



Multipoint Wireless Support for the Cisco uBR7200 Series Universal Broadband Router

The Cisco broadband fixed wireless multipoint system is an integrated solution consisting of a headend, or base station, and multiple subscriber units. This document describes the fixed wireless multipoint feature (headend) support for the Cisco uBR7200 series universal broadband router. This document includes the following sections:

- Feature Overview, page 1
- Supported Platforms, page 5
- Supported Standards, MIBs, and RFCs, page 5
- Prerequisites, page 5
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- Monitoring and Maintaining Multipoint Wireless Configurations, page 12
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Feature Overview

This document describes the multipoint headend system. For a description of the subscriber unit system, refer to the *Multipoint Wireless Support for the Cisco 2600 and 3600 Series Routers* document.

Multipoint Headend Components

Router

The Cisco uBR7200 series are designed for two-way transmission of digital data using either coaxial cable or broadband fixed wireless signals. These routers support IP routing with a wide variety of protocols and any combination of Ethernet, Fast Ethernet, High-Speed Serial Interface (HSSI), serial, and Asynchronous Transfer Mode (ATM) media. Network interfaces reside on port adapters that provide the connection between the router and external networks. Cable or wireless interfaces reside on modem cards and provide the connection to cable or wireless networks.

Other features include:

- Online insertion and removal (OIR)—Add, replace, or remove a port adapter and modem cards without interrupting the system or entering any console commands
- Downloadable software—Load new images into Flash memory remotely, without having to physically access the router

For further information regarding the Cisco uBR7200 series, including detailed installation and configuration instructions, refer to the *Cisco uBR7200 Series Universal Broadband Router Installation and Configuration Guide*.

Wireless Modem Card

The wireless modem card installs in a modem card slot of a Cisco uBR7200 series. It is configured through the router's system console or via the CiscoView network management system. The wireless modem card provides the control and data interface to the system's digital motherboard and the radio frequency (RF) subsystem in the wireless transverter. It also provides the up/down conversion from baseband to intermediate frequency (IF).

The wireless modem card consists of the following components:

- Digital motherboard
- IF analog board
- 10-MHz input connection for external reference clock signal (external reference clock is optional)
- 10-MHz output connection for forwarding optional external reference clock signal to another wireless modem card
- Monitor connections for monitoring the power feed panel connections (main and diversity)
- Power feed panel connections (main and diversity)
- Light-emitting diodes (LEDs) that provide a visual indication of the state of the modem card

For further information regarding the wireless modem card, including detailed installation and configuration information, refer to the *Cisco uBR7200 Series Router Multipoint Wireless Modem Card and Subsystem Installation* document.

Power Feed Panel

The power feed panel serves as an interconnection device between the wireless modem card, the wireless transverter, and a –48 VDC power supply. The main purpose of this unit is to provide DC power to the system, provide control signals to the wireless transverter, and transmit and receive IF signals to and from the transverters. In addition, the unit contains circuit breakers for the DC power.

The power feed panel consists of the following components:

- Coaxial cable connection ports to the wireless modem card on the front panel
- Power ON/OFF switches on the front panel, with LED power indicators
- Coaxial cable connection ports to the wireless transverter on the rear panel, with LED power indicators
- DC power supply terminal blocks on the rear panel

At least one power feed panel is required for each installation. Each power feed panel supports a maximum of four wireless transverters.

For further information regarding the power feed panel, including detailed installation information, refer to the *Cisco uBR7200 Series Router Multipoint Wireless Modem Card and Subsystem Installation* document.

Wireless Transverter

The ruggedized wireless transverter is the outdoor data interface to the indoor subsystems. It provides up/down conversion from IF to RF frequencies.

The wireless transverter consists of the following components:

- RF head
- Connector port for IF input, power, and control signal
- Duplexer assembly with antenna connection

For further information regarding the wireless transverter, including detailed installation information, refer to the *Cisco uBR7200 Series Router Multipoint Wireless Modem Card and Subsystem Installation* document.

Benefits

The broadband fixed wireless multipoint system provides:

- Fast, easy deployment
- Flexibility—Various interfaces to the host routers and numerous network deployment plans
- End-to-end Cisco IOS network, enabling multiservice security, multimedia, and management support
- Scalable network growth through the addition of more cells or sectors
- Full-duplex data rates of up to 22 Mbps
- Non-line-of-sight (Non-LOS) Vector Orthogonal Frequency Division Multiplexing (VOFDM) technology, enabling greater service coverage

Related Features and Technologies

The point-to-point wireless router system.

Related Documents

Headend documents:

- *Cisco uBR7200 Series Multipoint Wireless Modem Card & Subsystem Installation*
- *Cisco Multipoint Headend Wireless Transverter Duplexer Replacement Instructions*
- *Cisco Multipoint Headend Power Feed Panel Replacement Instructions*
- *Cisco Multipoint Headend Wireless Transverter Replacement Instructions*
- *Cisco Wireless Transverter Hail Shield Installation Instructions*

Subscriber-unit documents:

- *Multipoint Wireless Support for the Cisco 2600 and 3600 Series Routers*
- *Cisco 2600 Series Hardware Installation Guide*
- *Software Configuration Guide* (for Cisco 3600 series and Cisco 2600 series routers)
- *Cisco Network Modules Hardware Installation Guide* (for Cisco 3600 series and Cisco 2600 series routers)

Supported Platforms

uBR7200 series

Supported Standards, MIBs, and RFCs

Standards

DOCSIS 1.0 and 1.0+. The DOCSIS 1.0+ implementation is DOCSIS 1.0 with quality-of-service (QoS) support.

MIBs

This feature is supported by Cisco uBR7200 series MIBs and DOCSIS MIBs enhancing the manageability of customer infrastructures.

To obtain lists of MIBs supported by platform and Cisco IOS release and to download MIB modules, go to the Cisco MIB web site on Cisco Connection Online (CCO) at <http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>.

RFCs

No new or modified RFCs are supported by this feature.

Prerequisites

Multipoint wireless support

Configuration Tasks

This section discusses the following configuration tasks for the multipoint fixed wireless feature:

- Multipoint CLI Commands Classification
- Overriding the Default Microcode Path
- Configuring IF Loopback (Optional)
- Configuring RF Loopback (Optional)
- Setting the Power Levels and Frequencies
- Configuring the Automatic Level Control (ALC)
- Configuring the Modulation Profile for a Wireless Link

Multipoint CLI Commands Classification

The multipoint headend system CLI commands are classified as follows. Click on the link to go to the list of commands under each class.

- [Startup Commands](#)
- [Installation and Configuration Commands](#)
- [Verification Commands](#)
- [Operating Commands](#)
- [Monitoring Commands](#)
- [Troubleshooting Commands](#)

**Note**

This classification is made to help the user in chunking the commands. Some of the commands can be listed under any of these groups.

Overriding the Default Microcode Path

The wireless line card requires external microcode images in order to operate. The Cisco IOS software has a default file path where it looks to find the microcode and the microcode version. For routers that are configured with line cards at the factory, the path and version of the microcode image in flash memory matches the default setting and allows the line card to come up without any additional configuration. However, you may want to override the default microcode path, for example, to upgrade your software to the latest release. Use the following steps to change the path for the microcode.

	Command	Purpose
Step 1	Router# <code>dir flash</code>	Displays the content of the Flash memory.
Step 2	Router# <code>show microcode</code>	Displays the default path for the microcode.
Step 3	Router# <code>config t</code>	Enters the global configuration mode.
Step 4	Router(config)# <code>microcode cwrhe bundle-path</code>	Specifies the a new path for the headend microcode bundle.
Step 5	Router(config)# <code>end</code>	Exits the global configuration mode and enters the EXEC mode.
Step 6	Router# <code>show microcode</code>	Displays the specified path for the microcode.
Step 7	Router# <code>microcode reload cwrhe</code>	Loads the microcode onto the line card.
Step 8	Router# <code>copy running-config startup-config</code>	Saves the path for the microcode so that the microcode is loaded from the new path the next time the router is rebooted.

Configuring IF Loopback (Optional)

An IF loopback confirms that the hardware is seated properly in the chassis and that the analog and signal processing portions of the wireless modem card are functioning as expected. Loopback does not test forward error corrections (FEC) and MAC-layer interface of the line card; other tests must be done for these portions of the line card. Each receive path must be tested individually when there are two antennas employed.

Use the following commands to execute an IF loopback. Specifying these commands shuts down the radio link and initiates the IF loopback.

	Command	Purpose
Step 1	Router(config-if)# <code>shut</code>	Stops the interface.
Step 2	Router(config-if)# <code>loopback local if main 2</code>	Configures the IF to loop the lower half of the channel.
Step 3	Router(config-if)# <code>no shut</code>	Brings up the loopback mode.
Step 4	Router(config-if)# <code>shut</code>	Stops the interface.
Step 5	Router(config-if)# <code>loopback local if main 3</code>	Configures the IF to loop the upper half of the channel.
Step 6	Router(config-if)# <code>no shut</code>	Brings up the loopback mode.
Step 7	Router(config-if)# <code>shut</code>	Stops the interface.

	Command	Purpose
Step 8	Router(config-if)# no loopback	Removes the loopback commands used up to this point.
Step 9	Router(config-if)# no shut	Establishes link.

If a second antenna is employed, its receive path must also be tested. Use the following commands to configure the second antenna. Issue the **show running-configuration** command to see the IF configuration.

	Command	Purpose
Step 1	Router(config-if)# shut	Stops the interface.
Step 2	Router(config-if)# loopback local if diversity 2	Configures the IF to loop the lower half of the channel for antenna 2.
Step 3	Router(config-if)# no shut	Brings up the loopback mode.
Step 4	Router(config-if)# shut	Stops the interface.
Step 5	Router(config-if)# loopback local if diversity 3	Configures the IF to loop the upper half of the channel for antenna 2.
Step 6	Router(config-if)# no shut	Brings up the loopback mode.
Step 7	Router(config-if)# shut	Stops the interface.
Step 8	Router(config-if)# no loopback	Removes the loopback commands used up to this point.
Step 9	Router(config-if)# no shut	Establishes link.

Configuring RF Loopback (Optional)

An RF loopback confirms that the wiring to the transverter is correct, that communication has been established from the line card to the transverter, and that the transverter is operating correctly. (It does not test the duplexer, which is the final stage before the signal is sent to the antenna.) Also, loopback does not test forward error corrections (FEC) and MAC-layer interface of the line card; other tests must be done for these portions of the line card. Because there is only one transmit path, the path to each transverter must be tested separately. Use the following commands to configure the RF loopback.

	Command	Purpose
Step 1	Router(config-if)# shut	Stops the interface.
Step 2	Router(config-if)# loopback local rf main 2	Configures the RF to loop the lower half of the channel.
Step 3	Router(config-if)# no shut	Brings up the loopback mode.
Step 4	Router(config-if)# shut	Stops the interface.
Step 5	Router(config-if)# loopback local rf main 3	Configures the RF to loop the upper half of the channel.
Step 6	Router(config-if)# no shut	Brings up the loopback mode.
Step 7	Router(config-if)# shut	Stops the interface.

	Command	Purpose
Step 8	Router(config-if)# loopback local rf diversity 2	Configures the RF to loop the lower half of the channel for antenna 2. Note that this command is issued only if a second antenna is used.
Step 9	Router(config-if)# loopback local rf diversity 3	Configures the RF to loop the upper half of the channel for antenna 2. Note that this command is issued only if a second antenna is used.
Step 10	Router(config-if)# no shut	Brings up in loopback mode.
Step 11	Router(config-if)# shut	Stops the interface.
Step 12	Router(config-if)# no loopback	Removes any loopback commands used up to this point.
Step 13	Router(config-if)# no shut	Establishes link.

Issue the **show running-configuration** command to see the RF configuration.

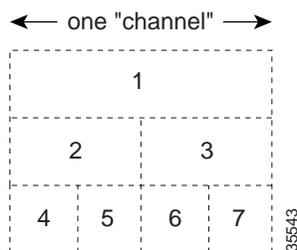
Configuring the Modulation Profile for a Wireless Link

The modulation profile describes the physical layer configuration of a wireless channel. The correct settings to use are the result of extensive site planning and quality-of-service models. The specified settings are stored in the router as profiles. These profile settings are entered in the router only once, but can be applied to multiple line cards in the router.

	Command	Purpose
Step 1	Router# show radio capability modulation-profile int radio slot/port	Displays the modulation profiles supported by the radio card installed in a particular <i>slot/port</i> .
Step 2	Router# configure terminal	Enables the global interface configuration mode.
Step 3	Router(config)# radio modulation-profile p bandwidth width throughput x.y mulipath-robust high burst-length medium	Creates a modulation profile.
Step 4	Router(config)# end	Exits the interface configuration mode and enters the EXEC mode.
Step 5	Router# show radio modulation-profile	Displays the modulation-profile configuration settings that the user specified.
Step 6	Router# configure terminal	Enables the global interface configuration mode.
Step 7	Router(config)# interface radio slot/port	Enters radio interface configuration mode.
Step 8	Router(config-if)# radio upstream usport subchannel sn modulation-profile p	Applies the modulation profile to an upstream port.

Setting the Power Levels and Frequencies

The power levels must be set correctly to ensure correct operation and compliance with the governing regulatory bodies (such as the FCC). After the power settings have been determined, use the following commands to configure the router. Refer to the following subchannel map as a reference for the subchannel assignments:



Downstream Channel

	Command	Purpose
Step 1	Router(config-if)# radio transmit-power <i>power-level</i>	Sets the upstream transmit-power to <i>power</i> in dBm.
Step 2	Router(config-if)# radio downstream frequency <i>freq</i> width <i>width</i>	Sets frequency and bandwidth for the downstream channel.
Step 3	Router(config-if)# radio downstream subchannel <i>sc</i> modulation-profile <i>p</i>	Sets the subchannel and modulation-profile assignment for the downstream channel.
		 <p>Note This command specifies the center frequency and width of the basic hardware channel. The downstream channel itself can be full, one-half, or one-quarter of this bandwidth. For example, the only basic channel bandwidth that is supported by the initial hardware release is 6.0 MHz.</p>

Upstream Channel

	Command	Purpose
Step 1	Router(config)# radio upstream frequency <i>freq</i> width <i>width</i>	Sets the upstream frequency and bandwidth.  Note The <i>width</i> parameter specifies the bandwidth for the upstream channel group (the basic hardware channel). The <i>freq</i> parameter specifies the center frequency for this group of upstream channels. For example, the only basic channel width that is supported by the initial hardware release is 6.0 MHz.
Step 2	Router(config-if)# radio upstream usportnum <i>usportnum</i> subchannel <i>sn</i> modulation-profile <i>p</i>	Sets the subchannel and modulation-profile assignment for the upstream channel.  Note The bandwidth of the subchannel must match the bandwidth of the modulation-profile.
Step 3	Router(config)# radio transmit-power <i>power-level</i>	Sets the downstream transmit power to <i>power</i> in dBm.
Step 4	Router(config-if)# radio upstream usportnum <i>usportnum</i> target-receive-power <i>power-level</i>	Sets the target receive power in dBm for the upstream port. The <i>usportnum</i> field specifies the upstream port number. The target receive power must be set for each upstream port.
Step 5	Router(config-if)# radio upstream usportnum <i>usportnum</i> shutdown	Shuts down the upstream channel.

Configuring the Automatic Level Control (ALC)

The automatic level control (ALC) module governs the individual transmit power levels of all the subscriber units. The purpose of ALC is to ensure that the target receive power at the headend is maintained over time by taking power measurements of all the subscribers many times per second. Taking power measurements in small intervals results in better resilience to the fading environment, but it consumes more upstream bandwidth. ALC can be disabled, but this is not recommended because it results in poor upstream link performance. The current system allows only one interval setting for an entire sector. The default interval is 96 ms.

	Command	Purpose
Step 1	Router# configure terminal	Enables the global interface configuration mode.
Step 2	Router(config)# interface radio <i>slot/port</i>	Specifies the line card to be configured. In this example, the line card installed in a specific <i>slot/port</i> number.
Step 3	Router(config-if)# radio alc interval <i>interval</i>	Configures the ALC interval for the sector at a specified <i>interval</i> value.

	Command	Purpose
Step 4	Router(config-if)# end	Exits the interface configuration mode and get to the EXEC mode.
Step 5	Router# show interface radio slot/port alc	Displays the ALC setting that you specified.

Verifying the Wireless Modem Card Configuration

- Step 1** Enter the **show running-configuration** command in privileged EXEC mode to display the configuration currently in effect on the Cisco uBR7200 series.
- Step 2** Enter the **show startup-configuration** command in privileged EXEC mode to display the system startup configuration.

For a complete list of commands to verify the installation and configuration of your fixed wireless multipoint system, see the “Verification Commands” section.

Monitoring and Maintaining Multipoint Wireless Configurations

This section describes the **clear** and **show** commands that are used to monitor and maintain the multipoint fixed wireless system. For a complete list of commands to monitor and maintain your fixed wireless multipoint system, see “Monitoring Commands” under the command reference section. For the syntax and description of a command, refer to the “Command Reference” section of this document.

Command	Purpose
Router# clear radio flap-list	Clears the current radio flap-list entries for a specific subscriber unit or for all subscriber units.
Router# clear radio link-metrics	Clears the link metrics settings.
Router# clear radio subscriber counters	Clears the counters for a radio modem or all radio modems in the Station Maintenance List.
Router# clear radio subscriber reset	Resets the radio modem or all radio modems on the network.
Router# show controllers radio downstream	Displays downstream port information for a wireless modem card.
Router# show controllers radio if	Displays the IF hardware information for the specified radio interface.
Router# show controllers radio rf	Displays the RF hardware information for the specified radio interface.
Router# show controllers radio upstream	Displays upstream port information for a wireless modem card.
Router# show interfaces radio metrics	Displays the parameters measured during the operation of the radio link.
Router# show interface radio accounting	Displays radio accounting information for a wireless modem card.

Command	Purpose
Router# <code>show interface radio alc</code>	Displays the automatic level control (ALC) and power ranging configuration information for the downstream.
Router# <code>show interface radio downstream</code>	Displays downstream port information for a wireless modem card.
Router# <code>show interface radio hist-data</code>	Displays histogram data.
Router# <code>show interface radio hist-spec</code>	Displays histogram specifications.
Router# <code>show interface radio led</code>	Displays the status of light-emitting diodes (LEDs) on the wireless modem card and the events related to the major and minor LEDs.
Router# <code>show interface radio ranging</code>	Displays ranging information.
Router# <code>show interface radio rf-meas-interval</code>	Displays the intervals of the ambient noise and the calibration noise measurements of the radio card for the specified slot and downstream port numbers.
Router# <code>show interface radio sid</code>	Displays information by service identifier (SID) about each subscriber unit on the network.
Router# <code>show interface radio snap-data</code>	Displays the data captured for the snapshot specification.
Router# <code>show interface radio snap-spec</code>	Displays the configured snapshot information.
Router# <code>show interface radio thresholds</code>	Displays the set of currently configured thresholds on the radio modem card.
Router# <code>show interface radio tl-data</code>	Displays the timelines data collected for the identified specifications.
Router# <code>show interface radio tl-spec</code>	Displays the details of the currently configured timeline specifications.
Router# <code>show interface radio upstream</code>	Displays upstream port information for a wireless modem card.
Router# <code>show interface radio zero-burst</code>	Displays zero-burst information for the downstream port of a wireless modem card.
Router# <code>show radio device</code>	Displays the access group information for the subscriber unit or the host behind the subscriber unit.
Router# <code>show radio errors</code>	Displays error details for the radio interface.
Router# <code>show radio flap-list</code>	Displays the radio flap-list of a wireless modem card.
Router# <code>show radio capability modulation-profile</code>	Displays the modulation profiles supported by the radio linecard.
Router# <code>show radio modulation-profile</code>	Displays modulation profile information for a wireless modem card that the user specified.
Router# <code>show radio privacy kek</code>	Displays the key encryption life-time and grace-time values that have been set.

Command	Purpose
Router# <code>show radio privacy tek</code>	Displays the traffic encryption life-time and grace-time values that have been set.
Router# <code>show radio qos profile</code>	Displays quality-of-service (QoS) profile and the configuration information for the profile.
Router# <code>show radio subscriber</code>	Displays information about a wireless modem card that is on the network.

Configuration Examples

This section provides the following examples for configuring the multipoint headend wireless modem car:

- RF-RF Link Configuration
- Downstream Channel Configuration
- Upstream Channel Configuration
- Modulation Profiles Configurations

RF-RF Link Configuration

The following is an example of RF-RF link configuration:

```
interface Radio3/0 multipoint
ip address 7.7.7.1 255.255.255.0
radio cable-loss auto
radio transmit-power 34
radio upstream frequency 2503000 width 6.0
radio upstream 0 subchannel 2 modulation-profile 8
no radio upstream 0 shutdown
radio upstream 1 shutdown
radio upstream 2 shutdown
radio upstream 3 shutdown
radio downstream frequency 2545000 width 6.0
radio downstream subchannel 2 modulation-profile 1
```

Downstream Channel Configuration

The following is an example of downstream channel configuration:

```
radio transmit-power 31
radio downstream frequency 2653000 width 6.0
radio downstream subchannel 4 modulation-profile 10
```

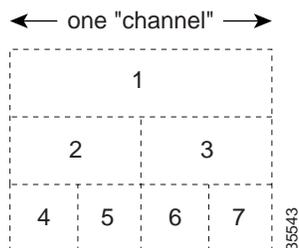
Upstream Channel Configuration

The following is an example of upstream channel configuration:

```
radio upstream frequency 2587000 width 6.0
radio upstream 0 subchannel 4 modulation-profile 14
radio upstream 0 target-receive-power -72
no radio upstream 0 shutdown
radio upstream 1 subchannel 5 modulation-profile 14
radio upstream 1 target-receive-power -72
no radio upstream 1 shutdown
radio upstream 2 subchannel 6 modulation-profile 14
radio upstream 2 target-receive-power -72
no radio upstream 2 shutdown
radio upstream 3 subchannel 7 modulation-profile 14
radio upstream 3 target-receive-power -72
no radio upstream 3 shutdown
```

Splitting an upstream channel

The following steps show how to split an upstream channel into two smaller upstream channels. In this example, a 3-MHz upstream (upstream 0, subchannel 2) is split into two 1.5-MHz upstreams, using the following commands. Refer to the following subchannel map as a reference for the subchannel assignments:



Command	Purpose
Router(config-if)# no radio upstream 0 subchannel	Removes the subchannel assignment from upstream port 0.
Router(config-if)# radio upstream 0 subchannel 4 modulation-profile 7	Assigns upstream port 0 to subchannel 4 using modulation profile 7, which must be a 1.5-MHz modulation profile.
Router(config-if)# radio upstream 1 subchannel 5 modulation-profile 7	Assigns upstream 1 to subchannel 5, using modulation profile 7.
Router(config-if)# no radio upstream 0 shutdown	Enables upstream 0.
Router(config-if)# no radio upstream 1 shutdown	Enables upstream 1.

Modulation Profiles Configurations

The following are examples of modulation profiles:

```
radio modulation-profile 1 bandwidth 3.0 throughput 6.6 multipath-robustness high
burst-length medium
radio modulation-profile 2 bandwidth 3.0 throughput 8.6 multipath-robustness high
burst-length medium
radio modulation-profile 3 bandwidth 3.0 throughput 4.4 multipath-robustness high
burst-length medium
```

Command Reference

This section documents the new commands associated with the fixed wireless multipoint feature. All other commands used with this feature are documented in the *Cisco IOS Release 12.1* command reference publications. The commands are classified into the following groups:

- Startup Commands
- Installation and Configuration Commands
- Verification Commands
- Operating Commands
- Monitoring Commands
- Troubleshooting Commands

**Note**

This classification is created to help the user in chunking the commands. Some of the commands can be listed under any of these groups.

