



Configuring the Cisco CMTS for the First Time

This chapter describes how to start up and configure the Cisco uBR7100 series CMTS for the first time. The chapter contains the following sections:

- [“Preparing for Configuration” section on page 2-1](#)
- [“Understanding Configuration Fundamentals” section on page 2-2](#)
- [“Configuring the Cisco uBR7100 Series CMTS Using AutoInstall” section on page 2-7](#)
- [“Configuring Using the setup Facility” section on page 2-7](#)
- [“Configuring Using the Configuration Mode” section on page 2-15](#)
- [“Using the Setup Facility for Cable Interfaces” section on page 2-17](#)
- [“Checking Your Settings and Reviewing Your Configuration Changes” section on page 2-24](#)
- [“Where to Go Next” section on page 2-25](#)

Preparing for Configuration

Complete these prerequisite steps before you power on and configure the Cisco uBR7100 series router:

- Ensure your network supports reliable broadband data transmission. Your plant must be swept, balanced, and certified based on NTSC or appropriate international cable plant recommendations. Ensure your plant meets all DOCSIS or EuroDOCSIS downstream and upstream RF requirements.
- Ensure your Cisco uBR7100 series router is installed according to the instructions in the hardware installation guide that came with your CMTS. The chassis must contain at least one port adapter to provide backbone connectivity, and one Cisco cable modem card to serve as the RF cable TV interface.
- Ensure all other required headend or distribution hub routing and network interface equipment is installed, configured, and operational (based on the supported services). This includes:
 - all routers
 - servers (DHCP, TFTP, and ToD)
 - network management systems
 - other configuration or billing systems, depending on your applications, including gatekeepers and gateways; backbone and other equipment for VPN support; dial-up access servers, telephone circuits and connections.
 - other equipment if supporting telco return

- Ensure DHCP and DOCSIS configuration files have been created and pushed to appropriate servers so that each cable modem, when initialized, can:
 - transmit a DHCP request
 - receive an IP address
 - obtain TFTP and ToD server addresses
 - download a DOCSIS configuration file (or updated software image if using Cisco uBR924 cable access routers or Cisco uBR910 cable data service units in your network)
- Ensure customer premises equipment (CPE)—cable modems or set top boxes, PCs, telephones, or facsimile machines—meet requirements for your network and service offerings.
- Be familiar with your channel plan to assign appropriate frequencies. Outline your strategies for setting up bundling or VPN solution sets if applicable to your headend or distribution hub. Know your dial plan if using H.323 for VoIP services and setting up VoIP-enabled CM configuration files. As appropriate, obtain:
 - passwords
 - IP addresses
 - subnet masks
 - device names

After these prerequisites are met, you are ready to configure the Cisco uBR7100 series CMTS. This includes, at a minimum, configuring a host name and password for the Cisco uBR7100 series router and configuring the CMTS to support IP over the cable plant and network backbone.

Understanding Configuration Fundamentals

This section describes the basic parameters of using passwords, and initial configuration utilities that the Cisco uBR7100 series routers support:

- [“Using the Enable Secret and the Enable Password” section on page 2-3](#)
- [“Configuring the Cisco uBR7100 Series CMTS Using AutoInstall” section on page 2-7](#)
- [“Configuring Using the setup Facility” section on page 2-7](#)
- [“Configuring Using the Configuration Mode” section on page 2-15](#)



Note

These sections provide minimal configuration instructions. For additional configuration information, refer to subsequent chapters in this guide. For examples of Cisco uBR7100 series configuration files, refer to the [Chapter 4, “Configuring Basic Broadband Internet Access.”](#)



Tip

Be sure you have appropriate addresses and values based on your network before you attempt to configure the router. Enter the **show version** command to display the release of Cisco IOS software on your router.

Using the Enable Secret and the Enable Password

The Cisco uBR7100 series router is administered using the Cisco command interpreter, called the EXEC mode. You must boot and log in to the router before you can enter an EXEC command.

Step 1 Connect a terminal to the console port of the Cisco uBR7100 series router and establish a terminal session. You can open a Terminal application (Hyper Terminal) on a PC as follows:

- a. Connect using: Direct to Com 1
- b. Set bits per second: 9600
- c. Set data bits: 8
- d. Set parity: none
- e. Set stop bit: 1
- f. Set flow control: none

Step 2 Power on the Cisco uBR7100 series router. The following prompt displays:

```
Would you like to enter the initial dialog?[yes]:no
```

Step 3 Enter **no** to choose the normal operating mode of the router. The user EXEC prompt displays:

```
Router>
```

**Note**

For security purposes, the EXEC has two levels of access to commands: user EXEC mode and privileged EXEC mode. The commands available at the user level are a subset of those available at the privileged level.

**Tip**

Because privileged-level EXEC commands can change the configuration of the router, password-protect these commands to prevent unauthorized use.

At the EXEC prompt, enter one of the following two commands to set password protection:

- **enable secret** *password* (which is a very secure, encrypted password)
- **enable password** (which is a less secure, nonencrypted password)

To gain access to privileged-level commands, enter the desired password.

**Note**

An enable secret password can contain from 1 to 25 uppercase and lowercase alphanumeric characters. An enable password can contain any number of uppercase and lowercase alphanumeric characters. A number cannot be the first character. Spaces are valid password characters; for example, “two words” is a valid password. Leading spaces are ignored. Trailing spaces are recognized. Alphanumeric characters are recognized as uppercase or lowercase.

Passwords should be different for maximum security. If you enter the same password for both during the setup script, the system will accept it, but you will receive a warning message indicating that you should enter a different password.

Replacing or Recovering a Lost Password

This section describes how to recover a lost enable or console login password, and how to replace a lost enable secret password on your Cisco uBR7100 series router.



Note

It is possible to recover the enable or console login password. The enable secret password is encrypted, however, and must be replaced with a new enable secret password.

