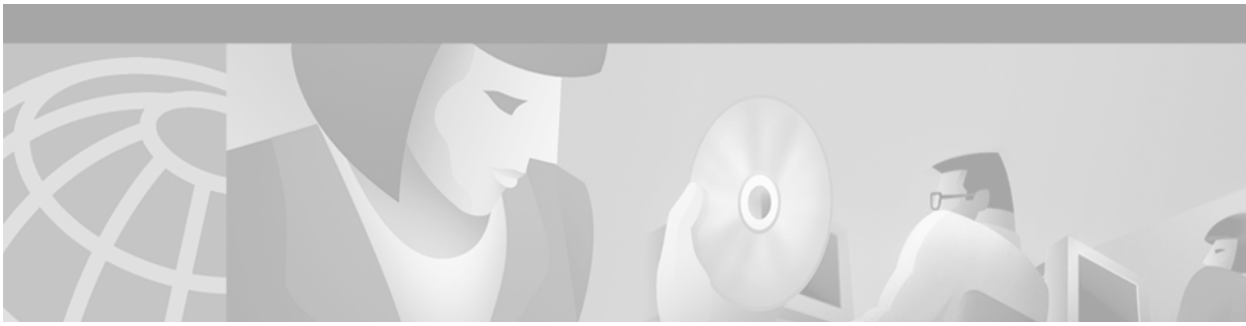


Configuring the Cisco uBR-MC28C Cable Modem Card

This feature module describes configuring the Cisco uBR-MC28C cable modem card. The card contains two downstream and eight upstream ports configured in two independent Cable Modem Termination System (CMTS) media access control (MAC) domains. A MAC domain is a collection of upstream and downstream channels for which a single MAC allocation and management protocol operates. Each domain on the Cisco uBR-MC28C cable modem card includes one downstream and four upstream ports. Both domains operate independently of each other.

This feature module includes the following sections:

Feature Overview

The Cisco uBR-MC28C cable modem card resides in a Cisco uBR7200 series universal broadband router and supports downstream and upstream traffic to and from Data-Over-Cable Service Interface Specification (DOCSIS)-based cable modems (CMs). The card supports 6-MHz National Television Systems Committee (NTSC) channel operation, using standard (STD), Harmonic Related Carrier (HRC), or Incremental Related Carrier (IRC) frequency plans conforming to EIA-S542. The card supports downstream channels in the 54-to-860 MHz range, therefore, with upstream ranges of 5 to 42 MHz.

Note While you can use the Cisco uBR-MC28C cable modem card in 8-MHz international cable plants, the card ignores 2 MHz of available channel width, operates at a maximum downstream bandwidth of 27 Mbps, and limits upstream choices to the range below 42 MHz.

The Cisco uBR-MC28C cable modem card contains two downstream modulators and eight upstream demodulators with the following modulation defaults beginning in Cisco IOS Release 12.1(2)EC1:

- 64 Quadrature Amplitude Modulation (QAM) downstream
- Quadrature Amplitude Phase-Shift Keying (QPSK) upstream

These values are based on the Cisco default modulation profile #1 that ships with product. Modulation profile #1 values are illustrated below:

```
cmts1# show cable modulation-profile
Mod IUC     Type Preamb Diff FEC    FEC   Scrambl Max  Guard Last Scrambl Preamb
                 length enco T      CW    seed    B    time  CW           offset
                              BYTES  size          size size  short
1   request qpsk 64     no   0x0    0x10  0x152   1    8     no   yes     952
1   initial qpsk 128    no   0x5    0x22  0x152   0    48    no   yes     896
1   station qpsk 128    no   0x5    0x22  0x152   0    48    no   yes     896
1   short   qpsk 72     no   0x5    0x4B  0x152   6    8     yes  yes     944
1   long    qpsk 80     no   0x8    0xDC  0x152   0    8     yes  yes     936

interface Cable4/0
 ip address 10.20.115.33 255.255.255.224
 ip helper-address 10.0.0.2
 load-interval 30
 no keepalive
 cable spectrum-group 1
 cable insertion-interval 100
 cable downstream annex B
 cable downstream modulation 64qam
 cable downstream interleave-depth 32
 cable downstream frequency 576000000
 cable upstream 0 spectrum-group 2
 no cable upstream 0 shutdown
 no cable upstream 1 shutdown
 no cable upstream 2 shutdown
 no cable upstream 3 shutdown
end
```

The Cisco uBR-MC28C cable modem card supports all DOCSIS 1.0-specified Annex B radio frequency (RF) data rates, channel widths, and modulation schemes. Table 1 shows the supported DOCSIS data rates. The card outputs +42 dBmV and +/- 2 dBmV.

Table 1 DOCSIS Data Rates

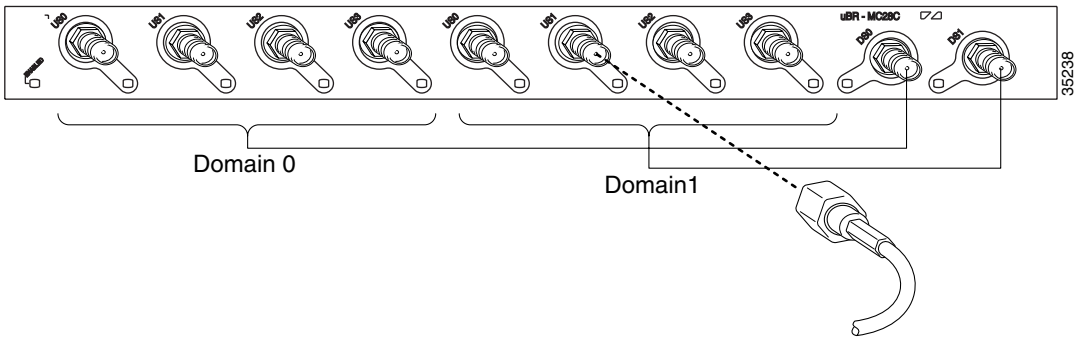
Upstream Channel Width	Modulation Scheme	Baud Rate Sym/sec	Raw Bit Rate Mbit/sec
3.2 MHz	16 QAM QPSK	2.56 M	10.24 5.12
1.6 MHz	16 QAM QPSK	1.28 M	5.12 2.56
800 kHz	16 QAM QPSK	640 K	2.56 1.28
400 kHz	16 QAM QPSK	320 K	1.28 0.64
200 kHz	16 QAM QPSK	160 K	0.64 0.32

Caution While the Cisco uBR-MC28C contains a total of two downstream and eight upstream ports, upstream ports are fixed to a specific downstream. You cannot mix and match upstream ports to downstreams ports. Instead, the card is configured to support a dual one-downstream-to-four-upstream port arrangement.

