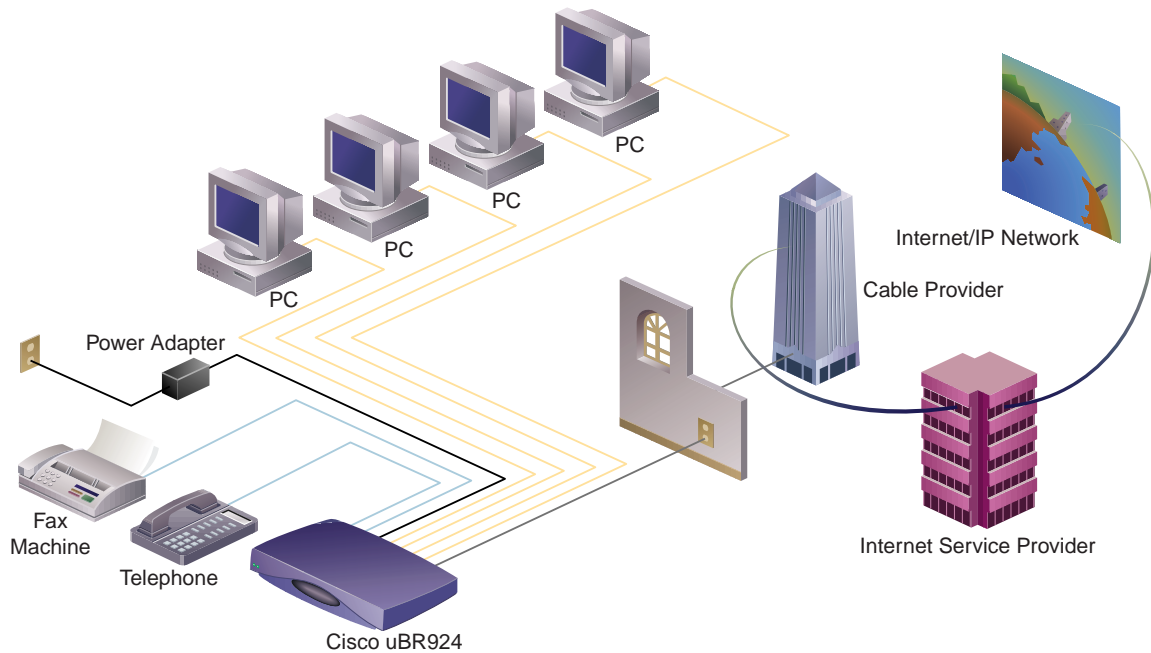


Quick Start Guide

CISCO uBR924 CABLE ACCESS ROUTER INSTALLATION AND STARTUP



1

PREPARE FOR INSTALLATION

2

INSTALL THE ROUTER AND CONNECT CABLES

3

INITIALIZE THE ROUTER

4

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RECONFIGURE THE ROUTER



1 Prepare for Installation

Obtain Tools and Equipment

Items that Cisco Provides

The Cisco uBR924 cable access router is available in differing bulk box and single packages:

- Bulk box packages include: five Cisco uBR924 cable access routers, five power supplies, five power cords based on the country of operation, five 10BaseT Ethernet straight-through cables, five subscriber documentation sets, and one service provider documentation set.
- Single packages include: one Cisco uBR924 cable access router, one power supply, one 10BaseT Ethernet straight-through cable, and one service provider and subscriber documentation set. A power cord appropriate to the country of operation can be purchased together or separately from the router.



Caution Use only a Cisco-provided power supply and cord. Using any other vendor's power supply and cord can cause loss of data or permanent damage.

- A cable console kit and console cable can be purchased separately.

The service provider documentation set includes:

- *Regulatory Compliance and Safety Information for the Cisco uBR924 Cable Access Router* publication.
- Warranty card, release note, and licensing information.

Two additional hardware-related documents are available via Cisco Connection Online (CCO): *Cisco uBR924 Cable Access Router Installation and Configuration Guide* and the *Quick Start Guide, Cisco uBR924 Cable Access Router Installation and Startup*—this document.

The subscriber documentation set includes the *Quick Start, Cisco uBR924 Cable Access Router Subscriber Setup* and the *Regulatory Compliance and Safety Information for the Cisco uBR924 Cable Access Router* publication.

Other Items Needed

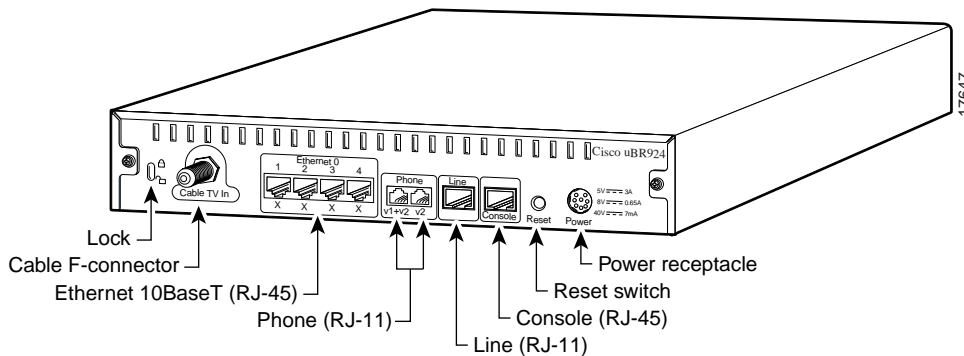
- High-quality, shielded RF coaxial cables (with at least 80% braid) to connect all Cisco uBR924 cable access routers to your HFC cable plant
- Additional 10BaseT Ethernet cables—straight-through or crossover—to connect Cisco uBR924 cable access routers to PCs or Ethernet hubs as applicable
- FXS voice cables (RJ-11 connectors) and adapter/connector assembly to connect telephones or fax devices to the Cisco uBR924 for routers configured to support voice
- Backup POTS cables (RJ-11 connectors) to connect the Cisco uBR924 cable access router to a standard, analog PSTN line for subscriber sites that support this
- 10BaseT Ethernet cable tester, telephone tester (handset) to check the PSTN line, signal level meter capable of digital measurements, and a laptop PC with an RS-232 serial port and communications software

1 Prepare for Installation (continued)

Verify the Following Before Going to a Subscriber Site:

Item	Description
General	
	<p>Coaxial cable is run from the CATV trunk to the subscriber building or residence.</p> <p><i>Note: Cisco recommends that a dedicated (new) CATV cable drop be run from the grounding block directly to the Cisco uBR924 cable access router. If such a drop is not available, careful qualification of existing cable is often necessary. Cable ground should be connected to the grounding system of the building or residence as close to the point of cable entry as practical. For the United States, refer to NEC section 820-40 guidelines for proper grounding.</i></p>
	<p>The site is characterized from the headend to support upstream transmission and meets DOCSIS upstream and downstream RF requirements. Follow procedures in the <i>NCTA Recommended Practices for Measurements on Cable Television Systems</i>.</p>
	<p>All required headend routing and network interface equipment is installed, configured, and operational. This includes all routers, servers (DHCP, TFTP, and TOD), network management systems, and/or other configuration or billing systems.</p>
	<p>DHCP, Cisco IOS images, and DOCSIS configuration files have been created and pushed to appropriate servers such that each Cisco uBR924 cable access router, when initialized, can transmit a DHCP request, receive an IP address, obtain TFTP and TOD server addresses, and download a DOCSIS configuration file (and/or updated software image) in compliance with DOCSIS.</p> <p><i>Note: The router's cable MAC address found on a label at the bottom of the unit ensures each unit downloads only the file(s) intended for that router.</i></p>
	<p>PCs at each subscriber site meet the minimum computing requirements and that TCP/IP and DHCP operating modes are enabled. Cisco recommends that the PC have a 486 DX 33 MHz processor minimum configuration (a 75 MHz Pentium or greater processor is recommended); 16 MB of RAM; Windows for Workgroups for 486-based PCs and Windows 95 (or higher) for Pentiums; an Internet browser; and a pre-installed Ethernet Network Interface Card (NIC) with DHCP enabled.</p> <p><i>Note: This recommendation is for Internet access in general. Other operating systems and hardware platforms of comparable capability are also supported.</i></p>
IP Telephony	
	<p>Telephones at each subscriber site support touch-tone dialing; rotary dialing is not supported. Wiring is in place at subscriber sites supporting multiple telephones and fax devices per VoIP telephone line.</p>
	<p>Fax devices—standard Group III and computer-based Group III machines up to 14,400 baud—are supported in Cisco IOS Release 12.0(5)T or higher.</p> <p><i>Note: In general, fax/modem cards are not supported over Voice over IP (VoIP) links. Contact your network management, provisioning, or operations team to determine what your network supports.</i></p>
	<p>A regular voice grade line and RJ-11 modular jack (USOC code) is installed near the location to install the router for all sites that support backup PSTN connections.</p>

2 Install the Router and Connect Cables



The Cisco uBR924 cable access router is DOCSIS-based and interoperates with any DOCSIS-qualified CMTS. The router uses Cisco IOS Release 12.0(4)XI, 12.0(5)T, or higher software, and supports many advanced routing features. The router can be configured to support data, voice, or a mixture of data and voice.

Note: The router ships from the Cisco factory with the console port enabled and a software image that supports data only. Based on your licensing agreement, you can use Cisco Connection Online (CCO) to download an image or images that support voice and/or other operating modes. Downloading a Cisco IOS image disables the console port by default and erases all saved configurations.

Safety Information

Note: Before installing equipment, review the Regulatory Compliance and Safety Information for the Cisco uBR924 Cable Access Router publication and follow all guidelines. Also refer to the Cisco uBR924 Cable Access Router Installation and Configuration Guide for more in-depth instructions.

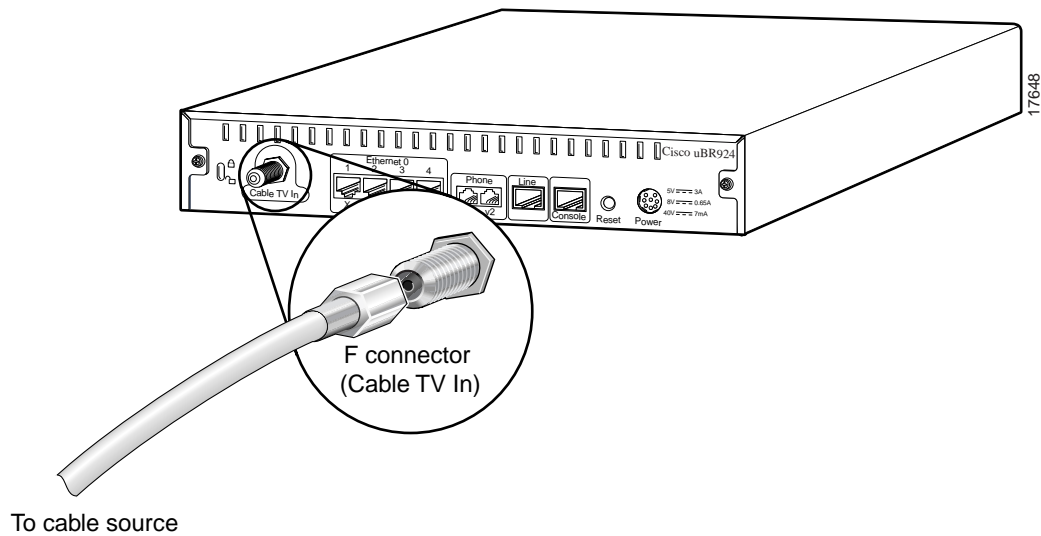


Warning Only trained and qualified personnel should be allowed to install or replace this equipment.

Install the Router


- Step 1** Place the router on a stable, flat surface close to the CATV drop connection and all devices to be connected at the subscriber site.
- Step 2** Make sure the bottom, sides, and rear of the router are clear and well-ventilated to prevent the unit from overheating.

2 Install the Router and Connect Cables (continued)



Step 3 Install the router in compliance with national and local electrical codes:

- US NFPA 70
- Canadian Electrical Code, part I, CC22.1
- IEC 364, part 1 through part 7


 **Warning** This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that a fuse or circuit breaker no larger than 120 VAC, 15A US (240 VAC, 10A International) is used on the phase conductors (all current-carrying conductors).

Note: The router uses an external AC power supply that allows the unit to operate in any country where the input voltage is between 100 to 240 VAC, and 50 or 60 Hz. Different power cords are available to suit the country of operation.