Startup Commands

Use the following commands to startup your fixed wireless multipoint headend system. Note that these commands are not specific to this feature; they are Cisco IOS generic commands, and their syntax can be found in the command reference documentation for *Cisco IOS Release 12.1*, available on CCO and the Documentation CD-ROM.

- **show running-configuration**
- **show start-up configuration**
- **shut**
- **write**

Installation and Configuration Commands

Use the following commands to install and configure your fixed wireless multipoint headend system:

- **loopback**
- **microcode reload**
- **radio arp**
- **radio cable-loss**
- **radio downstream annex B**
- **radio downstream frequency**
- **radio downstream subchannel modulation-profile**
- **radio helper-address**
- **radio insertion-interval**
- **radio interface radio rf-update duplexer**
- **radio modulation-profile**
- **radio receive-antennas**

- **radio self-test**
- **radio source-verify**
- **radio transmit-power**
- **radio upstream data-backoff**
- **radio upstream description**
- **radio upstream frequency**
- **radio upstream range-backoff**
- **radio upstream shutdown**
- **radio upstream subchannel**
- **radio upstream target-receive-power**

Verification Commands

Use the following commands to verify your installation and configuration of the fixed wireless multipoint headend system:

- **show controllers radio downstream**
- **show controllers radio if**
- **show controllers radio rf**
- **show controllers radio upstream**
- **show interface radio alc**
- **show interface radio downstream**
- **show interface radio ranging**
- **show interface radio upstream**
- **show radio capability modulation-profile**
- **show radio modulation-profile**

Operating Commands

After you have installed, configured, and verified your fixed wireless multipoint headend system, use the following commands to operate your system:

- **clear radio flap-list**
- **clear radio link-metrics**
- **clear radio subscriber counters**
- **clear radio subscriber reset**
- **pppoe enable**
- **pppoe-forwarding**
- **pppoe forwarding default-qos-level**
- **pppoe forwarding group**
- **pppoe su-mac**
- **pppoe tag**

- **radio alc**
- **radio downstream rate-limit**
- **radio ip-broadcast-echo**
- **radio ip-multicast-echo**
- **radio privacy kek grace-time**
- **radio privacy kek life-time**
- **radio privacy mandatory**
- **radio privacy tek grace-time**
- **radio privacy tek life-time**
- **radio proxy-arp**
- **radio qos permission**
- **radio qos profile**
- **radio ra-backoff**
- **radio relay-agent-option**
- **radio rf-meas-interval ambient**
- **radio rf-meas-interval calibration**
- **radio shared-secret**
- **radio upstream admission-control**
- **radio upstream rate-limit**
- **show interface radio rf-meas-interval**
- **show interface radio zero-burst**
- **show radio privacy kek**
- **show radio privacy tek**
- **show radio qos profile**

Monitoring Commands

Use the following commands to monitor and maintain your fixed wireless multipoint headend system:

- **radio flap-list aging**
- **radio flap-list insertion-time**
- **radio flap-list miss-threshold**
- **radio flap-list size**
- **radio metrics-threshold-channel**
- **radio metrics-threshold-su**
- **radio threshold**
- **show interfaces radio metrics**
- **show interface radio accounting**
- **show interface radio led**

- **show interface radio sid**
- **show interface radio thresholds**
- **show radio device**
- **show radio errors**
- **show radio flap-list**
- **show radio subscriber**

Troubleshooting Commands

Use the following commands to troubleshoot your fixed wireless multipoint headend system:

- **ping docsis**
- **radio hist-display**
- **radio histogram**
- **radio interface radio hist-clear**
- **radio interface radio hist-start**
- **radio interface radio hist-stop**
- **radio interface radio tl-clear**
- **radio interface radio tl-start**
- **radio interface radio tl-stop**
- **radio snapshot**
- **radio timeline**
- **show controllers radio**
- **show interface radio hist-data**
- **show interface radio hist-spec**
- **show interface radio snap-data**
- **show interface radio snap-spec**
- **show interface radio tl-data**
- **show interface radio tl-spec**

clear radio flap-list

To clear the current radio flap list entries for a specific subscriber unit or for all subscriber units, use the **clear radio flap-list EXEC** command.

clear radio flap-list [*MAC-address* | **all**]

Syntax Description	<i>MAC-address</i>	Specifies the MAC address to clear the flap-list entries for a specific wireless modem card.
	all	Clears the entries for all the wireless modems in the flap-list.

Defaults No default behavior or values.

Command Modes EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines When using this command, make sure that:

- You are in global configuration mode when you enter this command.
- You have recorded and analyzed all of the flapping activity on the radio modem before you clear the flap list.

Examples The following example shows how to clear the entries in the radio flap list for the subscriber unit with a specific MAC address:

```
CMTS01(config)# clear radio flap-list 0010.7b6b.5d1d
```

Related Commands	Command	Description
	radio flap-list aging	Specifies the number of days to record and retain flapping activity on a radio subscriber unit in the flap list table.
	radio flap-list insertion-time	Sets the radio flap-list insertion time.
	radio flap-list miss-threshold	Sets the miss-threshold for recording a flap-list event.
	radio flap-list size	Specifies the maximum number of radio subscriber units to be reported in the radio flap-list table.
	show radio flap-list	Displays the radio flap-list of a wireless modem card.

clear radio link-metrics

To clear link metrics settings, use the **clear radio link-metrics** EXEC command.

clear radio *slot/port* link-metrics

Syntax Description	<i>slot/port</i>	The slot and port address.
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Defaults	No default behavior or values.	
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Command Modes	EXEC	
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Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines	Make sure that you record and analyze the link-metrics data before executing this command.
-------------------------	--

Examples	The following example shows how to clear all radio link-metrics details:
-----------------	--

```
Router# clear radio 6/0 link-metrics
```

Related Commands	Command	Description
	show interfaces radio metrics	Displays the parameters measured during the operation of the radio link.
	show interface radio metrics-threshold	Displays the current link-metrics configuration thresholds for a radio modem.

clear radio subscriber counters

To clear the counters for a radio modem or all radio modems in the Station Maintenance List, use the **clear radio subscriber counters EXEC** command.

clear radio subscriber [*address* / **all**] **counters**

Syntax Description		
	<i>address</i>	Clears the counters in the Station Maintenance List for the subscriber unit with a specific IP address or MAC address.
	all	Clears the counters in the Station Maintenance List for all subscriber units.

Defaults No default behavior or values.

Command Modes EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines Make sure that you record and analyze the data before executing this command.

Examples The following example shows how to clear the flapping counters for all the subscribers that are on the network:

```
Router# clear radio subscriber all counter
```

Related Commands	Command	Description
	clear radio subscriber reset	Removes subscribers from the Station Maintenance List.
	show radio subscriber	Displays information about a wireless modem card that is on the network.

clear radio subscriber reset

To remove a radio modem or all radio modems from the Station Maintenance List and reset the radio modem or all radio modems on the network, use the **clear radio subscriber reset** EXEC command.

clear radio [*address* / **all**]

Syntax Description		
	<i>address</i>	Removes the subscriber unit with a specific IP or MAC address from the Station Maintenance List.
	all	Removes all subscriber units from the Station Maintenance List.

Defaults No default behavior or values.

Command Modes EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines Make sure that you record and analyze the data before you execute this command.

Examples The following example shows how to remove all the subscribers from the Station Maintenance List:

```
Router# clear radio subscriber all reset
```

Related Commands	Command	Description
	clear radio subscriber counter	Clears flapping counters for the subscribers.

loopback

To place the specified module in loopback mode, use the **loopback** interface configuration command. To remove the loopback specification use the **no** form of this command.

loopback local [*module*] [**main** | **diversity**] **subchannel**

no loopback [**local** *module*]

Syntax Description		
local	(Optional)	Specifies that the module is local.
<i>module</i>		Specifies the type of module: { fir if rf }
main diversity		Specifies the main or the diversity (backup) antenna.
subchannel	[2 3]	Specifies the subchannel numbers.

Defaults **no loopback**

Command Modes Interface configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines If you perform a loopback of the RF module while the transverter is attached to an antenna, some transmit power is radiated. Therefore, it is extremely important that you set the transmit frequency to your assigned and licensed band frequency. If the transverter is not attached to an antenna, attach an RF termination device to the duplexer port.

Examples The following example shows how to initiate a local RF loopback on the main antenna with the lower half of the subchannel:

```
Router(config-if)# loopback local rf main 2
```

Related Commands	Command	Description
	show running-configuration	Displays loopback configuration settings.

microcode reload

To configure the system to load its microcode from the specified slot number, use the **microcode reload** privileged EXEC command.

```
microcode reload {all | cwrhe [slot slot]}
```

Syntax Description	all	Specifies to reload all hardware types that support downloadable microcode.
	cwrhe	Specifies to reload the microcode for the wireless headend port adapter.
	slot <i>slot</i>	Specifies the slot number where to reload the microcode. Valid values are 0 to 6.

Defaults No default behaviors or values.

Command Modes Privileged EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines The **microcode** command is not normally needed when using the factory installed images.

Examples The following example shows how to reload a microcode in slot 6:

```
Router# microcode reload cwrhe slot 6
```

ping docsis

To determine whether a subscriber unit is on the network, use the **ping docsis** privileged EXEC command. To disable this function, use the **no** form of this command.

ping docsis [*MAC-address* | *ip-address*]

no ping docsis

Syntax Description		
	<i>MAC-address</i>	Specifies radio modem MAC address.
	<i>ip-address</i>	Specifies radio modem IP address.

Defaults No default behavior or values.

Command Modes Privileged EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines Make sure that you are using a valid MAC or IP address for the radio modem that you want to ping.

Examples The following example shows how to verify if a subscriber unit is on the network:

```
Router# ping docsis 172.19.0.0
```

pppoe enable

To enable Point-to-Point Protocol over Ethernet (PPPoE) termination on the radio interface, use the **pppoe enable** interface configuration command. To disable, use the **no** form of this command.

pppoe enable

no pppoe enable

Syntax Description This command has no arguments or keywords.

Defaults By default PPPoE is disabled.

Command Modes Interface configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced on the fixed wireless multipoint product.

Usage Guidelines The **pppoe enable** command and the **pppoe-forwarding** command cannot be configured at the same time. You can configure only one or the other at any given time.

Examples The following example shows how to enable PPPoE on the radio interface:

```
Router(config-if)# pppoe enable
```

Related Commands	Command	Description
	pppoe-forwarding	Enables PPPoE forwarding on the router.
	show interface	Displays information about whether or not PPPoE termination or PPPoE forwarding is enabled.

pppoe-forwarding

To enable PPP over Ethernet forwarding on the router, use the **pppoe-forwarding** global configuration command. To disable PPPoE forwarding on the router, use the **no** form of this command.

pppoe-forwarding

no pppoe-forwarding

Syntax Description This command has no arguments or keywords.

Defaults By default PPPoE forwarding is disabled (**no pppoe-forwarding**).

Command Modes Global configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines The **pppoe enable** command and the **pppoe-forwarding** command cannot be configured at the same time. You can configure only one or the other at any given time.

Examples The following example shows how to set PPPoE forwarding on the radio interface:

```
Router(config)# pppoe-forwarding
```

Related Commands	Command	Description
	pppoe enable	Enables PPPoE termination on the radio interface.
	pppoe-forwarding	Enables PPPoE forwarding on the router.
	forwarding default-qos-level	Sets all packets received on the radio interface with a single quality-of-service (QoS) level.
	forwarding group	Sets a PPPoE forwarding group number on the radio interface.
	su-mac	Specifies the subscriber unit MAC address that is mapped from the radio interface to the virtual circuit (VC) on the ATM interface for PPPoE forwarding.
	tag	Specifies the subscriber unit tag name that is mapped from the radio interface onto the VC on the ATM interface for PPPoE forwarding.

pppoe forwarding default-qos-level

To set all packets received on the radio interface with a single quality-of-service (QoS) level, use the **forwarding default-qos-level** radio interface configuration command. To disable PPPoE forwarding, use the **no** form of this command.

forwarding default-qos-level *qos-level-num*

no forwarding default-qos-level *qos-level-num*

Syntax Description	<i>qos-level-num</i>	QoS level number to map to a virtual circuit (VC). Valid range is 1 to 4,294,967,295.
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Defaults	No default behaviors or values.
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Command Modes	Interface configuration
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Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples	<p>The following example shows how to set PPPoE forwarding default-qos-level value to 1:</p> <pre>Router(config-if)# forwarding default-qos-level 1</pre>
-----------------	--

Related Commands	Command	Description
	pppoe-forwarding	Enables PPPoE forwarding on the radio interface.
	forwarding group	Sets a PPPoE forwarding group number on the router.
	su-mac	Specifies the subscriber unit MAC address that is mapped from the radio interface to the virtual circuit (VC) on the ATM interface for PPPoE forwarding.
	tag	Specifies the subscriber unit tag name that is mapped from the radio interface onto the VC on the ATM interface for PPPoE forwarding.

pppoe forwarding group

To set a PPP over Ethernet forwarding group number on the radio interface, use the **forwarding group** interface configuration command. To disable forwarding group assignment, use the **no** form of this command.

forwarding group *group-num*

no forwarding group *group-num*

Syntax Description	<i>group-num</i>	Specifies PPPoE forwarding group number. Valid range is 1 to 10.				
Defaults	No default behaviors or values.					
Command Modes	Interface configuration					
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>12.1(3)XQ1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	12.1(3)XQ1	This command was introduced.	
Release	Modification					
12.1(3)XQ1	This command was introduced.					

Usage Guidelines

The **forwarding group** command needs to be set on both the radio interface and the ATM or permanent virtual circuit (PVC) interface. The forwarding engine maintains an internal table of the forwarding group. The forwarding group information from the internal table is used for forwarding packets between the radio interfaces and the ATM or PVC interfaces. The *group-num* value needs to be the same on both the radio and the ATM or PVC interfaces. For more information about configuring PPPoE on an ATM or PVC interface refer to the *PPP over Ethernet* document.

Examples

The following example shows how to set the PPPoE forwarding group number to 1 for the radio interface:

```
Router(config-if)# forwarding group 1
```

The following example shows how to configure the forwarding group on the ATM or PVC interface:

```
router(config)# int atm2/0.1 p
router(config-subif)# pvc 0/60
router(config-if-atm-)# forwarding group 1
```

Related Commands	Command	Description
	pppoe-forwarding	Enables PPPoE forwarding on the radio interface.
	forwarding default-qos-level	Sets all packets received on the radio interface with a single quality-of-service (QoS) level.
	su-mac	Specifies the subscriber unit MAC address that is mapped from the radio interface to the virtual circuit (VC) on the ATM interface for PPPoE forwarding.
	tag	Specifies the subscriber unit tag name that is mapped from the radio interface onto the VC on the ATM interface for PPPoE forwarding.

pppoe su-mac

To to enable PPPoE forwarding on the radio interface using the subscriber unit's MAC address, use the **su-mac** global configuration command. To disable PPPoE specification, use the **no** form of this command.

```
su-mac MAC-address qos-level level-num type {pppoe | all} [cos-id id-num | sid-index]
```

```
no su-mac MAC-address qos-level level-num type {pppoe | all} [cos-id id-num | sid-index]
```

Syntax Description		
	<i>MAC-address</i>	Specifies the subscriber unit MAC address.
	qos-level <i>level-num</i>	Specifies QoS level number to map to a virtual circuit (VC). The range for <i>level-num</i> is 1 to 1024.
	type { pppoe all }	Specifies packet forwarding options as either pppoe or all .
	pppoe	Specifies that only pppoe packets are allowed to forwarding.
	all	Specifies that all packets allowed to forwarding.
	cos-id <i>id-num</i>	Optional class-of-service identifier specification in TFTP configuration file. Valid range is 1 to 16.
	sid-index	Creates service identifier index in an internal table.

Defaults No default behaviors or values.

Command Modes Global configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following examples show how to associate subscriber unit MAC addresses to QoS-level numbers:

```
Router(config)# su-mac 0090.8330.0215 qod_level 1 type all cos_id 10
Router(config)# su-mac 0050.7366.1241 qos_level 2 type pppoe cos_id 16
```

Related Commands	Command	Description
	pppoe-forwarding	Enables PPPoE forwarding on the radio interface.
	forwarding default-qos-level	Sets all packets received on the radio interface with a single quality-of-service (QoS) level.
	forwarding group	Sets a PPPoE forwarding group number on the radio interface.
	tag	Specifies the subscriber unit tag name that is mapped from the radio interface onto the VC on the ATM interface for PPPoE forwarding.

pppoe tag

To assign a qos-level tag for packet from a particular SU so that the packet is forwarded to a particular virtual circuit, use the **tag** global configuration command. To disable the tag specification, use the **no** form of this command.

```
tag string qos-level level-num type {pppoe | all [sid-index]}
```

```
no tag string qos-level level-num type {pppoe | all [sid-index]}
```

Syntax Description

<i>String</i>	Specifies the tag name to be used.
qos-level <i>level-num</i>	Specifies QoS level number to map to a virtual circuit (VC). The range for <i>level-num</i> is 1 to 1024.
type { pppoe all }	Specifies packet forwarding options as either pppoe or all .
pppoe	Specifies that only pppoe packets are allowed to forwarding.
all	Specifies that all packets are allowed to forwarding.
sid-index	Creates service identifier index in an internal table.

Defaults

No default behaviors or values.

Command Modes

Global configuration

Command History

Release	Modification
12.1(3)XQ1	This command was introduced.

Examples

In the following example, all PPPoE packets arriving from an SU previously registered with SU tag "UunNet-Gold" are assigned **qos-level** 1:

```
Router(config)# tag UUNet-Gold qos_level 1 type pppoe
```

Related Commands

Command	Description
pppoe-forwarding	Enable PPPoE forwarding on the radio interface.
forwarding default-qos-level	Set all packets received on the radio interface with a single quality-of-service (QoS)-level.
forwarding group	Sets a PPPoE forwarding group number on the radio interface.
su-mac	Specifies the subscriber unit MAC address that is mapped from the radio interface to the virtual circuit (VC) on the ATM interface for PPPoE forwarding.

radio alc

To enable the automatic level control (ALC) and the power ranging, and to set the ALC attributes at the headend, use the **radio alc** interface configuration command. To turn off the ALC and power ranging, use the **no** form of this command.

```
radio alc [interval interval [if-mode standard | robust] [rf-mode very-fast | fast | slow | very-slow]]
```

```
no radio alc
```

Syntax Description	interval	(Optional) if rf-mode . If one of these optional modes is not specified, the radio interface assumes the values specified prior to ALC and power ranging being off. Otherwise, the default values of 96 ms, standard , and fast are used for interval , if-mode , and rf-mode , respectively. Valid range is 32 ms to 1024 ms, in multiples of 32 ms.
	<i>interval</i>	Scheduling interval is the regular interval at which the ALC grant in MAP is transmitted to the subscriber units. Valid range is 50 to 200 ms.
	if-mode	standard robust (standard is the default).
	rf-mode	very-fast fast slow very-slow (fast is the default).

Defaults The ALC and power ranging are on.

Command Modes Interface configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines The **radio alc** command enables the ALC and power ranging, and sets the scheduling interval of all the powers for the subscriber IDs of the current radio interface. It also sets the IF and RF modes when the ALC is on. The scheduling interval is the regular interval at which the ALC enables MAPs to be transmitted to the subscribers.

Examples The following example shows how to specify the ALC scheduling interval to 64 ms and set the **if-mode** and **rf-mode** to default values:

```
Router (config-if)# radio alc interval 64 if-mode standard rf-mode fast
```

Related Commands	Command	Description
	show interface radio slot/port alc	Displays the radio ALC settings.

radio arp

The Reverse Address Resolution Protocol (RARP) is an Internet protocol that is used to map IP addresses to MAC addresses on computers and other equipment installed on the wireless network. To activate RARP requests so that the Cisco uBR7200 series can perform IP address resolution on the downstream path, use the **radio arp** interface configuration command. To disable, use the **no** form of this command.

radio arp

no radio arp

Syntax Description This command has no arguments or keywords.

Defaults ARP is activated by default.

Command Modes Interface configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to activate ARP requests:

```
Router(config-if)# radio arp
```

Related Commands	Command	Description
	show running-config	Shows if RARP has been activated or deactivated.

radio cable-loss

To specify the effective cable loss (measured in dB) of the cable between the wireless card and the specified wireless transverter, including the power feed panel, connectors, and lightning protection, use the **radio cable-loss** interface configuration command. To remove the setting, use the **no** form of this command.

radio cable-loss { *auto* | *antenna_num* *tx_loss* *rx_loss* }

no radio cable-loss

Syntax Description		
<i>auto</i>		The radio modem automatically determines the cable loss compensation for the specified antenna.
<i>antenna_num</i>		Enter 1 for the main antenna or 2 for the diversity antenna.
<i>tx_loss</i>		Positive number (less than or equal to 15 dB) that reflects the effective transmit cable loss at 330 MHz.
<i>rx_loss</i>		Positive number (less than or equal to 13 dB) that reflects the effective receive cable loss at 426 MHz.



Note The cable loss parameter cannot be set to a value greater than 13 dB for *rx_loss* and 15 dB for *tx_loss*. The exact cable-loss value is determined by the transverter. The system compares this value to the value when a **no shut** command is entered. To display the current cable loss setting, use the **show running-configuration interface radio** command.

Defaults No default behaviors or values.

Command Modes Interface configuration

Command History	Release	Modification
	12.0(1)XR	This command was introduced.
	12.1(3)XQ1	Support for multipoint was added.

Usage Guidelines

The following table provides an example of estimated cable, connector, and equipment loss for a typical installation.

Table 1 *Estimated Cable Loss Between Wireless Modem Card and Transverter*

Item	Wireless Modem Card to Power Feed Panel	Power Feed Panel to Primary Lightning Suppression	Primary Lightning Suppression to Transverter
Cable length (feet)	4	250	50
Cable type	RG 142	LMR400	LMR400
Loss per 100 feet (decibel)	8 dB at 400 MHz	2.7 dB at 400 MHz	2.7 dB at 400 MHz
Connectors	2	2	2
Loss per connector	.25 dB	.25 dB	.25 dB
Equipment loss	1.2 dB (power feed panel)	0.2 dB (Lightning Suppression)	--
Loss per segment (decibel)	2.02 dB	7.45 dB	1.85 dB
Total loss = 11.32 dB			

Examples

In the following example, the headend Tx cable loss was measured to be 11 dB, and the headend Rx cable-loss was measured to be 12 dB:

```
UBR04(config-if)# radio cable-loss 1 11 12
Headend ODU Tx Attenuation Setting = 15 dB - 11 dB = 4 dB
Headend IDU Tx Attenuation Setting = 13 dB - 12 dB = 1 dB
```

Related Commands

Command	Description
show	Displays the current configuration settings, including cable loss.
running-configuration	
interface radio	

radio downstream annex B

To enable the MPEG framing format for a downstream port on a radio card to annex B, use the **radio downstream annex B** interface configuration command. To disable, use the **no** form of this command.

radio downstream annex B

no radio downstream annex B

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values.

Command Modes Interface configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines Annex B is the MCS MPEG framing format standard. The radio card downstream port and the subscriber units on the radio network connected through these ports must be set to the same MPEG framing format.

