



## Configuring the Data Interfaces

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This section describes how to configure the data interfaces on the Catalyst 4224. To configure a data interface, you must use configuration mode. In this mode, you enter Cisco IOS command-line interface (CLI) commands at the gateway prompt.

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This section describes some of the most commonly used configuration procedures. For advanced configuration topics, refer to the Cisco IOS configuration guide and command reference publications. These publications are available on the Documentation CD-ROM or on Cisco.com. You can also order printed copies separately.

# Configuring the Host Name and Password

One of your first configuration tasks is to configure the host name and set an encrypted password. Configuring a host name allows you to distinguish multiple Catalyst 4224s. Setting an encrypted password allows you to prevent unauthorized configuration changes.

To configure the host name and password, perform these tasks:

	Task	Command
Step 1	<p>Enter enable mode.</p> <p>Enter the password.</p> <p>You know you have entered enable mode when the prompt changes to <code>gateway#</code>.</p>	<pre>gateway&gt; enable Password: &lt;password&gt; gateway#</pre>
Step 2	<p>Enter global configuration mode.</p> <p>You know you have entered global configuration mode when the prompt changes to <code>gateway(config)#</code>.</p>	<pre>gateway# configure terminal Enter configuration commands, one per line. End with Ctrl-Z. gateway(config)#</pre>
Step 3	<p>Provide the Catalyst 4224 a meaningful name. Substitute your host name for <code>gwyl</code>.</p>	<pre>gateway(config)# hostname gwyl gwyl(config)#</pre>
Step 4	<p>Substitute your enable secret password for <code>guessme</code>.</p> <p>This password gives you access to privileged EXEC mode. When you type <b>enable</b> at the EXEC prompt (<code>gateway&gt;</code>), you must enter the enable secret password to gain access to configuration mode.</p>	<pre>gwyl(config)# enable secret guessme</pre>
Step 5	<p>Enter line configuration mode to configure the console port. When you enter line configuration mode, the prompt changes to <code>gwyl(config-line)#</code>.</p>	<pre>gwyl(config)# line con 0 gwyl(config-line)#</pre>

	Task	Command
Step 6	Enter <code>exec-timeout 0 0</code> to prevent the Catalyst 4224's EXEC facility from timing out if you do not type any information on the console screen for an extended period.	<code>gwyl(config-line)# exec-timeout 0 0</code>
Step 7	Exit to global configuration mode.	<code>gwyl(config-line)# exit</code> <code>gwyl(config)#</code>

To verify that you configured the correct host name and password, follow these steps:

**Step 1** Enter the **show config** command:

```
gwyl# show config
Using 1888 out of 126968 bytes
!
version XX.X
.
.
!
hostname gwyl
!
enable secret 5 $1$60L4$X2JYOwoDc0.kqa1lo0/w8/
.
.
.
```

Check the host name and encrypted password displayed near the top of the command output.

**Step 2** Exit global configuration mode and attempt to reenter it using the new enable password:

```

gwyl# exit
.
.
.
gwyl con0 is now available
Press RETURN to get started.
```

```

gwyl> enable
Password: guessme
gwyl#
```



**Tip**

If you are having trouble, ensure that the Caps Lock function is off; passwords are case sensitive.

## Configuring the Fast Ethernet Interface

This section describes how to configure the Fast Ethernet interface on the Catalyst 4224.



**Timesaver**

Before you begin, disconnect all WAN cables from the Catalyst 4224 to prevent it from running the AutoInstall process. The Catalyst 4224 attempts to run AutoInstall if there is a WAN connection on both ends and the Catalyst 4224 does not have a valid configuration file stored in nonvolatile random-access memory (NVRAM). The Catalyst 4224 can take several minutes to determine that AutoInstall is not connected to a remote TCP/IP host.