Connect to the Broadband Network

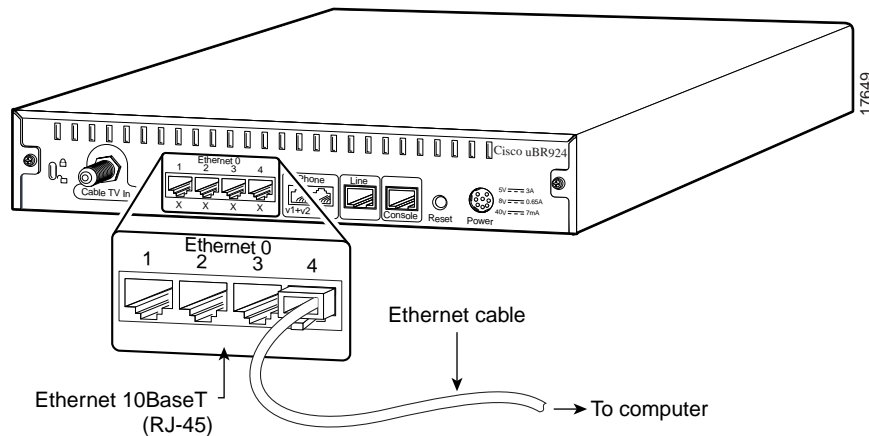
Step 1 Locate the RF coaxial cable coming from the CATV wall outlet.

Step 2 Connect the cable to the router's rear Cable TV In F connector. Hand tighten the connector, making sure it is finger tight; then give it a 1/6 turn.

 **Warning** Do not overtighten the connector. Overtightening can break off the connector.

2

Install the Router and Connect Cables (continued)



Step 3 Make sure all other coaxial cable connectors are securely tightened from the distribution tap to the Cisco uBR924 cable access router, following instructions in step 2. This includes all intermediate splitters, couplers, or ground blocks.

Note: Loose connectors inside the building or residence can cause intermittent router operation.



Caution To ensure compliance with FCC limits, connection to the cable system must be made with a high-quality, shielded cable. If the quality or general condition of the coaxial cable at the subscriber site is in question, replace the coaxial cable.

Connect PCs

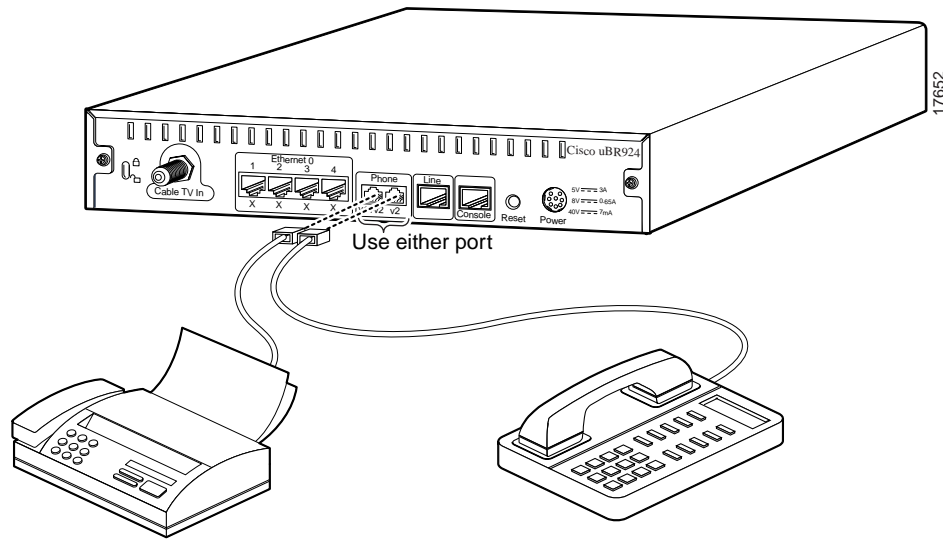
Step 1 Locate all needed 10BaseT Ethernet cables.

- Use straight-through Ethernet cables to directly connect up to four PCs to the router.
- Use crossover Ethernet cables to connect the router to an Ethernet hub if more than four PCs or other LAN devices are to be connected at the site. Connect all devices to the hub using crossover Ethernet cables.

Step 2 Connect one end of the Ethernet cable to one of the router's Ethernet hub rear ports (labeled 1X, 2X, 3X, or 4X).

Step 3 Press the cable end firmly into the router's Ethernet receptacle and connect the other end to the computer or Ethernet hub as appropriate.

Step 4 Repeat steps 2 and 3 for each Ethernet connection from the Cisco uBR924 cable access router.



Connect Telephones or Fax Devices

- Step 1** Locate one RJ-11 to RJ-11 cable for each device to directly connect to the two FXS Cisco uBR924 cable access router VoIP ports if voice is supported.
- Step 2** Connect one end of the cable to one of the Phone ports (labeled V1+V2 and V2) at the rear of the router. Press the cable firmly into the receptacle.
- Step 3** Connect the other end to the telephone, fax device, or adapter as appropriate.

Note: Use only a telephone with a pushbutton dial set. Fax devices and fax/modem cards can be used in Cisco IOS Release 12.0(5)T and higher; however, the data mode of the fax/modem card cannot. Contact your network management, provisioning or operations team to determine if fax/modem cards are supported across your VoIP network.



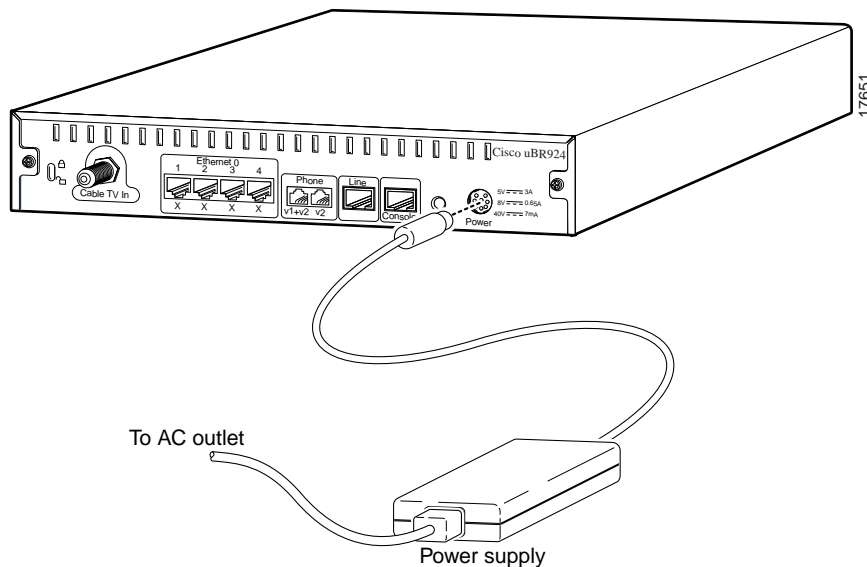
Caution Multiple telephones or fax devices can be connected to the two VoIP telephone lines, provided the sum of the REN of all devices on the line does not exceed five. A two-line telephone can be plugged into the V1+V2 rear connector of the router using a single cable if the cable has four wires.