Examples The following example sets the MPEG framing format to annex B:

```
Router# radio downstream annex B
```

Related Commands	Command	Description
	show controllers radio slot/port downstream	Displays the MPEG framing format for the downstream port that has been configured.

radio downstream frequency

To specify the downstream center frequency for a radio modem, use the **radio downstream frequency** interface configuration command. To disable, use the **no** form of this command.

radio downstream frequency [*freq*] **width** [*width*]

no radio downstream frequency

Syntax Description		
<i>freq</i>		Specifies the center frequency in kHz (decimal values are allowed). Valid range is 0 to 50000000 kHz.
width		Specifies the bandwidth.
<i>width</i>		Specifies the bandwidth value of the channel in MHz. Valid range is 1 to 12 MHz.

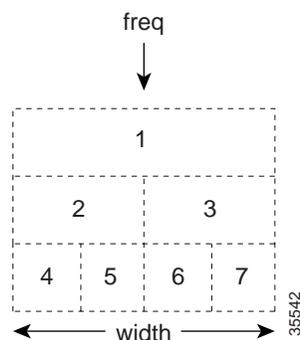
Defaults The center frequency is not specified by default.

Command Modes Interface configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines The radio interface cannot be enabled unless a center frequency is specified. Specify the center frequency and the bandwidth for the whole downstream channel group. The frequency group must be positioned within the transmit passband of the RF duplexer. Make sure to specify the center frequency that you are licensed to use.

The following is a pictorial representation of the center frequency:



Examples

The following example shows how to set the downstream center frequency for modem card in slot 6, port 0:

```
Router(config-if)# interface radio 6/0 radio downstream frequency 9600000
```

Related Commands

Command	Description
show controllers radio <i>slot/port</i> downstream	Displays the specified center frequency for the downstream port that has been configured.
show controllers radio <i>slot/port</i> rf	Displays the allowed ranges of frequency.

radio downstream rate-limit

To enable downstream rate limiting for downstream traffic, use the **radio downstream rate-limit** interface configuration mode command. To disable rate limiting on downstream traffic, use the **no** form of this command.

radio downstream rate-limit [**token-bucket** [*shaping*] | **weighted-discard** *exp-weight*]

no radio downstream rate-limit

Syntax Description	Parameter	Description
	token-bucket	(Optional) Specifies the token bucket filter algorithm.
	<i>shaping</i>	Enables shaping with default parameters. To change the defaults, you can specify <i>granularity</i> (which is the traffic-shaping granularity in msec), or you can specify <i>max-delay</i> (which is the maximum traffic-shaping buffering delay in msec).
	weighted-discard	(Optional) Specifies the weighted discard algorithm.
	<i>exp-weight</i>	Specifies the weight for the exponential moving average of the loss rate. Valid values are 1 to 4.

Defaults Rate-limit is enabled by default.

Command Modes Interface configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to use the token bucket filter algorithm:

```
Router(config-if)# radio downstream rate-limit token-bucket
```

Usage Guidelines Cisco recommends that you keep the default setting of **radio downstream rate-limit** in order to use the *shaping* option.

Related Commands	Command	Description
	radio upstream rate-limit	Enables rate limiting for an upstream port on an upstream channel.

radio downstream subchannel modulation-profile

To create a radio downstream in a subchannel configuration to use a specific modulation profile, use the **radio downstream subchannel modulation-profile** interface configuration command. To disable the specified modulation profile, use the **no** form of this command.

radio downstream subchannel *sc* **modulation-profile** *p*

no radio downstream subchannel *sc* **modulation-profile** *p*

Syntax Description

<i>sc</i>	Identifies the subchannel number. Valid values are 1 to 7.
<i>p</i>	Profile index defined by the radio modulation-profile command. Valid values are 1 to 32.
 Note	The width specified by the radio modulation-profile command must match the width of the subchannel where the downstream is being assigned.

Defaults

No default behavior or values.

Command Modes

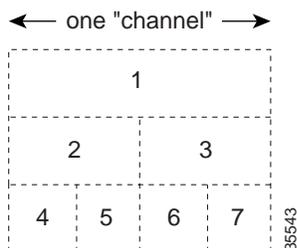
Interface configuration

Command History

Release	Modification
12.1(3)XQ1	This command was introduced.

Usage Guidelines

The *sc* field corresponds to the following subchannel numbering scheme. The center frequency and the width for the downstream is inferred from this subchannel assignment.



Examples

The following example shows how to set the modulation profile index to 3 for subchannel 1:

```
Router# radio downstream subchannel 1 modulation-profile 3
```

Related Commands

Command	Description
radio modulation-profile	Creates modulation profile for downstream or upstream channels.

radio flap-list aging

To specify the number of days to record and retain flapping activity on a radio subscriber unit in the flap-list table, use the **radio flap-list aging** global configuration command. To disable the flap-list recording, use the **no** form of this command.

radio flap-list aging *days*

no radio flap-list aging

Syntax Description	<i>days</i>	Specifies the number of days to record and retain flapping activity on a flap-list table. The valid range is 1 to 60 days.
---------------------------	-------------	--

Defaults	No default behavior or values.
-----------------	--------------------------------

Command Modes	Global configuration
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Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to set the age of the flap list to 30 days:

```
CMTS01(config)# radio flap-list aging 30
```

Related Commands	Command	Description
	clear radio flap-list	Clears the current radio flap-list entries for a specific subscriber unit or all subscriber units.
	radio flap-list insertion-time	Used for setting the radio flap-list insertion time.
	radio flap-list miss-threshold	Used for setting the miss-threshold for recording a flap-list event.
	radio flap-list size	Used for specifying the maximum number of the radio subscriber units to be reported in the radio flap-list table.
	show radio flap-list	Displays the radio flap-list of a wireless modem card.

radio flap-list insertion-time

To set the radio flap list insertion time, use the **radio flap-list insertion-time** global configuration command. To disable, use the **no** form of this command.

radio flap-list insertion-time *seconds*

no radio flap-list insertion-time

Syntax Description	<i>seconds</i>	Specifies the frequency for the flap list insertion request. The valid range is 60 to 86400 seconds. When a radio subscriber unit makes an insertion request more frequently than the amount of time defined by this command, the radio subscriber unit is placed in the flat list for activity recording.
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Defaults	No default behavior or values.
-----------------	--------------------------------

Command Modes	Global configuration
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Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples	The following example shows how to set the insertion time to 62 seconds: Router(config)# radio flap-list insertion-time 62
-----------------	--

Related Commands	Command	Description
	clear radio flap-list	Clears the current radio flap-list entries for a specific subscriber unit or all subscriber units.
	radio flap-list aging	Specifies the number of days to record and retain flapping activity on a radio subscriber unit in the flap-list table.
	radio flap-list miss-threshold	Sets the miss-threshold for recording a flap-list event.
	radio flap-list size	Specifies the maximum number of the radio subscriber units to be reported in the radio flap-list table.
	show radio flap-list	Displays the radio flap list of a wireless modem card.

radio flap-list miss-threshold

To specify the miss threshold for recording a flap-list event, use the **radio flap-list miss-threshold** global configuration command. A miss is the number of times a radio subscriber does not acknowledge a MAC layer keep-alive message from a subscriber unit. When the number of misses exceeds the threshold, the radio subscriber unit is placed in the flap list. To disable the miss threshold as a criterion for adding a radio subscriber unit to the flap list, use the **no** form of this command.

radio flap-list miss-threshold *threshold-num*

no radio flap-list miss-threshold

Syntax Description	<i>threshold-num</i>	The miss threshold value specified by the user. Any subscriber that misses more than the specified number is placed in the flap list.
---------------------------	----------------------	---

Defaults	No default behavior or values.
-----------------	--------------------------------

Command Modes	Global configuration
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Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to set the miss threshold to 50:

```
CMTS01(config)# radio flap-list miss-threshold 50
```

Related Commands	Command	Description
	clear radio flap-list	Clears the current radio flap-list entries for a specific subscriber unit or all subscriber units.
	radio flap-list aging	Specifies the number of days to record and retain flapping activity on a radio subscriber unit in the flap-list table.
	radio flap-list insertion-time	Sets the radio flap list insertion time.
	radio flap-list size	Specifies the maximum number of the radio subscriber units to be reported in the radio flap-list table.
	show radio flap-list	Displays the radio flap list of a wireless modem card.

radio flap-list size

To specify the maximum number of the radio subscriber units to be reported in the radio flap list tables, use the **radio flap-list size** global configuration command. To set the flap list table size to the default value, use the **no** form of this command.

radio flap-list size *size*

no radio flap-list

Syntax Description	<i>size</i>	The flap-list table size that is specified by the user. Valid values are 1 to 8191.
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Defaults	No default behaviors or values.
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Command Modes	Global configuration
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Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples	The following example specifies the flap-list size to 10:
-----------------	---

```
Router(config)# radio flap-list 10
```

Related Commands	Command	Description
	clear radio flap-list	Clears the current radio flap-list entries for a specific subscriber unit or all subscriber units.
	radio flap-list aging	Specifies the number of days to record and retain flapping activity on a radio subscriber unit in the flap-list table.
	radio flap-list insertion-time	Sets the radio flap list insertion time.
	radio flap-list miss-threshold	Sets the miss-threshold for recording a flap-list event.
	show radio flap-list	Displays the radio flap list of a wireless modem card.

radio helper-address

To specify an IP address of a Dynamic Host Configuration Protocol (DHCP) server where User Datagram Protocol (UDP) broadcast packets are sent, use the **radio helper-address** interface configuration command. You can specify a DHCP server for UDP broadcast packets from subscriber units and a DHCP server for UDP broadcast packets from hosts. To disable the helper address for the subscriber units, use the **no** form of this command.

radio helper-address *ip-address* **subscriber** | **host**

no radio helper-address *ip-address* **subscriber** | **host**

Syntax Description		
	<i>ip-address</i>	IP address for the DHCP server.
	subscriber	Sets the downstream helper address to the DHCP server for UDP broadcast packets from the subscriber units.
	host	Sets the downstream helper address to the DHCP server for UDP broadcast packets from hosts.

Defaults No default behavior or values.

Command Modes Interface configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The first of the following examples sets the downstream helper address to the DHCP server at IP address 10.x.x.x for UDP broadcast packets from the subscriber units, and the second example sets the downstream helper address to the DHCP server at IP address 172.56.x.x for UDP broadcast packets from hosts.

```
UBR(config-if)# radio helper 10.x.x.x subscriber
UBR(config-if)# radio helper 172.56.x.x host
```

radio hist-display

To control the display of histogram data, use the **radio hist-display** interface configuration command.

```
radio histogram { [all] | {statsParams MAC-address / chan-id} on | off }
```

Syntax Description		
all		Controls the display of all the histograms in the system.
<i>statsParams</i>		{ sinr-ant1 sinr-ant2 sinr-total timingOffset rf-rx-power-ant1 rf-rx-power-ant2 chan-delay-spread-ant1 chan-delay-spread-ant2 power-amb }
sinr-ant1		Signal to interference plus noise ratio for antenna 1.
sinr-ant2		Signal to interference plus noise ratio for antenna 2.
sinr-total		Signal to interference plus noise ratio for antennas 1 and 2.
timingOffset		Represents the timing delay variations detected in the radio link.
rf-rx-power-ant1		Represents the receive power at the main RF headend (antenna gain is not included).
rf-rx-power-ant2		Represents the receive power at the diversity RF headend (antenna gain is not included).
chan-delay-spread-ant1		The offset for channel delay spread on antenna 1.
chan-delay-spread-ant2		The offset for channel delay spread on antenna 2.
power-amb		Represents the noise floor of the ambient environment, in decibels.
<i>MAC-address</i>		Specifies a particular subscriber unit.
<i>chan-id</i>		Specifies an upstream channel ID. Valid values are 0 to 3.
on off		Specifies whether to turn the display of the histogram data on or off.

Defaults By default the histogram display is on.

Command Modes Interface configuration

Command History	Release	Modification
	12.0(7)XR	This command was introduced.
	12.1(3)XQ1	Support for multipoint radio modem was added.

Examples The following example shows how to set the display of histogram data for **sinr-ant1** on channel 0 to OFF:

```
UBR04(config-if)# radio hist-display sinr-ant1 0 off
```

Related Commands	Command	Description
	radio histogram	Configures a histogram collection specification.
	radio interface hist-clear	Clears histogram data.

radio histogram

To configure a histogram collection specification, use the **radio histogram** interface configuration command. To delete existing histogram collections, use the **no** form of this command.

```
radio histogram statsParams {MAC-address | chan-id} [bin-range {start end}] [duration
interval] [tone {circular | average | number toneVal}] [update interval sum {true | false}]
[width {coarse | fine}]
```

```
no radio histogram statsParams {MAC-address | chan-id}
```

Syntax Description	
<i>statsParams</i>	{ sinr-ant1 sinr-ant2 sinr-total timingOffset rf-rx-power-ant1 rf-rx-power-ant2 chan-delay-spread-ant1 chan-delay-spread-ant2 power-amb }
sinr-ant1	Signal to interference plus noise ratio for antenna 1.
sinr-ant2	Signal to interference plus noise ratio for antenna 2.
sinr-total	Signal to interference plus noise ratio for antennas 1 and 2.
timingOffset	Represents the timing delay variations detected in the radio link.
rf-rx-power-ant1	Represents the receive power at the main RF headend (antenna gain is not included).
rf-rx-power-ant2	Represents the receive power at the diversity RF headend (antenna gain is not included).
chan-delay-spread-ant1	The offset for channel delay spread on antenna 1.
chan-delay-spread-ant2	The offset for channel delay spread on antenna 2.
power-amb	Represents the noise floor of the ambient environment, in decibels.
<i>MAC-address</i>	Specifies a particular subscriber unit.
<i>chan-id</i>	Specifies an upstream channel ID. Valid values are 0 to 3.
bin-range <i>start end</i>	Specifies the start and end bin values. Values below the start bin values are assigned to the first bin in the histogram. Values above this value are assigned to the last bin in the histogram. Start and end bin values range -5000 to 5000. The following values are default start and end bin range values: sinr-ant1 : {10, 49} sinr-ant2 : {10, 49} sinr-total : {10, 49} timingOffset : {-10, 10} rf-rx-power-ant1 : {-86, -43} rf-rx-power-ant2 : {-86, -43} chan-delay-spread-ant1 : {0, 4} chan-delay-spread-ant2 : {0, 4} power-amb : {-101, -21}
duration <i>interval</i>	Specifies, in seconds, the duration in which histogram data is collected.
tone	{ circular average number } are applicable only to sinr-ant1 , sinr-ant2 , and sinr-total .
circular	Specifies histogram samples that use successive frequency tones.

average	Specifies histogram samples that should be the average of the burst data over all the frequencies.
number <i>toneVal</i>	Specifies that a particular tone in the burst should be used to report the histogram data.
update <i>interval</i>	Specifies how often, in seconds, the collected data is printed on the screen.
sum	Specifies whether to add the data at every update.
width <i>coarse</i> <i>fine</i>	Specifies the histogram resolution. Coarse is 50 bins and fine is 12 bins.

Defaults

No default behavior or values.

Command Modes

Interface configuration

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(3)XQ1	Support for multipoint radio modem was added.

Usage Guidelines

A histogram is a collection of statistics sampled over time on a burst-by-burst basis and presented as a function of bins.

The data for the histogram is collected as soon as the command succeeds and continues until either the specification is deleted using the **no** option, or the specified duration expires. The collected data is printed out to the console at user-specified intervals.

A histogram statistic is created when data is sampled for every burst. For each sampled burst, the count in a specific bin is incremented.

**Note**

There should be no measurable impact or degradation of router performance from running histograms. Cisco recommends that you keep the number of histograms that you are running simultaneously to a minimum, and that you terminate any histograms no longer needed.

**Note**

Histograms and timelines share the same DSP memory. A total of 10 histograms and timelines can be created on a single DSP. There are a total of 8 locations for **fine** histograms and timelines and 5 locations for **coarse** histograms. The combination of histograms and timelines must be less than 10.

Examples

The following example shows how to configure a histogram specification. The histogram collection starts as soon as the command succeeds. A histogram is collected for signal-to-interference plus noise ratio on channel 3. The remaining of the parameters are optional, and the system picks default values.

```
UBR04(config-if)# radio histogram sinr-ant1 3
```

Related Commands

Command	Description
radio hist-display	Displays radio histograms.
radio interface hist-clear	Clears histogram data.

radio insertion-interval

To control the frequency at which the headend schedules opportunities for the subscriber-unit to join the network, use the **radio insertion-interval** interface configuration command. A subscriber unit's request to join the network for the first time is called initial ranging. The default insertion interval setting configures the Cisco uBR7200 series to automatically vary the initial ranging times that are available to the new subscriber unit that attempts to join the network. To use the automatic (default) setting, use the **no** form of this command.

radio insertion-interval [*fixed-value* / **automatic**] [*millisecond*]

no radio insertion-interval

Syntax Description	<i>fixed-value</i>	Specifies fixed period between initial ranging slots in milliseconds (ms). Valid range is 100 to 2000 ms.
	automatic	The automatic (default) insertion interval setting configures the Cisco uBR7200 series to automatically vary the initial ranging times that are available to the new subscriber unit that attempts to join the network. Optionally, you can set the lower bound on period between initial ranging slots. The range for this value is 20 to 120 ms.

Defaults Automatic

Command Modes Interface configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines Use the default setting if a large number of subscriber units attempt to perform initial ranging at the same time (for example, after a major power failure).

Examples The following example shows how to set the insertion interval to 1500 milliseconds.

```
Router(config-if)# radio insertion-interval 1500
```

radio interface radio hist-clear

To clear histogram data, use the **radio interface radio hist-clear** EXEC command.

radio interface radio *slot/port* **hist-clear** *statsParams* {*MAC-address* | *chan-id*}

Syntax Description		
<i>slot/port</i>		Specifies the slot and port numbers.
<i>statsParams</i>		{ sinr-ant1 sinr-ant2 sinr-total timingOffset rf-rx-power-ant1 rf-rx-power-ant2 chan-delay-spread-ant1 chan-delay-spread-ant2 power-amb }
sinr-ant1		Signal-to-interference plus noise ratio for antenna 1.
sinr-ant2		Signal-to-interference plus noise ratio for antenna 2.
sinr-total		Signal-to-interference plus noise ratio for antennas 1 and 2.
timingOffset		Represents the timing delay variations detected in the radio link.
rf-rx-power-ant1		Represents the receive power at the main RF headend (antenna gain is not included).
rf-rx-power-ant2		Represents the receive power at the diversity RF headend (antenna gain is not included).
chan-delay-spread-ant1		The offset for channel delay spread on antenna 1.
chan-delay-spread-ant2		The offset for channel delay spread on antenna 2.
power-amb		Represents the noise floor of the ambient environment, in decibels.
<i>MAC-address</i>		Specifies a particular subscriber unit.
<i>chan-id</i>		Specifies an upstream channel ID. Valid values are 0 to 3.

Defaults No default behavior or values.

Command Modes EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to clear the histogram data for **sinr-ant1** on channel 0:

```
Router# radio int r6/0 hist-clear sinr-ant1 0
```

Related Commands

Command	Description
radio histogram	Configures a histogram collection specification.
radio interface radio <i>slot/port</i> hist-start	Starts a stopped histogram specification.
radio interface radio <i>slot/port</i> hist-stop	Stops a running histogram specification.

radio interface radio hist-start

To start a stopped histogram specification, use the **radio interface radio hist-start EXEC** command. To disable this function, use the **no** form of this command.

radio interface radio *slot/port* **hist-start** *statsParams* {*MAC-address* | *chan-id*}

Syntax Description		
<i>slot/port</i>		Specifies the slot and port numbers.
<i>statsParams</i>		{ sinr-ant1 sinr-ant2 sinr-total timingOffset rf-rx-power-ant1 rf-rx-power-ant2 chan-delay-spread-ant1 chan-delay-spread-ant2 power-amb }
sinr-ant1		Signal-to-interference plus noise ratio for antenna 1.
sinr-ant2		Signal-to-interference plus noise ratio for antenna 2.
sinr-total		Signal-to-interference plus noise ratio for antennas 1 and 2.
timingOffset		Represents the timing delay variations detected in the radio link.
rf-rx-power-ant1		Represents the receive power at the main RF headend (antenna gain is not included).
rf-rx-power-ant2		Represents the receive power at the diversity RF headend (antenna gain is not included).
chan-delay-spread-ant1		The offset for channel delay spread on antenna 1.
chan-delay-spread-ant2		The offset for channel delay spread on antenna 2.
power-amb		Represents the noise floor of the ambient environment, in decibels.
<i>MAC-address</i>		Specifies a particular subscriber unit.
<i>chan-id</i>		Specifies an upstream channel ID. Valid values are 0 to 3.

Defaults No default behavior or values.

Command Modes EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to start the stopped histogram specification for **sinr-ant1** on channel 0:

```
Router# radio int r6/0 hist-start sinr-ant 0
```

Related Commands

Command	Description
radio histogram	Configures a histogram collection specification.
radio interface radio <i>slot/port</i> hist-clear	Clears histogram data.
radio interface radio <i>slot/port</i> hist-stop	Stops a running histogram specification.

radio interface radio hist-stop

To stop a running histogram specification, use the **radio interface radio hist-stop** EXEC command.

radio interface radio *slot/port* **hist-stop** *statsParams* {*MAC-address* | *chan-id*}

Syntax Description		
<i>slot/port</i>		Specifies the slot and port numbers.
<i>statsParams</i>		{ sinr-ant1 sinr-ant2 sinr-total timingOffset rf-rx-power-ant1 rf-rx-power-ant2 chan-delay-spread-ant1 chan-delay-spread-ant2 power-amb }
sinr-ant1		Signal-to-interference plus noise ratio for antenna 1.
sinr-ant2		Signal-to-interference plus noise ratio for antenna 2.
sinr-total		Signal-to-interference plus noise ratio for antennas 1 and 2.
timingOffset		Represents the timing delay variations detected in the radio link.
rf-rx-power-ant1		Represents the receive power at the main RF headend (antenna gain is not included).
rf-rx-power-ant2		Represents the receive power at the diversity RF headend (antenna gain is not included).
chan-delay-spread-ant1		The offset for channel delay spread on antenna 1.
chan-delay-spread-ant2		The offset for channel delay spread on antenna 2.
power-amb		Represents the noise floor of the ambient environment, in decibels.
<i>MAC-address</i>		Specifies a particular subscriber unit.
<i>chan-id</i>		Specifies an upstream channel ID. Valid values are 0 to 3.

Defaults No default behavior or values.