To configure the Fast Ethernet interface, follow these steps:

	Task	Command
Step 1	Enter enable mode. Enter the password. You know you have entered enable mode when the prompt changes to <code>gateway#</code> .	<code>gateway&gt; enable</code> Password: <code>&lt;password&gt;</code> <code>gateway#</code>
Step 2	Enter global configuration mode. You know you have entered global configuration mode when the prompt changes to <code>gateway(config)#</code> .	<code>gateway# configure terminal</code> Enter configuration commands, one per line. End with Ctrl-Z. <code>gateway(config)#</code>
Step 3	Enable routing protocols as required for your global configuration.	<code>gateway(config)# ip routing</code>
Step 4	Enter interface configuration mode. You know you have entered interface configuration mode when the prompt changes to <code>gateway(config-if)#</code> .	<code>gateway(config)# interface fastethernet 0/0</code> <code>gateway(config-if)#</code>
Step 5	Assign an IP address and subnet mask to the interface.	<code>gateway(config-if)# ip address 172.16.74.3 255.255.255.0</code>
Step 6	Exit to global configuration mode. If your Catalyst 4224 has more than one Fast Ethernet interface that you need to configure, repeat Step 4 through Step 6.	<code>gateway(config-if)# exit</code>
Step 7	When you finish configuring interfaces, return to enable mode. You know you have entered enable mode when the prompt changes to <code>gateway#</code> .	<code>gateway(config)# Ctrl-Z</code>  <code>gateway#</code>

# Configuring Asynchronous/Synchronous Serial Interfaces

This section describes how to configure the serial interfaces on your asynchronous/synchronous serial WIC.



## Note

The asynchronous/synchronous serial WIC supports synchronous mode only. At this time, asynchronous mode is not supported.



## Timesaver

Before you begin, disconnect all WAN cables from the Catalyst 4224 to keep it from running the AutoInstall process. The Catalyst 4224 attempts to run AutoInstall if there is a WAN connection on both ends and the Catalyst 4224 does not have a valid configuration file stored in NVRAM. The Catalyst 4224 can take several minutes to determine that AutoInstall is not connected to a remote TCP/IP host.

To configure the serial interfaces, perform these steps:

	Task	Command
Step 1	Enter enable mode. Enter the password. You know you have entered enable mode when the prompt changes to <code>gateway#</code> .	<code>gateway&gt; enable</code> Password: <code>&lt;password&gt;</code> <code>gateway#</code>
Step 2	Enter global configuration mode. You know you have entered global configuration mode when the prompt changes to <code>gateway(config)#</code> .	<code>gateway# configure terminal</code> Enter configuration commands, one per line. End with Ctrl-Z. <code>gateway(config)#</code>
Step 3	Enable routing protocols as required for your global configuration.	<code>gateway(config)# ip routing</code>

	Task	Command
Step 4	Enter the interface configuration mode. You know you have entered interface configuration mode when the prompt changes to <code>gateway(config-if)#</code> .	<code>gateway(config)# interface serial 1/0</code> <code>gateway(config-if)#</code>
Step 5	Assign the IP address and subnet mask to the interface. <b>Note</b> All serial ports are initially configured as synchronous.	<code>gateway(config-if)# ip address 172.16.74.1 255.255.255.0</code>
Step 6	To use a port in Data Communication Equipment (DCE) mode, connect a DCE cable and set the internal transmit clock signal (TXC) speed in bits per second. (For ports used in Data Terminal Equipment (DTE) mode, the Catalyst 4224 automatically uses the external timing signal.)	<code>gateway(config-if)# clock rate 7200</code>
Step 7	When a port is operating in DCE mode, the default operation is for the DCE to send serial clock transmit (SCT) and serial clock receive (SCR) clock signals to the DTE, and for the DTE to return an serial clock transmit external (SCTE) signal to the DCE.  If the DTE does not return an SCTE signal, enter this command to configure the DCE port to use its own clock signal.	<code>gateway(config-if)# dce-terminal-timing-enable</code>
Step 8	A Catalyst 4224 that uses long cables might experience high error rates when operating at higher transmission speeds, because the clock and data signals can shift out of phase.  If a DCE port is reporting a high number of error packets, you can often correct the shift by inverting the clock using this command.	<code>gateway(config-if)# invert-txclock</code>
Step 9	All serial interfaces support both nonreturn to zero (NRZ) and nonreturn to zero inverted (NRZI) formats. NRZ is the default; NRZI is commonly used with EIA/TIA-232 connections in IBM environments. To enable NRZI encoding on an interface, enter this command.	<code>gateway(config-if)# nrzi-encoding</code>