Tips For those familiar with current Cisco cable modem cards, you can think of the Cisco uBR-MC28C card as two Cisco uBR-MC14C cable modem cards in one. The Cisco uBR-MC28C card supports a pair of downstream QAM 64 or QAM 256 ports, and four QPSK or QAM 16 upstream ports. Each port set is independent of the other. Upstream and downstream ports are not shared across the two MAC domains.

The Cisco uBR-MC28C cable modem card contains a color-coded label that identifies and groups the two supported downstream-to-upstream port sets. Figure 1 shows the dual downstream and upstream port pairs.

Figure 1 Cisco uBR-MC28C Face Plate View



The two downstream ports are labelled DS0 and DS1. Their corresponding upstream ports are labelled U0 through U3, applicable to each port set. To configure the Cisco uBR-MC28C cable modem card, use the **interface type slot/port** commands:

- Type—Cable
- Slot—Slot number refers to the downstream port; value is 0 or 1.
- Port—Port number refers to the upstream port associated with the specific downstream port; value is from 0 to 3.

Table 2 maps the Cisco uBR-MC28C cable modem card's physical port domains and interfaces.

Table 2 Interface to Port Mapping

Cisco uBR-MC28C Cable Modem Card	Physical Ports	Interfaces
Domain #1 Port Set	D0, U0, U1, U2, U3	Cable interface; CableX/0/U where: 0 represents the first downstream port U represents the upstream port associated with the downstream port; U is followed by the specific upstream port: 0, 1, 2, or 3
Domain #2 Port Set	D1, U0, U1, U2, U3	Cable interface; CableX/1/U where: 1 represents the second downstream port U represents the upstream port associated with the downstream port; U is followed by the specific upstream port: 0, 1, 2, or 3

Note The Cisco uBR-MC28C cable modem card operates using Cisco IOS Release 12.1(3a)EC1 or later release.

The card can be housed in a Cisco uBR7223, Cisco uBR7246, or the Cisco uBR7246 VXR universal broadband router. The card supports synchronization with a Cisco clock card in a Cisco uBR7246 VXR. The card distributes the clock signal to CMs supporting the clock feature set that are attached to specific network segments.

Benefits

The Cisco uBR-MC28C cable modem card:

- Expands the capacity of a Cisco uBR7200 series universal broadband router, providing the highest port density in Cisco cable modem cards available today; the card offers another downstream channel and additional upstream channels
- Gives cable operators additional flexibility in partitioning the cable plant to address growing subscriber bandwidth demands; enables cost-effective scaleability of services and subscribers
- Offers advanced functionality, supporting DOCSIS 1.0 and DOCSIS 1.0 extensions, as well as other Cisco IOS Release 12.1(3a)EC1 features such as Hot Standby 1+1 Redundancy and Dynamic Upstream Modulation

- Supports all earlier Cisco cable modem card features including:
  - Online insertion and removal (OIR), allowing key system components to be added or removed without powering off the chassis
  - Downloadable software, allowing new Cisco IOS images to be remotely loaded
- Interoperates with DOCSIS-compliant cable modems and other RF customer premises equipment (CPE) devices, including the Cisco uBR910 series cable data service units (DSUs), the Cisco uBR924, and the Cisco uBR904

Restrictions

Using the Cisco uBR-MC28C cable modem card:

- Requires a network processing engine (NPE) 200 or higher in a Cisco uBR7200 series chassis

  Note If you are using a Cisco uBR7246 VXR chassis, the chassis must contain an NPE-300.

- Requires 128 Megabytes dynamic random-access memory (DRAM)
- Requires Cisco IOS Release 12.1(3a)EC1 or later release
- Excludes support of international channel plans or EuroDOCSIS Annex A RF operations
- Excludes hardware-based spectrum management capabilities found in the Cisco uBR-MC16S cable modem card

Related Features and Technologies

Features that can be used with the Cisco uBR-MC28C cable modem card include:

- Software-based spectrum management introduced in Cisco IOS Release 12.0(7)XR2, Cisco IOS Release 12.1(1a)T1, or Cisco IOS Release 12.0(6)SC, as well as the dynamic upstream modulation feature introduced in Cisco IOS Release 12.1(3a)EC1. To view the Dynamic Upstream Modulation feature module, refer to:
  http://www.cisco.com/univercd/cc/td/doc/product/cable/cab_r_sw/spec_mgt.htm
- Hot Standby 1+1 Redundancy feature introduced in Cisco IOS Release 12.1(3a)EC; To view this feature module, refer to:
  http://www.cisco.com/univercd/cc/td/doc/product/cable/cab_r_sw/hccpfeat.htm

Related Documents

For other information on Cisco uBR7200 series cable modem cards, refer to the following documents:

- *Cisco uBR7200 Series Cable Modem Card Hardware Installation Guide*
- *Cisco uBR7200 Series Universal Broadband Router Software Configuration Guide*
- *Cisco uBR7200 Series Universal Broadband Router Hardware Installation Guide*
- *Cisco Broadband Cable and Fixed Wireless Command Reference Guide*
- Cisco uBR7200 series software release notes and feature modules

Supported Platforms

All current Cisco uBR7200 series universal broadband routers support the Cisco uBR-MC28C cable modem card. These include:

- Cisco uBR7223
- Cisco uBR7246
- Cisco uBR7246 VXR

Supported Standards, MIBs, and RFCs

Standards

- DOCSIS ITU J.112 standard and ITU J.83 Annex B
- CableLabs ECR; RFI-R-98036

MIBs

- All earlier Cisco uBR7200 series MIBs

Note Refer to the Cisco MIB web site on CCO at http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml for MIB listings and descriptions.

