Configuring ISDN

This chapter describes tasks that are required to get an Integrated Services Digital Network (ISDN) line and interface up, and describes features involved in configuring ISDN in a circuit-switched internetworking environment. For a complete description of the commands mentioned in this chapter, refer to the "ISDN Commands" chapter in the *Wide-Area Networking Command Reference*.

This chapter does not address routing issues, dialer configuration, and dial backup. For information about those topics, see the "Configuring DDR" chapter.

For information about the Channel Interface Processor (CIP), see the chapter entitled "IBM Channel Attach Commands" in the *Bridging and IBM Networking Command Reference*. The CIP is described in a separate chapter because of the interrelation of host system configuration values and router configuration values.

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

ISDN Task List

Perform the tasks in the following sections to configure ISDN lines and interfaces. You must configure the ISDN interface—Basic Rate Interface (BRI), MBRI, or Primary Rate Interface (PRI)—and network addressing. Perform the encapsulation for Frame Relay or X.25 task only if the traffic sent over the ISDN interface will cross a Frame Relay or X.25 network. The remaining tasks are optional.

- Understand Line Configuration Requirements
- Configure an ISDN BRI
- Configure an ISDN PRI
- Enable Asynchronous Access over ISDN
- Configure Encapsulation for Frame Relay or X.25 Networks
- Configure Network Addressing
- Configure Automatic Detection of Encapsulation Type
- Configure Combinet Compatibility
- Configure Semipermanent Connections (optional, for Germany only)
- Perform Configuration Self-Tests
- Monitor and Maintain ISDN Interfaces

You can also optionally configure *snapshot routing* for ISDN interfaces. Snapshot routing is a method of learning remote routes dynamically and keeping the routes available for a specified period of time, even though routing updates are not exchanged during that period. See the "Configuring DDR" chapter of this module for detailed information about snapshot routing.

To place calls on the ISDN interface, you must configure it with *dial-on-demand routing (DDR)*. For configuration information about ISDN using DDR, see the "Configuring DDR" chapter. For command information, refer to the chapter entitled "DDR Commands" in the *Wide-Area Networking Command Reference*.

To configure *bandwidth on demand* and *dial backup*, see the "Configuring DDR" chapter.

See the end of this chapter for the "ISDN Configuration Examples" section.

Understand Line Configuration Requirements

Before configuring the ISDN interfaces on your Cisco router, it is necessary to order a correctly configured ISDN line (BRI or PRI) from your telecommunications service provider.

This process varies dramatically from provider to provider on a national and international basis. However, some general guidelines follow:

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

Configure an ISDN BRI

This section describes how to configure a BRI, whether it is the only BRI in a router or is one of many in an MBRI. Each of the BRIs in an MBRI can be configured separately and is configured in the same way as a BRI.

Perform the tasks in the following sections to configure an ISDN BRI. The switch type selection and BRI specification tasks are required; the remaining are optional.

- Check the Buffers
- Select the ISDN Switch Type
- Define ISDN TEI Negotiation
- Specify ISDN Service Profile Identifiers (SPIDs) (if required)
- Specify an ISDN Basic Rate Interface (BRI)
- Configure Called Party Number Verification
- Configure Calling Line Identification Screening
- Configure BRI for Leased Line Service

- Configure ISDN Calling Number Identification (Australia only)
- Configure the Line Speed for Calls Not ISDN End-To-End

Check the Buffers

When configuring a BRI, after the system comes up, make sure enough buffers are in the free list of the buffer pool that matches the maximum transmission unit (MTU) of your BRI interface. If not, you must reconfigure buffers in order for the BRI interfaces to function properly.