## Configuring Asynchronous/Synchronous Serial Interfaces

	Task	Command
Step 10	Exit back to global configuration mode. If your Catalyst 4224 has more than one serial interface that you need to configure, repeat Step 4 through Step 9.	<code>gateway(config-if)# exit</code>
Step 11	When you finish configuring the interface, return to enable mode.	<code>gateway(config)# Ctrl-z</code> <code>gateway#</code>

Table 4-1 lists the half-duplex timer commands.

**Table 4-1** Half-duplex timer commands

Timer	Syntax	Default Setting (Milliseconds)
CTS delay <sup>1</sup>	<code>half-duplex timer cts-delay</code>	100
CTS drop timeout	<code>half-duplex timer cts-drop-timeout</code>	5000
DCD <sup>2</sup> drop delay	<code>half-duplex timer dcd-drop-delay</code>	100
DCD transmission start delay	<code>half-duplex timer dcd-txstart-delay</code>	100
RTS <sup>3</sup> drop delay	<code>half-duplex timer rts-drop-delay</code>	100
RTS timeout	<code>half-duplex timer rts-timeout</code>	2000
Transmit delay	<code>half-duplex timer transmit-delay</code>	0

1. CTS = Clear To Send.
2. DCD = Data Carrier Detect
3. RTS = Request To Send.

The following clock rate settings are for two-port asynchronous/synchronous serial WICs:

- 1200 bps
- 2400 bps
- 4800 bps
- 9600 bps



- 14400 bps
- 19200 bps
- 28800 bps
- 32000 bps
- 38400 bps
- 56000 bps
- 57600 bps
- 64000 bps
- 72000 bps
- 115200 bps
- 125000 bps
- 128000 bps

## Configuring ISDN BRI Interfaces

This section describes how to configure the interfaces on the basic rate interface (BRI) card of your Catalyst 4224.



### Note

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Before using a Catalyst 4224 with an ISDN BRI interface, you must order a correctly configured ISDN BRI line from your local telecommunications service provider. ISDN BRI provisioning refers to the types of services provided by the ISDN BRI line. Although provisioning is performed by your ISDN BRI service provider, you must tell the provider what you want.

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### Timesaver

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Before you begin, disconnect all WAN cables from the Catalyst 4224 to keep it from running the AutoInstall process. The Catalyst 4224 attempts to run AutoInstall if there is a WAN connection on both ends and the Catalyst 4224 does not have a valid configuration file stored in NVRAM. The Catalyst 4224 can take several minutes to determine that AutoInstall is not connected to a remote TCP/IP host.

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To configure ISDN BRI interfaces, perform the following steps:

	Task	Command
Step 1	<p>Enter enable mode.</p> <p>Enter the password.</p> <p>You know you have entered enable mode when the prompt changes to <code>gateway#</code>.</p>	<pre>gateway&gt; enable Password: &lt;password&gt; gateway#</pre>
Step 2	<p>Enter global configuration mode.</p> <p>You know you have entered global configuration mode when the prompt changes to <code>gateway(config)#</code>.</p>	<pre>gateway# configure terminal Enter configuration commands, one per line. End with Ctrl-Z. gateway(config)#</pre>
Step 3	<p>Enter an ISDN switch type. See <a href="#">Table 4-2</a> for a list of ISDN switch types.</p> <p><b>Note</b> Switch types configured in interface configuration mode override this setting for the configured interface.</p>	<pre>gateway(config)# isdn switch-type switch-type</pre>
Step 4	<p>Enable routing protocols as required for your global configuration.</p>	<pre>gateway(config)# ip routing</pre>
Step 5	<p>Enter the interface configuration mode.</p> <p>You know you have entered interface configuration mode when the prompt changes to <code>gateway(config-if)#</code>.</p>	<pre>gateway(config)# interface bri 2/0 gateway(config-if)#</pre>
Step 6	<p>Enable encapsulation. For data, you need to change the encapsulation to <i>hdlc</i>, <i>ppp</i>, or <i>frame-relay</i>. The default is <i>voice</i>.</p>	<pre>gateway(config)# encaps encaps-type</pre>
Step 7	<p>Assign the IP address and subnet mask to the interface.</p> <p>If you are configuring this interface for voice, enter the switch type instead of an IP address.</p>	<pre>gateway(config-if)# ip address 172.16.74.2 255.255.255.0 gateway(config-if)# isdn switch-type basic-5ess</pre>
Step 8	<p>Exit back to global configuration mode.</p> <p>If your Catalyst 4224 has more than one BRI interface that you need to configure, repeat Step 5 through Step 7.</p>	<pre>gateway(config-if)# exit</pre>