Overview of the Password Recovery Procedure

Following is an overview of the general steps in the password recovery procedure:

-
- Step 1** If you can log in to the router, enter the **show version** command to determine the existing configuration register value.
 - Step 2** Press the **Break** key to get to the bootstrap program prompt (ROM monitor). You might need to reload the system image by power cycling the router.
 - Step 3** Change the configuration register so that the following functions are enabled:
 - Break
 - ignore startup configuration
 - boot from Flash memory



Note

The key to recovering a lost password is to set the configuration register bit 6 (0x0040) so that the startup configuration (usually in NVRAM) is ignored. This allows you to log in without using a password and to display the startup configuration passwords. Cisco recommends setting the configuration register to 0x142.

-
- Step 4** Power cycle the router by turning power OFF and then back ON.
 - Step 5** Log in to the router and enter the privileged EXEC mode.
 - Step 6** Enter the **show startup-config** command to display the passwords.
 - Step 7** Recover or replace the displayed passwords.
 - Step 8** Change the configuration register back to its original setting.



Note

To recover a lost password if **Break** is disabled on the router, you must have physical access to the router.

Details of the Password Recovery Procedure

Complete the following steps to recover or replace a lost enable, enable secret, or console login password:

-
- Step 1** Attach an ASCII terminal to the console port on your Cisco uBR7100 series router.
 - Step 2** Configure the terminal to operate at 9600 baud, 8 data bits, no parity, and 2 stop bits.

Step 3 If you can log in to the router as a nonprivileged user, enter the **show version** command to display the existing configuration register value. Note the value for later use.

If you cannot log in to the router at all, continue with the next step.

Step 4 Press the **Break** key or send a Break from the console terminal.

- If Break is enabled, the router enters the ROM monitor, indicated by the ROM monitor prompt (`rommon n>`), where `n` is the number of the command line. Proceed to Step 6.
- If Break is disabled, power cycle the router (turn the router OFF or unplug the power cord, and then restore power). Proceed to Step 5.

Step 5 Within 60 seconds of restoring the power to the router, press the **Break** key or send a Break. This action causes the router to enter the ROM monitor and display the ROM monitor prompt (`rommon 1>`).

Step 6 To set the configuration register on a Cisco uBR7100 series router, use the configuration register utility by entering the **confreg** command at the ROM monitor prompt as follows:

```
rommon 1> confreg
```

Answer **yes** to the enable “ignore system config info?” question and note the current configuration register settings.

Step 7 Initialize the router by entering the **reset** command as follows:

```
rommon 2> reset
```

The router will initialize, the configuration register will be set to 0x142, and the router will boot the system image from Flash memory and enter the System Configuration dialog (setup) as follows:

```
--- System Configuration Dialog ---
```

Step 8 Enter **no** in response to the System Configuration dialog prompts until the following message displays:

```
Press RETURN to get started!
```

Step 9 Press **Return**. The user EXEC prompt displays as follows:

```
Router>
```

Step 10 Enter the **enable** command to enter the privileged EXEC mode. Then enter the **show startup-config** command to display the passwords in the configuration file as follows:

```
Router# show startup-config
```

Step 11 Scan the configuration file display looking for the passwords; the enable passwords are usually near the beginning of the file, and the console login or user EXEC password is near the end. The passwords displayed will look something like this:

```
enable secret 5 $1$ORPP$s9syZt4uKn3SnpuLDrhuei
enable password 23skiddoo
.
.
line con 0
  password onramp
```

The enable secret password is encrypted and cannot be recovered; it must be replaced. The enable and console passwords can be encrypted or clear text. Proceed to the next step to replace an enable secret, console login, or enable password. If there is no enable secret password, note the enable and console login passwords if they are not encrypted and proceed to [Step 16](#).

**Caution**

Do not perform the next step unless you have determined you must change or replace the enable, enable secret, or console login passwords. Failure to follow the steps as presented here could cause your router configuration to be erased.

- Step 12** Enter the **configure memory** command to load the startup configuration file into running memory. This action allows you to modify or replace passwords in the configuration.

```
Router# configure memory
```

- Step 13** Enter the **configure terminal** command for configuration mode:

```
Router# configure terminal
```

- Step 14** To change all three passwords, enter the following commands:

```
Router(config)# enable secret newpassword1
Router(config)# enable password newpassword2
Router(config)# line con 0
Router(config)# password newpassword3
```

Change only the passwords necessary for your configuration. You can remove individual passwords by using the **no** form of the previous commands. For example, enter the **no enable secret** command to remove the enable secret password.

- Step 15** You must configure all interfaces to be *not* administratively shut down as follows:

```
Router(config)# interface fast ethernet 0/0
Router(config)# no shutdown
```

Enter the equivalent commands for all interfaces that were originally configured. If you omit this step, all interfaces are administratively shut down and unavailable when the router is restarted.

- Step 16** Use the **config-register** command to set the configuration register to the original value noted in Step 3 or Step 7.

- Step 17** Press **Ctrl-z** or type **end** to exit configuration mode:

```
Router(config)# end
```

**Caution**

Do not perform the next step unless you have changed or replaced a password. If you have skipped [Step 12](#) through [Step 15](#) previously, then proceed now to [Step 19](#). Failure to observe this sequence causes the system to erase your router configuration file.

- Step 18** Enter the **copy running-config startup-config** command to save the new configuration to nonvolatile memory:

```
Router# copy running-config startup-config
```

- Step 19** Enter the **reload** command to reboot the router:

```
Router# reload
```

- Step 20** Log in to the router with the new or recovered passwords.

Configuring the Cisco uBR7100 Series CMTS Using AutoInstall

The AutoInstall process is designed to configure the Cisco uBR7100 series CMTS automatically after connection to your WAN. For AutoInstall to work properly, a Transmission Control Protocol/Internet Protocol (TCP/IP) host on your network must be preconfigured to provide the required configuration files. The TCP/IP host can exist anywhere on the network as long as the following two conditions are maintained:

- Host must be on the LAN or WAN side of the router's port adapter connection to the WAN.
- User Datagram Protocol (UDP) broadcasts to and from the router and the TCP/IP host are enabled.

This functionality is coordinated by your system administrator at the site where the TCP/IP host is located. You should not use AutoInstall unless the required files are available on the TCP/IP host. See the publications *Configuration Fundamentals Configuration Guide* and *Configuration Fundamentals Command Reference* for more information about AutoInstall.