- Step 4** Repeat steps 2 and 3 for other devices to connect to the second VoIP telephone line.



Warning Install equipment using an acceptable method of connection per your country. This equipment contains a ring signal generator (ringer), which is a source of hazardous voltage. Do not touch the RJ-11 (phone) port wires (conductors), the conductors of a cable connected to the RJ-11 port, or the associated circuit board when the ringer is active.

2 Install the Router and Connect Cables (continued)



Establish Power

- Step 1** Locate the power receptacle at the rear of the router.
- Step 2** Plug the 7-pin end of the power supply cord into the power connector at the rear of the router and connect the AC power cord to the power supply.

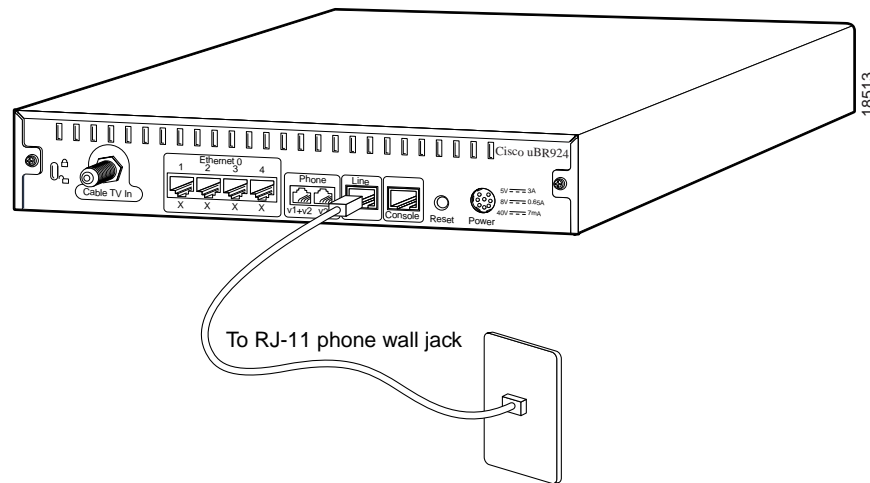


Caution Use only the Cisco-provided power supply and cord. Using any other vendor's power supply and cord can cause permanent damage. Ensure the power cord is appropriate to your country of operation. Cisco uBR924 and Cisco uBR904 power supplies and cords are identical and interchangeable, provided the power cords are applicable to the country of operation.

- Step 3** Plug the 3-prong end of the power cord into a standard electrical power outlet at the site. Power is immediately supplied to the router.
- Step 4** Turn on the power for all other equipment and wait for the devices to complete their startup processes.

2

Install the Router and Connect Cables (continued)



Connect the Backup POTS Connection

Step 1 Locate the needed minimum 26 AWG RJ-11 to RJ-11 cable to connect the router to a backup POTS line.

Note: If the Cisco uBR924 cable access router has a backup connection to the PSTN and the router loses power while VoIP calls are in progress, the subscriber can re-establish one of the two VoIP line connections—dialing out over the PSTN.

Caution The backup POTS connection enables only one of the two voice lines connected to the router to function during a power outage. Calls in progress prior to the power outage will be disconnected.

If power is re-established while a cutover call is in progress, the connection will remain in place until the call is terminated. When the cutover call is terminated, the router automatically reboots.

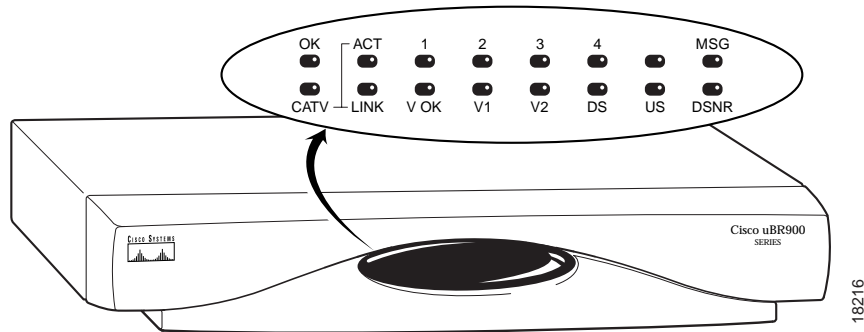


Warning This equipment is to be installed and maintained by personnel only as defined by AS/NZS 3260 Clause 1.2.14.3 Service Personnel.

Step 2 Connect one end of the cable to the backup POTS line port (labeled Line) at the rear of the router. Press the cable firmly into the receptacle.

Step 3 Connect the other end of the cable to the telephone wall jack.

3 Initialize the Router



View Initialization

When the router is connected and powered on, it executes automatic self-diagnostic and installation procedures. For this to occur, a number of actions must be performed at the headend. Refer to the “Prepare for Installation” section of this guide. The initialization process follows:

- All LEDs on the front of the router light (except for the ACT LED and LEDs 1 through 4) when the router first powers on.
- Different LEDs light to indicate diagnostic progress and turn off after all checks are successful.
- The OK LED then blinks as the router completes self-test and boots a Cisco IOS image.
- The router, in accordance with DOCSIS, acquires a downstream channel, establishes communications with the headend, and downloads a configuration file (and an optional updated image if set).
- When the download is complete, the following LEDs light and remain solid to indicate the router is operational:
 - DS LED reveals the router is locked to a downstream channel.
 - US LED reveals the upstream channel is operational.
 - LINK LED reveals the cable interface is operational.
 - DSNR LED reveals the router is receiving a good downstream signal-to-noise ratio.

3

Initialize the Router (continued)

LED Label	Description
OK	On = Power-on and self-test have completed successfully, the system image has been booted, and the system is operational. Blink = After power-on and self-test have completed successfully, LED blinks as the system image is booted. Off = No power
ACT	On = Cable activity Off = No activity
1, 2, 3 or 4	On = Ethernet link up for the port Blink = Activity on Ethernet link for the port Off = Ethernet link down for the port
V OK	On = Healthy VoIP system for a Cisco uBR924 cable access router configured to support voice Off = VoIP system problem or the router has switched over to the PSTN
V1	On = Call in progress on the voice port for a router configured to support voice Off = No call
V2	On = Call in progress on the voice port for a router configured to support voice Off = No call
LINK	On = Cable (RF) connection up Blink = Router searching for a downstream frequency Off = Cable (RF) connection down
DS	On = Router locked to a downstream frequency Off = Router not locked to a downstream frequency or the router has not yet located a digital signal
US	On = Router has established communications with the CATV headend per DOCSIS Off = Router has not completed secondary ranging
DSNR	On = Receiving quality, downstream signal 5 dB above the downstream lock threshold Off = Receiving low downstream signal strength or quality

4 Verify Installation

Verify Connections

Internet

Step 1 From a PC connected to the router, start the Internet browser program installed on the PC.