Command Modes EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to stop a running histogram specification for **sinr-ant1** on channel 0:

```
Router# radio int r6/0 hist-stop sinr-ant 0
```

Related Commands

Command	Description
radio histogram	Configures a histogram collection specification.
radio interface radio <i>slot/port</i> hist-start	Starts a stopped histogram specification.
radio interface radio <i>slot/port</i> hist-clear	Clears the histogram data.

radio interface radio rf-update duplexer

To set or update the radio frequency or wireless transverter duplexer information stored in the hardware, use the **radio interface radio rf-update duplexer** privileged EXEC command.

radio interface radio *slot/port* **rf-update duplexer** {**1** | **2**} *code-date* *Lo-bandStart* *Lo-bandEnd* *Hi-bandStart* *Hi-bandEnd* *Tx-insertion-loss* [*Tx-lo* | *Tx-hi*]

Syntax Description	
<i>slot/port</i>	Identifies the slot and port numbers.
1 2	Enter 1 for the main antenna or 2 for the diversity antenna.
<i>code-date</i>	Identifies the date the duplexer information was last updated or reset. The date must be specified in the <i>mmddyyyy</i> format. For single digit month and date values, you need to zero-fill them. For example, for August 3, 2000, you enter 08032000.
<i>Lo-bandStart</i>	Identifies the duplexer's start low-frequency range. Valid start low-band pass is 0 to 65535 MHz. When setting the start low-frequency range for the duplexer, this range of values must be lower than the range specified for the <i>Hi-bandStart</i> parameter.
<i>Lo-bandEnd</i>	Identifies the duplexer's end low-frequency range. Valid end low-band pass is 0 to 65535 MHz. When setting the end low-frequency range for the duplexer, this range of values must be lower than the range specified for the <i>Hi-bandEnd</i> parameter.
<i>Hi-bandStart</i>	Identifies the duplexer's start high-frequency range. Valid start high-band pass is 0 to 65535 MHz. When setting start high-frequency range for the duplexer, this range of values must be higher than the range specified in the <i>Lo-bandStart</i> parameter.
<i>Hi-bandEnd</i>	Identifies the duplexer's end hi-frequency range. Valid end high-band pass is 0 to 65535 MHz. When setting end hi-frequency range for the duplexer, this range of values must be higher than the range specified in the <i>Lo-bandEnd</i> parameter.
<i>Tx-insertion-loss</i>	Specifies the transmit insertion loss for the duplexer, in dB. The insertion loss of the duplexer is the degree to which it attenuates the signal passing through its pass-bands. Valid range is 0 255 dB.
<i>Tx-lo</i>	Indicates that the low-frequency range is used for transmission, which implies that the high-band frequency range is used for reception. Valid frequency range is 0 to 65535 MHz.
<i>Tx-hi</i>	Indicates that the high-frequency range is used for transmission, which implies that the low-band frequency range is used for reception. Valid frequency range is 0 to 65535 MHz.

Defaults No default behaviors and values.

Command Modes Privileged EXEC

Command History

Release	Modification
12.1(3)XQ1	This command was introduced.

Usage Guidelines

You must specify the antenna, either **1** or **2**, for which you want to update the duplexer settings. If no parameter is specified after **1** or **2**, the existing duplexer settings will be removed. Although the valid frequency ranges for the high-band and low-band are the same, the frequency range for hi-band start and end values must be set higher than the frequency range for low-band start and end values. Overlapping is not allowed between the bands.

**Note**

This command can be entered only when the radio link is down (**shut**), and takes effect when the link becomes active again (**no shut**).

Examples

The following example shows how to set the radio frequency for the duplexer:

```
Router# radio int radio 6/0 rf-update duplexer 1 08232000 2550 2600 2650 2700 10 tx-lo
```

Related Commands

Command	Description
show controllers radio slot/port rf	Displays the current settings for the duplexer.

radio interface radio tl-clear

To clear timeline data, use the **radio interface radio tl-clear** privileged EXEC command.

radio interface radio *slot/port* **tl-clear** *statsParams* {*MAC-address* | *chan-id*}

Syntax Description		
<i>slot/port</i>		Specifies the slot and port numbers.
<i>statsParams</i>		{ sinr-ant1 sinr-ant2 sinr-total timingOffset rf-rx-power-ant1 rf-rx-power-ant2 chan-delay-spread-ant1 chan-delay-spread-ant2 power-amb }
sinr-ant1		Signal-to-interference plus noise ratio for antenna 1.
sinr-ant2		Signal-to-interference plus noise ratio for antenna 2.
sinr-total		Signal-to-interference plus noise ratio for antennas 1 and 2.
timingOffset		Represents the timing delay variations detected in the radio link.
rf-rx-power-ant1		Represents the receive power at the main RF headend (antenna gain is not included).
rf-rx-power-ant2		Represents the receive power at the diversity RF headend (antenna gain is not included).
chan-delay-spread-ant1		The offset for channel delay spread on antenna 1.
chan-delay-spread-ant2		The offset for channel delay spread on antenna 2.
power-amb		Represents the noise floor of the ambient environment, in decibels.
<i>MAC-address</i>		Specifies a particular subscriber unit.
<i>chan-id</i>		Specifies an upstream channel ID. Valid values are 0 to 3.

Defaults No default behavior or values.

Command Modes Privileged EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to clear timeline data for **sinr-ant1** on channel 0:

```
Router# radio int r 6/0 tl-clear sinr-ant1 0
```

Related Commands

Command	Description
radio timeline	Configures a timeline collection specification.
radio interface radio <i>slot/port</i> tl-start	Starts a stopped timeline specification.
radio interface radio <i>slot/port</i> tl-stop	Stops a running timeline specification.

radio interface radio tl-start

To start a stopped timeline specification, use the **radio interface radio tl-start** privileged EXEC command.

```
radio interface radio slot/port tl-start statsParams {MAC-address | chan-id}
```

Syntax Description		
<i>slot/port</i>		Specifies the slot and port numbers.
<i>statsParams</i>		{ sinr-ant1 sinr-ant2 sinr-total timingOffset rf-rx-power-ant1 rf-rx-power-ant2 chan-delay-spread-ant1 chan-delay-spread-ant2 power-amb }
sinr-ant1		Signal-to-interference plus noise ratio for antenna 1.
sinr-ant2		Signal-to-interference plus noise ratio for antenna 2.
sinr-total		Signal-to-interference plus noise ratio for antennas 1 and 2.
timingOffset		Represents the timing delay variations detected in the radio link.
rf-rx-power-ant1		Represents the receive power at the main RF headend (antenna gain is not included).
rf-rx-power-ant2		Represents the receive power at the diversity RF headend (antenna gain is not included).
chan-delay-spread-ant1		The offset for channel delay spread on antenna 1.
chan-delay-spread-ant2		The offset for channel delay spread on antenna 2.
power-amb		Represents the noise floor of the ambient environment, in decibels.
<i>MAC-address</i>		Specifies a particular subscriber unit.
<i>chan-id</i>		Specifies an upstream channel ID. Valid values are 0 to 3.

Defaults No default behavior or values.

Command Modes Privileged EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to start a stopped timeline specification for **sinr-ant1** on channel 0:

```
Router# radio int r 6/0 tl-start sinr-ant1 0
```

Related Commands

Command	Description
radio timeline	Configures a timeline collection specification.
radio interface radio <i>slot/port</i> hist-clear	Clears timeline data.
radio interface radio <i>slot/port</i> tl-stop	Stops a running timeline specification.

radio interface radio tl-stop

To stop a running timeline specification, use the **radio interface radio tl-stop** privileged EXEC command.

```
radio interface radio slot/port tl-stop statsParams {MAC-address | chan-id}
```

Syntax Description		
<i>slot/port</i>		Specifies the slot and port numbers.
<i>statsParams</i>		{ sinr-ant1 sinr-ant2 sinr-total timingOffset rf-rx-power-ant1 rf-rx-power-ant2 chan-delay-spread-ant1 chan-delay-spread-ant2 power-amb }
sinr-ant1		Signal-to-interference plus noise ratio for antenna 1.
sinr-ant2		Signal-to-interference plus noise ratio for antenna 2.
sinr-total		Signal-to-interference plus noise ratio for antennas 1 and 2.
timingOffset		Represents the timing delay variations detected in the radio link.
rf-rx-power-ant1		Represents the receive power at the main RF headend (antenna gain is not included).
rf-rx-power-ant2		Represents the receive power at the diversity RF headend (antenna gain is not included).
chan-delay-spread-ant1		The offset for channel delay spread on antenna 1.
chan-delay-spread-ant2		The offset for channel delay spread on antenna 2.
power-amb		Represents the noise floor of the ambient environment, in decibels.
<i>MAC-address</i>		Specifies a particular subscriber unit.
<i>chan-id</i>		Specifies an upstream channel ID. Valid values are 0 to 3.

Defaults No default behavior or values.

Command Modes Privileged EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to stop a running timeline specification for **sinr-ant1** on channel 0:

```
Router# radio int r 6/0 tl-stop sinr-ant1 0
```

Related Commands

Command	Description
radio timeline	Configures a timeline collection specification.
radio interface radio <i>slot/port</i> hist-clear	Clears timeline data.
radio interface radio <i>slot/port</i> tl-start	Starts a stopped timeline specification.

radio ip-broadcast-echo

To activate the upstream IP broadcast echo so that the Cisco uBR7200 series can echo broadcast packets back to the subscriber, use the **radio ip-broadcast-echo** interface configuration command. To disable the IP broadcast echo, use the **no** form of this command.

radio ip-broadcast-echo

no radio ip-broadcast-echo

Syntax Description This command has no arguments or keywords.

Defaults IP broadcast echo is disabled.

Command Modes Interface configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to enable IP broadcast echo:

```
Router(config-if)# radio ip-broadcast echo
```

radio ip-multicast-echo

To activate the upstream radio IP multicast echo so that the Cisco uBR7200 series can echo multicast packets, use the **radio ip-multicast-echo** interface configuration command. To disable the IP multicast echo, use the **no** form of this command.

radio ip-multicast-echo

no radio ip-multicast-echo

Syntax Description This command has no arguments or keywords.

Defaults IP multicast echo is enabled.

Command Modes Interface configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to activate the upstream IP multicast echo:

```
Router(config-if)# radio ip-multicast-echo
```

radio metrics-threshold-channel

To configure a limit on the percentage of error codewords threshold, use the **radio metrics-threshold-channel** interface configuration command. When this limit is exceeded in a 1-hour period, alarms are generated to notify the user. Minor alarms are generated and displayed on the console when the specified 1-hour threshold is exceeded. To force the thresholds back to the default values, use the **no** form of this command.

radio metrics-threshold-channel *channel CERThresh* |

no radio metrics-threshold-channel *channel CERThresh | MINCodeword*

Syntax Description		
	<i>channel</i>	Specifies the channel ID numbers, which are 0 to 3.
	<i>CERThresh</i>	Specifies the percentage of error codewords threshold.
	<i>MINCodeword</i>	Specifies the minimum number of codewords to be received by subscriber unit.

Defaults No default behaviors or values.

Command Modes Interface configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines All link metrics are measured in codewords, where a codeword is a unit (228 bytes) of data transmission over the radio link. The codeword contains user data, error counts, and collation information so that successive codewords can be reconstructed at the receiving end of the transmitted data.

Examples The following example shows how to configure threshold for channel 2, such that if more than 10.05 percent of the received codewords in an hour are error codewords, the minor alarm is generated:

```
UBR04(config-if)# radio metrics-threshold-channel 1hour 2 999
```

Related Commands	Command	Description
	show interfaces radio <i>slot/port</i> metrics-threshold-channel	Displays the codeword thresholds set for link metrics.
	show interfaces radio <i>slot/port</i> 1sec-metrics-channel	Displays a table of values for the last 60 seconds. Values are cumulative—every successive row is the sum of the corresponding values in the previous row plus the values determined for the 1-second period represented by that row.
	show interfaces radio <i>slot/port</i> 1min-metrics-channel	Displays a table of values for the last 60 minutes. Values are cumulative—every successive row is the sum of the corresponding values in the previous row plus the values determined for the 1-minute period represented by that row. The displayed values are identical to those displayed by the 1hour-metrics-channel option, except that the period is 1 minute.
	show interfaces radio <i>slot/port</i> 1hour-metrics-channel	Displays a table of values for the last 60 minutes. Values are cumulative—every successive row is the sum of the corresponding values in the previous row plus the values determined for the 1-minute period represented by that row. The displayed values are identical to those displayed by the 1min-metrics-channel option, except that the period is 1 hour.

radio metrics-threshold-su

To set threshold values for the radio link to evaluate the performance of the radio link over time, use the **radio metrics-threshold-su** interface configuration command. To force the thresholds back to the default values, use the **no** form of this command.

radio metrics-threshold-su *CERThresh* *MINCodeword*

no radio metrics-threshold-su *CERThresh* *MINCodeword*

Syntax Description	Parameter	Description
	<i>CERThresh</i>	Specifies the percentage of error codewords threshold.
	<i>MINCodeword</i>	Specifies the minimum number of codewords to be received by the subscriber unit.

Defaults *CERThresh* has a default value of 10.00 percent, and *MINCodeword* has a default value of 100.

Command Modes Interface configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to configure the subscriber unit (SU) threshold, such that if more than 1000 codewords are received and 10.05percent of them are error codewords, the SU is added to the threshold crossed list:

```
UBR04(config-if)# radio metrics-threshold-su 1005 1000
```

Related Commands	Command	Description
	show interfaces radio <i>slot/port</i> metrics-threshold-bad-su	Displays the subscriber units that crossed the specified threshold.
	show interfaces radio <i>slot/port</i> metrics-threshold-su	Displays the metrics for the subscriber unit.

radio modulation-profile

To create or modify modulation profiles, use the **radio modulation-profile** global configuration command. To delete modulation profiles, use the **no** form of this command.

radio modulation-profile *n* [**bandwidth** *bandwidth* | **throughput** *throughput* | **multipath-robustness** | **burst-length**]

no radio modulation-profile

Syntax Description	<i>n</i>	The modulation profile index number. The maximum profile number is 32. Valid range is 1 to 32.
	bandwidth <i>bandwidth</i>	Specifies the bandwidth in MHz. Valid entries are decimal numbers in the range 0.0 to 100.0. The default value is 6.0 MHz.
	throughput <i>throughput</i>	Specifies the physical layer throughput in Mbps. Valid entries are integer numbers 0 to 500. The default value is 10 Mbps.
	multipath-robustness	Specifies the multipath robustness level (delay spread tolerance). The valid settings are standard high . The default setting is high .
	burst-length	Specifies the duration of OFDM burst. Valid settings are short medium long very-short . The default setting is medium .

Defaults See the syntax description above for the default settings.

Command Modes Global configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines Use the **show radio modulation-profile** command to verify the modulation-profile settings that you specified. You can apply modulation profiles to one or more upstream or downstream channels.

Examples The following example shows how to add a modulation profile:

```
Router(config)# radio modulation-profile 1 bandwidth 3.0 throughput 6.6
multipath-robustness high burst-length medium
```

Related Commands	Command	Description
	show radio capability modulation-profile	Displays all the profiles that the radio modem card supports.
	show radio modulation-profile	Displays the modulation-profile settings that you have specified.

radio privacy kek grace-time

To configure key encryption key (KEK) grace-time data privacy on the wireless network, use the **radio privacy kek grace-time** interface configuration command. To set to the default value, use the **no** form of this command.

radio privacy kek grace-time *seconds*

no radio privacy kek grace-time

Syntax Description	<i>seconds</i>	Specifies the user-input time in seconds. The default value of 600 seconds is used if you do not specify the grace-time value. Valid range is 300 to 1800 seconds.
---------------------------	----------------	--

Defaults	600 seconds
-----------------	-------------

Command Modes	Interface configuration
----------------------	-------------------------

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to set the privacy KEK grace-time to 800 seconds:

```
UBR(config-if)# radio privacy kek grace-time 800
```

Related Commands	Command	Description
	radio privacy enable	Activates radio privacy on the wireless link.
	radio privacy mandatory	Activates radio privacy and disallows access for any unencrypted wireless subscriber units.
	radio privacy kek life-time	Sets the radio privacy KEK life-time.
	radio privacy tek grace-time	Sets the radio privacy TEK grace-time.
	radio privacy tek life-time	Sets the radio privacy TEK life-time.
	show radio privacy kek	Displays the KEK life-time and grace-time values that have been set.
	show radio privacy tek	Displays the TEK life-time and grace-time values that have been set.

radio privacy kek life-time

To configure key encryption key (KEK) life-time data privacy on the wireless network, use the **radio privacy kek life-time** interface configuration command. To set to the default value, use the **no** form of this command.

radio privacy kek life-time *seconds*

no radio privacy kek life-time

Syntax Description	<i>seconds</i>	Specifies the user-input time in seconds. The default value of 604800 seconds is used if you do not specify the KEK life-time. Valid range is 86,400 to 6,048,000 seconds.
---------------------------	----------------	--

Defaults	604,800 seconds
-----------------	-----------------

Command Modes	Interface configuration
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Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples

The following example shows how to set the privacy KEK life-time to 750,000 seconds:

```
UBR(config-if)# radio privacy kek life-time 750000
```

Related Commands	Command	Description
		radio privacy enable
	radio privacy mandatory	Activates radio privacy and disallows access for any unencrypted wireless subscriber units.
	radio privacy kek grace-time	Sets the radio privacy KEK grace-time.
	radio privacy tek grace-time	Sets the radio privacy TEK grace-time.
	radio privacy tek life-time	Sets the radio privacy TEK life-time. display the traffic encryption key (TEK) life-time and grace-time values that have been set
	show radio privacy kek	Displays the KEK life-time and grace-time values that have been set.
	show radio privacy tek	Displays the TEK life-time and grace-time values that have been set.

radio privacy mandatory

To activate radio privacy and disallow access for any unencrypted wireless subscriber units on the wireless network, use the **radio privacy mandatory** interface configuration command. Use this command after setting KEK and TEK. To deactivate radio privacy, use the **no** form of this command.

radio privacy mandatory

no radio privacy mandatory

Syntax Description This command has no arguments or keywords.

Defaults Deactivated

Command Modes Interface configuration

Release	Modification
12.1(3)XQ1	This command was introduced.

Examples The following example shows how to activate radio privacy and disallow access for any unencrypted wireless subscriber units:

```
Router(config-if)# radio privacy mandatory
```

Command	Description
radio privacy enable	Activates radio privacy on the wireless link.
radio privacy kek grace-time	Sets the radio privacy KEK grace-time.
radio privacy kek life-time	Sets the radio privacy KEK life-time.
radio privacy tek grace-time	Sets the radio privacy TEK grace-time.
radio privacy tek life-time	Sets the radio privacy TEK life-time.
show radio privacy kek	Displays the KEK life-time and grace-time values that have been set.
show radio privacy tek	Displays the TEK life-time and grace-time values that have been set.

radio privacy tek grace-time

To configure traffic encryption key (TEK) grace-time data privacy on the wireless network, use the **radio privacy tek grace-time** interface configuration command. To deactivate radio privacy, use the **no** form of this command.

radio privacy tek grace-time *seconds*

no radio privacy tek grace-time

Syntax Description	<i>seconds</i>	Specifies the privacy TEK grace-time in seconds. The valid TEK grace-time entries are 300 to 1800.																
Defaults	600 seconds																	
Command Modes	Interface configuration																	
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>12.1(3)XQ1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	12.1(3)XQ1	This command was introduced.													
Release	Modification																	
12.1(3)XQ1	This command was introduced.																	
Examples	<p>The following example shows how to set the privacy TEK grace-time to 800 seconds:</p> <pre>UBR(config-if)# radio privacy tek grace-time 800</pre>																	
Related Commands	<table border="1"> <thead> <tr> <th>Command</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>radio privacy enable</td> <td>Activates radio privacy on the wireless link.</td> </tr> <tr> <td>radio privacy mandatory</td> <td>Activates radio privacy and disallows access for any unencrypted wireless subscriber units.</td> </tr> <tr> <td>radio privacy kek grace-time</td> <td>Sets the radio privacy KEK grace-time.</td> </tr> <tr> <td>radio privacy kek life-time</td> <td>Sets the radio privacy KEK life-time.</td> </tr> <tr> <td>radio privacy tek life-time</td> <td>Sets the radio privacy TEK life-time.</td> </tr> <tr> <td>show radio privacy kek</td> <td>Displays the KEK life-time and grace-time values that have been set.</td> </tr> <tr> <td>show radio privacy tek</td> <td>Displays the TEK life-time and grace-time values that have been set.</td> </tr> </tbody> </table>	Command	Description	radio privacy enable	Activates radio privacy on the wireless link.	radio privacy mandatory	Activates radio privacy and disallows access for any unencrypted wireless subscriber units.	radio privacy kek grace-time	Sets the radio privacy KEK grace-time.	radio privacy kek life-time	Sets the radio privacy KEK life-time.	radio privacy tek life-time	Sets the radio privacy TEK life-time.	show radio privacy kek	Displays the KEK life-time and grace-time values that have been set.	show radio privacy tek	Displays the TEK life-time and grace-time values that have been set.	
Command	Description																	
radio privacy enable	Activates radio privacy on the wireless link.																	
radio privacy mandatory	Activates radio privacy and disallows access for any unencrypted wireless subscriber units.																	
radio privacy kek grace-time	Sets the radio privacy KEK grace-time.																	
radio privacy kek life-time	Sets the radio privacy KEK life-time.																	
radio privacy tek life-time	Sets the radio privacy TEK life-time.																	
show radio privacy kek	Displays the KEK life-time and grace-time values that have been set.																	
show radio privacy tek	Displays the TEK life-time and grace-time values that have been set.																	

radio privacy tek life-time

To configure TEK life-time data privacy on the wireless network, use the **radio privacy tek life-time** interface configuration command. To force the default setting, use the **no** form of this command.

radio privacy tek life-time *seconds*

no radio privacy tek life-time

Syntax Description	<i>seconds</i>	Specifies the TEK life-time in seconds. The valid entries are 1800 to 604,800.
Defaults	43,200 seconds	
Command Modes	Interface configuration	
Command History	Release	Modification
	12-2(3)T	This command was introduced.
Examples	The following example shows how to set the privacy TEK life-time to 56000: <pre>UBR(config-if)# radio privacy tek life-time 56000</pre>	
Related Commands	Command	Description
	radio privacy enable	Activates radio privacy on the wireless link.
	radio privacy mandatory	Activates radio privacy and disallows access for any unencrypted wireless subscriber units.
	radio privacy kek grace-time	Sets the radio privacy KEK grace-time.
	radio privacy kek life-time	Sets the radio privacy KEK life-time.
	radio privacy tek grace-time	Sets the radio privacy TEK grace-time.
	show radio privacy kek	Displays the KEK life-time and grace-time values that have been set.
	show radio privacy tek	Displays the TEK life-time and grace-time values that have been set.

radio proxy-arp

To activate the radio proxy Address Resolution Protocol (ARP) for host-to-host communications, use the **radio proxy-arp** interface configuration command. The radio proxy ARP enables the Cisco uBR7200 series to issue ARP requests on behalf of the subscriber units on the same wireless network subnet. To disable this feature, use the **no** form of this command.

radio proxy-arp

no radio proxy-arp

Syntax Description This command has no arguments or keywords.

Defaults Enabled

Command Modes Interface configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines To verify if radio proxy ARP has been activated or deactivated, enter the **show running-config** command and look for the interface configuration information. If radio proxy ARP has been activated, it does not appear in this output. If radio proxy ARP has been deactivated, it appears in the output as **no radio proxy-arp**. If you are having trouble, make sure that you entered the correct port and radio modem card slot number when you activated radio proxy ARP.

Examples The following example shows how to activate proxy ARP for host-to-host communications:

```
CMTS01(config-if)# radio proxy-arp
```

radio qos permission

To specify permission for creating and updating the quality-of-service (QoS) table, use the **radio qos permission** global configuration command. To remove a previously enabled permission, use the **no** form of this command.

radio qos permission { create | enforce | subscribers | update }

no radio qos permission

Syntax Description

create	Permits creation of QoS table entries by Simple Network Management Protocol (SNMP).
enforce	Enforces SNMP specified in the QoS profile.
subscribers	Permits subscribers to create QoS table entries.
update	Permits dynamic update of QoS table entries by SNMP.

Defaults

No default behaviors or values.

Command Modes

Global configuration

Command History

Release	Modification
12.1(3)XQ1	This command was introduced.