Complete the following steps to prepare your Cisco uBR7100 series CMTS for the AutoInstall process:

Step 1 Attach the appropriate synchronous serial cable to the synchronous serial interface 0 on the router.

Step 2 Turn the power switch on each power supply to the ON (I) position. This action turns on power to the router.

The router loads the operating system image from Flash memory; this process can take several minutes. If the remote end of the WAN connection is connected and properly configured, the AutoInstall process begins.

Step 3 When the AutoInstall process is completed, use the **copy running-config startup-config** command to write the configuration data to the router's nonvolatile random-access memory (NVRAM):

```
Router# copy running-config startup-config
```

Completing this step saves the configuration settings that the AutoInstall process created to NVRAM. If you fail to do this, your configuration will be lost the next time you reload the router.

Configuring Using the setup Facility

The Cisco uBR7100 series setup facility is a useful and efficient tool for configuring your CMTS. The setup facility supports the following functionalities so that cable interfaces and cable modem cards are fully operational (after initial setup):

- Cable-specific commands
- Upstream frequency definition

For each cable interface, the following information is mandatory:

```
Per upstream:  
  cable upstream n frequency f  
  no cable upstream n shutdown
```

Options include definition of the following information:

- DHCP server address.
- Options are also provided to set downstream frequency for the up-converter per interface.

If you do not plan to use AutoInstall, do not connect the router's WAN or LAN cable to the channel service unit/data service unit (CSU/DSU). If the WAN or LAN cable is connected to the CSU/DSU and the router does not have a configuration stored in NVRAM, the router attempts to run AutoInstall at startup.

**Tip**

The router might take several minutes to determine that AutoInstall is not set up to a remote TCP/IP host.

When the router determines that AutoInstall is not configured, it defaults to the setup facility (also called the System Configuration dialog). If the LAN or WAN cable is not connected, the router boots from Flash memory and automatically runs the setup facility.

**Note**

You can run the setup facility when the enable prompt (#) is displayed by entering the **setup** command.

Configuring Global Parameters

When you first start the program, configure the global parameters to control system-wide settings:

- Step 1** Connect a console terminal to the console port on the I/O controller, and then boot the router.
- Step 2** After booting from Flash memory, the following information appears after about 30 seconds. When you see this information, you have successfully booted your router:

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Cisco Systems, Inc.
170 West Tasman Drive
San Jose, California 95134-1706

Cisco Internetwork Operating System Software
IOS (tm) uBR7100 Software (uBR7100-I-M), Released Version 12.1(5)EC
Copyright (c) 1986-1998 by Cisco Systems, Inc.
Compiled Mon 09-Oct-98 04:10 by
Cisco 7100 (R4700) processor with 22528K/10240K bytes of memory.
R4700 processor, Implementation 33, Revision 1.0 (Level 2 Cache)
Last reset from power-on
Bridging software.

SuperLAT software copyright 1990 by Meridian Technology Corp).
X.25 software, Version 2.0, NET2, BFE and GOSIP compliant.
TN3270 Emulation software (copyright 1994 by TGV Inc).
4 Ethernet/IEEE 802.3 interfaces.
5 FastEthernet/IEEE 802.3 interfaces.
8 Serial network interfaces.
125K bytes of non-volatile configuration memory.

20480K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
4096K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x0



Note The first two sections of the configuration script, the banner and the installed hardware, appear only at initial system startup. On subsequent uses of the **setup** command facility, the script begins with the following prompt.

```
--- System Configuration Dialog ---
```

```
At any point you may enter a questions mark '?' for help.
Use ctrl-c to abort configuration dialog at any prompt.
Default settings are in square brackets '['].
```

```
continue with configuration dialog? [yes/no]:
```

Step 3 When asked if you want to enter the System Configuration dialog and see the current interface summary, enter **yes** or press **Return**:

```
Continue with configuration dialog? [yes/no]:
```

```
First, would you like to see the current interface summary? [yes]:
```

In the following example, the summary shows a Cisco uBR7100 series router at first-time startup with nothing configured:

Any interface listed with OK? value "NO" does not have a valid configuration.

```
Interface  IP-Address  OK  Method  Status          Protocol
Ethernet1/0 9.2.22.3   YES NVRAM   up             up
Ethernet1/1 unassigned YES unset   administratively down down
Ethernet1/2 unassigned YES unset   administratively down down
Ethernet1/3 unassigned YES unset   administratively down down
Ethernet1/4 unassigned YES unset   administratively down down
Ethernet1/5 unassigned YES unset   administratively down down
Ethernet1/6 unassigned YES unset   administratively down down
Ethernet1/7 unassigned YES unset   administratively down down
```

Step 4 Choose which protocols to support on your interfaces. For IP-only installations, you can accept the default values for most of the questions. A typical configuration using IP follows and continues through [Step 7](#):

```
Configuring global parameters:
```

```
Enter host name [Router]: router
```

Step 5 Enter the enable secret password, the enable password, and the virtual terminal password:

```
The enable secret password is a one-way cryptographic secret
password used instead of the enable password when it exists.
```

```
Enter enable secret: *****
```

```
The enable password is used when there is no enable secret
password and when using older software and some boot images.
```

```
Enter enable password: *****
```

```
Enter virtual terminal password: *****
```

- Step 6** The Simple Network Management Protocol (SNMP) is the most widely supported open standard for network management. SNMP provides a means to access and set configuration and run-time parameters of routers and communication servers. SNMP also defines a set of functions that can be used to monitor and control network elements.

Enter **yes** to accept SNMP management; enter **no** to refuse it:

```
Configure SNMP Network Management? [no]:
Community string [public]:
```

- Step 7** In all cases, you will use IP routing. When you are using IP routing, select an interior routing protocol. You can specify only one of two interior routing protocols to operate on your system using setup, either Interior Gateway Routing Protocol (IGRP) or Routing Information Protocol (RIP).

To configure IP routing, enter **yes** (the default) or press **Return**, and then select an interior routing protocol:

```
Configure IP? [yes]:
Configure IGRP routing? [yes]:
Your IGRP autonomous system number [1]: 15
```

- Step 8** Configure your port adapter interface parameters. The following example shows how an 8-port Ethernet port adapter is installed in port adapter slot 3. The setup program determines the status of all interfaces.