	Task	Command
Step 9	By default, the Catalyst 4224 allocates 25 percent of DRAM to shared memory (used for data transmitted (or received) by WAN interface cards). Specifying <code>memory-size iomem 40</code> increases shared memory from 25 percent to 40 percent.	<code>gateway(config)# memory-size iomem 40</code>
Step 10	When you finish configuring the interface, return to enable mode.	<code>gateway(config)# Ctrl-z gateway#</code>

Table 4-2 lists the supported ISDN switch types by country.

*Table 4-2 ISDN Switch Types*

Region	ISDN Switch Type	Description
Australia	basic-ts013	Australian TS013 switches
Europe	basic-1tr6	German 1TR6 ISDN switches
	basic-nwnet3	Norwegian NET3 ISDN switches (phase 1)
	basic-net3	NET3 ISDN switches (UK and others)
	vn2	French VN2 ISDN switches
	vn3	French VN3 ISDN switches
Japan	ntt	Japanese NTT ISDN switches
New Zealand	basic-nznet3	New Zealand NET3 switches
North America	basic-5ess	AT&T basic rate switches
	basic-dms100	NT DMS-100 basic rate switches
	basic-nil1	National ISDN-1 switches

# Configuring T1 and E1 Interfaces

This section describes how to configure a T1/E1 multiflex trunk interface on your Catalyst 4224. It describes a basic configuration, including how to enable the interface and to specify IP routing. Depending on your own requirements and the protocols you plan to route, you might also need to enter other configuration commands.



## Timesaver

Before you begin, disconnect all WAN cables from the Catalyst 4224 to keep it from running the AutoInstall process. The Catalyst 4224 attempts to run AutoInstall if there is a WAN connection on both ends and the Catalyst 4224 does not have a valid configuration file stored in NVRAM. The Catalyst 4224 can take several minutes to determine that AutoInstall is not connected to a remote TCP/IP host.

## Configuring T1 Interfaces

To configure a new T1, Channelized T1 (CT1)/PRI, or CT1/PRI-channel status unit (CSU) interface, or to change the configuration of an existing interface, perform these steps:

	Task	Command
Step 1	Enter enable mode.  Enter the password.  You know you have entered enable mode when the prompt changes to <code>gateway#</code> .	<code>gateway&gt; enable</code>  <code>Password: &lt;password&gt;</code>  <code>gateway#</code>
Step 2	Enter global configuration mode.  You know you have entered global configuration mode when the prompt changes to <code>gateway(config)#</code> .	<code>gateway# configure terminal</code>  Enter configuration commands, one per line. End with Ctrl-Z.  <code>gateway(config)#</code>
Step 3	Enable routing protocols as required for your global configuration.	<code>gateway(config)# ip routing</code>