Step 2 In the appropriate area of the web browser screen, enter a URL of your choice.

Note: If a URL is not known, try using <http://www.cisco.com>.

If the selected web page displays, the Ethernet network installation is successful.

Step 3 Watch the appropriate Ethernet LED (1 through 4) on the front of the router blink as data is transmitted on the link.

Step 4 Repeat steps 1 through 3 for each PC connected to the router.

VoIP Telephone

Step 1 Pick up a telephone connected to one of the router's VoIP (V1+V2 or V2) rear ports.

Note: The router must be configured to support voice.

Step 2 Dial a telephone number.

The Cisco uBR924 cable access router is able to implement multiple classes of service (CoS) on the cable interface.

Note: Separate CoS streams are only available when the router is connected to a headend that supports multiple classes of service per Cisco uBR924 cable access router. In addition, the configuration file downloaded to the router must specify use of multiple classes of service.



Caution The Cisco uBR924 cable access router interoperates with a DOCSIS 1.0 CMTS that does not support multiple classes of service per router. Because voice and data will be mixed, however, voice traffic will be transmitted on a best effort basis. This can cause poorer voice quality and lower data throughput when calls are made from the router's telephone ports.

Voice quality is also affected by users transmitting or downloading large files, as well as other significant network traffic.

4

Verify Installation (continued)

Step 3 Watch the appropriate VoIP LED (V1 or V2) on the front of the router light when data is transmitted on the link.

Any call-progress indications and other signals that can be carried inband (for example, remote telephone ringing) are cut through the voice path as soon as an end-to-end audio channel is up. As applicable, class reservations are put in place to achieve the desired CoS over the cable interface.

Step 4 Ensure the call is picked up before hanging up.

VoIP Fax

Step 1 Place a document in the document feeder of a fax machine connected to the router, referencing instructions appropriate to the fax device.

Note: The router must be configured to support voice and you must be using Cisco IOS Release 12.0(5)T or higher.

Step 2 Enter a destination number to receive the fax and press Dial or Start on most fax machines.

The protocol appropriate to fax is turned on and the fax proceeds. Any call-progress indications and other signals that can be carried inband (for example, remote telephone ringing) are cut through the voice path as soon as an end-to-end audio channel is up.

Step 3 Watch the appropriate VoIP LED (V1 or V2) on the front of the router light as data is transmitted on the link.

Step 4 Listen for a fax tone on the other end and verify that the fax is transmitted.

Step 5 Verify completion of the fax transmission at the destination.

4 Verify Installation (continued)

Troubleshoot Connections

General

LED	Status	Possible Problem	Suggested Action
OK	System LED is off.	Power cord not properly seated. Power outlet not operating. Power supply has failed or you have a faulty router.	Check power connections. Check the outlet. Contact field service dispatch to replace the power supply or router.
1, 2, 3, or 4	Ethernet LEDs are off when data is transmitted to/from the device.	PC/device not powered on. Bad Ethernet connection. Incorrect cable between the router, the hub if applicable, or the PC. Faulty Ethernet card.	Verify PC/device powered on. Reseat the Ethernet cable at both ends. Make sure TCP/IP and DHCP are enabled. Replace the cable, reviewing the hub user guide or Ethernet user guide. Notify the subscriber to replace the Ethernet card.
LINK	Cable RF LED is off. Cable RF LED is blinking.	Router searching for a signal; RF levels wrong. Cable is out. Router is locked to a signal and connecting to the headend per DOCSIS.	Check for a DOCSIS system signal and verify the nearby analog video signal is within the correct range—0 to +15 dBmV for most CATV systems. Check if the cable TV is working if the subscriber also subscribes to broadcast TV services. Wait until the router completes initialization. The router can pause on a digital video signal during installation, but will time out and then locate the DOCSIS system signal.
DS	Downstream LED is off.	RF coaxial cable is not properly connected to the router.	Reconnect the cable.

4 Verify Installation (continued)

LED	Status	Possible Problem	Suggested Action
US	Upstream LED is off.	Upstream signal is not reaching the headend; router is unable to communicate with the remote end. Systematic RF noise problem or other outage.	Verify continuity back to the headend using the standard procedures for your system. Temporarily locate the router closer to the ground block, the tap, or another tap closer to the headend—ensuring correct RF input levels at all times.
DSNR	Downstream signal-to-noise ratio LED is off.	Systematic RF noise problem or other outage.	Verify correct RF input to the router. Temporarily locate the router closer to the ground block, the tap, or another tap closer to the headend—ensuring correct RF input levels at all times. Do not install the router unless your system management expressly states this is the procedure to follow. This is an early indication of low quality cable signals and indicates a high likelihood of intermittent router operation.

4 Verify Installation (continued)

IP Telephony

Note: The router must be configured to support voice and use Cisco IOS Release 12.0(5)T or higher to support fax.

LED	Status	Possible Problem	Suggested Action
V OK	Voice status LED is off for a router configured to support voice.	VoIP system configuration problem.	<p>Contact your provisioning or billing administrator or customer service department. If your provisioning or billing system is designed to support automatic feature upgrades, and the router's cable MAC address is already in the billing system and configured for use with voice, ask to have the router refreshed with the correct voice configuration.</p> <p><i>Note: This procedure can take several minutes.</i></p>
V1 or V2	Voice port LED is off when a call on the port is initiated for a router configured to support voice.	<p>Bad telephone or fax machine connection.</p> <p>Bad cable.</p> <p>Problem with equipment configuration</p>	<p>Reseat the RJ-11 to RJ-11 cable at both ends.</p> <p>Use a different cable.</p> <p>For a telephone, make sure a pushbutton dial set is used.</p> <p>For an external fax machine, make sure the device is on. If fax software is used, make sure the data mode is not used. For fax, also make sure you are using Cisco IOS Release 12.0(5)T or higher.</p> <p>If a two-line telephone is connected to the router, make sure it is connected to the V1+V2 rear connector.</p> <p>If multiple telephones or fax machines are connected to a telephone line, make sure the sum of the REN of all devices on the telephone line does not exceed five.</p>

5 Reconfigure the Router

Note: Cisco uBR924 cable access routers are typically configured at the headend. Most subscriber sites do not permit local configuration. Remote configuration is either disabled or routinely reset to settings in the provisioning or billing systems.