To check the MTU size and the buffers and, if necessary, to configure the buffers and the MTU size, complete the following tasks beginning in EXEC mode:

Task	Command
Check the MTU size.	**show interfaces bri** *number*
Check the free buffers.	**show buffers** [1]
Configure the buffers.	**configure terminal** [2] **buffers big permanent** *number* **buffers big max-free** *number* **buffers big min-free** *number* **buffers big initial** *number*
Specify the interface and enter interface configuration mode.	**interface bri** *number*
Set the MTU size.	**mtu 1500**[3]

1. This command is documented in the "System Management Commands" chapter in the *Configuration Fundamentals Command Reference*.
2. This command is documented in the "System Image, Microcode Image, and Configuration File Load Commands" chapter in the *Configuration Fundamentals Command Reference*.
3. This command is documented in the "Interface Commands" chapter in the *Configuration Fundamentals Command Reference*.

Select the ISDN Switch Type

ISDN supports a variety of service provider switches. Table 3 lists, by geographic areas, the ISDN switch types supported by the ISDN interface. If you configure an interface with the **interface bri** command, you must also select a switch. Perform the following task in global configuration mode:

Task	Command
Select the service provider switch type.	**isdn switch-type** *switch-type*

Table 3 ISDN Service Provider Switch Types

Keywords by Area	Switch Type
none	No switch defined
Australia	
basic-ts013	Australian TS013 switches
Europe	
basic-1tr6	German 1TR6 ISDN switches
basic-nwnet3	Norway NET3 switches (phase 1)
basic-net3	NET3 ISDN switches (UK, Denmark, and other nations); covers the Euro-ISDN E-DSS1 signalling system.
primary-net5	European ISDN PRI switches (UK and Europe)
vn2	French VN2 ISDN switches
vn3	French VN3 ISDN switches
Japan	
ntt	Japanese NTT ISDN switches
primary-ntt	Japanese ISDN PRI switches
North America	
basic-5ess	AT&T basic rate switches
basic-dms100	NT DMS-100 basic rate switches
basic-ni1	National ISDN-1 switches
primary-4ess	AT&T 4ESS switch type for the U.S. (ISDN PRI only)
primary-5ess	AT&T 5ESS switch type for the U.S. (ISDN PRI only)
primary-dms100	NT DMS-100 switch type for the U.S. (ISDN PRI only)
New Zealand	
basic-nznet3	New Zealand Net3 switches

Note Any router with an MBRI must be connected to the same switch type on all its ISDN interfaces.

Table 4 ISDN Switch Type Configuration Information

Switch Type	Configuration
5ESS Custom BRI	**For Data Only** 2 B channels for data. Point to point. Terminal type = E. 1 directory number (DN) assigned by service provider. MTERM = 1. Request delivery of calling line ID on Centrex lines. Set speed for ISDN calls to 56 K outside local exchange. **For Voice and Data** (Use these values only if you have an ISDN telephone connected.) 2 B channels for voice or data. Multipoint. Terminal type = D. 2 directory numbers assigned by service provider. 2 service profile identifiers (SPIDs) required, assigned by service provider. MTERM = 2. Number of call appearances = 1. Display = No. Ringing/idle call appearances = idle. Autohold= no. Onetouch = no. Request delivery of calling line ID on Centrex lines. Set speed for ISDN calls to 56 kbps outside local exchange. Directory number 1 can hunt to directory number 2.
5ESS National ISDN (NI-1) BRI	Terminal type = A. 2 B channels for voice and data. 2 directory numbers assigned by service provider. 2 SPIDs required; assigned by service provider. Set speed for ISDN calls to 56 K outside local exchange. Directory number 1 can hunt to directory number 2.
DMS-100 BRI	2 B channels for voice and data. 2 directory numbers assigned by service provider. 2 SPIDs required; assigned by service provider. Functional signaling. Dynamic terminal endpoint identifier (TEI) assignment. Maximum number of keys = 64. Release key = no, or key number = no. Ringing indicator = no. EKTS = no. PVC = 2. Request delivery of calling line ID on Centrex lines. Set speed for ISDN calls to 56 K outside local exchange. Directory number 1 can hunt to directory number 2.
Primary Rate Lines	Line format = Extended Superframe Format (ESF). Line coding = binary 8-zero substitution (B8ZS). Call type = 23 incoming channels and 23 outgoing channels. Speed = 64 K. Call-by-call capability. 23 B+D. Trunk selection sequence = descending from 23 to 1. Set B+D glare to yield. Only 1 directory number assigned by service provider. Set speed of ISDN calls to 56 K outside local exchange. No SPIDs required.

