.

---

---

**Examples** The following example enables LAT on Ethernet interface 0:

```
interface ethernet 0
  lat enabled
```

The following example disables LAT on the same Ethernet interface:

```
interface ethernet 0
  no lat enabled
```

# lat group-list

To allow a name to be assigned to the group list, use the **lat group-list** command in global configuration mode. Use the **no** form of this command to remove the specified group list.

**lat group-list** *groupname* {*number* | *range* | **all**} [**enabled** | **disabled**]

**no lat group-list** *groupname* {*number* | *range* | **all**} [**enabled** | **disabled**]

Syntax Description	
<i>groupname</i>	Specifies a group code name.
<i>number</i>	Specifies a group code number. You can enter both a group code name and group code numbers.
<i>range</i>	Specifies a hyphenated range of numbers.
<b>all</b>	Specifies the range from 0 to 255.
<b>enabled</b>	(Optional) Allows incremental changes to the list; that is, you can add a group code without retyping the entire command.
<b>disabled</b>	(Optional) Allows selective removal of a group code from the list.

## Defaults

A group list is any combination of group names, numbers, or ranges. No group names are assigned to the list.

## Command Modes

Global configuration

## Command History

Release	Modification
11.1	This command was introduced.

## Usage Guidelines

Specifying a name for a group list simplifies the task of entering individual group codes. In other words, a name makes it easier to refer to a long list of group code numbers. The group list must already exist. Use the **show lat groups EXEC** command to see a list of existing groups.

## Examples

The following example creates the new group named stockroom and defines it to include the group numbers 71 and 99:

```
lat group-list stockroom 71 99
```

The following example adds group code 101 to the group named stockroom:

```
lat group-list stockroom 101 enabled
```

The following example deletes the group named Bldg-2:

```
no lat group-list Bldg-2
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>lat out-group</b>	Defines a group list for the outgoing user-initiated connections for a line.
<b>lat service-group</b>	Specifies a group code mask to use when advertising all services for this node and to control incoming services.

# lat host-buffers

To set the number of receive buffers that will be negotiated when the router is acting as a local-area transport (LAT) host, use the **lat host-buffers** command in global configuration mode. Use the **no** form of this command to return to the default of one receive buffer.

**lat host-buffers** *receive-buffers*

**no lat host-buffers** *receive-buffers*

<b>Syntax Description</b>	<i>receive-buffers</i> An integer that specifies the number of receive buffers that will be negotiated. The argument can be any number from 1 to 128.
---------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------

<b>Defaults</b>	One receive buffer
-----------------	--------------------

<b>Command Modes</b>	Global configuration
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	10.0	This command was introduced.

<b>Usage Guidelines</b>	Before LAT Version 5.2, LAT allowed only one outstanding message at a time on a virtual circuit. This could limit the performance of large routers. For example, only one Ethernet packet of data could be in transit at a time. With LAT Version 5.2, nodes can indicate that they are willing to receive more than one message at a time. During virtual circuit startup, each side communicates to the other how many outstanding messages it is willing to accept.
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<b>Examples</b>	The following example enables LAT and configures the LAT host to negotiate 100 receive buffers:
-----------------	-------------------------------------------------------------------------------------------------

```
lat enabled
lat host-buffers 100
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>lat server-buffers</b>	Sets the number of receive buffers that will be negotiated when the router is acting as a LAT server.

# lat ka-timer

To set the rate of the keepalive timer, use the **lat ka-timer** command in global configuration mode. Use the **no** form of this command to restore the default.

**lat ka-timer** *seconds*

**no lat ka-timer**

Syntax Description	<i>seconds</i>	The timer rate in seconds.
--------------------	----------------	----------------------------

Defaults	20 seconds
----------	------------

Command Modes	Global configuration
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Command History	Release	Modification
	10.0	This command was introduced.

Usage Guidelines	The keepalive timer sets the rate that messages are sent in the absence of actual traffic between the router and the remote node. The server uses keepalive messages to detect when communication with a remote node is disrupted or when the remote node has crashed.
------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Examples	The following example sets the keepalive timer rate to 5 seconds:
----------	-------------------------------------------------------------------

```
lat ka-timer 5
```

# lat node

To change the local-area transport (LAT) node name without changing the system host name, use the **lat node** command in global configuration mode.