- The OLD-CISCO-CHASSIS-MIB and the ENTITY MIB are updated to enable the Simple Network Management Protocol (SNMP) Manager to correctly identify the Cisco uBR-MC28C domain sets; the OLD-CISCO-CHASSIS-MIB and ENTITY MIB contain *cardTable*, *cardIfIndexTable*, *entPhysicalTable*, *entAliasMapping Table*, and *entPhysicalContainsTable* objects that are updated.

RFCs

- All earlier Cisco uBR7200 series RFCs

Note No new or modified RFCs are introduced with this card.

Prerequisites

Before you configure the Cisco uBR-MC28C cable modem card:

- Ensure that your network is designed to support reliable broadband data transmission; at minimum, your network must include:
  - Computer on the WAN side of your Cisco uBR7200 series configured as a Dynamic Host Configuration Protocol (DHCP) server to assign IP addresses to cable modems on the cable plant
  - Required headend or distribution hub equipment, based on the services to be offered
  - Cisco uBR7200 series-compatible external downconverter/upconverter installed in the data path between the Cisco uBR-MC28C cable modem card and the combiner or optical receiver

Note This refers to all cables, amplifiers, and taps at the headend or cable distribution center that connect the Cisco uBR7200 series to the cable plant. Refer to instructions in the *Cisco uBR7200 Series Universal Broadband Router Hardware Installation Guide* located at: http://www.cisco.com/univercd/cc/td/doc/product/cable/cab_rout/cr72hig/index.htm

- Complete a basic configuration of the Cisco uBR7200 series; this includes, at a minimum, the following tasks:
  - Configure a host name and password for the Cisco uBR7200 series.
  - Configure the Cisco uBR7200 series to support the Internet Protocol (IP).
  - Install and configure at least one port adapter to provide backbone connectivity.
  - Install at least one Cisco uBR-MC28C cable modem card in the appropriate slot of the Cisco uBR7200 series chassis; a Cisco cable modem card serves as the RF interface, connecting to an external downconverter/upconverter.
  - Follow the basic steps in the *Cisco uBR7200 Series Universal Broadband Router Software Configuration Guide* that involve bringing up the router; refer to: http://www.cisco.com/univercd/cc/td/doc/product/cable/cab_rout/cr72scg/index.htm
- Define your spectrum based on your channel plan and your cable plant, following general spectrum management configuration guidelines in the *Cisco uBR7200 Series Universal Broadband Router Software Configuration Guide* or the Cisco IOS Release 12.1(3a)EC1 *Cisco uBR7200 Series Dynamic Upstream Modulation* feature module.

Configuration Tasks

To configure the Cisco uBR-MC28C cable modem card, perform the following tasks:

- Designate the downstream center frequency for each of the two MAC domains that reflect the digital carrier frequency for the downstream RF carrier—the channel—for that downstream port; do this for both downstream ports.

  Note Enter the fixed center frequency for your downstream RF carrier in Hz. This value is informational only. The external downconverter/upconverter actually sets the frequency. Noting the correct value for the cable modem card, however, provides useful troubleshooting information.

- For the first MAC domain:
  - Activate the downstream port on the cable modem card.
  - Set each of the four upstream port frequencies associated with that downstream.
  - Activate each upstream port.
- For the second MAC domain:
  - Activate the second downstream port.
  - Set each of the four upstream port frequencies associated with the second downstream.
  - Activate each upstream port.

Note The Cisco uBR-MC28C cable modem card supports multiple modulation profiles. The card ships from the Cisco factory with modulation profile #1 set. For information on modulation profiles, refer to the Cisco IOS Release 12.1(3a)EC1 *Cisco uBR7200 Series Dynamic Upstream Modulation* feature module.

Configuring the Cisco uBR-MC28C Cable Modem Card

	Command	Purpose
Step 1	`Router# configure terminal`	Enter configuration mode.
Step 2	`Router (config)# interface` *type slot/port*	Configure the interface where: – *type* = cable – *slot* = downstream number on card; 0 or 1 – *port* = upstream port number associated with specific downstream; 0, 1, 2, or 3
Step 3	`Router (config-int) # cable downstream frequency` *down-freq-hz*	Enter the fixed center frequency for your first domain downstream RF carrier in Hz. The **downstream frequency** command is an information-only command; it has no effect on the external downconverter/upconverter. The **downstream frequency** command should reflect the digital carrier frequency, which is the center frequency of the downstream RF carrier (the channel) for that downstream port. The downstream frequency is set on the downconverter/upconverter connected to the downstream port. The digital carrier frequency is specified to be the center of a 6-MHz channel. The digital carrier frequency is not the same as the video carrier frequency.
Step 4	`Router (config-int) # no shutdown`	Activate a downstream port on a cable modem card for digital data transmission over the cable plant.

	Command	Purpose
Step 5	`Router (config-int) # cable upstream port frequency up-freq-hz`	Enter the fixed center frequency for the upstream RF carrier (in Hz) and port number. Set the upstream frequency of the RF output to comply with the expected input frequency of the Cisco uBR-MC28C cable modem card port. To set the upstream frequency, enter a fixed frequency of the upstream RF carrier for an upstream port. The valid range for a fixed upstream frequency is 5,000,000 Hz to 42,000,000 Hz. Ensure that the selected upstream frequency does not interfere with the frequencies used for any other upstream applications in the cable plant. The cable interface does not operate until you either set a fixed upstream frequency or create and configure a spectrum group. Repeat this command for each of the four ports associated with the downstream.
Step 6	`Router (config-int) # no cable upstream port shutdown`	Activate the RF carrier on each of the upstream ports. Each upstream port must be activated to enable upstream data from the cable modems on your network to the Cisco uBR7200 series. Repeat this command for each upstream port associated with the downstream.
Step 7	`Router (config-int) # exit`	Enter **exit** to return to the configuration mode.