Examples

The following example shows how to enable SNMP access to create entries in the QoS tables:

```
CMTS01(config)# radio qos permission create
```

Related Commands

Command	Description
radio qos profile	Creates radio QoS profiles.
show radio qos profile	Verifies whether a QoS profile has been created and to see how it is configured.

radio qos profile

To configure a QoS profile, use the **radio qos profile** global configuration command. To set default values for profile group numbers 1 and 2, and to remove the QoS profile if no specific parameters remain, use the **no** form of this command.

radio qos profile {*groupnum* | *guaranteed-upstream* | *max-burst* | *max-upstream* | *max-downstream* *priority* | *privacy* | *tos-overwrite* | *value*}

no radio qos profile {*groupnum* | *guaranteed-upstream* | *max-burst* | *max-downstream* | *priority* | *tos-overwrite* | *value*}

Syntax Description		
<i>groupnum</i>		QoS profile group number. QoS profiles 1 and 2 are required by the system. QoS profile 1 is used during registration, and QoS profile 2 is the default QoS profile. Both profiles are preconfigured and cannot be removed; however, you can modify these profiles.
<i>guaranteed-upstream</i>		Guaranteed minimum upstream rate in kilobytes per second. Valid values are from 0 to 100,000. Default value is 0 (no reserved rate).
<i>max-burst</i>		Maximum upstream transmit burst size in bytes that the modem can send for any single transmit burst. Default value is 0 (no limit).
<i>max-upstream</i>		Maximum upstream data rate in kilobytes per second that a modem using this QoS profile can receive. Valid values are 0 to 255 minislots. Default value is 0 (no upstream rate limit).
<i>max-downstream</i>		Maximum downstream data rate in kilobytes per second that a modem using this QoS profile can receive. Valid values are 0 to 255 minislots. Default value is 0 (no downstream rate limit).
<i>priority</i>		Relative priority number assigned to upstream traffic by this QoS profile. Valid values are from 0 to 7, with 7 being the highest priority. Default value is 0.
<i>privacy</i>		Enables radio baseline privacy.
<i>tos-overwrite</i>		Overwrite of the type of service (ToS) field in the IP datagrams received on the upstream before forwarding them downstream (or IP backbone). This parameter sets the mask-hex (hexadecimal mask) bits to value hex (hexadecimal value). This helps the headend identify datagrams for QoS on the backbone.
<i>value</i>		The value substituted for the ToS value.

Defaults See the previous syntax description for default values.

Command Modes Global configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples

The following examples show how to configure QoS profile 4 with guaranteed upstream of 2 kbps, maximum transmission burst of 2, maximum downstream rate of 3 kbps, a priority of 4, DOCSIS baseline privacy set, and a tos-overwrite mask and value byte (in hex) of 0x2:

```
Router(config)# radio qos profile 4 guaranteed-upstream 2
Router(config)# radio qos profile 4 max-burst 2
Router(config)# radio qos profile 4 max-downstream 3
Router(config)# radio qos profile 4 priority 4
Router(config)# radio qos profile 4 privacy
Router(config)# radio qos profile 4 tos-overwrite 0x2
```

Related Commands

Command	Description
radio qos permission	Specifies permission for creating and updating the QoS table.
show radio qos profile	Verifies whether a QoS profile has been created and to see how it is configured.

radio ra-backoff

To turn on the request access (RA) backoff, use the **radio ra-backoff** interface configuration command. The RA power control loop is used for minimizing interference on the upstream channels upon RA collisions. To turn off the RA backoff at the headend, use the **no** form of this command.

radio ra-backoff

no radio ra-backoff

Syntax Description This command has no arguments or keywords.

Defaults RA is off by default.

Command Modes Interface configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines When the RA backoff is turned on at the headend, the RA power for each subscriber unit is reduced to 3 dB. This is a one-time power reduction. When the RA backoff is turned off (default), all subscriber units restore their RA power to the highest setting.

Examples The following example shows how to turn on the RA power:

```
Router(config-if)# radio ra-backoff
```

Related Commands	Command	Description
	show interface radio slot/port alc	Displays the current RA setting.

radio receive-antennas

To configure the wireless modem card to use a specified number of receive antennas, use the **radio receive-antennas** interface configuration command. To set the antenna number to 1, use the **no** form of this command.

radio receive-antennas {1 | 2}

no radio receive-antennas

Syntax Description	1 2	Specifies whether antenna 1 (main) or antenna 2 (diversity) is used.
---------------------------	--------------	--

Defaults	1
-----------------	---

Command Modes	Interface configuration
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Command History	Release	Modification
	12.0(7)XR	This command was introduced.
12.1(3)XQ1	Support for multipoint radio modem was added.	

Usage Guidelines	You can enter this command only when the radio link is down (shut). The command takes effect when the link is again active (no shut).
-------------------------	---



Note	Before this command can take effect, the receive antennas and wireless transverters must be available.
-------------	--

Examples	The following example shows how to configure the wireless modem card to use two receive antennas:
-----------------	---

```
Router(config-if)# radio receive-antennas 2
```

Related Commands	Command	Description
	show running-configuration interfaces radio	Displays the current setting.

radio relay-agent-option

To configure the Cisco uBR7200 series so that it inserts the subscriber unit MAC-address into a DHCP packet when a packet is received from a subscriber unit or another host, use the **radio relay-agent-option** interface configuration command. The Cisco uBR7200 series then forwards the packet to a DHCP server. To disable the insertion, use the **no** form of this command.

radio relay-agent-option

no radio relay-agent-option

Syntax Description This command has no arguments or keywords.

Defaults Disabled

Command Modes Interface configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines If you are having trouble, make sure that you entered the correct port and subscriber unit card slot number when you activate **radio relay-agent-option**. A DOCSIS-compliant DHCP server is required. The DHCP server verifies that the fixed IP address, if any, returned to the host is valid for the IP subnet on that downstream interface. The IP address must be unique and valid in the subnet for the user to obtain connectivity.

Examples The following example enables the insertion of DHCP relay-agent information into DHCP packets:

```
Router(config-if)# radio relay-agent-option
```

radio rf-meas-interval ambient

To set the measurement interval of the ambient noise for performing noise floor statistics (NFS) functions, use the **radio rf-meas-interval ambient** interface configuration command. The NFS functions allow the user to determine the noise floor of the radio link and make adjustments to the system, (for example, adjust the target receive-power level of the upstream port). To set the interval to the default value, use the **no** form of this command.

radio rf-meas-interval ambient *aint-seconds*

no radio rf-meas-interval ambient

Syntax Description	<i>aint-seconds</i>	Specifies the ambient measurement interval in seconds. Valid values are 1 to 3600 seconds. The default value is 300 seconds.
---------------------------	---------------------	--

Defaults	300 seconds.
-----------------	--------------

Command Modes	Interface configuration
----------------------	-------------------------

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to set the ambient noise measurement interval to 400 seconds:

```
Router(config-if)# radio rf-meas-interval ambient 400
```

Related Commands	Command	Description
	radio rf-meas-interval calibration	Sets the measurement interval of a calibrated noise source.
	show interface slot/dsport rf-meas-interval	Displays the intervals of the ambient noise and the calibration noise measurements of the radio card for the specified slot and downstream port numbers.

radio rf-meas-interval calibration

To set the measurement interval of a calibrated noise source for performing the headend gain control (HGC) function, use the **radio rf-meas-interval calibration** interface configuration command. To set the interval to the default value, use the **no** form of this command.

radio rf-meas-interval calibration *cint-seconds*

no radio rf-meas-interval calibration

Syntax Description	<i>cint-seconds</i>	Specifies the interval for the calibration measurement. Valid values are 1 to 3600 seconds. The default value is 300 seconds.						
Defaults	300 seconds							
Command Modes	Interface configuration							
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>12.1(3)XQ1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	12.1(3)XQ1	This command was introduced.			
Release	Modification							
12.1(3)XQ1	This command was introduced.							
Usage Guidelines	The HGC function, which is automatically performed by the headend, ensures that the headend accurately measures the power levels of the subscriber units and the noise floor. The HGC function is obtained by taking measurements of a calibrated noise source in the transverter. The radio rf-meas-interval calibration command is used to set the interval at which these measurements are taken.							
Examples	The following example shows how to set the calibration noise measurement interval to 500 seconds: <pre>Router(config-if)# radio rf-meas-interval calibration 500</pre>							
Related Commands	<table border="1"> <thead> <tr> <th>Command</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>radio rf-meas-interval ambient</td> <td>Used for setting the measurement interval of the ambient noise for performing Noise Floor Statistics functions.</td> </tr> <tr> <td>show interface slot/dsport rf-meas-interval</td> <td>Displays the intervals of the ambient noise and the calibration noise measurements of the radio card for the specified slot and downstream port numbers.</td> </tr> </tbody> </table>	Command	Description	radio rf-meas-interval ambient	Used for setting the measurement interval of the ambient noise for performing Noise Floor Statistics functions.	show interface slot/dsport rf-meas-interval	Displays the intervals of the ambient noise and the calibration noise measurements of the radio card for the specified slot and downstream port numbers.	
Command	Description							
radio rf-meas-interval ambient	Used for setting the measurement interval of the ambient noise for performing Noise Floor Statistics functions.							
show interface slot/dsport rf-meas-interval	Displays the intervals of the ambient noise and the calibration noise measurements of the radio card for the specified slot and downstream port numbers.							

radio self-test

To test the memory and hardware integrity of the wireless modem card, use the **radio self-test** interface configuration command. To configure a link without a self-test, use the **no** form of this command.

radio self-test

no radio self-test

Syntax Description	enable (Optional) Causes execution of self-tests each time the card is initiated.
---------------------------	--

Defaults	Self-test is disabled by default.
-----------------	-----------------------------------

Command Modes	Interface configuration
----------------------	-------------------------

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines	Self-test is executed when microcodes are loaded in each of the field-programmable gate arrays (FPGAs) and digital signal processes (DSPs) when the router loads, or after a microcode reload command is executed. Self-test is not executed on each no shut command.
-------------------------	---

Examples	The following example shows how to download and execute self-tests each time the modem card is enabled:
-----------------	---

```
UBR04(config-if)# radio self-test
```

Related Commands	Command	Description
	show running-configuration interface radio	Displays the current settings.

radio shared-secret

To activate authentication so that all subscriber units must return a known text string to register with the Cisco headend for access to the network, use the **radio shared-secret** interface configuration command. To disable the authentication, use the **no** form of this command.

```
radio shared-secret [0 | 7 ] authen-key
```

```
no radio shared-secret
```

Syntax Description		
	0	Specifies that an unencrypted password will follow.
	7	Specifies that an encrypted password will follow.
	<i>authen-key</i>	Specifies that the unencrypted is a shared-secret string. Valid authentication key range is 1 to 80 characters.

Defaults **no radio shared-secret**

Command Modes Interface configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to activate authentication of a shared-secret key, and indicates that an encrypted message will follow:

```
Router(config-if)# radio shared-secret 7 55533344cisco
```

radio snapshot

To create a snapshot specification on the radio modem card, use the **radio snapshot** interface configuration command. To delete a specification and its associated data, use the **no** form of this command.

radio snapshot *dspNum snapshotType [burstType]*

no radio snapshot *dspNum*

Syntax Description	
<i>dspNum</i>	Specifies the digital signal process (DSP) number (dsprx0, dsprx1, dsprx 2, or dsprx3).
<i>snapshotType</i>	<p>Specifies the snapshot type. You can specify the bitwise OR operation value of as many as four of the following values in hexadecimal:</p> <ul style="list-style-type: none"> 0x1—raw burst data received from a subscriber through antenna 1 0x2—raw burst data received from a subscriber through antenna 2 0x4—frequency spectrum received from antenna 1 0x8—frequency spectrum received from antenna 2 0x10—channel impulse response for antenna 1 (what the physical channel looks like between the headend and the subscriber end) 0x20—channel impulse response for antenna 2 (what the physical channel looks like between the headend and the subscriber end) 0x40—frequency domain of the channel-impulse response for antenna 1 (for a group of subscriber units on an upstream channel) 0x80—frequency domain of the channel-impulse response for antenna 2 (for a group of subscriber units on an upstream channel) 0x100—frequency domain of the channel-impulse response for antenna 1 (for a specific subscriber ID) 0x200—frequency domain channel-impulse response for antenna 2 (for a specific subscriber ID) 0x400—Codec data 0x800—interference estimate for antenna 1 0x1000—interference estimate for antenna 2 0x200000—TSID power array for power data burst or received power wavelength for the up synchronization process. Shows a snapshot of subscribers on an automatic level control (ALC) window. 0x400000—correlation of power vector and power mask of the upstream ranging signal (power for initial ranging) 0x800000—initial ranging time domain channel for antenna 1 0x1000000—initial ranging time domain channel for antenna 2 0x2000000—initial ranging time domain channel for antenna 1 and antenna 2 combined 0x4000000—ranging smoothed time domain channel power
<i>burstType</i>	{ initial-ranging maint-range sm-data ra power null short-data long-data inr-data cable-pad }
initial-ranging	The range where a subscriber can register. Snapshot is taken when initial ranging burst is received.

maint-range	Keeps the link between a subscriber unit and headend “alive” even if data is not being transmitted. Snapshot is taken when a stationary range burst is received.
sm-data	Keeps the link between a subscriber unit and headend “alive” even if data is not being transmitted. Snapshot is taken when a stationary ranging data burst is received.
ra	Snapshot is taken when request access burst is received.
power	Snapshot is taken when automatic level control (ALC) burst is received.
null	Snapshot is taken when NULL burst is received. It measures ambient and calibration noise.
short-data	Snapshot is taken when data burst is received. It measures the actual traffic burst.
long-data	Snapshot is taken when data burst is received. It measures the actual traffic burst.
inr-data	Snapshot is taken when initial range data burst is received.
cable-pad	Snapshot is taken when cable-pad burst is received.

Defaults

No default behavior or values.

Command Modes

Interface configuration

Command History

Release	Modification
12.1(3)XQ1	This command was introduced.

Usage Guidelines

A snapshot is a specified amount of data captured from the wireless modem card.

When you issue a snapshot request, as many as four simultaneous radio signal attributes can be captured. The four attributes are specified by the bitwise OR operation data of as many as four of the snapshot types.

Examples

The following example shows how to create a snapshot specification for **dsprx0**:

```
Router(config-if)# radio snapshot dsprx0 1 initial-ranging
```

Related Commands	Command	Description
	show interface radio snap-data	Displays the data captured for the snapshot specification.
	show interface radio snap-spec	Displays the configured snapshot information.

radio source-verify

To verify that only hosts that have received DHCP leases through the Cisco headend can access the network, use the **radio source-verify** interface configuration command. The headend discards all packets received from hosts that have not received DHCP-assigned addresses. To deactivate upstream verification, use the **no** form of this command.

radio source-verify

no radio source-verify

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values.

Command Modes Interface configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example activates upstream verification:

```
UBR(config-if)# radio source-verify
```

radio threshold

To configure a threshold specification, use the **radio threshold** interface configuration command. To delete a threshold specification, use the **no** form of this command.

```
radio threshold statsParams {MAC-address | chan-id} threshType threshValue [repeat-time]
[clear-time] [dsp dspNum]
```

```
no radio threshold statsParams threshType
```

Syntax Description

<i>statsParams</i>	{ sinr-ant1 sinr-ant2 sinr-total timingOffset rf-rx-power-ant1 rf-rx-power-ant2 chan-delay-spread-ant1 chan-delay-spread-ant2 power-amb }
sinr-ant1	Signal-to-interference plus noise ratio for antenna 1.
sinr-ant2	Signal-to-interference plus noise ratio for antenna 2.
sinr-total	Signal-to-interference plus noise ratio for antennas 1 and 2.
timingOffset	Represents the timing delay variations detected in the radio link.
rf-rx-power-ant1	Represents the receive power at the main RF headend (antenna gain is not included).
rf-rx-power-ant2	Represents the receive power at the diversity RF headend (antenna gain is not included).
chan-delay-spread-ant1	The offset for channel delay spread on antenna 1.
chan-delay-spread-ant2	The offset for channel delay spread on antenna 2.
power-amb	Represents the noise floor of the ambient environment, in decibels.
<i>MAC-address</i>	Specifies a particular subscriber unit.
<i>chan-id</i>	Specifies an upstream channel ID. Valid values are 0 to 3.
<i>threshType</i>	{ high-thresh low-thresh up-change down-change pos-crossing neg-crossing }
high-thresh	Specifies that the threshold condition is met when the value being monitored is above <i>threshValue</i> .
low-thresh	Specifies that the threshold condition is met when the value being monitored is below <i>threshValue</i> .
up-change	Specifies that the threshold condition is met when the positive change of the value being monitored is greater than <i>threshValue</i> .
down-change	Specifies that the threshold condition is met when the negative change of the value being monitored is greater than the <i>threshValue</i> .
pos-crossing	Specifies that the threshold condition is met when the value being monitored does a positive crossing (positive increase) of the <i>threshValue</i> .
neg-crossing	Specifies that the threshold condition is met when the value being monitored does a negative crossing (negative increase) of the <i>threshValue</i> .
<i>threshValue</i>	A 32-bit integer value.
<i>repeat-time</i>	Identifies how much time is left before another event of the same type is generated when oscillating across a threshold.

<i>clear-time</i>	Identifies how long the signal stays below a threshold before another event is generated.
dsp	Specifies one of the following digital signal process (DSP) numbers (<i>dspNum</i>): dsprx0, dsprx1, dsprx2, or dsprx3.

Defaults No default behavior or values.

Command Modes Interface configuration

Release	Modification
12.1(3)XQ1	This command was introduced.

Usage Guidelines The following describes how *clear-time* and *repeat-time* work for the three scenarios:

1. If *clear-time* is any value and *repeat-time* is 0, the user is notified whenever one of the following threshold conditions are met: { **high-thresh** | **low-thresh** | **up-change** | **down-change** | **pos-crossing** | **neg-crossing** }.
2. If *clear-time* is greater than 0 and *repeat-time* is 0, the following occurs:
 - a. When a threshold condition is met for the first time, the user is notified.
 - b. When a threshold condition does not occur for the length of *clear-time*, the user is notified and the cycle continues with Step **2a**.
3. If both *clear-time* and *repeat-time* are greater than 0, the following occurs:
 - a. When one of the threshold conditions occurs for the first time, the user is notified. After the first notification, no more notifications are sent for the length of *repeat-time*. At the end of *repeat-time*, the user is notified indicating how many times the user was not notified when the threshold condition occurred.
 - b. When a threshold condition stops being met for the length of *clear-time* period, the user is notified then the cycle starts with Step **3a**.

Examples The following example configures threshold specification for **sinr-ant1** on channel 0:

```
Router(config-if)# radio threshold sinr-ant1 0 high 30
```

Command	Description
show interface radio thresholds	Displays the set of currently configured thresholds on the radio card.

radio timeline

To configure a timeline collection specification, use the **radio timeline** interface configuration command. To delete a timeline, use the **no** form of this command.

```
radio timeline statsParams {MAC-address | chan-id} size [dsp dspNum] [print-options {on | off}]
[sampling-period] [tone {circular | average | number toneVal}]
[Trigger threshParams threshType postTrigBufmgmt]
```

```
no radio timeline statsParams {MAC-address | chan-id}
```

Syntax Description	
<i>statsParams</i>	{ sinr-ant1 sinr-ant2 sinr-total timingOffset rf-rx-power-ant1 rf-rx-power-ant2 chan-delay-spread-ant1 chan-delay-spread-ant2 power-amb } The data for the radio attribute is collected as a histogram.
sinr-ant1	Signal-to-interference plus noise ratio for antenna 1.
sinr-ant2	Signal-to-interference plus noise ratio for antenna 2.
sinr-total	Signal-to-interference plus noise ratio for antennas 1 and 2.
timingOffset	Represents the timing delay variations detected in the radio link.
rf-rx-power-ant1	Represents the receive power at the main RF headend (antenna gain is not included).
rf-rx-power-ant2	Represents the receive power at the diversity RF headend (antenna gain is not included).
chan-delay-spread-ant1	The offset for channel delay spread on antenna 1.
chan-delay-spread-ant2	The offset for channel delay spread on antenna 2.
power-amb	Represents the noise floor of the ambient environment, in decibels.
<i>MAC-address</i>	Specifies a particular subscriber unit.
<i>chan-id</i>	Specifies an upstream channel ID. Valid values are 0 to 3.
<i>size</i>	Specifies the number of values to be collected.
dsp	Specifies one of the following digital signal process (DSP) <i>dspNum</i> values: dsprx0, dsprx1, dsprx2, or dsprx3.
print-options	on or off .
<i>sampling-period</i>	Specifies, in seconds, the frequency of data collection.
<i>Trigger</i>	Specifies when the collection of data must stop. Trigger identifies a threshold specification. When the threshold is reached, the timeline collection is stopped.
<i>threshParams</i>	Has same attributes as <i>statsParams</i> .
<i>threshType</i>	{ high-thresh low-thresh up-change down-change pos-crossing neg-crossing }
high-thresh	Specifies that the threshold condition is met when the value being monitored is above <i>threshValue</i> .
low-thresh	Specifies that the threshold condition is met when the value being monitored is below <i>threshValue</i> .
up-change	Specifies that the threshold condition is met when the positive change of the value being monitored is greater than <i>threshValue</i> .

down-change	Specifies that the threshold condition is met when the negative change of the value being monitored is greater than the <i>threshValue</i> .
pos-crossing	Specifies that the threshold condition is met when the value being monitored does a positive crossing (positive increase) of the <i>threshValue</i> .
neg-crossing	Specifies that the threshold condition is met when the value being monitored does a negative crossing (negative increase) of the <i>threshValue</i> .
<i>postTrigBufMgt</i>	Specifies the position (position 1 or 2) of the trigger in the data collected. If the trigger position is 1, then most of the data collected before the trigger is returned. If the trigger position is 2, most of the data returned is captured after the occurrence of the trigger.

Defaults No default behavior or values.

Command Modes Interface configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines A timeline is a sequence of data values collected for a specified attribute. The amount of data collected is controlled by the *size* parameter. The maximum size is 1000 points.

Collection starts as soon as the command succeeds, and continues until the *Trigger* option occurs or the **radio interface radio tl-stop** command is entered.



Note

Histograms and timelines share the same digital signal process (DSP) memory. A total of 10 histograms and timelines can be created on a single DSP. There are a total of 8 locations for **fine** histograms and timelines and 5 locations for **coarse** histograms. The combination of histograms and timelines must be less than 10.

Examples The following example shows how to configure a timeline specification. The collection process starts as soon as the command succeeds. It collects a timeline for **sinr-ant1**. The timeline is collected on channel 3. The timeline size is 600 points. The rest of the parameters are optional and the system picks default values.

```
UBR04# radio timeline sinr-ant1 3 600
```

Related Commands	Command	Description
	radio interface radio tl-start	Starts a stopped timeline specification.
	radio interface radio tl-stop	Stops a running timeline specification.
	show interface radio tl-data	Displays timeline data for the specified card.
	show interface radio tl-spec	Displays the details of the timeline specification.

radio transmit-power

To set the transverter to transmit the specified amount of power (in dBm) when in operation, use the **radio transmit-power** interface configuration command. To disable this function, use the **no** form of this command.

radio transmit-power *power-level*

no radio transmit-power

Syntax Description	<i>power-level</i>	Positive number representing power stated in dBm. Transmit power range is between 4 and 33 dBm.
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Defaults	No default behavior or values.
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Command Modes	Interface configuration
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Command History	Release	Modification
	12.0(7)XR	This command was introduced.
12.1(1)T	Transmit power range was modified.	
12.1(3)XQ1	Supported on the fixed wireless multipoint product.	

Usage Guidelines	Maximum transmission power is limited by the capabilities of the transverter. In addition, your country's telecommunications authority (the FCC in the United States) regulates the maximum power. It is the responsibility of the installer and operator to comply with the relevant regulations.
-------------------------	--

To support the maximum number of users in an area, keep the power as low as possible while maintaining sufficient margin and performance. Refer to the *Cisco Broadband Fixed Wireless Site Planning Guide* for additional information.



Note The command takes effect on the next **no shut**.