Caution Before attempting to reconfigure a Cisco uBR924 cable access router at a subscriber site, contact your network management, provisioning, or billing system administrator to ensure remote configuration is allowed. If remote configuration is disabled, settings you make and save at the local site will not remain in effect after the router is powered off and on. Instead, settings will return to the previous configuration.

Connect the Console Port

Step 1 Configure the terminal to support:

- 9600 baud
- 8 data bits
- No parity
- 1 stop bit (8N1)

Step 2 Connect the terminal to the Cisco uBR924 cable access router's console port.

Note: The console port is configured as DCE and uses an RJ-45 connector. The port is wired the same as all other Cisco products.



Caution After you connect a laptop to a Cisco uBR924, perform all actions, and save configuration changes, power cycle the router if that laptop will not be used at the subscriber site. This is particularly important when the Cisco uBR924 is configured to operate in a DOCSIS-compliant bridging mode. Power cycling the Cisco uBR924 ensures the laptop computer does not remain in the list of CPE devices at the subscriber site for the Cisco uBR924 to support. Only reinitialization of the cable interface clears out the bridge table and resets the counter that specifies the number of CPE devices being bridged. Refer to the “Basic Internet Access Bridging Example” section of this document.

*Note: This behavior is in accordance with DOCSIS. For configurations including Cisco Series 7200 CMTS equipment, issuing the **clear cable modem host <mac address>** command may be required to clear the laptop from the headend security access control tables.*

5 Reconfigure the Router (continued)

Understand the Command Line Interface

Command	Purpose
uBR924 enable Password: <password> uBR924#	Enters enable mode. Enters the enable password. You have entered enable mode when the prompt changes to uBR924#.
uBR924# config terminal Enter configuration commands, one per line. End with CNTL/Z. uBR924(config)#	Enters global configuration mode and the prompt changes to uBR924(config)#.
uBR924(config)# ? interface Select an interface to configure	Displays the configuration commands available for your router.
uBR924(config)# interface ?	Displays the interface configuration commands for your router.
uBR924(config)# interface cable-modem0	Enters the interface configuration mode for your router.
uBR924(config-if)# cable-modem ?	Displays the router interface parameters you can set.

Note: If you are having trouble entering commands, check the prompt and then enter a question mark (?) for a list of available commands. You might be in the wrong command mode or using the wrong syntax.



Timesaver Entering **exit** at the prompt returns you to the previous mode. Entering **Ctrl-z** immediately returns you to the enable mode.

View Current Router Configuration

To view the current configuration, enter the **show running-config** command in the global configuration mode. A response displays based on the configuration set up for the router. Review the examples that follow.

Note: For descriptions of configuration file settings defined by DOCSIS 1.0, refer to the DOCSIS 1.0 Radio Frequency (RFI) specifications, section C.3 “Configuration File Settings.”

5

Reconfigure the Router (continued)

Basic Internet Access Bridging Example

A configuration file to support a typical residential, Internet-access (data only) subscriber appears below:

```
Current configuration:
!
! No configuration change since last restart
!
version 12.0
service config
no service pad
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname Router
!
!
clock timezone - 4
ip subnet-zero
no ip routing
!
!
!
voice-port 0
!
!
voice-port 1
!
!
interface Ethernet0
 ip address 10.1.0.25 255.255.0.0
 no ip directed-broadcast
 no ip route-cache
 bridge-group 59
 bridge-group 59 spanning-disabled
!
interface cable-modem0
 ip address 10.1.0.25 255.255.0.0
 no ip directed-broadcast
 no ip route-cache
 cable-modem downstream saved channel 477000000 56
 bridge-group 59
 bridge-group 59 spanning-disabled
!
ip classless
no ip http server
!
```

5 Reconfigure the Router (continued)

```
!  
line con 0  
  transport input none  
line vty 0 4  
!  
end
```

Note: For most residential subscribers, DOCSIS-compliant bridging is the default—also referred to as “plug-and-play” bridging.

The plug-and-play router is able to locate a downstream and upstream channel; find TOD, TFTP, and DHCP server(s); obtain an IP address; download a DOCSIS configuration file; and obtain DHCP parameters to work in a bridging mode. For a better understanding of the processes involved, refer to the *Cisco uBR924 Cable Access Router Installation and Configuration Guide*.

The Cisco uBR924 cable access router acts as a transparent bridge for up to four PCs directly connected to it. Cisco IOS software treats all four of the router’s Ethernet hub ports as one Ethernet interface.



Caution The ability of the router to grant access to CPE devices is controlled by the “MAC CPE” field in the DOCSIS configuration file. The Cisco uBR924 cable access router defaults to one CPE MAC address unless this option is set to a higher number.

Basic Internet Access Routing Example

The Cisco uBR924 cable access router can also be configured to act as a router to preserve IP address space and limit broadcasts that can impact the performance of the network. A sample configuration file follows.

Note: The configuration file contains the **no cable-modem compliant bridge command**. This command disables DOCSIS-compliant bridging. Also note the absence of the default **bridge group 59** line from the Ethernet and cable 0 interfaces from that shown earlier. These lines must be removed if the unit is to act as a router. In addition, the routing protocol must be configured. Applicable commands are in bold in the example that follows.

5

Reconfigure the Router (continued)

```
Current configuration:
!
! No configuration change since last restart
!
version 12.0
service config
no service pad
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname Router
!
!
clock timezone - 4
ip subnet-zero
!
!
!
voice-port 0
!
voice-port 1
!
!
interface Ethernet0
 ip address 24.1.0.1 255.255.0.0
 no ip directed-broadcast
!
interface cable-modem0
 ip address 10.1.0.25 255.255.0.0
 no ip directed-broadcast
cable-modem downstream saved channel 477000000 56
 no cable-modem compliant bridge
!
router rip
 version 2
 network 10.0.0.0
 network 24.0.0.0
!
ip classless
no ip http server
!
!
line con 0
 transport input none
line vty 0 4
!
end
```

5

Reconfigure the Router (continued)

Multicast-Enabled Routing Example

A routing configuration file, where the cable modem is configured to belong to a specific multicast group, is shown below. This example shows PIM sparse-dense-mode. Other multicast routing protocols, such as PIM sparse-mode or PIM dense-mode, can be used. Applicable commands are in bold.