Define ISDN TEI Negotiation

This section applies to ISDN BRI only. You can determine when Layer 2 ISDN terminal endpoint identifier (TEI) negotiation occurs. The default is for negotiation to occur when the router is powered on. TEI negotiation is useful in Europe and also useful for switches that might deactivate Layer 2 when no calls are active.

To define when TEI negotiation will occur, perform the following task in global configuration mode:

Task	Command
Determine when ISDN TEI negotiation occurs.	**isdn tei** [**first-call** | **powerup**]

Specify an ISDN Basic Rate Interface (BRI)

To specify an ISDN Basic Rate Interface (BRI) and enter interface configuration mode, perform the following task in global configuration mode:

Task	Command
Begin BRI configuration.	**interface bri** *number*

Specify ISDN Service Profile Identifiers (SPIDs)

This section applies to ISDN BRIs only. All ISDN devices subscribe to services provided by an ISDN service provider, usually a telephone company. However, only some service providers use service profile identifiers (SPIDs) to define the services subscribed to by the ISDN device that is accessing the ISDN service provider. The service provider assigns the ISDN device one or more SPIDs when you first subscribe to the service. If you are using a service provider that requires SPIDs, your ISDN device cannot place or receive calls until it sends a valid, assigned SPID to the service provider when accessing the switch to initialize the connection.

Currently, only the DMS-100 and NI-1 switch types require SPIDs. The AT&T 5ESS switch type may support a SPID, but we recommend that you set up that ISDN service without SPIDs. In addition, SPIDs have significance at the local access ISDN interface only. Remote routers are never sent the SPID.

A SPID is usually a seven-digit telephone number with some optional numbers. However, service providers may use different numbering schemes. For the DMS-100 switch type, two SPIDs are assigned, one for each B channel. Once your service provider has assigned you SPIDs, you must define these SPIDs on the router so that when access to the switch is attempted, the router has the valid information available.

To define the SPIDs and the local directory number (LDN) on the router, perform the following tasks in interface configuration mode (after specifying **interface bri**):

Task	Command
Specify a SPID and local directory number for the B1-channel.	**isdn spid1** *spid-number* [*ldn*]
Specify a SPID and local directory number for the B2-channel.	**isdn spid2** *spid-number* [*ldn*]

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

See the "Configuring DDR" chapter for information about configuring dial-on-demand routing (DDR). Refer to the "DDR Commands" chapter in the *Wide-Area Networking Command Reference* for specific DDR commands.

Configure Calling Line Identification Screening

This task applies only to Cisco 2500 series, Cisco 3000 series, and Cisco 4000 series routers that have a BRI. Calling line identification (also called *caller ID*) screening adds a level of security by allowing you to screen incoming calls. You can verify that the calling line ID is from an expected origin. CLI screening requires a local switch that is capable of delivering the CLI to the router.

To configure caller ID screening, perform the following task in interface configuration mode:

Task	Command
Configure caller ID screening.	**isdn caller** *number*

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

Configure Called Party Number Verification

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

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

Task	Command
Specify that the router verify a called-party number or subaddress number in the incoming setup message.	**isdn answer1** [*called-party-number*][**:***subaddress*]

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

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

Task	Command
Specify that the router verify a second called-party number or subaddress number in the incoming setup message.	**isdn answer2** [*called-party-number*][**:***subaddress*]

Configure ISDN Calling Number Identification

This feature applies only to routers used in Australia. A router with a basic TS013 ISDN BRI interface might need to supply the network with a billing number for outgoing calls. The Australian network offers better pricing on calls in which the number is presented.

To configure the interface to identify the billing number, perform the following task in interface configuration mode:

Task	Command
Specify the calling party number.	**isdn calling-number** *calling-number*

Note The **isdn calling-number** command is supported only on Australian basic TS013 switch types.