To configure each active interface port for IP, enter **yes** (the default) or press **Return**. For all inactive ports, the default is **no**. You can press **Return** to accept the default.

```
Configuring interface Ethernet 1/0:
Is this interface in use? [yes]:
Configure IP on this interface? [yes]:
IP address for this interface [19.2.22.4]:
Number of bits in subnet field [8]:
Class A network is 19.0.0.0, 8 subnet bits; mask is /16
```

```
Configuring interface Ethernet1/1:
Is this interface in use? [no]:
```

```
Configuring interface Ethernet1/2:
Is this interface in use? [no]:
```

```
Configuring interface Ethernet1/3:
Is this interface in use? [no]:
```

```
Configuring interface Ethernet1/4:
Is this interface in use? [no]:
```

```
Configuring interface Ethernet1/5:
Is this interface in use? [no]:
```

```
Configuring interface Ethernet1/6:
Is this interface in use? [no]:
```

```
Configuring interface Ethernet1/7:
Is this interface in use? [no]:
```

- Step 9** Configure your cable interface. The following example shows a Cisco uBR71111 router with cable interface. The setup program will, for the most part, determine the status of all interfaces.

To configure each active interface port, enter **yes** (the default) or press **Return**. For all inactive ports, the default is **no**. You can press **Return** to accept the default.

```
Configuring interface cable 1/0:
Is this interface in use? [yes]:
```

```
Configure this interface? [yes]:
IP address for this interface [19.2.22.5]:
Number of bits in subnet field [8]:
Class A network is 19.0.0.0, 8 subnet bits; mask is /16
```

```
Configuring interface cable 1/1:
Is this interface in use? [yes]:
Configure this interface? [yes]:
IP address for this interface [19.2.22.6]:
Number of bits in subnet field [8]:
Class A network is 19.0.0.0, 8 subnet bits; mask is /16
```

The configuration program displays the newly-created command interface script:

The following command script was created:

```
hostname router
enable secret 5 $1$f0fc$A38P/KN/9yD3sEKSt6hKQ/
enable password betty
line vty 0 4
password wilma
snmp-server community public
!
ip routing
!
interface Ethernet 1/0
ip address 19.2.22.4 255.255.0.0
!
interface Ethernet1/1
shutdown
no ip address
!
interface Ethernet1/2
shutdown
no ip address
!
interface Ethernet1/3
shutdown
no ip address
!
interface Ethernet1/4
shutdown
no ip address
!
interface Ethernet1/5
shutdown
no ip address
!
interface Ethernet1/6
shutdown
no ip address
!
interface Ethernet1/7
shutdown
no ip address
!

interface cable 1/0
ip address 19.2.22.5 255.255.0.0

interface cable 1/1
ip address 19.2.22.6 255.255.0.0

router igrp 15
network 19.0.0.0
!
end
```

Step 10 When asked if you want to use this configuration, enter **yes** or press **Return**.

Use this configuration? [yes/no]: **yes**

Step 11 Save your settings to NVRAM. (Refer to the “Using the Setup Facility for Cable Interfaces” section on page 2-17.)



Note You must always manually save the configuration settings to NVRAM whenever they are modified.

Configuring Upstream Frequencies

Upstream parameters must be configured manually. After the **setup** facility is run, upstream ports have a default state of “shutdown.” You have two methods to configure upstream channel frequencies:

- Configure a fixed frequency between 5 to 42 MHz for North American channel plans or between 5 to 65 MHz for PAL and SECAM channel plans (requires MC16E), and enable the upstream port.
- Create a global spectrum group, assign the interface to it, and enable the upstream port.

The cable interface card receiver accepts time-division multiplexed burst transmissions from cable interfaces (or cable modems in set top boxes) which are DOCSIS- or EuroDOCSIS-based. The upstream port becomes “up” when it is assigned an upstream frequency and is configured to be administratively up.

The upstream port is frequency-agile. The frequency can change while the interface is up and carrying traffic, if you define spectrum groups per the example provided.

You can define individual modulation profiles. A modulation profile consists of a table of physical layer characteristics for the different types of upstream bursts, for example, initial maintenance, long grant, request/data, request, short grant, and station maintenance.



Note Only qualified personnel should define upstream modulation profiles.

Complete these steps to activate upstream interfaces:

Step 1 After the **setup** facility has initially configured noncable interfaces on the Cisco uBR7100 series router, enter the **enable** command and your password (privileged EXEC).

Step 2 Enter the **configure terminal** command to get into global configuration mode.

Step 3 In global configuration mode, configure modulation profiles and spectrum groups for your Cisco uBR7100 series router using the **cable modulation-profile** and **cable spectrum-group** commands.

Step 4 In cable interface configuration mode, configure various characteristics for the interface in question using the **cable upstream** commands.



Note Refer to [Chapter 3, “Configuring the Cisco Cable Interface”](#) for further information.

Configuring Non-Cable Interfaces

Follow the procedure in this section to configure WAN or LAN interfaces. To configure interface parameters, have your interface network addresses and subnet mask information ready.

Configuring Ethernet Interfaces

- Step 1** In the following example, the system is being configured for an Ethernet LAN using IP. Respond to the prompts as follows, using your own addresses and mask at the setup prompts:

Configuring interface parameters:

```
Configuring interface Ethernet0/0:
  Is this interface in use? [no]: yes
  Configure IP on this interface? [no]: yes
  IP address for this interface: 1.1.1.10
  Number of bits in subnet field [0]:
  Class A network is 1.0.0.0, 0 subnet bits; mask is 255.0.0.0
```

- Step 2** Do not enable Internetwork Package Exchange (IPX) on this interface; IPX is not supported on the Cisco uBR7100 series CMTS:

```
Configure IPX on this interface? [no]: no
```

- Step 3** If additional Ethernet interfaces are available in your system, enter their configurations when you are prompted.

- Step 4** Save your settings to NVRAM. (See the [“Using the Setup Facility for Cable Interfaces”](#) section on page 2-17.)



Note You must always manually save the configuration settings to NVRAM whenever they are modified.