	Task	Command
Step 4	Select frame clock.	<code>gateway(config)# <b>frame-clock</b> <b>-select</b></code>
Step 5	Enter controller configuration mode for the CT1/PRI interface at the specified slot/port location.  This example configures a T1 interface in slot 1 and unit 0.	<code>gateway(config)# <b>controller</b> <b>t1 1/0</b></code>
Step 6	Specify which end of the circuit provides clocking.  The clock source should be set to use internal clocking only for testing the network or if the full T1 line is used as the channel group. Only one end of the T1 line should be set to internal.	<code>gateway(config-controller)# <b>clock source line</b></code>
Step 7	Specify the T1 framing type. The framing type defines the control bits and data bits. Cisco supports super frame (SF) and extended super frame (ESF) for T1s.  SF is used in channel-bank robbed bit signalling (RBS) configurations. SF uses the framing bit to identify the channel and voice-related signaling within the frame. SF is not recommended for PRI configurations.  ESF is required for 64 kb operation on DS0s. ESF requires 2k-framing bits for synchronization. The remaining 6k is used for error detection, CRC, and data link monitoring. ESF is recommended for PRI configurations.  This example uses ESF.	<code>gateway(config-controller)# <b>framing esf</b></code>
Step 8	Specify the line code format. This is an encoding method used to allow synchronous data to be transmitted in a compatible format for T1 transmission. Common line codes are RZ (return to zero), NRZ (non-return to zero), binary zero 0 substitution (B8ZS), alternate mark inversion (AMI), and HDB3 (high density bipolar order 3).  The most popular line-code scheme used in North America is B8ZS. To maintain clock synchronization, B8ZS replaces a string of eight binary 0s with variations. B8ZS is more reliable than AMI, and it should be used with PRI configurations.	<code>gateway(config-controller)# <b>linecode b8zs</b></code>

	Task	Command
<b>Step 9</b>	<p>Specify the channel group and time slots to be mapped.</p> <p>When configuring a T1 data line, channel-group numbers can be values from 0 to 23.</p> <p>Time slots are assigned to channels. One or more time slots or ranges of time slots belong to the channel group. The first time slot is numbered 1. For a T1 controller, the time slot range is from 1 to 24. For T1 PRI scenarios, all 24 T1 time slots are assigned as ISDN/PRI channels.</p> <p>The default line speed when configuring a T1 controller is 56 kbps.</p> <p>In this example, channel-group 0 consists of five time slots and runs at a speed of 56 kbps per time slot.</p>	<pre>gateway(config-controller)# channel-group 0 timeslots 1,3-5,7</pre>
<b>Step 10</b>	<p>Configure each channel group as a virtual serial interface. Specify the T1 interface (1), unit number (0), and channel group (0) to modify and enter the interface configuration mode.</p> <p>You know you have entered interface configuration mode when the prompt changes to <code>gateway(config-if)#</code>.</p>	<pre>gateway(config-controller)# interface serial 1/0:0  gateway(config-if)#</pre>
<b>Step 11</b>	<p>Assign an IP address and subnet mask to the interface.</p>	<pre>gateway(config-if)# ip address 10.1.15.1 255.255.255.0</pre>
<b>Step 12</b>	<p>Exit back to global configuration mode.</p> <p>If your Catalyst 4224 has more than one CT1/PRI interface that you need to configure, repeat Steps 4 through 10.</p>	<pre>gateway(config-if)# exit</pre>
<b>Step 13</b>	<p>When you finish configuring interfaces, return to enable mode.</p>	<pre>gateway(config)# Ctrl-z gateway#</pre>

## Configuring E1 Interfaces

To configure a new E1 interface (balanced or unbalanced) or to change the configuration of an existing interface, perform these steps:

	Task	Command
Step 1	Enter enable mode. Enter the password. You know you have entered enable mode when the prompt changes to <code>gateway#</code> .	<code>gateway&gt; enable</code> Password: <code>&lt;password&gt;</code> <code>gateway#</code>
Step 2	Enter global configuration mode. You know you have entered global configuration mode when the prompt changes to <code>gateway(config)#</code> .	<code>gateway# configure terminal</code> Enter configuration commands, one per line. End with Ctrl-Z. <code>gateway(config)#</code>
Step 3	Enable routing protocols as required for your global configuration.	<code>gateway(config)# ip routing</code>
Step 4	Select frame clock.	<code>gateway(config)# frame-clock-select</code>
Step 5	Enter controller configuration mode for the CE1/PRI interface at the specified slot/port location. This example configures a E1 interface in slot 1 and unit 0.	<code>gateway(config)# controller e1 1/0</code>
Step 6	Specify the framing type as cyclic redundancy check 4 (CRC4).	<code>gateway(config-controller)# framing crc4</code>
Step 7	Specify the line code format as high-density bipolar 3 (HDB3).	<code>gateway(config-controller)# linecode hdb3</code>