Configure the Line Speed for Calls Not ISDN End-To-End

When calls are made at 56 kbps but delivered by the ISDN network at 64 kbps, the incoming data can be corrupted.

However, on ISDN calls, if the receiving side is informed that the call is not an ISDN call from end to end, it can set the line speed for the incoming call.

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

Task	Command
Set the speed to be used for incoming calls recognized as not ISDN end-to-end.	**isdn not-end-to-end** {**56** | **64**}

Configure BRI for Leased Line Service

To configure a Basic Rate Interface (BRI) interface to use the ISDN physical connection as a leased-line service, use the **isdn leased-line** command.

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

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

Task	Command
Specify the BRI interface number.	**isdn leased-line bri** *number*

When you configure this feature on a router, make sure that an ISDN switch type is also configured.

For example:

```
!
isdn switch-type basic-net3
isdn leased-line BRI0
!
```

The type of switch is not important. Pick the switch type you normally use in your country.

Configure an ISDN PRI

ISDN Primary Rate Interface (PRI) is supported on the Cisco 4000, the Cisco 4500, and the Cisco 7000 series routers using T1 or E1 versions of the Multichannel Interface Processor (MIP) card in conjunction with PRI signaling software. Channelized T1 ISDN PRI offers 23 B channels and 1 D channel. Channelized E1 ISDN PRI offers 30 B channels and 1 D channel.

Channelized T1 and channelized E1 are supported by corresponding controllers. A T1 or E1 controller has one physical network termination. However, it can have many virtual interfaces, depending on the configuration.

Perform the tasks in the following sections as appropriate for the T1 controller or the E1 controller:

- Configure Channelized T1 ISDN PRI
- Configure Channelized E1 ISDN PRI

Configure Channelized T1 ISDN PRI

To configure ISDN PRI on a channelized T1 controller, perform the following tasks beginning in global configuration mode:

Task	Command
Select a service provider switch type that accommodates PRI. (See Table 3, earlier in this chapter, for a list of supported switch types.)	**isdn switch-type** *switch-type*
Specify a T1 controller on a Cisco 7000 or Specify a T1 controller on a Cisco 4000.	**controller t1** *slot/port*[1] or **controller t1** *number*[1]
Define the framing characteristics as Extended Superframe Format (ESF).	**framing esf** [1]
Define the line code as binary 8 zero substitution (B8ZS).	**linecode b8zs**
Configure ISDN PRI.	**pri-group** [**timeslots** *range*]

1. This command is documented in the "Interface Commands" chapter in the *Configuration Fundamentals Command Reference*.

If you do not specify the time slots, the specified controller is configured for 23 B channels and 1 D channel.

Note Any router configured for ISDN support must be connected to the same switch type on all its ISDN interfaces.

Configure Channelized E1 ISDN PRI

To configure ISDN PRI on a channelized E1 controller, perform the following tasks, beginning in global configuration mode:

Task	Command
Select a service provider switch type that accommodates PRI. (See Table 3, earlier in this chapter, for a list of supported switch types.)	**isdn switch-type** *switch-type*
Define the controller location in the Cisco 7000 series by slot and port number. or Define the controller location in the Cisco 4000 series by unit number, ranging from 0 through 2.	**controller e1** *slot/port*[1] **controller e1** *number*[1]
Define the framing characteristics as cyclic redundancy check 4 (CRC4).	**framing crc4**[1]
Define the line code as high-density bipolar 3 (HDB3).	**linecode hdb3**
Configure ISDN PRI.	**pri-group** [**timeslots** *range*]

1. This command is documented in the "Interface Commands" chapter in the *Configuration Fundamentals Command Reference*.

If you do not specify the time slots, the specified controller is configured for 30 B channels and one D channel.

Note Any router configured for ISDN support must be connected to the same switch type on all its ISDN interfaces.

Enable Asynchronous Access over ISDN

You can configure a router to support asynchronous access over ISDN by globally enabling PPP on VTY lines. PPP is typically enabled on synchronous or asynchronous serial interfaces; however, the Cisco IOS software permits you to configure PPP on virtual terminal (VTY) lines. This configures the VTY line to support asynchronous access over ISDN from the ISDN terminal to the VTY session on the router.