Configuring Synchronous Serial Interfaces

The synchronous serial interfaces are configured to allow connection to WANs through a CSU/DSU. Complete the following steps to configure the serial ports:

- Step 1** To configure serial port 0 enter **yes**:

```
Configuring interface Serial0/0:
  Is this interface in use? [no]: yes
```

- Step 2** Determine which protocols you want on the synchronous serial interface and enter the appropriate responses:

```
Configure IP unnumbered on this interface? [no]:
  IP address for this interface: 10.1.1.20
  Number of bits in subnet field [0]:
  Class A network is 10.0.0.0, 0 subnet bits; mask is 255.0.0.0
```

- Step 3** If additional synchronous serial interfaces are available in your system, enter their configurations when you are prompted.

- Step 4** Save your settings to NVRAM. (See the “Using the Setup Facility for Cable Interfaces” section on page 2-17.)



Note You must always manually save the configuration settings to NVRAM whenever they are modified.

The following sample display includes a continuous listing of all interface configuration parameters selected for Ethernet and synchronous serial interfaces. These parameters are shown in the order in which they appear on your console terminal.



Note Only one Ethernet and one synchronous serial interface are configured for this example.

Configuring interface parameters:

```
Configuring interface Ethernet0/0:
  Is this interface in use? [no]: yes
  Configure IP on this interface? [no]: yes
    IP address for this interface: 10.1.1.10
    Number of bits in subnet field [0]:
      Class A network is 10.0.0.0, 0 subnet bits; mask is 255.0.0.0
  Configure IPX on this interface? [no]:
  Configure AppleTalk on this interface? [no]: no
Configuring interface Serial0/0:
  Is this interface in use? [no]: yes
  Configure IP on this interface? [no]: yes
  Configure IP unnumbered on this interface? [no]:
    IP address for this interface: 10.1.1.20
    Number of bits in subnet field [0]:
      Class A network is 10.0.0.0, 0 subnet bits; mask is 255.0.0.0
  Configure IPX on this interface? [no]:
  Configure AppleTalk on this interface? [no]:
```

The following configuration command script was created:

```
hostname Router
enable secret 5 $1$u8z3$PMYY8em./8sszhzk78p/Y0
enable password wilma
line vty 0 4
password s
snmp-server community public
!
ip routing
no vines routing
no ipx routing
no appletalk routing
no apollo routing
no decnet routing
no xns routing
no clns routing
no bridge 1

! Turn off IPX to prevent network conflicts.
interface Ethernet0/0
no ipx network
interface Ethernet0/1
```

```

no ipx network
!
interface Ethernet0/0
ip address 1.1.1.10 255.0.0.0
no mop enabled
!
interface serial0/0
ip address 1.1.1.20 255.0.0.0
ip route-cache cbus
no keepalive
!
!
router igrp 15
network 1.0.0.0
!
end

```

Use this configuration? [yes/no]: **yes**

[OK]

Use the enabled mode 'configure' command to modify this configuration.

Press RETURN to get started!

Your Cisco uBR7100 series CMTS is now minimally configured and is ready to use. You can use the **setup** command if you want to modify the parameters after the initial configuration. To perform more complex configurations, use the **configure** command.

Configuring Using the Configuration Mode

You can configure the Cisco uBR7100 series CMTS manually if you prefer not to use the setup facility or AutoInstall. Complete the following:

-
- Step 1** Connect a console terminal to the console port on the I/O controller.
- Step 2** When asked if you want to enter the initial dialog, answer **no** to go into the normal operating mode of the router:
- ```
Would you like to enter the initial dialog? [yes]: no
```
- Step 3** After a few seconds, the user EXEC prompt (`Router>`) displays. Type **enable** to enter enable mode (configuration changes can only be made in enable mode):
- ```
Router> enable
```
- The prompt changes to the enable mode (also called privileged EXEC) prompt:
- ```
Router#
```
- Step 4** Enter the **configure terminal** command at the enable prompt to enter configuration mode from the terminal:
- ```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
```



Tip

To see a list of the configuration commands available to you, enter **?** at the prompt or type **help** while in configuration mode.

- Step 5** At the `Router(config)#` prompt, enter the **interface** *type slot/port* command to enter the interface configuration mode:

```
Router(config)# interface cable slot/port
Router(config-if)#
```

- Step 6** Set the downstream center frequency to reflect the digital carrier frequency of the downstream RF carrier (the channel) for the downstream port:

```
Router (config-int) # cable downstream frequency down-freq-hz
```



Note This command has no effect on the external upconverter. It is informational only.

- Step 7** Activate the downstream port on the cable modem card to support digital data transmission over the HFC network:

```
Router (config-int) # no shutdown
```

- Step 8** Enter the fixed center frequency for your downstream RF carrier in Hz and the port number:

```
Router (config-int) # cable upstream port frequency up-freq-hz
```



Note Be sure not to select an upstream frequency that interferes with that used for any other upstream application in your cable plant.

- Step 9** Repeat Step 8 for each upstream port on the cable modem card.

- Step 10** Activate the upstream port:

```
Router (config-int) # no cable upstream port shutdown
```

- Step 11** Repeat Step 10 to activate each port used on your cable modem card.

- Step 12** Exit to return to the configuration mode:

```
Router (config-if) # exit
Router (config) #
```

- Step 13** Enter the next interface to configure, following Step 6 through Step 12, or type **exit** to return to the enable mode.

```
Router (config) # exit
Router#
%SYS-5-CONFIG_I: Configured from console by console#
```

- Step 14** Save the configuration to NVRAM:

```
Router# copy running-config startup-config
```

Using the Setup Facility for Cable Interfaces

The setup facility creates an initial configuration. The basic management setup configures only enough connectivity for management of the system; the extended setup prompts you to configure each interface on the system.

To invoke the configuration facility, use the following command:

Router# setup

The following is the system configuration dialog:

```
Continue with configuration dialog? [yes/no]: yes
```

Interface Slot Numbering

For Cisco uBR7100 series components, the slot number is the chassis slot in which a port adapter or a cable interface card is installed. The logical interface number is the physical location of the interface port on a port adapter.