Follow Step 1 through Step 7 for the second MAC domain. Save your settings to nonvolatile random access memory (NVRAM) to ensure that the system retains the settings after a power cycle:

```
Router# copy running start
```

Verifying Your Settings

To verify your settings, enter the **show running-config** command:

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

Verifying Upstream Settings

To verify upstream settings, enter the **show contr** command:

```
Router# show contr c4/0
Interface Cable4/0
Hardware is MC28C(F-connector)
 BCM3210 revision=0x56B2
 idb 0x6158A4CC MAC regs 0x3E104000 PLX regs 0x3E000000
 rx ring entries 1024 tx ring entries 128 MAP tx ring entries 128
 Rx ring 0x4B09CCC0 shadow 0x615A7E78 head 0
 Tx ring 0x4B09ED00 shadow 0x615A8EE8 head 6 tail 6 count 0
 MAP Tx ring 0x4B09F140 shadow 0x615A9358 head 16 tail 16 count 0

 MAP timer sourced from slot 4

 throttled 0 enabled 0 disabled 0
 Rx:spurious 0 framing_err 0 hcs_err 0 no_buffer 0 short_pkt 0
     no_enqueue 0 no_enp 0 miss_count 0 latency 0
     invalid_sid 0 invalid_mac 0 bad_ext_hdr_pdu 0 concat 0 bad-concat 0
 Tx: full 0 drop 0 stuck 0 latency 0
 MTx:full 0 drop 0 stuck 0 latency 96
 Slots 0 NoUWCollNoEngy 0 FECorHCS 4 HCS 4
 Req 28448325 ReqColl 0 ReqNoise 23 ReqNoEnergy 28448302
 ReqData 0 ReqDataColl 0 ReqDataNoise 0 ReqDataNoEnergy 0
 Rng 0 RngColl 0 RngNoise 0
 FECBlks 4 UnCorFECBlks 4 CorFECBlks 0
 MAP FIFO overflow 0, Rx FIFO overflow 0, No rx buf 0
 Bandwidth Requests= 0x0
 Piggyback Requests= 0x0
 Ranging Requests= 0x0
 Timing Offset = 0x0
 Bad bandwidth Requests= 0x0
 No MAP buffer= 0x0
 Cable4/0 Downstream is up
  Frequency 576.0000 MHz, Channel Width 6 MHz, 64-QAM, Symbol Rate 5.056941 Msps
  FEC ITU-T J.83 Annex B, R/S Interleave I=32, J=4
  Downstream channel ID:1
```

```
➔ Cable4/0 Upstream 0 is up
    Frequency 35.184 MHz, Channel Width 1.600 MHz, QPSK Symbol Rate 1.280 Msps
    Spectrum Group 2
    SNR - Unknown
    Nominal Input Power Level 0 dBmV, Tx Timing Offset 0
    Ranging Backoff automatic (Start 0, End 3)
    Ranging Insertion Interval 100 ms
    Tx Backoff Start 0, Tx Backoff End 4
    Modulation Profile Group 1
    Concatenation is enabled
    part_id=0x3137, rev_id=0x03, 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 = 64
    Bandwidth Requests = 0x0
    Piggyback Requests = 0x0
    Invalid BW Requests= 0x0
    Minislots Requested= 0x0
    Minislots Granted  = 0x0
    Minislot Size in Bytes = 16
    Map Advance (Dynamic) :2180 usecs
    UCD Count = 288
➔ Cable4/0 Upstream 1 is up
    Frequency 20.400 MHz, Channel Width 1.600 MHz, QPSK Symbol Rate 1.280 Msps
    Spectrum Group 1
    SNR - Unknown
    Nominal Input Power Level 0 dBmV, Tx Timing Offset 0
    Ranging Backoff automatic (Start 0, End 3)
    Ranging Insertion Interval 100 ms
    Tx Backoff Start 0, Tx Backoff End 4
    Modulation Profile Group 1
    Concatenation is enabled
    part_id=0x3137, rev_id=0x03, 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 = 64
    Bandwidth Requests = 0x0
    Piggyback Requests = 0x0
    Invalid BW Requests= 0x0
    Minislots Requested= 0x0
    Minislots Granted  = 0x0
    Minislot Size in Bytes = 16
    Map Advance (Dynamic) :2180 usecs
    UCD Count = 280
➔ Cable4/0 Upstream 2 is up
    Frequency 18.800 MHz, Channel Width 1.600 MHz, QPSK Symbol Rate 1.280 Msps
    Spectrum Group 1
    SNR - Unknown
    Nominal Input Power Level 0 dBmV, Tx Timing Offset 0
    Ranging Backoff automatic (Start 0, End 3)
    Ranging Insertion Interval 100 ms
    Tx Backoff Start 0, Tx Backoff End 4
    Modulation Profile Group 1
    Concatenation is enabled
    part_id=0x3137, rev_id=0x03, 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 = 64
  Bandwidth Requests = 0x0
  Piggyback Requests = 0x0
  Invalid BW Requests= 0x0
  Minislots Requested= 0x0
  Minislots Granted  = 0x0
  Minislot Size in Bytes = 16
  Map Advance (Dynamic) :2180 usecs
  UCD Count = 276
→ Cable4/0 Upstream 3 is down
  Frequency not set, Channel Width 1.600 MHz, QPSK Symbol Rate 1.280 Msps
  Spectrum Group 1
  SNR - Unknown
  Nominal Input Power Level 0 dBmV, Tx Timing Offset 0
  Ranging Backoff automatic (Start 0, End 3)
  Ranging Insertion Interval 100 ms
  Tx Backoff Start 0, Tx Backoff End 4
  Modulation Profile Group 1
  Concatenation is enabled
  part_id=0x3137, rev_id=0x03, 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 = 64
  Bandwidth Requests = 0x0
  Piggyback Requests = 0x0
  Invalid BW Requests= 0x0
  Minislots Requested= 0x0
  Minislots Granted  = 0x0
  Minislot Size in Bytes = 16
  Map Advance (Dynamic) :2180 usecs
  UCD Count = 0
```

Verifying Downstream Center Frequency

To verify the downstream center frequency of each domain, enter the **show controllers cable** *slot/port* **downstream** command:

```
Router# show controllers cable 4/0 downstream

Cable4/0 Downstream is up
  Frequency 576.0000MHz, Channel Width 6MHz, 64-QAM, Symbol Rate
  5.056941 Msps
  FEC ITU-T J.83 Annex B, R/S Interleave I=32, J=4
  Downstream channel ID: 0
```

Command Reference

Command reference pages are included for the following configuration commands:

- **cable downstream frequency**
- **cable downstream if-output**
- **cable downstream interleave-depth**
- **cable downstream modulation**
- **cable downstream rate-limit**
- **cable insertion-interval**
- **cable intercept**
- **cable modulation profile**
- **cable qos profile**
- **cable upstream admission-control**
- **cable upstream channel-width**
- **cable upstream concatenation**
- **cable upstream data-backoff**
- **cable upstream differential-encoding**
- **cable upstream fec**
- **cable upstream fec-strength**
- **cable upstream freq-adj averaging**
- **cable upstream frequency**
- **cable upstream minislot-size**
- **cable upstream modulation**
- **cable upstream modulation-profile**
- **cable upstream power-adjust**
- **cable upstream power-level**
- **cable upstream range-backoff**
- **cable upstream rate-limit**
- **cable upstream scrambler**
- **cable upstream shutdown**
- **cable upstream timing-adjust**

cable downstream frequency

To have the downstream center frequency reflect the digital carrier frequency of the downstream RF carrier for that downstream port, use the **cable downstream frequency** command in cable interface configuration mode.

cable downstream frequency *down-freq-hz*

Syntax Description

down-freq-hz	The known center frequency of the downstream carrier in Hz.