To enable asynchronous protocol features on VTY lines, perform the following task in global configuration mode:

Task	Command
Configure all VTY lines to support asynchronous protocol features	**vty-async**[1]

1. This command is documented in the "Terminal Lines and Modem Support" chapter in the *Access Services Command Reference*.

This task enables PPP on VTY lines on a global basis on the router. To configure PPP on a per-VTY basis, use the **translate** command in the "Protocol Translation Configuration Commands" chapter of the *Access Services Command Reference*.

Configure Encapsulation for Frame Relay or X.25 Networks

Each of the ISDN B channels is treated as a serial line and supports HDLC and PPP encapsulation. The default serial encapsulation is HDLC.

However, if traffic sent from this ISDN interface will cross a Frame Relay network or an X.25 network, the appropriate addressing and encapsulation tasks must be completed as required for Frame Relay or X.25 networks.

See the "Configuring Frame Relay" chapter or "Configuring X.25 and LAPB" chapter for more information about addressing, encapsulation, and other tasks necessary to configure Frame Relay or X.25 networks.

Configure Network Addressing

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

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

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

You must configure the switch type before you configure network addressing.

To configure network addressing, complete the following tasks beginning in interface configuration mode:

Task		Command
Step 1	Define the remote recipient's protocol address, host name, and dialing string; optionally, provide the ISDN subaddress; set the dialer speed to 56 or 64 kbps, as needed.	**dialer map** *protocol next-hop-address* **name** *hostname* **speed** *56/64* *dial-string*[**:***isdn-subaddress*][1]
Step 2	Assign the interface to a dialer group to control access to the interface.	**dialer-group** *group-number*[1]
Step 3	Associate the dialer group number with an access list number.	**dialer-list** *dialer-group* **list** *access-list-number*[1]
Step 4	Define an access list permitting or denying access to specified protocols, sources, or destinations.	**access-list** *access-list-number* {**deny** | **permit**} *protocol source address source-mask destination destination-mask*[2]

1. This command is documented in the "DDR Commands" chapter in the *Wide-Area Networking Command Reference*.
2. Many forms of this command are documented in various protocol-specific chapters in the *Network Protocols Command Reference, Part 1* and the *Network Protocols Command Reference, Part 2*.

Packets that are permitted by the access list specified in Step 4 are considered *interesting* and will cause the router to place a call to the destination protocol address identified in both Steps 1 and 4.

Note The access list reference in Step 4 of this task list is an example of the access list commands allowed by different protocols. Some protocols might require a different command form or might require multiple commands. Refer to the relevant protocol chapter in the *Network Protocols Configuration Guide, Part 1* or the *Network Protocols Configuration Guide, Part 2* for more information about setting up access lists for a protocol.

For more information about defining outgoing call numbers, see the "Configuring DDR" chapter.

Configure Automatic Detection of Encapsulation Type

You can enable a serial or ISDN interface to accept calls and dynamically change the encapsulation in effect on the interface when the remote device does not signal the call type. For example, if an ISDN call does not identify the call type in the Lower Layer Compatibility fields and is using an encapsulation that is different from the one configured on the interface, the interface can change its encapsulation type on the fly.

This feature enables interoperation with ISDN terminal adapters that use V.120 encapsulation but do not signal V.120 in the call setup message. An ISDN interface that by default answers a call as synchronous serial with PPP encapsulation can change its encapsulation and answer such calls.

Automatic detection is attempted for the first 10 seconds after the link is established or the first five packets exchanged over the link, whichever is first.

To enable automatic detection of encapsulation type, perform the following task in interface configuration mode:

Task	Command
Enable automatic detection of encapsulation type on the specified interface.	**autodetect encapsulation** *encapsulation-type*

You can specify one or more encapsulations to detect. Cisco IOS software currently supports automatic detection of PPP and V.120 encapsulations.