**lat node** *node-name*

<b>Syntax Description</b>	<i>node-name</i>	Name of the LAT node.
---------------------------	------------------	-----------------------

<b>Defaults</b>	No default LAT node name
-----------------	--------------------------

<b>Command Modes</b>	Global configuration
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	10.0	This command was introduced.

<b>Usage Guidelines</b>	This command allows you to give the server a node name that is different from the host name. Use the <b>show entry EXEC</b> command to determine which LAT hosts have queue entries for printers on the servers. Use the <b>clear entry EXEC</b> command to delete entries from the queue.
-------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

<b>Examples</b>	The following example specifies the LAT node name as DEC2:
-----------------	------------------------------------------------------------

```
lat node DEC2
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>clear dialer dnis</b>	Deletes an entry from the list of queued host-initiated connections.
	<b>hostname</b>	Specifies or modifies the host name for the network server.
	<b>show entry</b>	Displays the list of queued host-initiated connections to a router.

# lat out-group

To define a group list for a line's outgoing user-initiated connections, use the **lat out-group** command in line configuration mode. Use the **lat out-group 0** command to return to the default value.

**lat out-group** {*groupname number* | *range* | **all**}

Syntax Description	
<i>groupname</i>	Group code name.
<i>number</i>	Group code number. You can also enter both a group code name and group code numbers.
<i>range</i>	Hyphenated range of numbers.
<b>all</b>	Range from 0 to 255.

**Defaults** The default group code number is 0.

**Command Modes** Line configuration

Command History	Release	Modification
	10.0	This command was introduced.

**Usage Guidelines** You can have values for one, two, or all three arguments. If the **all** keyword is specified, no arguments can be used. You can enter the *groupname*, *number*, and *range* arguments in any order.

Use the EXEC command **show lat** to display group numbers. If the host node and router do not share a common group number, the host's services will not be displayed.

**Examples** The following example defines the services for lines 1 through 7, 10 through 17, and 20 through 24. Access to systems on the first set of lines is limited to groups 12 and 18 through 23; the second set is limited to group 12; the third set is limited to group codes 12, 18 through 23, and 44. All other lines use the default of group zero.

```
line 1 7
  lat out-group 12 18-23
line 10 17
  lat out-group 12
line 20 24
  lat out-group 12 18-23 44
```

Related Commands	Command	Description
	<b>lat group-list</b>	Allows a name to be assigned to the group list, which is any combination of group names, numbers, or ranges.
	<b>template</b>	Temporarily defines the list of services to which you or another user can connect.

# lat remote-modification

To enable remote local-area transport (LAT) modification of a line's characteristics (for example, baud rate), use the **lat remote-modification** command in line configuration mode. Use the **no** form of this command to disable remote LAT modification of line characteristics.

**lat remote-modification**

**no lat remote-modification**

**Syntax Description** This command has no arguments or keywords.

**Defaults** Remote modification is disabled.

**Command Modes** Line configuration

Command History	Release	Modification
	10.0	This command was introduced.

**Usage Guidelines** Enabling the line for remote modification allows the remote LAT node to change the line's characteristics (for example, baud rate, parity, and so forth).

**Examples** The following example enables remote LAT modification on line 4:

```
line 4
 lat remote-modification
```

Related Commands	Command	Description
	<b>template</b>	Temporarily defines the list of services to which you or another user can connect.

# lat retransmit-limit

To set the number of times that local-area transport (LAT) resends a message before declaring the remote system unreachable, use the **lat retransmit-limit** command in global configuration mode. Use the **no** form of this command to restore the default retry value.

**lat retransmit-limit** *number*

**no lat retransmit-limit**

<b>Syntax Description</b>	<i>number</i>	Number of retries; any number from 4 to 255.
<b>Defaults</b>	8 retries	
<b>Command Modes</b>	Global configuration	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	10.0	This command was introduced.

**Usage Guidelines** Assigning larger values to the number of tries increases the robustness of the LAT service at the cost of longer delays when communications are disrupted. Because LAT generally retransmits messages once per second, the value is approximately the number of seconds that LAT connections will survive connection disruption.

If you bridge LAT, the retransmission limit should be set to at least 20 tries for LAT sessions to survive a worst-case spanning-tree reconfiguration, because bridging spanning-tree reconfiguration can take up to 15 seconds.

**Examples** The following example sets the retransmission limit to 30 tries, enough time to sustain the down time incurred when the system must reconfigure a spanning-tree topology:

```
lat retransmit-limit 30
```

# lat server-buffers

To set the number of receive buffers that will be negotiated when the router is acting as a local-area transport (LAT) server, use the **lat server-buffers** command in global configuration mode. Use the **no** form of this command to return to the default of one receive buffer.

**lat server-buffers** *receive-buffers*

**no lat server-buffers** *receive-buffers*

## Syntax Description

*receive-buffers* Integer that specifies the number of receive buffers that will be negotiated. The argument can be any number from 1 to 128.

## Defaults

1 receive buffer

## Command Modes

Global configuration

## Command History

Release	Modification
10.0	This command was introduced.

## Usage Guidelines

Before LAT Version 5.2, LAT allowed only one outstanding message on a virtual circuit at a time. This could limit the performance of large routers because only one Ethernet packet of data could be in transit at a time. With LAT Version 5.2, nodes can indicate that they are willing to receive more than one message at a time. During virtual circuit startup, each side communicates to the other how many outstanding messages it is willing to accept.

## Examples

The following example enables LAT and configures the server to negotiate 25 receive buffers:

```
lat enabled
lat server-buffers 25
```

## Related Commands

Command	Description
<b>lat host-buffers</b>	Sets the number of receive buffers that will be negotiated when the router is acting as a LAT host.

# lat service-announcements

To reenables local-area transport (LAT) broadcast service announcements, use the **lat service-announcements** command in global configuration mode. Use the **no** form of this command to disable the sending of LAT service announcements.

**lat service-announcements**

**no lat service-announcements**

**Syntax Description** This command has no arguments or keywords.

**Defaults** Enabled

**Command Modes** Global configuration

Command History	Release	Modification
	10.0	This command was introduced.

**Usage Guidelines** If this command is enabled, the LAT code will periodically broadcast service advertisements. If the command is disabled, the LAT code will not send service announcements, so solicit information messages will have to be used to look up node information.



**Note**

You should only disable service announcements if all of the nodes on the local-area network (LAN) support the service responder feature.

**Examples** The following example reenables the sending of broadcast service announcements:

```
lat service-announcements
```

Related Commands	Command	Description
	<b>lat service-responder</b>	Configures a node to act as proxy for other nodes when a solicit-information multicast message is received.

# lat service enabled

To enable inbound connections to the specified service and enable the advertisement of this service to routers on the network, use the **lat service enabled** command in global configuration mode. Use the **no** form of this command to delete the named service.

**lat service** *service-name* **enabled**

**no lat service** *service-name* **enabled**

---

## Syntax Description

*service-name* Name of the service.

---



---

## Defaults

No services enabled

---

## Command Modes

Global configuration

---

## Command History

Release	Modification
10.0	This command was introduced.

---



---

## Usage Guidelines

In the simplest form, this command creates a service that gives connecting users access to a VTY port on the server.

Use the **enabled** keyword after commands that define a service so that users do not connect to a service before all the parameters are set.

Deleting a service does not disconnect existing connections.

---

## Examples

The following example enables inbound connections to the service WHEEL:

```
lat service WHEEL enabled
```

# lat service-group

To specify a group code mask to use when advertising all services for this node and to control incoming services, use the **lat service-group** command in global configuration mode. Use the **no** form of this command to remove the group code mask specified.

```
lat service-group { groupname | number | range | all } [enabled | disabled]
```

```
no lat service-group { groupname | number | range | all } [enabled | disabled]
```

## Syntax Description

<i>groupname</i>	Specifies a group code name.
<i>number</i>	Specifies a group code number.
<i>range</i>	Specifies a hyphenated range of numbers between 0 and 255.
<b>all</b>	Specifies the range from 0 to 255.
<b>enabled</b>	(Optional) Allows incremental changes to the list; that is, you can add a group code without retyping the entire command.
<b>disabled</b>	(Optional) Allows selective removal of a group code from the list.

## Defaults

If no service group is specified, the Cisco IOS software defaults to advertising to group 0.

## Command Modes

Global configuration

## Command History

Release	Modification
10.0	This command was introduced.

## Usage Guidelines

When this command is written to nonvolatile memory (using the **write memory EXEC** command), the system looks for an exact match on a group code name. If it finds one, it uses that name in the command. Otherwise, it writes out a list of numbers, using the range syntax whenever possible.

## Examples

The following example specifies groups 100 through 103, then defines engineering as the group code list to advertise:

```
lat group-list engineering 100-103
lat service-group engineering enabled
```

The following example specifies the groups 1, 5, 20 through 36, and 52:

```
lat service-group 1 5 20-36 52
```

## Related Commands

Command	Description
<b>lat group-list</b>	Allows a name to be assigned to the group list, which is any combination of group names, numbers, or ranges.

# lat service ident

To set the local-area transport (LAT) service identification for a specified service, use the **lat service ident** command in global configuration mode. Use the **no** form of this command to remove the identification.

**lat service** *service-name* **ident** *identification*

**no lat service** *service-name* **ident**

## Syntax Description

<i>service-name</i>	Name of the service.
<i>identification</i>	Descriptive name (text only) that identifies the service.

## Defaults

No LAT service identification is set for specific services.

## Command Modes

Global configuration

## Command History

Release	Modification
10.0	This command was introduced.

## Usage Guidelines

The identification is advertised to other servers on the network and is displayed along with the list of name services on the LAN.

## Examples

The following example specifies the identification “Welcome to Gateway-A” on service STELLA:

```
lat service STELLA ident Welcome to Gateway-A
```

# lat service password

To set up a local-area transport (LAT) password for a service, use the **lat service password** command in global configuration mode. Use the **no** form of this command to remove the password.

```
lat service service-name password password
```

```
no lat service service-name password
```

---

**Syntax Description**

---

<i>service-name</i>	Name of the service.
<i>password</i>	Password used to gain access to the service.

---

---

**Defaults**

No default LAT service passwords

---

**Command Modes**

Global configuration

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**Command History**

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Release	Modification
10.0	This command was introduced.

---

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**Usage Guidelines**

The connecting user will be required to enter the password to complete the connection.  
The password is obtained through the LAT password mechanism.

---

**Examples**

The following example specifies a service named BLUE and the password secret:

```
lat service BLUE password secret
```

# lat service rating

To set a static service rating for the specified service, use the **lat service rating** command in global configuration mode. Use the **no** form of this command to remove the service rating.

**lat service** *service-name* **rating** *static-rating*

**no lat service** *service-name* **rating**

## Syntax Description

<i>service-name</i>	Name of the service.
<i>static-rating</i>	Static service rating. The rating must be in the range of 1 to 255.

## Defaults

Dynamic rating

## Command Modes

Global configuration

## Command History

Release	Modification
10.0	This command was introduced.

## Usage Guidelines

If this command is not entered, the Cisco IOS software calculates a dynamic rating based on the number of free ports that can handle connections to the service. Setting a static rating overrides this calculation and causes the specified value to be used.

## Examples

The following example specifies a service rating of 84 on the service WHEEL:

```
lat service WHEEL rating 84
```

# lat service-responder

To configure a node to act as proxy for other nodes when a solicit-information multicast message is received, use the **lat service-responder** command in global configuration mode. Use the **no** form of this command to remove any proxy definition set up using the **lat service-responder** command.

**lat service-responder**

**no lat service-responder**

**Syntax Description** This command has no arguments or keywords.

**Defaults** Disabled

**Command Modes** Global configuration

Command History	Release	Modification
	10.0	This command was introduced.

**Usage Guidelines**

The Cisco IOS software can be configured to support the service responder feature that is part of the latest LAT Version 5.2 specification.

Specifically, the DECserver90L+, which has less memory than other DEC servers, does not maintain a cache of learned services. Instead, the DECserver90L+ solicits information about services as they are needed.

LAT Version 5.2 nodes can respond for themselves; LAT Version 5.1 nodes, for example VMS Version 5.4 or earlier nodes, cannot. Instead, a LAT Version 5.2 node configured as a service responder can respond in proxy for those LAT Version 5.1 nodes.

The Cisco IOS software can be configured as a LAT service responder. If all your nodes are LAT Version 5.2 nodes, you do not need to enable the service responder features.

**Examples**

The following example configures a node to act as a proxy for a node when a solicit information multicast message is received. The node configured with this command will respond to solicit messages.