Defaults

Disabled

Command Modes

Cable interface configuration

Command History

Release	Modification
11.3 XA	This command was introduced to support DOCSIS Annex B RF operation.
12.0(7)XR2, 12.0(8)SC	This command was modified to support EuroDOCSIS Annex A RF operation. **Note** This option is not applicable to the Cisco uBR-MC28C because this cable modem card excludes support for EuroDOCSIS operation.
12.1(2)EC1	This command was introduced to support Annex A and Annex B RF operation based on the Cisco cable modem card used. **Note** The Cisco uBR-MC28C cable modem card does not support EuroDOCSIS Annex A RF operation.

Usage Guidelines

The downstream frequency is an information-only parameter. The configuration controlling the actual digital carrier frequency is set by the external upconverter. The display parameter you set for a Cisco uBR7200 cable modem card should match the digital carrier frequency you set when you configure the upconverter. The **cable downstream frequency** command has no effect on the external upconverter; it is informational only.

Examples

The following example shows how to set the downstream center frequency value:

```
router(config-if)# cable downstream frequency 96000000
```

cable downstream if-output

To activate a downstream port on a cable modem card for digital data transmissions over the cable plant, use the **cable downstream if-output** command in cable interface configuration mode. To disable the intermediate frequency (IF) carrier, use the **no** form of this command.

cable downstream if-output

no cable downstream if-output

Syntax Description

This command has no arguments or keywords.

Defaults

Downstream carrier is enabled

Command Modes

Cable interface configuration

Command History

Release	Modification
11.3 XA	This command was introduced.
12.0(7)XR2, 12.(0)SC,12.1(2)EC1	This command was modified to support Annex A RF operation.  **Note** This option is not applicable to the Cisco uBR-MC28C because this cable modem card excludes support for EuroDOCSIS Annex A RF operation.

Usage Guidelines

Caution Disabling the IF output mutes the IF output signal of the Cisco uBR700 series. The upconverter may then change to an alarm state. Cable modems that are connected to that plant segment may be disconnected from the network.

Examples

The following example shows how to enable downstream port 0 on a cable modem card installed in slot 6 of a Cisco uBR7200 series:

```
router(config-if)# cable 6/0 cable downstream if-output
```

cable downstream interleave-depth

To set the downstream interleave depth, use the **cable downstream interleave-depth** command in cable interface configuration mode. To restore the default setting, use the **no** form of this command.

cable downstream interleave-depth {**8** | **16** | **32** | **64** | **128**}

no cable downstream interleave-depth

Syntax Description

8 | **16** | **32** | **64** | **128**	Indicates the downstream interleave depth in microseconds.

Defaults

The cable downstream interleave-depth default value is 32.

Command Modes

Cable interface configuration

Command History

Release	Modification
11.3 XA	This command was introduced.

Usage Guidelines

This command sets the minimum latency for the system. A higher interleave depth provides more protection from bursts of noise on the Hybrid Fiber Coax (HFC) system. A higher depth, however, also increases downstream latency which slows TCP/IP throughput in some configurations. Table 3 shows interleave characteristics and relationships. The command applies to Cisco "C-based" cable modem cards and the Cisco uBR-MC16S. The command does not apply to the Cisco uBR-MC16E.

Caution Low interleave depth values typically cause some packet loss on HFC networks, because burst noise lasts beyond the forward error correction (FEC) block correctable length. Changing the interleave depth disconnects all connected cable modems on that plant segment.

Table 3 Interleave Characteristics and Relationships

I (Number of Taps)	J (Increment)	Burst Protection 64 QAM/256 QAM	Latency 64 QAM/256 QAM
8	16	5.9 microseconds/4.1 milliseconds	0.22 ms/0.15 ms
16	8	12 microseconds/8.2 milliseconds	0.48 ms/0.33 ms
32	4	24 microseconds/16 milliseconds	0.98 ms/0.68 ms
64	2	47 microseconds/33 milliseconds	2.0 ms/1.4 ms
128	1	95 microseconds/66 milliseconds	4.0 ms/2.8 ms

Examples

The following example shows how to set the downstream interleave depth to 128 microseconds:

```
router(config-if)# cable downstream interleave-depth 128
```

cable downstream modulation

To set the modulation format for a downstream port on a cable modem card, use the **cable downstream modulation** command in cable interface configuration mode.

cable downstream modulation {**64qam** | **256qam**}

Syntax Description

64qam	Modulation rate is 6 bits per downstream symbol.
256qam	Modulation rate is 8 bits per downstream symbol.

Defaults

The cable downstream modulation default is **64qam**.

Command Modes

Cable interface configuration

Command History

Release	Modification
11.3 XA	This command was introduced.

Usage Guidelines

Downstream modulation defines the speed in bits per second at which data travels downstream to the cable modem. A symbol is the basic unit of modulation; 64 QAM encodes 6 bits per symbol; 256 QAM encodes 8 bits per symbol.

Note Setting a downstream modulation format of 256 QAM requires approximately a 6 dB higher signal-to-noise ratio (SNR) than 64 QAM at the subscriber's cable modem. If your network is marginal or unreliable at 256 QAM, use the 64 QAM format instead.

Caution Changing the modulation format disconnects all connected cable modems.