Examples	The following example shows how to set the transmit power to +25 dBm:
-----------------	---

```
UBR04(config-if)# radio transmit-power 25
```

Related Commands	Command	Description
	show controllers radio rf	Displays the current transmit power settings.

radio upstream admission-control

To specify the percentage of the overbooking rate, use the **radio upstream admission-control** interface configuration command. To disable upstream admission control, use the **no** form of this command.

radio upstream *portnum* **admission-control** *percentage*

no radio upstream *portnum* **admission-control**

Syntax Description		
	<i>portnum</i>	Specifies the upstream port.
	<i>percentage</i>	The admission control is set as a percentage of the specified upstream channel capacity. Percentage limits overbooking. Valid values are from 100 to 10000 percent.

Defaults Disabled

Command Modes Interface configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to limit overbooking on upstream port 4 to 1000 percent:

```
Router(config-if)# radio upstream 4 admission-control 1000
```

radio upstream data-backoff

To set fixed start and stop values for initial ranging backoff on the upstream port, use the **radio upstream data-backoff** interface configuration command. To set the initial ranging backoff values to the default start and end values, use the **no** form of this command.

radio upstream *n* data-backoff *start-value end-value* [auto]

no radio upstream *n* data-backoff

Syntax Description		
<i>n</i>		Specifies the upstream port number.
<i>start-value</i>		Specifies the initial ranging start backoff value. Valid start values are 0 to 15; 0 is the default start value.
<i>end-value</i>		Specifies the initial ranging end backoff value. Valid end values are 0 to 15; 4 is the default end value.
auto		Specifies the automatic changed data backoff value.

Defaults The default initial ranging value is **auto**.

Command Modes Interface configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to set the initial ranging start and end backoff values to 2 and 4, respectively, for upstream port 2:

```
UBR(config-if)# radio upstream 2 data-backoff 2 4
```

Related Commands	Command	Description
	radio upstream range-backoff	Sets the start and end ranging backoff values.

radio upstream description

To store a string description about a particular upstream channel, use the **radio upstream description** interface configuration command. To disable this function, use the **no** form of this command.

radio upstream *usport* **description** [*string*]

no radio upstream description

Syntax Description		
	<i>usport</i>	Specifies the upstream port number. Valid values are 0 to 3.
	<i>string</i>	User-defined string that the router retains in the configuration file that describes the specified port number. Valid values are 1 to 80 characters.

Defaults No default behavior or values.

Command Modes Interface configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to set a description for upstream port 2:

```
Router(config-if)# radio upstream 2 description sampledescription
```

radio upstream frequency

To specify the upstream radio frequency, use the **radio upstream frequency** command. To disable this function, use the **no** form of this command.

radio upstream frequency [*freq*] **width** [*width*]

no radio upstream frequency

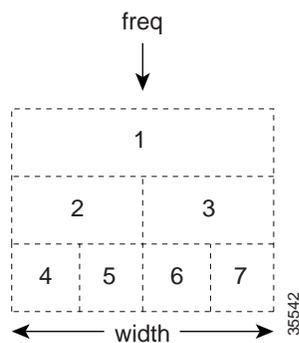
Syntax Description	<i>freq</i>	The frequency in kHz (dBs are allowed). Valid range is 0 to 50000000 kHz.
	width	The keyword used for specifying the bandwidth.
	<i>width</i>	The bandwidth in MHz. The width must be supported by the RF/IF modules.

Defaults The default bandwidth will depend on the band that your multipoint system uses.

Command Modes Interface configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines The radio interface cannot be enabled unless a center frequency is specified. Specify the center frequency and the bandwidth for the whole upstream channel group. The following is a pictorial representation of the center frequency:



Examples The following example shows how to set the upstream center frequency for the radio mode in slot 6, port 0:

```
UBR(config-if)# interface radio 6/0 radio upstream 0 frequency 5700000
```

■ radio upstream frequency

Related Commands	Command	Description
	show controllers radio <i>slot/port</i> upstream	Displays the specified center frequency for the upstream port that has been configured.
	show controllers radio <i>slot/port</i> rf	Displays the allowed ranges of frequency.

radio upstream range-backoff

To set fixed start and stop values for ranging backoff on the upstream ports, use the **radio upstream range-backoff** interface configuration command. To set the ranging backoff values to the default start and end values, use the **no** form of this command.

radio upstream *n* **range-backoff** *start-value end-value*[**auto**]

no radio upstream *n* **range-backoff**

Syntax Description		
	<i>n</i>	Specifies the upstream port number.
	<i>start-value</i>	Specifies the start ranging backoff value. Valid start values are 0 to 15. The default start value is 0.
	<i>end-value</i>	Specifies the end ranging backoff value. Valid end values are 0 to 15. The default end value is 4.
	auto	Specifies the automatic change data backoff value.

Defaults The default initial ranging value is **auto**.

Command Modes Interface configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to set the start and end ranging backoff values to 2 and 4, respectively, for upstream port 2:

```
UBR(config-if)# radio upstream 2 range-backoff 2 4
```

Related Commands	Command	Description
	radio upstream data-backoff	Sets the initial ranging start and end backoff values.

radio upstream rate-limit

To set the upstream rate limiting for an upstream port on an upstream channel, use the **radio upstream rate-limit** interface configuration command. To disable the upstream rate limiting, use the **no** form of this command.

radio upstream *portnum* **rate-limit** [**token-bucket** [**shaping**]]

no radio upstream *portnum* **rate-limit**

Syntax Description

<i>portnum</i>	Specifies the upstream port number. Valid values are 0 to 3.
token-bucket	This optional keyword applies the token bucket algorithm.
shaping	This optional keyword applies the token bucket policing with grant shaping.

Defaults

The **rate-limit token-bucket** is the default setting.

Command Modes

Interface configuration

Command History

Release	Modification
12.1(3)XQ1	This command was introduced.

Examples

The following example shows how to use the token bucket filter algorithm for upstream port 4:

```
Router(config-if)# radio upstream 4 rate-limit token-bucket
```

Related Commands

Command	Description
radio downstream rate-limit	Controls downstream rate limiting.

radio upstream shutdown

To activate the radio frequency carrier on the upstream ports, use the **radio upstream shutdown** command. Each upstream port must be activated to enable upstream data from the subscriber units to the Cisco uBR7200 series. To enable upstream data traffic, use the **no** form of this command.

radio upstream *portnum* shutdown

no radio upstream *portnum* shutdown

Syntax Description	<i>portnum</i>	Specifies the upstream port number. Valid values are 0 to 3.				
Defaults	The upstream data traffic is disabled.					
Command Modes	Interface configuration					
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>12.1(3)XQ1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	12.1(3)XQ1	This command was introduced.	
Release	Modification					
12.1(3)XQ1	This command was introduced.					
Examples	<p>The following example shows how to activate upstream port 2 to enable upstream data flow from the subscriber unit to the headend:</p> <pre>Router(config-if)# radio upstream 2 shutdown</pre>					

radio upstream subchannel

To create a radio upstream in a subchannel configuration to use a specific modulation profile, use the **radio upstream subchannel** interface configuration command. To disable this function, use the **no** form of this command.

radio upstream *n* **subchannel** *sc* **modulation-profile** *p*

no radio upstream subchannel *sc* **modulation-profile** *p*

Syntax Description

<i>n</i>	User-specified logical index number. Valid range is 1 to 255.
<i>sc</i>	Specifies the subchannel assignment. Valid range is 1 to 7.
<i>p</i>	Specifies the modulation profile to use. Valid range is 1 to 32. The modulation profiles are created with the radio modulation-profile command.



Note

The width specified by the **radio modulation-profile** command must match the width of the subchannel to which this upstream is assigned. Also, note that the upstream must not overlap spectra with any other existing upstreams (for example, upstream 1 and upstream 4 should not be created because their spectra overlap).

modulation-profile	Creates modulation profiles for upstream and downstream channels.
---------------------------	---

Defaults

No default behavior or values.

Command Modes

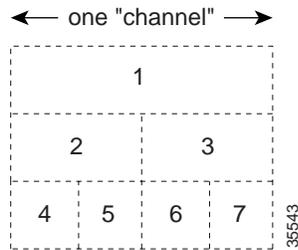
Interface configuration

Command History

Release	Modification
12.1(3)XQ1	This command was introduced.

Usage Guidelines

The *sc* argument corresponds to the following subchannel numbering scheme. The center frequency and the width for the upstream is inferred from this subchannel assignment.

**Examples**

The following example shows how to create a modulation profile for subchannel 1 on the upstream port 0:

```
Router(config-if)# radio upstream 0 subchannel 1 modulation-profile 2
```

Related Commands

Command	Description
radio modulation-profile	Creates a modulation profile for downstream or upstream channels.

radio upstream target-receive-power

To set the desired target-receive power level, use the **radio upstream target-receive-power** interface configuration command. To disable this function, use the **no** form of this command.

radio upstream *usportnum* **target-receive-power** *power-level*

no radio upstream *usportnum* **target-receive-power**

Syntax Description	Parameter	Description
	<i>usportnum</i>	Specifies the upstream port number. Valid values are 0 to 3.
	<i>power-level</i>	Specifies the target-receive power level set by the user. Valid values are -100 to -30. The default value is -66.

Defaults The *power-level* parameter has a default value of -66.

Command Modes Interface configuration

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines The specified gain value must be within the range supported by the RF hardware. This command can be entered only when the radio link is down (**shut**) and will take effect when the link becomes active again (**no shut**).

Use the **show controllers radio slot/port rf | if** command to display the current target-receive power settings for the RF and IF.

Examples The following example shows how to set the target-receive power level for upstream port 1 to -60:

```
UBR04(config-if)# radio upstream 1 target-receive-power -60
```

Related Commands	Command	Description
	show controllers radio slot/port rf if	Displays attributes about a particular modem card.

show controllers radio

To display all or a subset of attributes of a particular modem card, use the **show controllers radio** privileged EXEC command.

show controllers radio *slot-num/port-num* [{**if** | **rf** | **fir** | **codec** | **rfsm** | **rxdsp** | **txdsp** | **us** | **ds** | **host** }]

Syntax	Description
<i>slot-num</i>	Positive integer representing the Cisco uBR7200 series slot number.
<i>port-num</i>	Positive integer representing the port number on that slot.
if	(version, freq, register1): <ul style="list-style-type: none"> • Version is the name, version of the module. • Freq is the current operating frequency. • Register1 is the IF Register 1.
rf	(version, freq, power) <ul style="list-style-type: none"> • Version is the name, version of the module. • Freq is the current operating frequency. • Power is the minimum, maximum power capacity.
fir	(version, firThresh,) <ul style="list-style-type: none"> • Version is the name, version of the module. • firThresh is the queue threshold.
codec	(version, rsDecodeErrThresh, rdDecodeErrBytes) <ul style="list-style-type: none"> • Version is the name, version of the module. • rsDecodeErrThresh is the decode error threshold. • rdDecodeErrBytes are the decode error bytes.
rfsm	Radio FSM task information.
rxdsp	Receiving digital signal process (DSP).
txdsp	Transmitting DSP.
us	Upstream configuration information.
ds	Downstream configuration information.
host	Host FPGA subsystem registers.

Defaults No default behavior or values.

Command Modes Privileged EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

show controllers radio**Usage Guidelines**

If you do not specify any option, all the hardware subsystem information appears. Actual output parameters depend on the hardware and implementation.

Examples

The following example shows how to display the attributes of a radio modem card:

```
Router# show controllers radio
```

Related Commands

Command	Description
show interface radio sid	Displays information about each service identifier (SID) information on the network

show controllers radio downstream

To display downstream port information for a wireless modem card, use the **show controllers radio downstream** EXEC command. To disable this function, use the **no** form of this command.

show controllers radio *slot/downstream-port* downstream

no show controllers radio *slot/downstream-port* downstream

Syntax Description	<i>slot/downstream-port</i> Specifies the slot and downstream port numbers of the wireless modem card.				
Defaults	No default behavior or values.				
Command Modes	EXEC				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>12.1(3)XQ1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	12.1(3)XQ1	This command was introduced.
Release	Modification				
12.1(3)XQ1	This command was introduced.				

Examples

The following example shows how to display downstream port information in slot number 3, port number 0:

```
Router# show controllers radio 3/0 downstream
Radio 3/0 Downstream is up
Frequency not set, Channel Width 6 MHz, 64-QAM,
Symbol Rate 5.056941 Msp/s
FEC ITU-T J.83 Annex B, R/S Interleave I=12, J=17
```

show controllers radio if

To display the IF hardware information for the specified radio interface, use the **show controllers radio if** EXEC command. To disable this function, use the **no** form of this command.

show controllers *slot/port* **radio if**

no show controllers *slot/port* **radio if**

Syntax Description	<i>slot/port</i>	Specifies the slot and port numbers for the specified radio interface.
---------------------------	------------------	--

Defaults	No default behaviors or values.	
-----------------	---------------------------------	--

Command Modes	EXEC	
----------------------	------	--

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines	<p>The following IF information is displayed:</p> <ul style="list-style-type: none"> • The IF board identification and capability information obtained from the IF board's EEPROM or NVS. • The IF board control (ctrl reg) information. • Alarm status information.
-------------------------	---

Examples

The following example shows the displayed information for the IF hardware in slot number 3, port number 0:

```
UBR04# show controllers 3/0 radio if
IF Hardware Identification Info:
  Checksum: 0xc4
  PROM version: 0x01
  Card Type: 0xb0
  Vendor name: cisco
  Part number: 800-99999-15
  Board number: 73-0905-09
  HW Rev Code: A0
  Serial Number: SN123456789
  Date Code: 122019999

IF Hardware Capability Info:
  Capability flag1: 0x1f
  Capability flag2: 0x0
  Tx gain min: 5, max: 22, step: 4
  FLL nominal freq: 5
  FLL minimum freq: 5
  FLL maximum freq: 5
  Rx1 gain min: 5, max: 20, step: 2
  Rx2 gain min: 5, max: 20, step: 2
  Rx frequency: 330000
  Tx frequency: 346000
  Channelization max: 0, freq: 0

RX1 Radio comp: 3 dB
RX2 Radio comp: 3 dB
```

show controllers radio rf

To display the RF hardware information for the specified radio interface, use the **show controllers radio rf** EXEC command. To disable this function, use the **no** form of this command.

show controllers *slot/port* **radio rf**

no show controllers *slot/port* **radio rf**

Syntax Description	<i>slot/port</i>	Specifies the slot and port numbers for the specified radio interface.
--------------------	------------------	--

Defaults	No default behaviors or values.
----------	---------------------------------

Command Modes	EXEC
---------------	------

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines	<p>The following RF information is displayed:</p> <ul style="list-style-type: none"> • The RF board identification and capability information obtained from the RF board's EEPROM or NVS. • The RF board control (ctrl reg) information. • Alarm status information.
------------------	---

Examples

The following example shows the displayed information for the RF hardware in slot number 3, port number 0:

```
UBR04# show controllers 3/0 radio rf
RF Hardware Identification Info:
  Checksum: 0xfe
  PROM version: 0x01
  Card Type: 0x10
  Vendor name: cisco
  Part number: 800-11111-15
  Board number: 73-0909-09
  HW Rev Code: A0
  Serial Number: SN123456789
  Date Code: 122019999
RF Hardware Capability Info:
  Capability flag1: 0xe0
  Capability flag2: 0x01
Duplexer info:
  Band1 freq1: 0, freq2: 0
  Band2 freq1: 0, freq2: 0
  Tx insertion loss: 0
  Tx Lo/Hi: 0
  Date Code: 0
Max chan. BW: 1
Tx frequency bands: 1, step: 1
  min: 220000, max: 460000
Rx frequency bands: 2, step: 1
  min1: 220000, max1: 360000
  min2: 410000, max2: 440000
IF Tx freq: 330000
IF Rx freq: 346000
Freq reference: 0
Tx power range min: 10, max: 23, step: 1
Tx fixed gain min: 0, max: 22, step: 1
Rx fixed gain min: 0, max: 22, step: 1
Tx var gain min: 0, max: 22, step: 2
Rx var gain min: 0, max: 22, step: 2
Temp. threshold low: 4, high: 5
TX Radio comp: 3 dB
RF RX Frequency: 230000000 kHz
RF TX Frequency: 250000000 kHz
```

show controllers radio upstream

To display upstream port information for a wireless modem card, use the **show controllers radio upstream** EXEC command. To disable this function, use the **no** form of this command.

show controllers radio *slot/upstream-port* upstream

no show controller radio *slot/upstream-port* upstream

Syntax Description	<i>slot/upstream-port</i> Specifies the slot and upstream port numbers of the wireless modem card.				
Defaults	No default behavior or values.				
Command Modes	EXEC				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>12.1(3)XQ1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	12.1(3)XQ1	This command was introduced.
Release	Modification				
12.1(3)XQ1	This command was introduced.				

Examples The following example shows how to display information for upstream 0 in slot number 3, port number 0:

```
CMTS01# show controllers radio 3/0 0 upstream
Radio 3/0 Upstream 0 is up
  Frequency 5.008 MHz, Channel Width 0.200 MHz, QPSK Symbol Rate 0.160 Msps
  Spectrum Group 4
  Nominal Input Power Level 5 dBmV, Tx Timing Offset 0
  Ranging Backoff Start 16, Ranging Backoff End 16, Tx Backoff Start 16
  Tx Backoff End 16, Modulation Profile Group 1
  part_id=0x3137, rev_id=0x01, rev2_id=0xFF
  nb_agc_thr=0x0000, nb_agc_nom=0x0000
  Range Load Reg Size=0x58
  Request Load Reg Size=0x0E
  Minislot Size in number of Timebase Ticks is = 8
  Minislot Size in Symbols =8
  Bandwidth Requests = 0x0
  Piggyback Requests = 0x0
  Invalid BW Requests= 0x0
  Minislots Requested= 0x0
  Minislots Granted = 0x0
  Minislot Size in Bytes = 2
  UCD Count = 0
  DES Ctrl Reg#0 = C00C0C43, Reg#1 = 0
```

show interfaces radio metrics

To display the parameters measured during the operation of the radio link, use one of the following **show interfaces radio metrics** privileged EXEC command. These metrics provide a quantitative measure of how well the per-subscriber link or per-channel link is performing over time.

Metrics that quantify per-subscriber performance:

```
show interfaces radio slot/port metrics-su MAC-address
```

```
show interfaces radio slot/port metrics-bad-su
```

```
show interfaces radio slot/port metrics-threshold-su
```

Metrics that quantify per-channel performance:

```
show interfaces radio slot/port metrics-threshold-channel channel
```

```
show interfaces radio slot/port 1sec-metrics-channel channel
```

```
show interfaces radio slot/port 1min-metrics-channel channel
```

```
show interfaces radio slot/port 1hour-metrics-channel channel
```

Syntax Description		
<i>slot/port</i>		Specifies the slot and port numbers of the wireless modem card.
<i>MAC-address</i>		Specifies the valid MAC address.
metrics-bad-su		Displays the list of subscriber units (SUs) that crossed the specified threshold.
metrics-su		Displays the cumulative SU metrics for the last 1 hour.
metrics-threshold-su		Displays metrics thresholds for the SU.
metrics-threshold-channel		Displays metrics thresholds for the channel.
<i>channel</i>		Specifies the channel number. Valid numbers are 0 to 3.
1sec-metrics-channel		Displays the cumulative channel metrics for the last 1 second.
1min-metrics-channel		Displays the cumulative channel metrics for the last 1 minute.
1hour-metrics-channel		Displays the cumulative channel metrics for the last 1 hour.

Defaults No default behaviors or values.

Command Modes EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines

There are two classes of metrics that are maintained by the radio link's software and hardware. One class of metrics maintains the total codewords and error codewords per subscriber over a 24-hour period with 1 hour granularity. The second class of metrics maintains the total codewords and error codewords per channel, providing time metrics for link synchronization between the two ends.

Examples

The following example shows how to display one subscriber codeword rate for the wireless modem card in slot, 6 port 0 of the Cisco uBR7200 series router:

```
Router# show interfaces radio 6/0 metrics-su 0000.0acd.8933
captured at 13:08:14 UTC Tue Nov 23 1999
```

Hour Ago	Time	Total Codewords	Total Error Codewords	SINR
0	16:00:23	57599	1	0

Hour Ago—Represents how long ago (in hours) this entry was captured.
 Time—Represents the time this entry was updated.
 Total Codewords—Represents the total number of codewords received on this link in the last 1 hour.
 Total Error CW—Represents the total number of error codewords received on this link in the last 1 hour.
 SINR—Represents the average SINR from each burst (in dB)

The following example shows how to display subscribers that have crossed the specified threshold:

```
Router# show int radio r6/0 metrics-bad-su
List of Threshold crossed SU. Captured at 19:50:16 UTC Sat Jan 1 2000
```

Serial Number	Time	MAC Address	Total Err Code word	% CW error
1	01:22:35	0000.0000.0011	529	11.00

Serial Number—Serial Number.
 Time—Time at which SU added to the threshold crossed list
 MAC address—Mac address of the subscriber which crossed the threshold.
 Total Err code word—Total error code words received
 % CW error—Percentage of codewords error received

The following example shows how to display the codeword threshold for channel 1:

```
Router# show interfaces radio 6/0 metrics-threshold-channel 1
One hour alarm thresholds for channel 1:
  Minimum Codewords : = 100
  Percent Codeword errors : = 10.0
```

The following example shows how to display a second codeword rate of channel 0 for the wireless modem card in slot 6, port 0:

```
Router# show interfaces radio 6/0 1hour-metrics-channel 0
```

```
====|=====|=====|=====|
Hour|   Time   |      Total      |      Total      |
Ago |          |      Codewords  |      Error      |
    |          |                  |      Codewords  |
====|=====|=====|=====|
 19 | 01:22:35 |           3529  |              0  |
 18 | 02:22:35 |           7129  |              0  |
 17 | 03:22:35 |          10729  |              0  |
 16 | 04:22:36 |          14329  |              0  |
 15 | 05:22:36 |          14499  |              0  |
 14 | 06:22:36 |          14499  |              0  |
 13 | 07:22:36 |          14499  |              0  |
 12 | 08:22:36 |          14499  |              0  |
 11 | 09:22:36 |          14499  |              0  |
 10 | 10:22:36 |          14499  |              0  |
  9 | 11:22:36 |          14499  |              0  |
  8 | 12:22:36 |          14499  |              0  |
  7 | 13:22:36 |          14499  |              0  |
  6 | 14:22:37 |          14499  |              0  |
  5 | 15:22:37 |          14499  |              0  |
  4 | 16:22:37 |          15189  |              0  |
  3 | 17:22:37 |          18789  |              0  |
```

When the **1min-metrics-channel** option is specified, a table of values for the last 60 minutes is displayed. Values are cumulative—every successive row is the sum of the corresponding values in the previous row plus the values determined for the 1-minute period represented by that row. The values displayed are identical to those displayed by the **1hour-metrics-channel** option, except that the period is 1 minute.

When the **1sec-metrics-channel** option is specified, a table of values for the last 60 seconds is displayed. Values are cumulative—every successive row is the sum of the corresponding values in the previous row plus the values determined for the 1-second period represented by that row.