	Task	Command
Step 8	<p>Specify the channel group and time slots to be mapped.</p> <p>When configuring a E1 data line, channel-group numbers can be values from 0 to 30.</p> <p>Time slots are assigned to channels. One or more time slots or ranges of time slots belong to the channel group. The first time slot is numbered 1. For an E1 controller, the time slot range is from 1 to 31. For E1 PRI scenarios, all 31 T1 time slots are assigned as ISDNPRI channels.</p> <p>The default line speed when configuring an E1 controller is 64 kbps.</p> <p>In this example, channel-group 0 consists of five time slots and runs at a speed of 64 kbps per time slot.</p>	<pre>gateway(config-controller)# channel-group 0 timeslots 1,3-5,7</pre>
Step 9	<p>Configure each channel group as a virtual serial interface. Specify the E1 interface, unit number, and channel group to modify and enter the interface configuration mode.</p> <p>You know you have entered interface configuration mode when the prompt changes to <code>gateway(config-if)#</code>.</p>	<pre>gateway(config-controller)# interface serial 1/0:0  gateway(config-if)#</pre>
Step 10	Assign an IP address and subnet mask to the interface.	<pre>gateway(config-if)# ip address 10.1.15.1 255.255.255.0</pre>
Step 11	<p>Exit back to global configuration mode.</p> <p>If your Catalyst 4224 has more than one CE1/PRI interface that you need to configure, return to Step 4.</p>	<pre>gateway(config-if)# exit</pre>
Step 12	When you finish configuring interfaces, return to enable mode.	<pre>gateway(config)# Ctrl-z  gateway#</pre>



# Checking the Interface Configuration

After configuring the new interface, you can perform the following tests to verify that the new interface is operating correctly:

- Display the Catalyst 4224 hardware configuration with the **show version** command. Check that the list includes the new interface.
- Specify an interface with the **show interfaces** [*type slot/port*] command and verify that the first line of the display shows the interface with the correct slot and port number, and that the interface and line protocol are in the correct state, up or down.
- Display the protocols configured for the entire Catalyst 4224 and for individual interfaces with the **show protocols** command. If necessary, return to configuration mode to add or remove protocol routing on the Catalyst 4224 or its interfaces.
- Display the running configuration with the **show running-config** command, and the configuration stored in NVRAM using the **show startup-config** command.
- Use the **ping** command to send an echo request to a specified IP address. Each returned signal is displayed as an exclamation point (!) on the console; each signal that is not returned before the timeout is displayed as a period (.). A series of exclamation points (!!!!!) indicates a good connection; a series of periods (.....) or the messages “timed out” or “failed” indicate that the connection failed.

If an interface is down and you configured it as up, or if the displays indicate that the hardware is not functioning properly, make sure that the new interface is properly connected and configured.

# Saving Configuration Changes

To prevent the loss of the Catalyst 4224 configuration, you need to save it to NVRAM.

To save configuration changes, perform these steps:

	Task	Command
Step 1	<p>Enter enable mode.</p> <p>Enter the password.</p> <p>You know you have entered enable mode when the prompt changes to gateway#.</p>	<pre>gateway&gt; <b>enable</b> Password: <i>password</i> gateway#</pre>
Step 2	<p>Save the configuration changes to NVRAM so that they are not lost during resets, power cycles, or power outages.</p>	<pre>gateway# <b>copy running-config startup-config</b> [or] gateway# <b>write memory</b></pre>
Step 3	<p>Return to enable mode.</p> <p>This message is normal and does not indicate an error.</p>	<pre>gateway(config-if)# <b>Ctrl-z</b> gateway# %SYS-5-CONFIG_I: Configured from console by console</pre>