Numbers on a Cisco uBR7100 series router begin with 0 and are as follows:

- Slot 0—Fixed Fast Ethernet LAN interface
- Slot 1—Fixed cable modem card interface
- Slot 2—Not used
- Slot 3—Modular single-slot port adapter
- Slot 4—Not used
- Slot 5—Not used

Configuring the Interfaces

To configure the system, define the Cisco uBR7100 series interfaces, using the **interface type slot/port** command, where:

- **type**—Cable, FastEthernet, and installed port adapter.
- **slot**—Slot number in chassis. Slot numbers begin with 0.
- **port**—Port number on a cable modem card slot. Port numbers begin with 0.

Configuring the cable interface is particularly important because these components serve as the cable TV RF interfaces. Configuration involves the following for each interface:

- Setting the downstream center frequency for the card to reflect the digital carrier frequency of the downstream RF carrier (the channel) for that downstream port. To do this, enter the fixed center frequency for your downstream RF carrier in Hz:

```
Router (config-int) # cable downstream frequency down-freq-hz
```



Note Make note of the correct value for the cable modem card. This provides useful information for troubleshooting.

The digital carrier frequency is specified to be the center of a 6 or 8 MHz channel based on your channel plan. For NTSC channel plans, EIA channel 95 spans 90.00 to 96.00 MHz. The center frequency is 93.000 MHz which is the digital carrier frequency that should be configured as the downstream frequency.

**Tip**

The digital carrier frequency is not the same as the video carrier frequency. For EIA channel 95, the video carrier frequency is 91.250 MHz which is 1.75 MHz below the center frequency.

- Activating the downstream port on the cable modem card for data transmission over the HFC network, using the following command:

```
Router (config-int) # no shutdown
```

The particular downstream port LED should light.

- Setting the upstream frequency of your RF output to comply with the expected input frequency of your Cisco cable interface.

**Tip**

The valid range for a fixed upstream frequency is 5,000,000 to 65,000,000 Hz for the cable modem card. The valid range for the Cisco uBR7100 series is 5,000,000 to 42,000,000 Hz.

The cable interface will not operate until you either set a fixed upstream frequency or create and configure a spectrum group. Enter the fixed center frequency for your upstream RF carrier in Hz and specify a port number from 0 to 5:

```
Router (config-int) # cable upstream port frequency up-freq-hz
```

**Note**

Ensure that the selected upstream frequency does not interfere with the frequencies used for any other upstream applications in your cable plant.

- Enter an upstream RF carrier frequency for each upstream port on a cable modem.
- Activate the RF carrier on each upstream port to support data from cable modems or set top boxes on your network to the Cisco uBR7100 series CMTS. Enable upstream data traffic, using the following command:

```
Router (config-int) # no cable upstream port shutdown
```

The specified upstream port LED lights.

Enter the previous command for each upstream port that you wish to activate.

- Verify your settings using the following command:

```
Router# show running-config
```

- Save the configuration to nonvolatile random access memory (NVRAM) so that your settings are retained after a power cycle:

```
Router# copy running start
```

- Verify the upstream frequency, using the **show controllers cable slot/port upstream** command for the upstream port that you have just configured.
- Verify the downstream center frequency, using the **show controllers cable slot/port downstream** command for the downstream port that you have just configured.

Identifying the Cable Interface

The Cisco uBR7100 series routers feature a fixed cable interface at slot 1. On the Cisco uBR7111 and Cisco uBR7111E universal broadband routers, the cable interface supports one downstream modulator and one upstream demodulator. On the Cisco uBR7114 and Cisco uBR7114E universal broadband routers, the cable interface supports one downstream modulator and four upstream demodulators.

On all models, the cable interface has the following characteristics:

- The cable interface supports the following defaults: QAM-256 at 40 MBps downstream, and QAM-16 at 5 Mbps upstream.
- The card supports upstream channel widths of 200 kHz, 400 kHz, 800 kHz, 1.6 MHz, and 3.2 MHz.
- The card outputs +42 dBmV and +/- 2 dBmV.
- The downstream modulator has both an RF output, using the integrated upconverter, and an IF output, which must be connected to an external upconverter.



Note The Cisco uBR7111 and Cisco uBR7114 default to transmitting downstream signals to the integrated upconverter using a 44 MHz frequency. The Cisco uBR7111E and Cisco uBR7114E default to transmitting downstream IF signals to the integrated upconverter using the 36.125 MHz frequency.

The cable interface cards can be configured in a number of different upstream combinations based on the card used, your cable network, and the anticipated subscription and service levels. [Table 2-1](#) shows the DOCSIS and EuroDOCSIS data rates.

Table 2-1 DOCSIS and EuroDOCSIS Data Rates

Upstream Channel Width	Modulation Scheme	Baud Rate Sym/sec	Raw Bit Rate Mbit/sec
3.2 MHz	16 QAM QPSK	2.56 M	10.24 5.12
1.6 MHz	16 QAM QPSK	1.28 M	5.12 2.56
800 kHz	16 QAM QPSK	640 K	2.56 1.28
400 kHz	16 QAM QPSK	320 K	1.28 0.64
200 kHz	16 QAM QPSK	160 K	0.64 0.32

Cable Interface Card Slots

On Cisco uBR7100 series routers, the cable modem card is fixed and is always slot 1. To display information about a specific cable interface slot's downstream channel, use the **show interfaces cable** command with the CM card's slot number and downstream port number in the following format:

```
show interfaces cable slot/downstream-port [downstream]
```

Use the slot number and downstream port number to display information about a downstream interface. You can abbreviate the command to **sh int c**. The following example shows the display for upstream channel port 0 on a Cisco uBR7100 series router.

```
Router# sh int c 1/0

Cable1/0: Upstream 0 is up
  Received 9972 broadcasts, 6096 multicasts, 370221275 unicasts
  0 discards, 36137535 errors, 0 unknown protocol
  370237908 packets input, 2064921 uncorrectable
  29354454 noise, 0 microreflections
  Total Modems On This Upstream Channel : 56 (55 active)
  Default MAC scheduler
  Queue[Rng Polls] 0/64, fifo queuing, 0 drops
  Queue[Cont Mslots] 0/53, fifo queuing, 7 drops
  Queue[CIR Grants] 0/64, fair queuing, 0 drops
  Queue[BE Grants] 1/64, fair queuing, 0 drops
  Queue[Grant Shpr] 0/64, calendar queuing, 0 drops
  Reserved slot table currently has 0 CBR entries
  Req IEs 114588350, Req/Data IEs 0
  Init Mtn IEs 241758, Stn Mtn IEs 208872
  Long Grant IEs 300445295, Short Grant IEs 1924354
  Avg upstream channel utilization : 78%
  Avg percent contention slots : 20%
  Avg percent initial ranging slots : 1%
  Avg percent minislots lost on late MAPs : 0%
  Total channel bw reserved 0 bps
  CIR admission control not enforced
  Admission requests rejected 0
  Current minislot count : 9461304 Flag: 0
  Scheduled minislot count : 9462255 Flag: 0
```