Related Commands

Command	Description
radio metrics-threshold-channel	Sets the limit on percentage of error codewords threshold.
radio metrics-threshold-su	Sets the threshold values for the radio link to measure the performance of the subscriber link over time.

show interface radio accounting

To display radio accounting information for a wireless modem card, use the **show interface radio accounting EXEC** command.

show interface radio *slot/downstream-port* [**accounting**]

Syntax Description	<i>slot/downstream-port</i>	Specifies the slot and downstream port numbers of the wireless modem card.
---------------------------	-----------------------------	--

Defaults	No default behaviors or values.
-----------------	---------------------------------

Command Modes	EXEC
----------------------	------

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to display the radio accounting information table for the wireless modem card in slot 6, port 0:

```
CMTS01# show interface radio 6/0 accounting
```

```
Radio 6/0
```

Protocol	Pkts In	Chars In	Pkts Out	Chars Out
IP	5386	623076	5375	644712
ARP	5522	231924	37	1776

show interface radio alc

To display the automatic level control (ALC) and power ranging configuration information for the downstream, use the **show interface radio alc** EXEC command.

show interface radio *slot/downstream-port* **alc**

Syntax Description	<i>slot/downstream-port</i>	Specifies the slot and downstream port numbers of the wireless modem card.
Defaults	No default behaviors or values.	
Command Modes	EXEC	
Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples

The following example shows how to display the ALC and power ranging configuration information for the wireless modem card in slot 5, port 0:

```
uBR7200# show interface radio 5/0 alc
Power Ranging: on; Automatic power Level Control: on

Power SID Schedule interval = 100 ms;
IF Loop Mode = standard; RF Loop Mode = fast.

Power SID = 64:
  MAC address      MSID  TSID  ALC Primary SID
  00e0.1eab.2c0b   0     0     1
  00e0.1eb2.bb07   0     1     2
```

show interface radio downstream

To display downstream port information for a wireless modem card, use the **show interface radio downstream** EXEC command.

show interface radio *slot/downstream-port* downstream

Syntax Description	<i>slot/downstream-port</i> Specifies the slot and downstream port numbers for a wireless modem card.
---------------------------	---

Defaults	No default behavior or values.
-----------------	--------------------------------

Command Modes	EXEC
----------------------	------

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to display information for downstream port 0 located in slot 6:

```
UBR# show interface radio 6/0 downstream
Radio 6/0: Downstream is up
      111947771 packets output, 1579682655 bytes, 0 discarded
      0 output errors
```

show interface radio hist-data

To display histogram data, use the **show interface radio hist-data** EXEC command.

```
show interface radio slot/port hist-data statsParams {MAC-address | chan-id}
```

Syntax Description		
<i>slot/port</i>		Specifies the slot and port numbers of a wireless modem card.
<i>statsParams</i>	{ sinr-ant1 sinr-ant2 sinr-total timingOffset rf-rx-power-ant1 rf-rx-power-ant2 chan-delay-spread-ant1 chan-delay-spread-ant2 power-amb }	The data for the radio attribute is collected as a histogram.
sinr-ant1		Signal-to-interference plus noise ratio for antenna 1.
sinr-ant2		Signal-to-interference plus noise ratio for antenna 2.
sinr-total		Signal-to-interference plus noise ratio for antennas 1 and 2.
timingOffset		Represents the timing delay variations detected in the radio link.
rf-rx-power-ant1		Represents the receive power at the main RF headend (antenna gain is not included).
rf-rx-power-ant2		Represents the receive power at the diversity RF headend (antenna gain is not included).
chan-delay-spread-ant1		The offset for channel delay spread on antenna 1.
chan-delay-spread-ant2		The offset for channel delay spread on antenna 2.
power-amb		Represents the noise floor of the ambient environment, in decibels.
<i>MAC-address</i>		Specifies the MAC address for a particular subscriber unit.
<i>chan-id</i>		Specifies an upstream channel ID. Valid values are 0 to 3.

Defaults No default behavior or values.

Command Modes EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to display histogram data for **sinr-ant1** on channel 0 for the radio card in slot 6, port 0:

```
Router# show int r6/0 hist-data sinr-ant 0
```

■ show interface radio hist-data

Related Commands	Command	Description
	show interface radio slot/port hist-spec	Displays histogram specifications.

show interface radio hist-spec

To display histogram specifications, use the **show interface radio hist-spec** EXEC command.

```
show interface radio slot/port hist-spec [statsParams {MAC-address | chan-id}]
```

Syntax Description		
<i>slot/port</i>		Specifies the slot and port numbers of a wireless modem card.
<i>statsParams</i>		{ sinr-ant1 sinr-ant2 sinr-total timingOffset rf-rx-power-ant1 rf-rx-power-ant2 chan-delay-spread-ant1 chan-delay-spread-ant2 power-amb }
sinr-ant1		Signal-to-interference plus noise ratio for antenna 1.
sinr-ant2		Signal-to-interference plus noise ratio for antenna 2.
sinr-total		Signal-to-interference plus noise ratio for antennas 1 and 2.
timingOffset		Represents the timing delay variations detected in the radio link.
rf-rx-power-ant1		Represents the receive power at the main RF headend (antenna gain is not included).
rf-rx-power-ant2		Represents the receive power at the diversity RF headend (antenna gain is not included).
chan-delay-spread-ant1		The offset for channel delay spread on antenna 1.
chan-delay-spread-ant2		The offset for channel delay spread on antenna 2.
power-amb		Represents the noise floor of the ambient environment, in decibels.
<i>MAC-address</i>		Specifies the MAC address for a particular subscriber unit.
<i>chan-id</i>		Specifies an upstream channel ID.

Defaults No default behavior or values.

Command Modes EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to display the histogram specification for **sinr-ant1** on channel 0 for the radio card in slot 6, port 0:

```
Router# show int radio 6/0 hist-spec sinr-ant1 0
```

Related Commands	Command	Description
	show interface radio <i>slot/port</i> hist-data	Displays histogram data.

show interface radio led

To display the status of light-emitting diodes (LEDs) on the wireless modem card, and to display the events related to the major and minor LEDs, use the **show interface radio led** EXEC command.

show interface radio *slot/port* **led** [**major-events** | **minor-events**]

Syntax Description	<i>slot/port</i>	Specifies the slot and upstream port numbers of the wireless modem card.
	major-events	Lists any major event that occurred in the system.
	minor-events	Lists any minor event that occurred in the system.

Defaults No default behavior or values.

Command Modes EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines Table 2 lists the LEDs and their functions for the multipoint fixed wireless modem card:

Table 2 *show interface radio led* Field Description

LEDs	Function
Enabled	When green, it indicates that the wireless modem card is on, receiving power from the router midplane, and enabled for operation. This LED remains on during normal operation of the Cisco uBR7200 series router.
Major alarm	When yellow, it indicates that a major alarm has occurred in the radio subsystem. The link is down.
Minor alarm	When yellow, it indicates that a minor error occurred in the radio subsystem. The link is degraded and might need maintenance action, or one or more user-defined event thresholds have been exceeded.
Out of service	Identifies the service availability of the radio link. When yellow, it indicates that the radio link is up, but not available for use (typically during a test or loopback mode). If there is no light, it indicates that service is permitted.
Carrier	Identifies the state of the radio link. When green, it indicates that the radio link is synchronized and the line protocol is up. When yellow, it indicates that the radio link is not in synchronization.

Table 2 *show interface radio led Field Description (continued)*

LEDs	Function
Send data	When green, indicates that packets are being sent. If off, it indicates that there is no data traffic.
Receive data	When green, it indicates that data packets are being received by the line card. If off, it indicates that there is no data traffic.

Examples

The following example shows how to display the status of the LEDs:

```
Router# show int radio 6/0 led
```

LED Name	Status
Enabled	GREEN
Major alarm	OFF
Minor alarm	OFF
Out of Service	OFF
Carrier	GREEN
Send Data	GREEN
Receive	GREEN

show interface radio ranging

To display ranging information, use the **show interface radio ranging** EXEC command.

show interface radio *slot/port* ranging

Syntax Description	<i>slot/port</i>	Specifies the slot and port numbers of a wireless modem card.
Defaults	No default behavior or values.	
Command Modes	EXEC	
Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples

The following example shows how to display ranging information for downstream port 0 located in slot 6:

```
CMTS01# show interface radio 6/0 ranging
CMTS using fixed init ranging period : 500 msec
Periodic ranging period/modem: 10000 (msec)
Periodic ranging-request timeout: 30 (msec)
Periodic ranging sids in station maintenance list: 11
Periodic ranging sids in rng request pending list: 0
```

show interface radio rf-meas-interval

To display the intervals of the ambient noise and the calibration noise measurements of the radio card for the specified slot and downstream port numbers, use the **show interface radio rf-meas-interval** EXEC command.

show interface *slot/dsport* rf-meas-interval

Syntax Description	<i>slot/dsport</i>	Specifies the slot and downstream port numbers of the Cisco uBR7200 series router.
---------------------------	--------------------	--

Defaults No default behavior or values.

Command Modes EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to display the ambient noise and calibration noise measurement intervals (the default values) for the radio card that is in slot 3, downstream port 0:

```
Router# show interface r3/0 rf-meas-interval
rf-meas-interval ambient      300
rf-meas-interval calibration  300
```

Related Commands	Command	Description
	radio rf-meas-interval ambient	Sets the measurement interval of the ambient noise for performing noise floor statistics functions.
	radio rf-meas-interval calibration	Sets the measurement interval of a calibrated noise source.

show interface radio sid

To display information about each service identifier (SID) information on the network, use the **show interface radio sid** EXEC command. The information is displayed by the SID.

show interface radio *slot/downstream-port* **sid** [*sid-number*] **counters** [**verbose**] | **connectivity**]

Syntax	Description
<i>slot/downstream-port</i>	Specifies the slot and downstream port numbers for the wireless modem card.
<i>sid-number</i>	Specifies the service identifier number. Valid range is 1 to 8191.
counters	Displays information about a SID.
verbose	Displays detailed information per SID.
connectivity	Displays connectivity information.

Defaults No default behaviors or values.

Command Modes EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following examples show how to display information about each subscriber unit. The first example shows how to display information for subscriber units 1 to 3. The second example shows how to display information for SID 1.

```
CMTS01# show interface radio 6/0 sid
SID Status QoS Creattime Inoctets Inpackets IP address MAC address
1 enable 2 57 80139964 101336 1.1.1.5 00e0.1eab.2c0b
2 enable 2 57 49132 649 1.1.1.7 00e0.1eb2.bb07
3 enable 2 58 80042891 100555 1.1.1.2
```

```
CMTS01# show interface radio 6/0 sid 1
SID Status QoS Creattime Inoctets Inpackets IP address MAC address
1 enable 2 57 80140204 101340 1.1.1.5
```

Related Commands	Command	Description
	show controllers radio	Displays all or a subset of attributes of a particular modem card.

show interface radio snap-data

To display the data captured for the snapshot specification, use the **show interface radio snap-data** privileged EXEC command.

show interface radio *slot/port snap-data dspNum snapshotType*

Syntax Description	
<i>slot/port</i>	The slot and port address.
<i>dspNum</i>	The digital signal process (DSP) number (dsprx0, dsprx1, dsprx2, or dsprx3).
<i>snapshotType</i>	<p>Specifies the snapshot type. User can specify the bitwise OR value of as many as four of the following values in hexadecimal:</p> <p>0x1—raw burst data received from a subscriber through antenna 1</p> <p>0x2—raw burst data received from a subscriber through antenna 2</p> <p>0x4—frequency spectrum received from antenna 1</p> <p>0x8—frequency spectrum received from antenna 2</p> <p>0x10—channel impulse response for antenna 1 (what the physical channel looks like between the headend and the subscriber end)</p> <p>0x20—channel impulse response for antenna 2 (what the physical channel looks like between the headend and the subscriber end)</p> <p>0x40—frequency domain of the channel-impulse response for antenna 1 (for a group of subscriber units on an upstream channel)</p> <p>0x80—frequency domain of the channel-impulse response for antenna 2 (for a group of subscriber units on an upstream channel)</p> <p>0x100—frequency domain of the channel-impulse response for antenna 1 (for a specific subscriber ID)</p> <p>0x200—frequency domain channel-impulse response for antenna 2 (for a specific subscriber ID)</p> <p>0x400—Codec data</p> <p>0x800—interference estimate for antenna 1</p> <p>0x1000—interference estimate for antenna 2</p> <p>0x200000—TSID power array for power data burst or received power wavelength for the up synchronization process. Shows a snapshot of subscribers on an ALC window.</p> <p>0x400000—correlation of power vector and power mask of the upstream ranging signal (power for initial ranging)</p> <p>0x800000—initial ranging time domain channel for antenna 1</p> <p>0x1000000—initial ranging time domain channel for antenna 2</p> <p>0x2000000—initial ranging time domain channel for antenna 1 and antenna 2 combined</p> <p>0x4000000—ranging smoothed time domain channel power</p>
Defaults	No default behavior or values.
Command Modes	Privileged EXEC

■ show interface radio snap-data

Command History

Release	Modification
12.1(3)XQ1	This command was introduced.

Examples

The following example shows how to display raw-burst data on antenna 1 for **dsprx0** on the modem card in slot 3, port 0:

```
UBR04# show interfaces radio 3/0 snap-data dsprx0 0x1
```

Related Commands

Command	Description
radio snapshot	Creates a snapshot specification.
show interface radio snap-spec	Displays snapshot specification information.

show interface radio snap-spec

To display snapshot specification information, use the **show interface radio snap-spec** privileged EXEC command.

show interface radio *slot/port snap-spec dspNum*

Syntax Description		
	<i>slot/port</i>	The slot and port address.
	<i>dspNum</i>	The DSP number (dsprx0, dsprx1, dsprx2, or dsprx3).

Defaults No default behavior or values.

Command Modes Privileged EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to display snapshot specification information for **dsprx0** on the modem card in slot 3, port 0:

```
UBR04# show interface radio 3/0 snap-spec dsprx0
```

Related Commands	Command	Description
	radio snapshot	Creates a snapshot specification.
	show interface radio snap-data	Displays data captured for the snapshot specification.

show interface radio thresholds

To display the set of currently-configured thresholds on the radio modem card, use the **show interface radio thresholds** privileged EXEC command.

show interface radio *slot/port* thresholds

Syntax Description	<i>slot/port</i>	The slot and port numbers of the radio card.
---------------------------	------------------	--

Defaults	No default behavior or values.
-----------------	--------------------------------

Command Modes	privileged EXEC
----------------------	-----------------

Command History	Release	Modification
	12.1(3)XQ1	.This command was introduced

Examples The following command displays the set of currently configured thresholds for the modem card in slot 6, port 0 for the Receive DSP 1b:

```
UBR04# show interface radio 6/0 thresholds i+n 3
```

```
Statistic parameter    i+n
channel id             3

Threshold Type        downChange
Threshold Value       200
Threshold Repeat Time 5
Threshold Clear Time  8
Index                 2
Default Threshold     false
```

Related Commands	Command	Description
	radio threshold	Configures a threshold specification.

show interface radio tl-data

To display the timeline data collected for the identified specifications, use the **show interface radio tl-data** privileged EXEC command.

```
show interface radio slot/port tl-data [statsParams {MAC-address | chan-id}]
```

Syntax Description		
<i>slot/port</i>		The slot and port numbers of the radio card.
<i>statsParams</i>		{ sinr-ant1 sinr-ant2 sinr-total timingOffset rf-rx-power-ant1 rf-rx-power-ant2 chan-delay-spread-ant1 chan-delay-spread-ant2 power-amb }
		The data for the radio attribute is collected as a histogram.
sinr-ant1		Signal-to-interference plus noise ratio for antenna 1.
sinr-ant2		Signal-to-interference plus noise ratio for antenna 2.
sinr-total		Signal-to-interference plus noise ratio for antennas 1 and 2.
timingOffset		Represents the timing delay variations detected in the radio link.
rf-rx-power-ant1		Represents the receive power at the main RF headend (antenna gain is not included).
rf-rx-power-ant2		Represents the receive power at the diversity RF headend (antenna gain is not included).
chan-delay-spread-ant1		The offset for channel delay spread on antenna 1.
chan-delay-spread-ant2		The offset for channel delay spread on antenna 2.
power-amb		Represents the noise floor of the ambient environment, in decibels.
<i>MAC-address</i>		Specifies the MAC address for a particular subscriber unit.
<i>chan-id</i>		Specifies an upstream channel ID.

Defaults No default behavior or values.

Command Modes Privileged EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to display the timeline data for **sinr-ant1** on channel 0 for the radio card in slot 6, port 0:

```
Router# show int radio 6/0 tl-data sinr-ant1 0
```

■ show interface radio tl-data

Related Commands	Command	Description
	radio timeline	Configures a timeline collection specification.
	radio interface radio tl-start	Starts a stopped timeline specification.
	radio interface radio tl-stop	Stops a running timeline specification.
	show interfaces radio tl-spec	Displays the details of the timeline specification.

show interface radio tl-spec

To display the details of the currently-configured timeline specifications, use the **show interface radio tl-spec** privileged EXEC command.

show interface radio *slot/port* **tl-spec** [*statsParams* {*MAC-address* | *chan-id*}]

Syntax Description		
<i>slot/port</i>		The slot and port numbers of the radio card.
<i>statsParams</i>		{ sinr-ant1 sinr-ant2 sinr-total timingOffset rf-rx-power-ant1 rf-rx-power-ant2 chan-delay-spread-ant1 chan-delay-spread-ant2 power-amb }
		The data for the radio attribute is collected as a histogram.
sinr-ant1		Signal-to-interference plus noise ratio for antenna 1.
sinr-ant2		Signal-to-interference plus noise ratio for antenna 2.
sinr-total		Signal-to-interference plus noise ratio for antennas 1 and 2.
timingOffset		Represents the timing delay variations detected in the radio link.
rf-rx-power-ant1		Represents the receive power at the main RF headend (antenna gain is not included).
rf-rx-power-ant2		Represents the receive power at the diversity RF headend (antenna gain is not included).
chan-delay-spread-ant1		The offset for channel delay spread on antenna 1.
chan-delay-spread-ant2		The offset for channel delay spread on antenna 2.
power-amb		Represents the noise floor of the ambient environment, in decibels.
<i>MAC-address</i>		Specifies the MAC address for a particular subscriber unit.
<i>chan-id</i>		Specifies an upstream channel ID.

Defaults No default behavior or values.

Command Modes Privileged EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to display the timeline specification for the radio card in slot 6, port 0:

```
Router# show int radio 6/0 tl-spec
```

■ show interface radio tl-spec

Related Commands	Command	Description
	radio timeline	Configures a timeline collection specification.
	radio interface radio tl-start	Starts a stopped timeline specification.
	radio interface radio tl-stop	Stops a running timeline specification.
	show interface radio tl-data	Displays timeline data for the specified card.

show interface radio upstream

To display upstream port information for a wireless modem card, use the **show interface radio upstream EXEC** command.

show interface radio *slot/upstream-port* upstream

Syntax Description	<i>slot/upstream-port</i>	Specifies the slot and upstream port numbers for wireless modem card.
Defaults	No default behavior or values.	
Command Modes	EXEC	
Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples

The following example shows how to display information for the radio card located in slot 6, port 0:

```

UBR# show interface radio 6/0 upstream
Radio 6/0: 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, 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

```

show interface radio zero-burst

To display zero-burst information for the downstream port of a wireless modem card, use the **show interface radio zero-burst** EXEC command.

show interface radio *slot/port* zero-burst

Syntax Description	<i>slot/port</i>	Specifies the slot and downstream port numbers of a wireless modem card.
---------------------------	------------------	--

Defaults	No default behavior or values.	
-----------------	--------------------------------	--

Command Modes	EXEC	
----------------------	------	--

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to display zero-burst information for the radio card located in slot 5, port 0:

```
uBR7200# show interface radio 5/0 zero-burst
```

```
Zero Burst:
Ambient SID = 1c5c Interval = 720 min.
Calibration SID = 1c5d Interval = 360 min.
```

show radio capability modulation-profile

To display all profiles that the radio modem card supports, use the **show radio capability modulation-profile** privileged EXEC command.

show radio capability modulation-profile interface radio *slot/port*

Syntax Description	<i>slot/port</i>	Specifies the slot and port numbers of a wireless modem card.
---------------------------	------------------	---

Defaults No default behavior or values.

Command Modes EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to display a table of the profiles that the radio modem card supports:

```
router# show radio capability modulation-profile int radio 6/0
```

The following output is an example of the profiles that the radio modem card supports for downstream:

```
DOWNSTREAM
=====|=====|=====|=====|
Bandwidth | Throughput | Multipath | Burst |
(Mhz)     | (Mbps)     | Robustness | Length |
=====|=====|=====|=====|
1.5       | 4.2        | standard  | medium |
1.5       | 3.2        | standard  | medium |
1.5       | 1.6        | standard  | medium |
3.0       | 10.0       | standard  | medium |
3.0       | 7.6        | standard  | medium |
3.0       | 5.1        | standard  | medium |
3.0       | 8.6        | high      | medium |
3.0       | 6.6        | high      | medium |
3.0       | 4.4        | high      | medium |
6.0       | 22.0       | standard  | medium |
6.0       | 17.0       | standard  | medium |
6.0       | 12.0       | standard  | medium |
6.0       | 19.0       | high      | medium |
6.0       | 14.0       | high      | medium |
6.0       | 11.0       | high      | medium |
```

■ show radio capability modulation-profile

The following output is an example of the profiles that the radio modem card supports for upstream:

```
UPSTREAM
=====|=====|=====|=====|
  Bandwidth | Throughput | Multipath | Burst |
  (Mhz)     | (Mbps)     | Robustness | Length |
=====|=====|=====|=====|
          1.5 |          4.3 |    standard |  medium |
          1.5 |          3.2 |    standard |  medium |
          1.5 |          1.4 |    standard |  medium |
          3.0 |          8.1 |         high |  medium |
          3.0 |          6.3 |         high |  medium |
          3.0 |          4.4 |         high |  medium |
          6.0 |         19.0 |         high |  medium |
          6.0 |         15.0 |         high |  medium |
          6.0 |         11.0 |         high |  medium |
```

Related Commands

Command	Description
radio modulation-profile	Creates modulation profiles for downstream and upstream channels.
show radio modulation-profile	Displays the modulation-profile settings that you have specified.

show radio device

To display the access group information for the subscriber unit or the host behind the subscriber unit, use the **show radio device** privileged EXEC command.

show radio device access-group

Syntax Description	access-group	Specifies the access group per subscriber or host.
---------------------------	---------------------	--

Defaults	No default behavior or values.
-----------------	--------------------------------

Command Modes	Privileged EXEC
----------------------	-----------------

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following command displays access group information for the subscriber unit or the host behind subscriber unit:

```
router# show radio device access-group
MAC address      IP address      Type      Access-group
00d0.ba3b.5df0   9.9.9.13       radio
```

show radio errors

To display the cyclic redundancy check (CRC) and header check sum (HCS) error counters for the allocated subscriber identifier (SID), use the **show radio errors** privileged EXEC command.

show radio errors

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values.

Command Modes Privileged EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following command displays the CRC and HCS error counters for SID 131:

```
router# show radio errors
MAC Address      SID   I/F           CRC      HCS
00d0.ba3b.5df0  131   Radio6/0/U0  0         0
```

show radio flap-list

To display the radio flap-list of a wireless modem card, use the **show radio flap-list EXEC** command.

```
show radio flap-list [sort-flap | sort-time]
```

Syntax Description	sort-flap	A sorting option that specifies the number of times the radio modem had flapped.
	sort-time	A sorting option that specifies the most recent flapping activity.

Defaults No default behavior or values.

Command Modes EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines The Cisco uBR7200 series universal broadband routers maintain a database of flapping radio subscriber to assist in locating problems. The flapping radio modem detector tracks the upstream and downstream performance of all radio modems on the network, without impacting throughput and performance or creating additional packet overhead on the network. The radio modem flap list keeps track of the radio modem MAC address, up and down transitions, registration events, missed periodic ranging packets, upstream power adjustments, and the physical interface on the Cisco uBR7200 series.