Note: In DOCSIS-compliant bridging mode, no setup is required.

```
Current configuration:
!
! Last configuration change at 23:16:44 - Thu Mar 18 1999
!
version 12.0
service config
no service pad
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname Router
!
!
clock timezone - 4
ip subnet-zero
!
!
ip multicast-routing
ip dvmrp route-limit 20000
!
!
!
voice-port 0
!
voice-port 1
!
!
interface Ethernet0
 ip address 24.1.0.1 255.255.0.0
 no ip directed-broadcast
 ip pim sparse-dense-mode
 no ip route-cache
 no ip mroute-cache
!
interface cable-modem0
 ip address 10.1.0.25 255.255.0.0
 no ip directed-broadcast
 ip pim sparse-dense-mode
 no ip route-cache
 no ip mroute-cache
```

5

Reconfigure the Router (continued)

```
no keepalive
  cable-modem downstream saved channel 477000000 56
  no cable-modem compliant bridge
!
!
router rip
  version 2
  network 24.0.0.0

network 10.0.0.0
!
!
ip classless
no ip http server
!
!
line con 0
  transport input none
line vty 0 4
!
end
```

VoIP (Using H.323v2) Bridging Example

```
Current configuration:
!
! No configuration change since last restart
!
version 12.0
service config
no service pad
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname Router
!
!
clock timezone - 4
ip subnet-zero
no ip routing
!
voice-port 0
!
!
voice-port 1
!
dial-peer voice 1 pots
destination-pattern 1000
port 0
```


5

Reconfigure the Router (continued)

```
!  
dial-peer voice 2 pots  
  destination-pattern 2000  
  port 0  
!  
dial-peer voice 10 voip  
  destination-pattern 1000  
  session target ras  
!  
dial-peer voice 20 voip  
  destination-pattern 2000  
  session target ras  
!  
interface Ethernet0  
  ip address 10.1.0.25 255.255.0.0  
  no ip directed-broadcast  
  no ip route-cache  
  bridge-group 59  
  bridge-group 59 spanning-disabled  
!  
interface cable-modem0  
  ip address 10.1.0.25 255.255.0.0  
  no ip directed-broadcast  
  no ip route-cache  
  cable-modem downstream saved channel 477000000 56  
  bridge-group 59  
  bridge-group 59 spanning-disabled  
!  
ip classless  
no ip http server  
!  
!  
line con 0  
  transport input none  
line vty 0 4  
!  
end
```

Note: The example above shows VoIP setup in bridging mode when using Cisco Network Registrar (CNR) version 2.5 and higher. CNR assigns E.164 addresses to local voice ports and uses the DHCP Option to define E.164 addresses-to-port assignments. The Cisco uBR924 cable access router software creates the dial-peers, starts H.323 RAS gateway support, and registers the E.164 addresses with the gatekeeper. The gatekeeper resolves the remote peers' IP addresses. Support for RAS and H.323v2 in Cisco gatekeeper products are found in Cisco IOS Release 12.0(5)T or higher. Support for multiple classes of service when using Cisco uBR7200 CMTS equipment is found in any Cisco 12.0(4)XI or higher headend image.

If you are not using CNR or Cisco gateway products running Cisco IOS Release 12.0(5)T software, you can set static routes. For the local peers, define the port and E.164 addresses. For remote peers, define the remote peers' IP addresses and E.164 addresses. The local dial peers assign an E.164 address to the POTS port.

5

Reconfigure the Router (continued)

VoIP (Using H.323v2) Routing Example

Note: You can also configure the Cisco uBR924 cable access router to act as a router when supporting VoIP traffic. IP addresses for the session targets must be valid for your network and must be for a router configured to support voice. If not configured to support voice, calls will not be completed.

```
Current configuration:
!
Last configuration change at 23:24:55 - Thu Mar 18 1999
!
version 12.0
service config
no service pad
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname Router
!
clock timezone - 4
ip subnet-zero
ip host-routing
!
voice-port 0
!
voice-port 1
!
dial-peer voice 1 pots
  destination-pattern 1001
  port 1
!
dial-peer voice 2 pots
  destination-pattern 1000
  port 0
!
dial-peer voice 10 voip
  destination-pattern 1001
  codec g711ulaw
  session target ras
!
dial-peer voice 20 voip
  destination-pattern 1000
  codec g711ulaw
  session target ras
!
dial-peer voice 30 voip
  destination-pattern 2000
  codec g711ulaw
  session target ras
!
```

5

Reconfigure the Router (continued)

```
dial-peer voice 40 voip
  destination-pattern 2001
  codec g711ulaw
  session target ras
interface Ethernet0
  ip address 24.1.0.1 255.255.0.0
  no ip directed-broadcast
  no ip mroute-cache
!
interface cable-modem0
  ip address 10.1.0.25 255.255.0.0
  no ip directed-broadcast
  no ip mroute-cache
  no keepalive
  cable-modem downstream saved channel 477000000 56
  no cable-modem compliant bridge
!
router rip
  version 2
  network 10.0.0.0
  network 24.0.0.0
!
ip classless
no ip http server
!
line con 0
  transport input none
line vty 0 4
!
end
```

5

Reconfigure the Router (continued)

IPSec Example

Note: Encryption/decryption is subject to export licensing controls. To support IPSec, the Cisco uBR924 must be configured in routing mode, rather than bridging. Cisco IOS Release 12.0(5)T or higher must be used. Both the CMTS and the Cisco uBR924 must be enabled and properly configured to support encryption.

```
Current configuration:
!
Last configuration change at 23:24:55 - Thu Mar 18 1999
!
version 12.0
no service pad
service timestamps debug uptime
service timestamps log uptime
!
hostname Router
!
clock timezone - 0 6
ip subnet-zero
no ip domain-lookup
!
crypto isakmp policy 1
  hash md5
  authentication pre-share
  lifetime 5000
crypto isakmp key 1111 address 30.1.1.1
crypto isakmp identity hostname
!
crypto ipsec transform-set test-transform ah-md5-hmac esp-des esp-md5-hmac
!
crypto map test-ipsec local-address cable-modem0
crypto map test-ipsec 10 ipsec-isakmp
set peer 30.1.1.1
set transform-set test-transform
match address 100
!
interface Ethernet0
 ip address 24.1.0.1 255.255.0.0
 no ip directed-broadcast
!
interface cable-modem0
 ip address 10.1.0.25 255.255.0.0
 no ip directed-broadcast
 no keepalive
 cable-modem downstream saved channel 213000000 30
 no cable-modem compliant bridge
crypto map test-ipsec
```