To display information about a specific cable interface slot's upstream channel, use the **show interfaces cable** command. Include these CM card parameters:

- slot number
- downstream port number
- upstream port number

Use this format:

show interfaces cable *slot/downstream-port* [**upstream**] *upstream-port*

Use the slot number, downstream port number, and upstream port number to display information about an upstream interface. You can abbreviate the command to **sh int c**.

The following example shows the display for upstream channel port 0 in cable interface slot 3 of a Cisco uBR7100 series router that is turned up:

```
Router# sh int c 1/0 0

Cable1/0: Upstream 0 is up
  Received 3699 broadcasts, 0 multicasts, 28586 unicasts
  0 discards, 0 errors, 0 unknown protocol
  21817 packets error-free, 2371 corrected, 8097 uncorrectable
  0 noise, 0 microreflections
  CBR_queue_depth: [not implemented], ABR_queue_depth: [not implemented],
  UBR[1]_queue_depth: 0, UBR[2]_queue_depth: 0,
  UBR[3]_queue_depth: 0, POLLS_queue_depth: [not implemented]
  ADMIN_queue_depth: [not implemented]
  Last Minislot Stamp (current_time_base):190026 FLAG:1
  Last Minislot Stamp (scheduler_time_base):200706 FLAG:1
```

Mapping Interfaces and Physical Ports

Table 2-2 maps the cable interface card's interfaces and physical ports. The cards can be configured in a number of different upstream combinations.

Table 2-2 Interface to Port Mapping

Cisco uBR7100 Series	Cable Interface	Physical Ports
Cisco uBR7111	Cable 1/0	DS RF, DS IF, US0
Cisco uBR7111E	Cable 1/0	DS RF, DS IF, US0
Cisco uBR7114	Cable 1/0	DS RF, DS IF, US0, US1, US2, US3
Cisco uBR7114E	Cable 1/0	DS RF, DS IF, US0, US1, US2, US3

Identifying Port Adapter Slots

On the Cisco uBR7100 series universal broadband routers, two port adapter slots are available. Slot 0 is the fixed FastEthernet interface, and slot 3 is the modular port adapter. You can display information on a specific port adapter or all port adapters in the Cisco uBR7100 series router. To display information about all port adapter slots, use the **show interfaces** command. To display information about a specific port adapter slot, use the **show interfaces** command with the port adapter type and slot number in the format of **show interfaces [type slot/port]**.



Tip

If you abbreviate the command (**sh int**) and do not specify the port adapter type and slot number (or arguments), the system interprets the command as **show interfaces**. The system displays the status of all port adapters, all cable interface cards, and all ports.

Following is an example of how the **show interfaces** command displays status information (including the physical port adapter number) for each port adapter and cable interface card in the Cisco uBR7111:

```
FastEthernet0/0 is up, line protocol is up
  Hardware is DEC21140A, address is 0002.b9ff.7c00 (bia 0002.b9ff.7c00)
  Internet address is 1.7.35.1/16
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive not set
  Full-duplex, 100Mb/s, 100BaseTX/FX
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:01, output 00:00:04, output hang never
  (statistical information omitted)
FastEthernet0/1 is administratively down, line protocol is down
  Hardware is DEC21140A, address is 0002.b9ff.7c01 (bia 0002.b9ff.7c01)
  Internet address is 1.1.1.2/24
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
    reliability 252/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex, 100Mb/s, 100BaseTX/FX
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input never, output 23:55:58, output hang never
  (statistical information omitted)
Cable1/0 is up, line protocol is up
  Hardware is BCM3210 ASIC, address is 0002.b9ff.7c1c (bia 0002.b9ff.7c1c)
  Internet address is 2.35.1.1/16
```

```

MTU 1500 bytes, BW 27000 Kbit, DLY 1000 usec,
  reliability 255/255, txload 19/255, rxload 24/255
Encapsulation MCNS, loopback not set
Keepalive not set
ARP type: ARPA, ARP Timeout 04:00:00
Last input 00:00:02, output 00:00:00, output hang never
  (statistical information omitted)
Interface Cable1/0
Hardware is IMC11
BCM3210 revision=0x56B2
Upconverter info: Config status 0x4E, Dynamic Status 0x0
  Upconverter output is Enabled
  IF ALC is Enabled, Threshold capability is Enabled
  RF ALC is Enabled, Threshold capability is Enabled

Downstream Frequency 669.0000 MHz
  (statistical information omitted)

Cable1/0 Downstream is up
Frequency 669.0000 MHz, Channel Width 6 MHz, 256-QAM, Symbol Rate 5.360537 Msps
FEC ITU-T J.83 Annex B, R/S Interleave I=32, J=4
Downstream channel ID: 0
Cable1/0 Upstream 0 is up
Frequency 38.0000 MHz, Channel Width 3.200 MHz, 16-QAM Symbol Rate 2.560 Msps
Spectrum Group is overridden
SNR 30.8820 dB
  (statistical information omitted)

FastEthernet1/0 is up, line protocol is up
Hardware is DEC21140A, address is 0002.b9ff.7c28 (bia 0002.b9ff.7c28)
Internet address is 192.100.68.100/24
MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
  reliability 255/255, txload 1/255, rxload 1/255
Encapsulation ARPA, loopback not set
Keepalive not set
Full-duplex, 100Mb/s, 100BaseTX/FX
ARP type: ARPA, ARP Timeout 04:00:00
Last input 00:00:01, output 00:00:01, output hang never
  (statistical information omitted)