The flap list collects the following station maintenance statistics:

- Detects interface up/down flap; the reinsertion counter counts the number of times a radio modem comes up and inserts into the network. This helps identify potential problems in the downstream, because improperly provisioned radio modems tend to try to reestablish a link repeatedly.
- Detects intermittent upstream; the keepalive hits versus misses is the number of times radio modems do not respond or do not respond to the MAC layer keepalive messages. A number of misses indicates a potential problem in the upstream.
- Lists radio modem MAC addresses sorted by flap rate or most recent flap time.

Use the following suggestions for interpreting different network conditions based on the flap-list statistics:

- **Condition 1:** Low miss/hit ratio, low insertion, low flap counter, and old timestamp.
Analysis: This exhibits an optimal network situation.
- **Condition 2:** High ratio of misses over hits (> 10%)
Analysis: Hit/miss analysis should be done after the Ins count stops incrementing. In general, if the hit and miss counts are about the same order of magnitude, then the upstream may be experiencing noise. If the miss count is greater, then the modem is probably dropping out frequently

and not completing registration. The upstream or downstream is perhaps not stable enough for reliable link establishment. Very low hits and miss counters and high insertion counters indicate provisioning problems.

- **Condition 3:** High insertion rate.

Analysis: If link reestablishment happens too frequently, then the modem probably is having a registration problem. This is indicated by a high Ins counter which tracks the Flap counter.

Examples

The following example shows the output of the **show radio flap-list** command:

```
router# show radio flap-list
MAC Address      Upstream      Ins   Hit   Miss  CRC   P-Adj  Flap  Time
00d0.58ec.d210   Radio3/0/U0  5654 12070 19903 5     2     11343 Oct 27 13:54:03
00b0.64ea.2410   Radio3/0/U0  10    25057 180    0     0     22    Oct 26 13:58:58
0002.4b61.adf0   Radio3/0/U0  0     34134 15     0     0     1     Oct 25 12:51:20
```

Table 3 describes the fields displayed by the **show radio flap-list** command.

Table 3 Show radio flap-list Command Description

Statistic	Description
MAC addr	This is the MAC-layer address of a radio modem. The first six digits indicate the vendor ID of the radio modem manufacturer, followed by six digits specifying a unique host address. Each radio modem's MAC address is unique.
Radio IF	This is the physical upstream interface on the Cisco uBR7200. It denotes the slot and downstream port numbers for the radio interface. The flap-list data can be sorted based on the upstream port number, which is useful when isolating upstream problems unique to certain combining groups.

Table 3 Show radio flap-list Command Description (continued)

Insertions (Ins)	<p>Link insertion is the process whereby a modem performs an initial maintenance procedure to establish a link with the headend. The Ins column is the flapping modem's insertion count and indicates the number of times the RF link was abnormally reestablished. An abnormality is detected when the time between link reestablishment attempts is less than the user-configurable parameter.</p> <p>Normal modem activity follows the sequence below:</p> <ol style="list-style-type: none"> 1. The initial link insertion is followed by a keepalive loop between the headend and radio modem and is called station maintenance. 2. Power on 3. Initial maintenance 4. Station maintenance 5. Power off <p>When the link is broken, initial maintenance is repeated to reestablish the link:</p> <ol style="list-style-type: none"> 1. Initial maintenance time T1 2. Station maintenance 3. Init maintenance at time T2 <p>The Ins and Flap counters in the flap list are incremented whenever $T2 - T1 < N$, where N is the insertion-time parameter configured by the radio flap-list insertion-time command. Default value for this parameter is 180 seconds.</p> <p>A high Ins number indicates:</p> <ul style="list-style-type: none"> • Intermittent downstream sync loss • Dynamic Host Configuration Protocol (DHCP) or modem registration problems
Hit and Miss	<p>The hit and miss columns are keepalive polling statistics between the Cisco uBR7200 series and the radio modem. The station maintenance process occurs for every modem approximately every 25 seconds. When the headend receives a response from the modem, the event is counted as a hit. If the headend does not receive a response from the radio modem, the event is counted as a miss. A radio modem fails to respond either because of noise or if it is down. Modems that only log misses and zero hits are assumed to be powered off.</p> <p>Misses are not desirable, because they are usually an indication of an upstream problem; however, having a few misses is normal. The flap count is incremented if there are M consecutive misses where, M is configured by the radio flap miss-threshold command. The parameter value ranges from 1 to 12, with a default of 6.</p> <p>Ideally, the hit count should be much greater than the miss counts. If a modem has a hit count much less than its miss count, then registration is failing. Noisy links cause the miss/hit ratio to deviate from a nominal 1 percent or less. High miss counts can indicate:</p> <ul style="list-style-type: none"> • Intermittent upstream, possibly due to noise • Too much or too little upstream attenuation
Cyclical Redundancy Check (CRC)	<p>This statistic tracks the CRC error counter per modem. CRC errors are usually an indication of noise on a plant. A low count can be always be expected, but a high CRC number calls for plant troubleshooting. The CRC counter indicates:</p> <ul style="list-style-type: none"> • Intermittent upstream • Impulsive noise or interference

Table 3 Show radio flap-list Command Description (continued)

Power Adjustments (p-adj)	Not used for radio modem. The value is always zero.
Flap	<p>The flap counter indicates the number of times the modem has flapped. This counter is incremented when one of the following events is detected:</p> <ul style="list-style-type: none"> • Unusual modem insertion or reregistration attempts. The Flap and the Ins counters are incremented when the modem tries to reestablish the RF link with the headend within a period of time that is less than the user-configurable insertion interval value. • Abnormal miss/hit ratio. The flap counter is incremented when <i>N</i> consecutive misses are detected after a hit, where <i>N</i> can be user-configurable with a default value of 6.
Time	Time is the time stamp indicating the last time the modem flapped. The value is based on the clock configured on the local Cisco uBR7200 series. If no time is configured, this value is based on the current uptime of the Cisco uBR7200 series. When a modem meets one of the three flap list criteria, the flap counter is incremented and time is set to the current time.

Related Commands

Command	Description
clear radio flap-list	Clears the current radio flap-list entries for a specific subscriber unit or all subscriber units.
radio flap-list aging	Specifies the number of days to record and retain flapping activity on a radio subscriber unit in the flap-list table.
radio flap-list insertion-time	Sets the radio flap-list insertion time.
radio flap-list miss-threshold	Sets the miss-threshold for recording a flap-list event.
radio flap-list size	Specifies the maximum number of the radio subscriber units to be reported in the radio flap-list table.

show radio modulation-profile

To display the user-specified modulation profile information for a wireless modem card, use the **show radio modulation-profile** privileged EXEC command.

show radio modulation-profile

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values.

Command Modes Privileged EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines You can create modulation profiles using the **radio modulation-profile** command.

Examples The following example shows how to display a table of the modulation-profile for a radio modem:

```
Router# show radio modulation-profile
Mod  Bandwidth  Throughput  Multipath-Robust  Burst-Length
1    1.5        4           high              medium
2    6.0        22          standard          medium
3    3.0        8           high              medium
```

Related Commands	Command	Description
	radio modulation-profile	Creates modulation profiles for downstream and upstream channels.
	show radio capability modulation-profile	Displays all the profiles that the radio modem card supports.

show radio privacy kek

To display the key encryption key (KEK) life-time and grace-time values that have been set, use the **show radio privacy kek** privileged EXEC command.

show radio privacy kek

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values.

Command Modes Privileged EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines If you have difficulty, make sure that you have entered valid values for *grace-time* and *life-time* when creating or modifying the modulation profile.

Examples The following example shows how to display the life-time and grace-time values of key encryption:

```
CMTS01# show radio privacy kek
Configured KEK life time value = 750000
Configured KEK grace time value = 800
```

Related Commands

Command	Description
radio privacy enable	Activates radio privacy on the wireless link.
radio privacy mandatory	Activates radio privacy and disallows access for any unencrypted wireless subscriber units.
radio privacy kek grace-time	Sets the radio privacy KEK grace-time.
radio privacy kek life-time	Sets the radio privacy KEK life-time.
radio privacy tek grace-time	Sets the radio privacy TEK grace-time.
radio privacy tek life-time	Sets the radio privacy TEK life-time. display the traffic encryption key (TEK) life-time and grace-time values that have been set
show radio privacy tek	Displays the TEK life-time and grace-time values that have been set.

show radio privacy tek

To display the traffic encryption key (TEK) life-time and grace-time values that have been set, use the **show radio privacy tek** privileged EXEC command.

show radio privacy tek

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values.

Command Modes EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines If you have difficulty, make sure that you have entered valid values for *grace-time* and *life-time* when creating or modifying the modulation-profile.

Examples The following example displays the life-time and grace-time values of the traffic encryption:

```
CMTS01# show radio privacy tek
Configured TEK life time value = 56000
Configured TEK grace time value = 900
```

Related Commands	Command	Description
	radio privacy enable	Activates radio privacy on the wireless link.
	radio privacy mandatory	Activates radio privacy and disallows access for any unencrypted wireless subscriber units.
	radio privacy kek grace-time	Sets the radio privacy KEK grace-time.
	radio privacy kek life-time	Sets the radio privacy KEK life-time.
	radio privacy tek grace-time	Sets the radio privacy TEK grace-time.
	radio privacy tek life-time	Sets the radio privacy TEK life-time. display the traffic encryption key (TEK) life-time and grace-time values that have been set
	show radio privacy kek	Displays the KEK life-time and grace-time values that have been set.

show radio qos profile

To verify whether a quality-of-service (QoS) profile has been created, and to see how it has been configured, use the **show radio qos profile EXEC** command.

show radio qos profile [*number verbose*]

Syntax Description	
<i>number</i>	Specifies the class index number. Valid range is 1 to 255.
<i>verbose</i>	Displays detailed information on the QoS profile.

Defaults No default behavior or values.

Command Modes EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines If you have difficulty, check the following:

- Make sure that you are in EXEC mode.
- Make sure that you typed the correct QoS profile number and profile elements when you used the command.
- Subscriber units that register continuously and fail consume more resources than subscriber units that stay registered. For customers who do not pay for service, assign QoS profile 3.

Examples The following example shows how to display a QoS profile table:

```
CMTS01# show radio qos profile
Service Prio Max Guarantee Max Max tx TOS TOS Create B
class upstream upstream downstream burst mask value by priv
bandwidth bandwidth bandwidth
1 0 0 0 0 0 0x0 0x0 cmts no
2 0 64000 0 1000000 0 0x0 0x0 cmts no
3 0 1000 0 1000 0 0x0 0x0 cmts no
4 7 2000000 100000 4000000 0 0x0 0x0 cm yes
```

Related Commands	Command	Description
	radio qos profile	Configures the QoS profile.

show radio subscriber

To display information about a radio modem card that is on the network, use the **show radio subscriber** EXEC command.

show radio subscriber [*ip-address / mac-address*] [**access-group** | **detail** | **maintenance** | **offline** | **registered** | **summary** | **unregistered**]

Syntax Description		
	<i>IP-address</i>	Specifies the IP address of the radio modem card.
	<i>MAC-address</i>	Specifies the MAC address of the radio modem card.
	access-group	Displays access group information.
	detail	Displays detailed information on modems.
	maintenance	Displays the Station Maintenance Error Statistics report.
	offline	Displays information about connected modems that are offline.
	registered	Displays information about registered modems.
	summary	Displays information about all the modems connected to this interface.
	unregistered	Displays information about unregistered modems.

Defaults No default behavior or values.

Command Modes EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines The **show radio subscriber** command displays a list of options for a single radio modem to be specified by entering either the radio modem card's IP address or MAC address: summary display of the total number of modems connected for each upstream channel, total number of registered and unregistered modems for the specified interface or upstream, total number of offline modems for the specified interface or upstream, and status for each offline modem before it went offline.

With Cisco IOS Release 12.1(5)XM or later, the **show radio subscriber** command includes all DOCSIS states, as well as other useful troubleshooting information such as the maximum number of provisioned customer premises equipment.

For each upstream channel, you can obtain the following information:

- The total number of modems
- The number of active modems
- The number of registered modems
- The number of unregistered modems
- The number of offline modems

- The time the modem went offline
- The status before the modem went offline

Examples

The following examples show how to display information for the **show radio subscriber** command:

```
Router# show radio subscriber
Interface  Prim Online   Timing Rec   QoS CPE IP address   MAC address
         Sid  State      Offset Power
Radio3/0/U0 139  online    48    0.00  5  0  10.1.1.12   00b0.64ea.2410
Radio3/0/U0 140  online    50    0.00  6  0  10.1.1.4    00d0.58ec.d210
```

```
Router# show radio subscriber detail
Interface  SID  MAC address   Max CPE  Concatenation  Rx SNR
Radio3/0/U0 139  00b0.64ea.2410 4        yes           -----
Radio3/0/U0 140  00d0.58ec.d210 10       yes           -----
```

Table 4 describes the fields shown in the **show radio subscriber** examples.

Table 4 *show radio subscriber Field Descriptions*

Field	Description
Interface	The interface on which the radio modem has an active connection.
Prim Sid	The primary service identifier assigned to the modem.
SID	The service identifier assigned to a modem.
Timing Offset	The radio modem's current timing adjustment.
QoS	The service class assigned to the modem.
CPE	The number of customer premises equipment devices (PCs, Macintoshes, UNIX workstations, and so on) behind this radio modem.
Max CPE	The maximum number of customer premises equipment (CPE) configured for this modem.
IP address	The IP address of the modem.
MAC address	The media access layer address of the modem.
Concatenation	The status of concatenation.
Rx SNR	This field is not currently used.
S/N Ratio	This field is not currently used.

Table 4 *show radio subscriber Field Descriptions (continued)*

Field	Description
Modem State	<p>The status of the modem when it was last polled. Possible states are:</p> <p>init(o)—Option file transfer was started</p> <p>init(t)—Time-of-day (TOD) exchange was started</p> <p>init(r1)—Modem sent initial ranging</p> <p>init(r2)—Modem is ranging</p> <p>init(rc)—Ranging is complete</p> <p>init(d)—Dynamic Host Configuration Protocol (DHCP) request was received</p> <p>init(i)—DHCP reply was received; IP address assigned</p> <p>online—Modem registered; enabled for data</p> <p>online(d)—Modem registered but network access for the cable modem is disabled</p> <p>online(pk)—Modem registered; baseline privacy interface (BPI) enabled, and key encryption key (KEK) is assigned</p> <p>online(pt)—Modem registered; BPI enabled, and traffic encryption key (TEK) is assigned</p> <p>reject(m)—Modem did attempt to register; registration was refused due to bad mic</p> <p>reject(c)—Modem did attempt to register; registration was refused due to bad COS</p> <p>reject(pk)—KEK modem key assignment is rejected</p> <p>reject(pt)—TEK modem key assignment is rejected</p> <p>offline—Modem is considered to be offline.</p> <p>Offline Time—Time the modem went offline. The format is same as other show radio subscriber commands (month, day, time, and year info).</p>
Offline Time	For offline modems, the time the modem went offline.
Previous State	For offline modems, the status prior to going offline. See Modem State for definitions.
Rx Power	This field is not currently used.
SM Exhaust Count	The number of times the headend declared that modem to be offline. The modem could be marked offline due to various reasons (modem went dead, modem has not been active for a while, and so on).
Access group	The access group number.

Table 4 *show radio subscriber Field Descriptions (continued)*

Field	Description
CRC	Indicates the number of times the cyclic redundancy checksum (CRC) generated by the originating LAN station or far-end device does not match the checksum calculated from the data received.
HCS	Indicates the number of times the header checksum (HCS) generated by the originating LAN station or far-end device does not match the checksum calculated from the data received.

Related Commands

Command	Description
Clear radio subscriber counters	Clears the counters for radio modems.

Debug Commands

This section documents new or modified **debug** commands. All other commands used with this feature are documented in the *Cisco IOS Release 12.1* command reference publications.

- **debug docsis arp**
- **debug docsis err**
- **debug docsis keyman**
- **debug docsis mac**
- **debug docsis map**
- **debug docsis privacy**
- **debug docsis qos**
- **debug docsis range**
- **debug docsis receive**
- **debug docsis reg**
- **debug docsis reset**
- **debug docsis startalloc**
- **debug docsis transmit**
- **debug docsis ucc**
- **debug docsis ucd**
- **debug radio p2mp alc**
- **debug radio p2mp phy cwrlog radio**

debug docsis arp

To activate debugging of Address Resolution Protocol (ARP) request messages on the DOCSIS interfaces, use the **debug docsis arp** privileged EXEC command. Use the **no** form of this command to deactivate debugging of ARP requests.

debug docsis arp

no debug docsis arp

Syntax Description This command has no arguments or keywords.

Defaults Deactivated

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to display ARP requests:

```
CMTS01# debug docsis arp
```

debug docsis err

To debug error messages that occur in the DOCSIS MAC protocol, use the **debug docsis err** privileged EXEC command. Use the **no** form of this command to disable the debugging of MAC protocol error messages.

debug docsis err

no debug docsis err

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values.

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to enable debugging of DOCSIS error messages:

```
Router# debug docsis err
```

debug docsis keyman

To display debug messages for the traffic encryption key (TEK) and key encryption key (KEK) baseline privacy key activity, use the **debug docsis keyman** privileged EXEC command. To disable, use the **no** form of this command.

debug docsis keyman

no debug docsis keyman

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values.

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to display debug messages for TEK and KEK baseline privacy key activity:

```
Router# debug docsis keyman
```

debug docsis mac

To display debug messages that are generated by the DOCSIS MAC, use the **debug docsis mac** privileged EXEC command. To deactivate the debugging of MAC messages, use the **no** form of this command.

debug docsis mac [log | messages]

no debug docsis mac

Syntax Description

log	DOCSIS MAC real-time log.
messages	DOCSIS MAC management messages.

Defaults

No default behavior or values.

Command History

Release	Modification
12.1(3)XQ1	This command was introduced.

Examples

The following example shows how to display messages that are generated by DOCSIS MAC:

```
Router# debug docsis mac
```

debug docsis map

To display DOCSIS maps that identify data on the DOCSIS interfaces, use the **debug docsis map** privileged EXEC command. To deactivate debugging of DOCSIS maps, use the **no** form of this command.

debug docsis map

no debug docsis map

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values.

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to display DOCSIS maps:

```
Router# debug docsis map
```

debug docsis privacy

To display debug messages for the spectrum manager, use the **debug docsis privacy** privileged EXEC command. To deactivate debugging of baseline privacy, use the **no** form of this command.

debug docsis privacy

no debug docsis privacy

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values.

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to display debug messages for the spectrum manager:

```
router# debug docsis privacy
```

debug docsis qos

To display messages about the QoS parameters, use the **debug docsis qos** privileged EXEC command. To deactivate debugging of QoS parameters, use the **no** form of this command.

debug docsis qos

no debug docsis qos

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values.

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to display debug messages about QoS parameters:

```
router# debug docsis qos
```

debug docsis range

To display ranging messages that are generated when subscribers request or change their upstream frequencies on the network, use the **debug docsis range** privileged EXEC command. To deactivate debugging of DOCSIS subscribers ranging, use the **no** form of this command.

debug docsis range

no debug docsis range

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values.

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to display debug ranging messages:

```
router# debug docsis range
```

debug docsis receive

To display upstream debug messages from DOCSIS subscribers, use the **debug docsis receive** privileged EXEC command. To deactivate debug of upstream messages, use the **no** form of this command.

debug docsis receive

no debug docsis receive

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values.

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to display upstream debug messages:

```
router# debug docsis receive
```

debug docsis reg

To debug subscriber registration-request error messages, use the **debug docsis reg** privileged EXEC command. To deactivate debug of DOCSIS registration, use the **no** form of this command.

debug docsis reg

no debug docsis reg

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values.

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to display debug registration-request error messages:

```
router# debug docsis reg
```

debug docsis reset

To debug reset messages that are generated by subscribers, use the **debug docsis reset** privileged EXEC command. To deactivate debugging of reset messages, use the **no** form of this command.

debug docsis reset

no debug docsis reset

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values.

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to display debug reset messages:

```
router# debug docsis reset
```

debug docsis startalloc

To activate debug messages that are generated when channels are allocated to subscribers on the network, use the **debug docsis startalloc** privileged EXEC command. To deactivate debugging of channel allocations, use the **no** form of this command.

debug docsis startalloc

no debug docsis startalloc

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values.

Command Modes EXEC

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to activate debug messages that are generated when channels are allocated to subscribers:

```
router# debug docsis startalloc
```

debug docsis transmit

To activate debugging transmissions from the Cisco uBR7200 series router across the network, use the **debug docsis transmit** privileged EXEC command. To deactivate debugging of DOCSIS transmissions, use the **no** form of this command.

debug docsis transmit

no debug docsis transmit

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values.

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to activate debugging transmissions from the Cisco uBR7200 series router across the network:

```
router# debug docsis transmit
```

debug docsis ucc

To display upstream channel change (UCC) messages that are generated when DOCSIS subscriber requests are assigned a new channel, use the **debug docsis ucc** privileged EXEC command. To deactivate debugging of upstream channel changes, use the **no** form of this command.

debug docsis ucc

no debug docsis ucc

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values.

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to display UCC messages generated when DOCSIS subscriber requests are assigned a new channel:

```
router# debug docsis ucc
```

debug docsis ucd

To display upstream channel descriptor (UCD) messages, use the **debug docsis ucd** privileged EXEC command. To deactivate debugging of DOCSIS UCD, use the **no** form of this command.

debug docsis ucd

no debug docsis ucd

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values.

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Usage Guidelines UCD messages contain information about upstream channel characteristics, and are sent to the DOCSIS subscribers on the network. DOCSIS subscribers that are configured to use enhanced upstream channels use these UCD messages to identify and select an enhanced upstream channel to use. When this command is activated, any messages related to upstream channel descriptors are displayed on the Cisco uBR7200 series console.

Examples The following example shows how to display UCD messages:

```
router# debug docsis ucd
```

debug radio p2mp alc

To display messages related to the automatic level control (ALC) for all the radio interfaces, use the **debug radio p2mp alc** privileged EXEC command. To stop displaying ALC messages on the console, use the **no** form of this command.

debug radio p2mp alc

no debug radio p2mp alc

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values.

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following example shows how to display debug messages related to ALC for all the radio interfaces:

```
router# debug radio p2mp alc
```

debug radio p2mp phy cwrlog radio

To view the digital signal processing (DSP) synchronization for a subscriber-unit modem card, use the **debug radio p2mp phy cwrlog radio** EXEC command. To disable, use the **no** form of this command.

debug radio p2mp phy cwrlog radio

no debug radio p2mp phy cwrlog radio

Syntax Description This command has not arguments or keywords.

Defaults No default behavior or values.

Command History	Release	Modification
	12.1(3)XQ1	This command was introduced.

Examples The following command shows how to view the DSP synchronization for a subscriber-unit modem card:

```
router# debug radio p2mp phy cwrlog radio
```

Glossary

This section defines terms and acronyms associated with the fixed wireless multipoint feature module.

ALC—Automatic level control

ARP—Address Resolution Protocol

CER—Codeword error return

DOCSIS—Data-over-cable System Interface Specifications

DSP—Digital signal process

EEPROM—Electrically Erasable Programmable Read Only Memory

EIRP—Equivalent isotropic radiated power

FEC—Forward error correction

FIR—Finite input response

HE—Headend

IDU—Indoor unit

IF—Intermediate frequency

KEK—Key encryption key

LED—Light-emitting diode

MAP—Bandwidth allocation mapping message

MIB—Management Information Base

MPEG—Moving Picture Experts Group

ODU—Outdoor unit

OFDM—Orthogonal Frequency Division Multiplexing

QoS—Quality of Service

RF—Radio frequency

SINR—Signal interference plus noise ratio

SU—Subscriber unit

TEK—Traffic encryption key

uBR—Universal broadband router