Configure Combinet Compatibility

Historically, Combinet devices supported only the Combinet Proprietary Protocol (CPP) for negotiating connections over ISDN B channels. To enable Cisco routers to communicate with those Combinet bridges, the Cisco IOS supports a new CPP encapsulation type.

To enable routers to communicate over ISDN interfaces with Combinet bridges that support only CPP, perform the following tasks in interface configuration mode:

Task	Command
Specify CPP encapsulation.	**encapsulation cpp**
Enable CPP callback acceptance.	**cpp callback accept**
Enable CPP authentication.	**cpp authentication**

Now most Combinet devices support PPP. Cisco routers can communicate over ISDN with these devices by using PPP encapsulation, which supports both routing and fast switching.

Combinet devices support only IP, IPX and bridging. For AppleTalk, Cisco routers automatically perform half-bridging with Combinet devices. For more information about half-bridging, see the "Configure PPP Half-Bridging on Serial Interfaces" section in the "Configuring PPP for Wide-Area Networking" chapter of this publication.

Cisco routers can also half-bridge IP and IPX with Combinet devices that support only CPP. To configure this feature, you only need to set up the addressing with the ISDN interface as part of the remote subnet; no additional commands are required.

Configure Semipermanent Connections

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

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

To configure a BRI for semipermanent connections, use the following form of the **dialer map** command when you set up network addressing:

Task	Command
Define the remote recipient's protocol address, host name, and dialing string; indicate semipermanent connections; optionally, provide the ISDN subaddress; set the dialer speed to 56 or 64 kbps, as needed.	**dialer map** *protocol next-hop-address* **name** *hostname* **spc** [**speed 56** | **64**] [**broadcast**] *dial-string*[**:***isdn-subaddress*][1]

1. This command is documented in the "DDR Commands" chapter in the *Wide-Area Networking Command Reference*.

Perform Configuration Self-Tests

To test the router's ISDN configuration, we suggest that you perform the following tasks:

Task	Command
Check Layer 1 (physical layer) of the BRI.	**show controllers bri** *number*[1]
Check Layer 1 (physical layer) of the PRI over T1.	**show controllers t1** *slot*/*port* [1]
Check Layer 1 (physical layer) of the PRI over E1.	**show controllers e1** *slot*/*port*[1]
Check Layer 2 (data link layer).	**debug q921**
Check Layer 3 (network layer).	**debug isdn events** **debug q931** **debug dialer** **show dialer** [2]

1. This command is documented in the "Interface Commands" chapter in the *Configuration Fundamentals Command Reference*.
2. This command is documented in the "DDR Commands" chapter in the *Wide-Area Networking Command Reference*.

See the *Debug Command Reference* for information about the **debug** commands.

Monitor and Maintain ISDN Interfaces

Use the following commands to monitor and maintain ISDN interfaces:

Task	Command
Display information about the physical attributes of the ISDN BRI B and D channels.	**show interfaces bri** *number*
Display information about the physical attributes of the ISDN PRI over T1 B and D channels. (The *number* argument takes values between 1 and 23.)	**show interfaces serial** *slot*/*port* **bchannel** *number*[1]
Display information about the physical attributes of the ISDN PRI over E1 B and D channels. (The *number* argument takes values between 1 and 31.)	**show interfaces serial** *slot*/*port* **bchannel** *number*
Display protocol information about the ISDN B and D channels.	**show controllers bri** *number*
Display information about memory, Layer 2 or Layer 3 timers, or status of PRI channels. (The **service** keyword is available for PRI only.)	**show isdn** {**memory** | **timers** | **service**}
Obtain general diagnostic information about the specified interface.	**show dialer** [**interface** *type number*] [2]

1. This command is documented in the "Interface Commands" chapter in the *Configuration Fundamentals Command Reference*.
2. This command is documented in the "DDR Commands" chapter in the *Wide-Area Networking Command Reference*.