5

Reconfigure the Router (continued)

```
!
router rip
  version 2
  network 10.0.0.0
  network 24.0.0.0
!
ip classless
no ip http server
!
access-list 100 permit ip host 10.1.0.25 30.1.1.0 0.0.0.255
!
line con 0
  exec-timeout 0 0
  transport input none
line vty 0 4
  login
!
end
```

L2TP Example

Note: Encryption/decryption is subject to export licensing controls. To support this feature set, the router must be configured in routing mode, rather than bridging. Cisco IOS Release 12.0(5)T or higher must be used. Both the CMTS and the Cisco uBR924 must be enabled and properly configured to support the mode.

```
Current configuration:
!
! Last configuration change at 20:24:59 - Thu Apr 1 1999
! NVRAM config last updated at 20:34:52 - Thu Apr 1 1999
!
version 12.0
no service pad
service timestamps debug uptime
service timestamps log uptime
!
hostname Router
!
class-map class-default
  match any
!
!
!
clock timezone - 0 1
ip subnet-zero
ip tftp source-interface cable-modem0
no ip domain-lookup
!
```

5

Reconfigure the Router (continued)

```

vpdn enable
!
vpdn-group 1
  accept dialin l2tp virtual-template 1 remote L2TP_LAC
  no l2tp tunnel authentication
  !
  !
  interface Ethernet0
    ip address 80.1.1.1 255.255.255.0
    no ip directed-broadcast
  !
  interface Virtual-Template1
    ip unnumbered Ethernet0
    no ip directed-broadcast
    peer default ip address pool dialup
    ppp authentication chap
  !

interface cable-modem0
  ip address 255.255.0.0
  no ip directed-broadcast
  cable-modem downstream saved channel 639000000 38
  no cable-modem compliant bridge
  !
router rip
  version 2
  network 10.0.0.0
  network 24.0.0.0
  !
ip local pool dialup 24.1.0.100
ip classless
no ip http server
!
!
line con 0
  transport input none
line vty 0 4
  login
!
end

```

Change Operating Modes



Warning Incorrectly configuring the Cisco uBR924 cable access router can cause loss of network connectivity. Before attempting to reconfigure the router, print the last working configuration and ensure remote configuration is enabled for the site. If the router does not connect to the network after you have reconfigured it, enter the cable downstream saved frequency from the printout and then clear the interface. Power off and on the router. If network connectivity is not restored, contact your network management, provisioning, or billing system administrator to reload software.

5 Reconfigure the Router (continued)

Set Routing

To configure routing, follow the instructions below in global configuration mode. After you have completed the procedure, enter the **show startup-config** command to verify that routing is enabled. Refer to the “Basic Internet Access Routing Example” section for a sample.

Step	Command	Purpose
1	<code>uBR924(config)#int c 0</code>	Enter interface configuration mode for the router interface.
2	<code>uBR924(config-if)#no cable-modem compliant bridge</code> <code>uBR924(config-if)#no bridge group number and remove bridge-group number.</code> <code>uBR924(config-if)#ip address mask ip address x.x.x.x (0-255)</code> <code>subnet mask x.x.x.x (0-255)</code> <code>uBR924(config-if)#exit</code>	Turn off DOCSIS-compliant bridging. Enable the IP address and subnet. Return to global configuration mode.
3	<code>uBR924(config)#int e 0</code> <code>uBR924(config-if)#no bridge group number and remove bridge-group number.</code> <code>uBR924(config-if)#ip address mask ip address x.x.x.x (0-255)</code> <code>subnet mask x.x.x.x (0-255)</code> <code>uBR924(config-if)#exit</code>	Enter interface configuration mode for Ethernet 0. Enable the IP address and subnet. Return to global configuration mode.
4	<code>uBR924(config)#ip routing</code>	Enable IP routing for the router.
5	<code>uBR924(config)#router rip</code> <code>uBR924(config)#version 2 rip</code> <code>uBR924(config)#network network-number</code> <code>uBR924(config-if)#exit</code>	Enter router configuration mode and enable RIP version 2 routing. Specify the network connected to the router on which RIP will operate. If the router is attached to more than one network, enter each IP address in a separate command. Return to global configuration mode.
6	<code>uBR924(config-if)#Ctrl-z</code> <code>uBR924#copy running-config startup-config</code> Building configuration...	Return to privileged EXEC mode. Save the configuration to nonvolatile RAM so that it will not be lost in the event of a reset, power cycle, or power outage.

5

Reconfigure the Router (continued)

Reconfigure Bridging from Routing

To reconfigure the Cisco uBR924 to support bridging after it has been configured for routing, follow the instructions below. After you have completed the procedure, enter the **show startup-config** command to verify that bridging is enabled. Refer to the “Basic Internet Access Bridging Example” section for a sample.

Step	Command	Purpose
1	<code>uBR924(config)#no ip routing</code>	Disable IP routing on the uBR924.
2	<code>uBR924(config)#int e 0</code>	Enter interface configuration mode for Ethernet0.
3	<code>uBR924(config-if)#no ip address</code>	Disable IP address on Ethernet0.
4	<code>uBR924(config-if)#no ip route-cache</code>	Disable high-speed switching caches for IP routing.
5	<code>uBR924(config-if)#bridge-group bridge-group</code>	Assign the Ethernet0 interface to a bridge group. The bridge group must be an integer between 1 and 63.
6	<code>uBR924(config-if)#bridge-group bridge-group spanning-disabled</code> <code>uBR924(config-if)#exit</code>	Disable spanning tree on the Ethernet interface. Exit interface configuration mode for the Ethernet0 interface.
7	<code>uBR924(config)#int c 0</code>	Enter interface configuration mode for the cable modem interface.
8	<code>uBR924(config-if)#no ip address</code>	Disable the IP address of the cable interface, if one has been set.
9	<code>uBR924(config-if)#no keep alive</code>	Disable keepalives on the cable interface.
10	<code>uBR924(config-if)#no ip route-cache</code>	Disable high-speed switching caches for IP routing on the cable interface.
11	<code>uBR924(config-if)#cable modem compliant bridge</code>	Enable DOCSIS-compliant bridging.
12	<code>uBR924(config-if)#bridge-group bridge-group</code>	Assign the cable modem interface to a bridge group. The bridge group must be an integer from 1 to 63.
13	<code>uBR924(config-if)#bridge-group bridge-group spanning-disabled</code>	Disable spanning tree on the cable interface.
14	<code>uBR924(config-if)#exit</code>	Exit interface configuration mode.
15	<code>uBR924(config-line)#Ctrl-z</code> <code>uBR924#copy running-config startup-config</code>	Return to privileged EXEC mode. Save the configuration to nonvolatile RAM.

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