Examples

The following example shows how to set the downstream modulation to 256 QAM from the default of 64 QAM:

```
router(config-if)# cable downstream modulation 256qam
```

cable downstream rate-limit

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

cable downstream rate-limit [**token-bucket** [[**shaping** [**granularity** *msec* | **max-delay** *msec*]] | **weighted-discard**] [*exp-weight*]

no cable downstream rate-limit

Syntax Description

token-bucket	(Optional) Specifies the token bucket filter algorithm.
shaping	(Optional) Enables rate limiting on the downstream port using the token-bucket policing algorithm with default traffic shaping.
granularity *msec*	(Optional) Specifies traffic shaping granularity in milliseconds. Valid values are 1, 2, 4, 8, or 16 milliseconds.
max-delay *msec*	(Optional) Specifies the maximum traffic shaping buffering delay in milliseconds. Valid values are 128, 256, 512, or 1028 milliseconds.
weighted-discard	(Optional) Specifies the weighted discard algorithm.
exp-weight	(Optional) Specifies the weight for the exponential moving average of loss rate. Valid values are from 1 to 4.

Defaults

The default value is **token-bucket**

Command Modes

Cable interface configuration

Command History

Release	Modification
11.3(6) NA	This command was introduced.
12.0(4)XI	The **shaping** keyword was added.
12.0(5)T1, 12.1(1)EC1	Support for **shaping** was added.

Usage Guidelines

When you enter this command without an option, the **token-bucket** option is used.

Examples

The following example shows how to apply the token-bucket filter algorithm:

```
router(config-if)# cable 6/0 cable downstream rate-limit token-bucket
```

cable insertion-interval

To configure the interval between consecutive initial ranging slots on an upstream, use the **cable insertion-interval** interface configuration command. To configure the automatic setting and ignore any minimum or maximum time settings, use the **no** form of this command.

cable insertion-interval [*fixed-inrvl* | **automatic** [*min-intrvl* | *max-intrvl*]]

no cable insertion-interval

Syntax Description

fixed-intrvl	(Optional) Fixed interval between initial ranging slots in milliseconds (ms).
automatic	(Optional) Causes the Cisco uBR7200 series MAC scheduler for each upstream cable modem to vary the initial ranging times available to new cable modems joining the network.
min-intrvl	(Optional) Minimum value in msecs between the initial ranging slots on the upstream. Valid range is 25 to 200 ms. Default is 50 ms.
max-intrvl	(Optional) Maximum value in msecs between the initial ranging slots on the upstream. Valid range is 500 to 2000 ms. Default is 500 ms.

Defaults

The default for the insertion interval is **automatic**. This setting dynamically varies the frequency of initial ranging upstream slots between 50 milliseconds to 2 seconds.

Command Modes

Cable interface configuration

Command History

Release	Modification
11.NA	This command was introduced.
12.1 T	This command was modified to adjust the algorithm.

Usage Guidelines

Use this command to specify the minimum and maximum duration between initial ranging opportunities that appear in MAP messages the Cisco uBR7200 series sends. MAP messages define the precise time intervals for cable modems.

The default insertion interval setting (**automatic**) configures the Cisco uBR7200 series to automatically vary the initial ranging times available to new cable modems that attempt to join the network between 50 milliseconds and 2 seconds.

Use the **automatic** keyword with this command when you have to bring a large number of cable modems online (for example, after a major power failure). Override the **automatic** keyword by specifying an insertion interval.

Examples

The following example shows how to specify automatic insertion intervals:

```
router(config-if)# cable insertion-interval automatic
```

The following example shows how to specify minimum insertion interval to 100 ms:

```
Router(config-if)# cable insertion-interval min 100
```

Related Commands

Command	Description
cable upstream data-backoff	Specifies automatic or fixed start and stop values for data backoff.
cable upstream range-backoff	Specifies automatic or configured initial ranging backoff calculation.

cable intercept

To allow the CMTS to forward all traffic to and from a particular cable modem to a data collector located at particular User Datagram Protocol (UDP) port, use the **cable intercept** command cable interface configuration command. To deactivate this function, use the **no** form of this command.

cable intercept [*mac-address*] *ip-address udp-port*

no cable intercept

Syntax Description

mac-address	Specifies the MAC address.
ip-address	Specifies the IP address.
udp-port	Specifies the destination UDP port number for the intercept stream. Valid range is 0 to 65,535.

Defaults

Disabled

Command Modes

Cable interface configuration

Command History

Release	Modification
12.0(5)T1	This command was introduced on the T train.
12.0(6)SC	This command was introduced on the SC train.
12.1(2)EC	This command was introduced on the EC train.

Usage Guidelines

When this command is activated, the Cisco uBR7200 series universal broadband router examines each packet for the desired MAC address. When a matching MAC address is found for either the origination or destination endpoint, a copy of the packet is encapsulated into a UDP packet. The packet is then sent to the specified server at the given IP address and port.

Note This command can be used only in the Cisco uBR700 series universal broadband router configuration. It requires maximum privilege to set. The system at *ip-address* on the *udp-port* must be configured to listen for and capture the necessary data stream. An IP route to the specified *ip-address* must exist, and IP connectivity to that device must be present for the traffic to be captured.

This command can be used to comply with the United States Federal Communications Assistance for Law Enforcement Act (CALEA) and other law enforcement wiretap requirements for voice communications.

Examples

The following command shows how to specify the destination IP address and UDP port number for the Cisco uBR7200 series universal broadband router:

```
(config-if)# cable intercept 0080.fcaa.aabb 3.12.13.8 512
```

cable modulation-profile

To define the modulation profile, use the **cable modulation-profile** global configuration command. Use the **no** form of this command to remove the specified modulation profile.

cable modulation-profile *profile iuc fec-tbytes fec-len burst-len guard-t mod scrambler seed diff pre-len last-cw uw-len*

no cable modulation-profile *profile iuc fec-tbytes fec-len burst-len guard-t mod scrambler seed diff pre-len last-cw uw-len*

Syntax Description

profile	Modulation profile number.
iuc	Interval usage code. Valid entries are: **initial, long, request, short, or station.**
fec-tbytes	The number of bytes that can be corrected per FEC code word. Valid values are from 0 to 10, where 0 means no FEC.
fec-len	FEC code word length. Valid values are from 16 to 253.
burst-len	Maximum burst length in minislots. Valid values are from 0 to 255, where 0 means no limit.
guard-t	Guard time in symbols. The time between successive bursts.
mod	Modulation. Valid entries are **16qam** and **qpsk**.
scrambler	Enable or disable scrambler. Valid entries are **scrambler** and **no-scrambler**.
seed	Scrambler seed in hexidecimal format. Valid values are from 0x0000 to 0x7FFF.
diff	Enable or disable differential encoding. Valid entries are **diff** and **no-diff**.
pre-len	Preamble length in bits. Valid values are from 2 to 128.
last-cw	Handling of FEC for last code word. Valid entries are **fixed** for fixed code-word length and **shortened** for shortened last code word.
uw-len	Upstream unique word length. Enter **uw8** for 8-bit unique words or **uw16** for 16-bit unique code words.