```

You can also use arguments such as the interface type (Ethernet, Fast Ethernet, ATM, serial, HSSI, Packet-over-SONET, and so forth) and the port address (slot/port) to display information about a specific port adapter interface only. The following example shows such a display:

```

R7732-01-uBR7111_Router# sh int f0/0
FastEthernet 1/0 is up, line protocol is up
Hardware is AmdFE, address is 0030.7bfa.a81c (bia 0030.7bfa.a81c)
Internet address is 111.0.1.18/30
MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
  reliability 255/255, txload 1/255, rxload 1/255
Encapsulation ARPA, loopback not set
Keepalive set (10 sec)
Full-duplex, 100Mb/s, 100BaseTX/FX
ARP type:ARPA, ARP Timeout 04:00:00
Last input 00:00:01, output 00:00:02, output hang never
Last clearing of "show interface" counters never
Queuing strategy:fifo
Output queue 0/40, 0 drops; input queue 0/75, 0 drops
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
  0 packets put, 230925 bytes
  Received 146107 broadcasts, 0 runts, 0 giants, 0 throttles
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
  0 watchdog

```

```

0 input packets with dribble condition detected
0 packets put, 284529 bytes, 0 underruns
0 output errors, 0 collisions, 10 interface resets
0 babbles, 0 late collision, 0 deferred
0 lost carrier, 0 no carrier
0 output buffer failures, 0 output buffers swapped out

```

**Note**

The interface type in the **show interfaces** command must match the actual interface type of the port adapter. For example, if you enter **sh int e 1/0** and a HSSI port adapter is actually in port adapter slot 1/0, the command returns an “invalid input” error.

**Tip**

At any time you can enter a question mark (?) for help. Use ctrl-c to abort the configuration dialog at any prompt. The default settings are enclosed in brackets '['].

```

Would you like to enter basic management setup? [yes/no]: no
First, would you like to see the current interface summary? [yes]:
Interface                IP-Address      OK? Method Status      Protocol
FastEthernet0/0          10.20.133.2     YES NVRAM  up
up
FastEthernet1/0          1.11.1.1        YES NVRAM  up
Cable1/0                 10.20.133.65   YES NVRAM  up

```

Configuring Global Parameters

- Step 1** Type this command: **Enter host name** [ishita-cmts]:
- Next, the enable secret is a password used to protect access to privileged EXEC and configuration modes. This password, after entered, becomes encrypted in the configuration.
- Step 2** Type this command: **Enter enable secret** [*Use current secret*]: aa
- Next, the enable password is used when you do not specify an enable secret password, with some older software versions, and some boot images.
- Step 3** Type this command: **Enter enable password** [rHoz]: bb
- Next, the virtual terminal password is used to protect access to the router over a network interface.
- Step 4** Type this command: **Enter virtual terminal password** [cc]:cc

The following system information displays.

```

Configure SNMP Network Management? [no]:
Configure IP? [yes]:
Configure IGRP routing? [yes]:
Your IGRP autonomous system number [1]:
Configure CLNS? [no]:
Configuring interface parameters:
Do you want to configure FastEthernet0/0 interface? [yes]:
Use the 100 Base-TX (RJ-45) connector? [yes]:
Operate in full-duplex mode? [no]:
Configure IP on this interface? [yes]: no
Do you want to configure Ethernet1/0 interface? [yes]: n
Do you want to configure Cable1/0 interface? [yes]:
Downstream setting frequency : 531000000
For cable upstream [0]
Shut down this upstream ? [yes/no]: no
Frequency : 33808000

```

```

Would you like to configure the DHCP server ? [yes/no]: yes
IP address for the DHCP server
[X.X.X.X]: 10.0.0.2
Configure IP on this interface? [no]: yes
IP address for this interface: 10.20.133.65
Subnet mask for this interface [255.0.0.0] : 255.255.255.248
Class A network is 10.0.0.0, 29 subnet bits; mask is /29

```

The following configuration command script is created:

```

interface Cable1/0
ip address 10.20.133.65 255.255.255.248
no ip mroute-cache
no keepalive
cable insertion-interval 500
cable downstream annex B
cable downstream modulation 64qam
cable downstream interleave-depth 32
cable downstream frequency 531000000
cable upstream 0 frequency 33808000
cable upstream 0 power-level 0
no cable upstream 0 shutdown
cable helper-address 10.0.0.2

```


Note

For modems to acquire an IP address, they must have direct access to DHCP, TFTP, or TOD servers, or have a static route set.

Saving Your Configuration Settings

To store the configuration or changes to your startup configuration in NVRAM, enter the **copy running-config startup-config** command at the `Router#` prompt:

```
Router# copy running-config startup-config
```

This command saves the configuration settings you set using configuration mode, the setup facility, or AutoInstall.


Tip

If you do not save your settings, your configuration will be lost the next time you reload the router.

Checking Your Settings and Reviewing Your Configuration Changes

You can check your settings and review any changes to your configuration using various software commands.

To view information specific to the hardware and cable interface configuration on your Cisco uBR7100 series CMTS, use **show** commands.

To verify the downstream center frequency:

```
Router# show controllers cable slot/port downstream
```

To verify the current value of an upstream port frequency:

```
Router# show controllers cable slot/port upstream
```

To check the value of the settings you entered, enter the **show running-config** command at the Router# prompt:

```
Router# show running-config
```

To review changes you make to the configuration, use the EXEC **show startup-config** command to display the information stored in NVRAM.

Where to Go Next

After you have minimally configured the Cisco uBR7100 series CMTS, refer to [Chapter 3, “Configuring the Cisco Cable Interface”](#) for more advanced configuration instructions. Also refer to [Chapter 5, “Troubleshooting the System”](#) for information on troubleshooting your initial configuration.

The Cisco IOS software running the Cisco uBR7100 series CMTS contains extensive features and functionality. The effective use of these features is easier if you have more information at hand. For additional documentation about configuring the Cisco uBR7100 series CMTS and system capabilities, refer to resources cited in the [“Preface”](#). For instructions on configuration of port adapters, refer to the respective installation document that shipped with the port adapter.