```
lat service-responder
```

Related Commands	Command	Description
	<b>lat service-announcements</b>	Reenables LAT broadcast service announcements.

# lat service rotary

To associate a rotary group with a service, use the **lat service rotary** command in global configuration mode. Use the **no** form of this command to remove the association.

**lat service** *service-name* **rotary** *group*

**no lat service** *service-name* **rotary**

## Syntax Description

<i>service-name</i>	Name of the service.
<i>group</i>	Rotary group number.

## Defaults

Disabled

## Command Modes

Global configuration

## Command History

Release	Modification
10.0	This command was introduced.

## Usage Guidelines

Establish rotary groups using the **rotary** line configuration command.

When an inbound connection is received for this service, the router establishes a reverse LAT connection to a terminal in that rotary group.

If the rotary option is not set, the connection will be to a virtual terminal session on the router.

## Examples

The following example creates a service called MODEM to establish a rotary group:

```
lat services MODEM rotary 1
```

## Related Commands

Command	Description
<b>rotary</b>	Defines a group of lines consisting of one or more lines.

# lat service-timer

To adjust the time between local-area transport (LAT) service advertisements, use the **lat service-timer** command in global configuration mode.

**lat service-timer** *interval*

<b>Syntax Description</b>	<i>interval</i>	Number of seconds between service announcements. Note that the granularity offered by this command is ten-second intervals, and the <i>interval</i> value is rounded up.
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<b>Defaults</b>	20 seconds
-----------------	------------

<b>Command Modes</b>	Global configuration
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	11.1	This command was introduced.

<b>Usage Guidelines</b>	This command adjusts the time, in seconds, between LAT service announcements for services offered by the router. This is useful in large networks with many LAT services and limited bandwidth.
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<b>Examples</b>	The following example sets the interval between LAT service advertisements to 11, and illustrates the rough granularity of the <b>lat service-timer</b> command:
-----------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------

```
! The time between LAT service advertisements is set to 11. Because the
! granularity is in ten-second intervals, the actual time between advertisement
! is 20 seconds.
lat service-timer 11
! 20 seconds between updates
lat service-timer 19
! 120 seconds between updates
lat service-timer 120
```

# lat vc-sessions

To set the maximum number of sessions to be multiplexed onto a single local-area transport (LAT) virtual circuit, use the **lat vc-sessions** command in global configuration mode. Use the **no** form of this command to remove a prior session's definition.

**lat vc-sessions** *number*

**no lat vc-sessions** *number*

## Syntax Description

<i>number</i>	Specifies the number of sessions that will be multiplexed onto a single LAT virtual circuit. This number cannot be greater than 255.
---------------	--------------------------------------------------------------------------------------------------------------------------------------

## Defaults

255 sessions per virtual circuit

## Command Modes

Global configuration

## Command History

Release	Modification
10.0	This command was introduced.

## Usage Guidelines

Setting the number of sessions to a smaller number can increase throughput if there are many sessions on one host, especially with routers with many physical ports. It can also increase overhead if there is little traffic but a large number of sessions to the same host.

## Examples

The following example sets the maximum number of sessions to be multiplexed onto a single LAT virtual circuit at 100:

```
lat vc-sessions 100
```

# lat vc-timer

To set the interval of time local-area transport (LAT) waits before sending any traffic, use the **lat vc-timer** command in global configuration mode. Use the **no** form of this command to remove a timer definition.

**lat vc-timer** *milliseconds*

**no lat vc-timer** *milliseconds*

<b>Syntax Description</b>	<i>milliseconds</i> Timer value. Specifies the amount of time LAT will wait before sending traffic. Acceptable values are between 10 and 1000 milliseconds.
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<b>Defaults</b>	80 milliseconds
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<b>Command Modes</b>	Global configuration
----------------------	----------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	10.0	This command was introduced.

<b>Usage Guidelines</b>	<p>Smaller timer values increase the overhead on both the router and the host. However, you can use smaller values to correct buffer overflows, which happen when the router receives more data than it can buffer during a virtual circuit timer interval.</p> <p>Larger values increase the need for buffering and can cause noticeable echoing delay. However, increased values can reduce traffic. In environments with slow bridging, retransmissions can be reduced if you increase the value to at least three times the worst-case, round-trip interval.</p>
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<b>Examples</b>	<p>The following example sets the time between transmitting messages to 500 milliseconds:</p> <pre>lat vc-timer 500</pre>
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