Defaults

Modulation profile #1 with the **qpsk** option is the default.

Command Modes

Global configuration

Command History

Release	Modification
11.3 NA	This command was introduced.

Usage Guidelines

A modulation profile is a collection of six burst profiles that are sent out in an Upstream Channel Descriptor (UCD) message to configure a cable modem's transmit parameters for the following upstream message types: request, initial maintenance, station maintenance, short grant, and long grant.

For Cisco cable modem cards other than the Cisco uBR-MC11 FPGA and the Cisco uBR-MC16B, you can use the **no cable modulation-profile** command to remove all modulation profiles except modulation profile 1. In the case of modulation profile 1, the **no cable modulation-profile** command sets all of the parameters in a burst to default values.

Note Changes to modulation profiles cause changes to the physical layer. Because changing physical layer characteristics affects router performance and function, this command should be reserved for expert users.

Tips To use this command correctly, enter a line with all parameters for each upstream burst type.

Caution An incomplete burst profile causes unreliable operation or loss of modem connectivity.

Turning the scrambler off might cause packet loss; recommended only in lab testing environments.

Errors or incompatible configurations in burst profiles can cause cable modems to drop connectivity, drop short or long data packets, or even to fail to connect to the network.You can build a burst profile set for which a DOCSIS receiver cannot receive the modem's transmission.

The 160 Ksymbol/sec and 2560 Ksymbol/sec data rates are highly sensitive to unique word length, preamble length, and FEC sizing. Incorrect choices for these values can cause poor, or no, connectivity at these symbol rates.

Examples

The following example shows how to define the burst parameters for profile 2 as follows:

The request burst is defined to have 0 fec-tbytes, 16 kbytes fec-len, a burst-len of 1, a guard time of 8, a mod value of qpsk, scrambler enabled with a seed value of 152, differential encoding disabled, a preamble length of 64 bits, a fixed code word length, and 8-bit unique words for upstream unique word length. The remaining initial, station, short, and long bursts are defined in similar fashion for profile 2.

```
Router(config)# cable modulation-profile 2 request 0 16 1 8 qpsk scrambler 152 no-diff 64
fixed uw8
Router(config)# cable modulation-profile 2 initial 5 34 0 48 qpsk scrambler 152 no-diff
128 fixed uw16
Router(config)# cable modulation-profile 2 station 5 34 0 48 qpsk scrambler 152 no-diff
128 fixed uw16
Router(config)# cable modulation-profile 2 short 6 75 6 8 16qam scrambler 152 no-diff 144
fixed uw8
Router(config)# cable modulation-profile 2 long 8 220 0 8 16qam scrambler 152 no-diff 160
fixed uw8
```

Note You must create all of the bursts (request, initial, station, short and long) for this modulation profile, using the **modulation profile** command.

Related Commands

Command	Description
cable upstream modulation-profile	Assigns a modulation profile to an interface.

cable qos profile

To configure a quality of service (QoS) profile, use the **cable qos profile** command in global configuration mode. To either set default values for profile group numbers 1 or 2, or to remove the QoS profile if no specific parameters remain, use the **no** form of this command.

cable qos profile {*groupnum* | **grant-interval** {*interval*} | **grant-size** {*size*} | **guaranteed-upstream** {rate} | **ip-precedence** {value} | **max-burst** {rate} | **max-downstream** {*rate*} | **max-upstream** {*rate*} | **name** {*string*} | **priority** {*value*} | **privacy** | **tos-overwrite** {*value*}}

no cable qos profile {*groupnum* | **grant-interval** {*interval*} | **grant-size** {*size*} | **guaranteed-upstream** {*rate*} | **ip-precedence** {*value}* | **max-burst** {*rate*} | **max-downstream** {*rate*} | **max-upstream** {*rate*} | **name** {*string*} | **priority** {*value*} | **privacy** | **tos-overwrite** {*value*}}

Syntax Description

groupnum	QoS profile group number. Qos profiles 1 and 2 are required by the system; they are preconfigured and can be modified, but cannot be removed. QoS profile1 is used during registration; QoS profile 2 is the default QoS profile.
grant-interval	The periodic interval in microseconds at which the cable modem (CM) wants to send the fixed-sized upstream MAC frames. It is used to compute the period in between constant bit rate (CBR) slots for the CM. Valid range is from 0 to 65,535.
grant-size	The size of the DOCSIS MAC frame the CM wants periodically to send on the upstream transmission. This value in bytes does not include any PHY layer overhead. It includes the complete fixed MAC frame size starting from the frame control byte to the CRC of the protocol data unit (PDU). This parameter is used by the CMTS to set the size of the periodic CBR slot for the CM after adding the PHY overhead.
guaranteed-upstream	Guaranteed minimum upstream rate in kilobytes per second. Valid values are from 0 to 100000. Default value is 0 (no reserved rate).
ip-precedence	Bits in the type-of-service (ToS) byte that enable you to configure individual data rate limits on a per modem basis. Valid values are from 0 to 7.
max-burst	Maximum upstream transmit burst size in bytes that the modem can send for any single transmit burst. Valid values are from 0 to 65535 bytes. Default value is 0 (no limit).
max-downstream	Maximum downstream data rate in kilobytes per second that a modem using this QoS profile receives. Valid values are from 0 to 100000. Default value is 0 (no downstream rate limit).
*m***aximum-upstream**	Maximum upstream data rate in kilobytes per second that a modem using this QoS profile receives. Valid values are from 0 to 255. Default value is 0 (no upstream rate limit).
name	QoS name string.
priority	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.

privacy	Enables cable baseline privacy.
tos-overwrite	Overwrite the ToS field in the IP datagrams received on the upstream before forwarding them downstream (or IP backbone). This parameter sets the hexadecimal mask bits to a hexadecimal value, thereby helping the CMTS identify datagrams for QoS on the backbone. Valid range is from 0x0 to 0xFF.
value	The value substituted for the ToS value.