ISDN Configuration Examples

This section provides the following ISDN configuration examples:

- Multilink PPP Example
- Compression Examples
- Voice Over ISDN Examples
- Network Service Facility Example
- Dialer Rotary Groups Example

Multilink PPP Example

The following example enables Multilink PPP on BRI 0.

```
interface BRI0
 description Enables PPP Multilink on BRI 0
 ip address 7.1.1.1 255.255.255.0
 encapsulation ppp
 dialer map ip 7.1.1.2 name starbuck 14195291357
 dialer map ip 7.1.1.3 name roaster speed 56 14098759854
 ppp authentication chap
 ppp multilink
 dialer-group 1
```

Compression Examples

The following example enables predictor compression on BRI 0.

```
interface BRI0
```

```
 description Enables predictor compression on BRI 0
 ip address 7.1.1.1 255.255.255.0
 encapsulation ppp
 dialer map ip 7.1.1.2 name starbuck 14195291357
 compress predictor
 ppp authentication chap
 dialer-group 1
```

The following example enables Stacker compression on BRI 0.

```
interface BRI0
 description Enables stac compression on BRI 0
 ip address 7.1.1.1 255.255.255.0
 encapsulation ppp
 dialer map ip 7.1.1.2 name starbuck 14195291357
 compress stac
 ppp authentication chap
 dialer-group 1
```

Multilink PPP and Compression Example

The following example enables PPP Multilink and Stacker compression on BRI 0.

```
interface BRI0
 description Enables PPP Multilink and stac compression on BRI 0
 ip address 7.1.1.1 255.255.255.0
 encapsulation ppp
 dialer map ip 7.1.1.2 name starbuck 14195291357
 ppp authentication chap
 compress stac
 ppp multilink
 dialer-group 1
```

Voice Over ISDN Examples

The following example allows incoming voice calls to be answered BRI 0.

```
interface BRI0
 description Allows incoming voice calls to be answered BRI 0
 ip address 7.1.1.1 255.255.255.0
 encapsulation ppp
 isdn incoming-voice data
 dialer map ip 7.1.1.2 name starstruck 14038182344
 ppp authentication chap
 dialer-group 1
```

The following example places an outgoing call as a voice call on BRI 1.

```
interface BRI1
 description Places an outgoing call as a voice call on BRI 1
 ip address 9.1.1.1 255.255.255.0
 encapsulation ppp
 dialer map ip 9.1.1.2 name angus class calltype 19091238877
 ppp authentication chap
 dialer-group 1

map-class dialer calltype
 dialer voice-call
```


Network Service Facility Example

This is Network Service Facility (NSF), needed for an AT&T 4ESS switch when it is configured for Call-by-Call selection. The PRI 4ESS switch expects some AT&T specific information when placing outgoing ISDN PRI calls; the options are accunet, sdn and megacom.

```
isdn switchtype primary-4ess

interface Serial1/1:23
 description Will mark outgoing calls from AT&T type calls
 ip address 7.1.1.1 255.255.255.0
 encapsulation ppp
 dialer map ip 7.1.1.2 name tommyjohn class sdnplan 14193460913
 dialer map ip 7.1.1.3 name angus class megaplan 14182616900
 dialer map ip 7.1.1.4 name angus class accuplan 14193453730

dialer-group 1
 ppp authentication chap

map-class dialer sdnplan
 dialer outgoing sdn

map-class dialer megaplan
 dialer voice-call
 dialer outgoing mega

map-class dialer accuplan
 dialer outgoing accu
```

Dialer Rotary Groups Example

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

```
interface BRI 0
 description connected into a rotary group
 encapsulation ppp
 dialer rotary-group 1

interface BRI 1
 no ip address
 encapsulation ppp
 dialer rotary-group 1

interface BRI 2
 encapsulation ppp
 dialer rotary-group 1

interface BRI 3
 no ip address
 encapsulation ppp
 dialer rotary-group 1

interface BRI 4
 encapsulation ppp
 dialer rotary-group 1

interface Dialer 0
 description Dialer group controlling the BRIs
 ip address 8.1.1.1 255.255.255.0
 encapsulation ppp
 dialer map ip 8.1.1.2 name angus 14802616900
```

```
 dialer-group 1
 ppp authentication chap

dialer-list 1 protocol ip permit
```


ISDN Configuration Examples