Defaults

No default behavior or values.

Command Modes

Global configuration

Command History

Examples

The following example shows how to configure QoS profile 4 with a guaranteed upstream rate of 8 kbps, maximum transmission burst of 16 minislots, maximum downstream rate of 128 kbps, a priority of 4, cable baseline privacy set, and a tos-overwrite mask and value byte (in hex) of 0x2:

```
router(config)# cable qos profile 4 guaranteed-upstream 8
router(config)# cable qos profile 4 max-burst 16
router(config)# cable qos profile 4 max-downstream 128
router(config)# cable qos profile 4 privacy
router(config)# cable qos profile 4 priority 4
router(config)# cable qos profile 4 tos-overwrite 0xA0 0xE0
```

Related Commands

Command	Description
cable qos permission	Specifies permission for updating the cable router QoS table.
show cable qos profile	Displays cable router QoS profiles.

cable upstream channel-width

To specify an upstream channel width for an upstream port, use the **cable upstream channel-width** command in cable interface configuration mode. To set the channel width back to the default setting of 1600,000 Hz, use the **no** form of this command.

cable upstream *usport* **channel-width** *first-choice-width* [*last-choice-width*]

no cable upstream *usport* **channel-width**

Syntax Description

usport	Specifies the port number.
first-choice-width	Specifies upstream channel width in hertz (Hz). Valid values for Annex A RF operation are: 200,000 (160000 symbols/sec), 400,000 (320,000 symbols/sec), 800,000 (640,000 symbols/sec), 1600,000 (1,280,000 symbols/sec), and 3,200,000 (2,560,000 symbols/sec).
last-choice-width	(Optional) The upstream channel width in hertz. The valid values are the same as those for the *first-choice-width* parameter. You can use this parameter with the Cisco uBR-MC16S cable modem card to enable symbol rate management algorithms. The symbol rate automatically steps up from the *first-choice-width* value to the highest value until a stable channel is established. **Note** The *last-choice-width* arguement does not apply to the Cisco uBR-MC28C. The command is applicable only to the Cisco uBR-MC16S.

Defaults

1,600,000 Hz

Command Modes

Cable interface configuration

Command History

Release	Modification
11.3(5)NA	This command was introduced.
12.0(4)XI	The *last-choice-width* argument was added.
12.0(7)XR2	The command was updated to support the Cisco uBR-MC16S.

Usage Guidelines

The *last-choice-width* parameter is supported only by the Cisco uBR-MC16S cable modem card. When the Cisco uBR-MC16S is installed, the system attempts to increase the channel width from the *first-choice-width* value to the *last-choice-width* value one step at a time.

Examples

The following example configures upstream port 2 with a channel width of 200,000 Hz (which is equivalent to a symbol rate of 160 kilosymbols/second):

```
router(config-if)# cable upstream 2 channel-width 200000
```

The following example configures upstream port 3 to step from a channel width of 1,600,000 Hz to a channel width of 3,200,000 Hz in increments of 200,000 Hz:

```
router(config-if)# cable upstream 3 channel-width 1600000 3200000
```

Related Commands

Command	Description
cable upstream fec-strength	Overrides the FEC setting specified in the modulation profile for an upstream channel.
cable upstream hop algorithm	Configures the frequency hop algorithm for the upstream port of a cable router.
cable upstream modulation	Overrides modulation types specified in the modulation profile for the specified upstream channel.

cable upstream concatenation

To turn concatenation on or off from the CMTS, use the **cable upstream concatenating** cable interface configuration command. To turn off concatenation, use the **no** form of this command.

cable upstream *n* **concatenation**

no cable upstream *n* **concatenation**

Syntax Description

n	Specifies the upstream channel.

Defaults

On

Command Modes

Cable interface configuration

Command History

Release	Modification
12.0(7)XR2	This command was introduced.

Usage Guidelines

Concantenation is part of DOCSIS 1.0 extension support. Concatenation must be supported at both the CMTS and the CM.

DOCSIS concatenation combines multiple upstream packets into one packet to reduce packet overhead and overall latency, and increase transmission efficiency. Using concatenation, a DOCSIS cable modem needs to make only one bandwidth request for a concatenated packet, compared to making bandwidth requests for each individual packet. This technique is especially effective for bursty real-time traffic such as voice calls. Concatenation support improves upstream per cable modem (CM) data throughput.

The current Cisco uBR7200 series cable modem card driver can only receive one MAC frame in a data burst. Thus, the CM must make explicit bandwidth requests for every packet it wishes to send upstream. This limits the maximum upstream data throughput a CM receives due to the inherent request-to-grant round-trip latency of the HFC system incurred by every packet. To increase this per-CM upstream throughput, the Cisco uBR7200 driver has been enhanced to receive a concatenated burst of multiple MAC frames from the same CM.

Note Concatenation is supported only on Cisco cable modem cards that are fully DOCSIS-compliant—"C based" cable modem cards and the Cisco uBR-MC16S. The cable modem must also support the DOCSIS 1.0 extensions.

cable upstream data-backoff

To specify automatic or fixed start and stop values for the data backoff, use the **cable upstream data-backoff** command in cable interface configuration mode. To use the default data backoff values, use the **no** form of this command.

cable upstream *usport* **data-backoff** {**automatic** | *start end*}

no cable upstream *usport* **data-backoff**

Syntax Description

usport	Specifies the upstream port number.
automatic	Specifies automatic data backoff start and stop values. It enables dynamic variation in the *start* and *end* values.
start	Binary exponential algorithm. Sets the start value for data backoff. Valid values are from 0 to 15.
end	Binary exponential algorithm. Sets the end value for data backoff. Valid values are from 0 to 15.

Defaults

automatic

Command Modes

Cable interface configuration

Command History

Release	Modification
12.1 T	This command was introduced.

Usage Guidelines

The DOCSIS-specified method of contention resolution for cable modems used to send data or requests on the upstream channel is a truncated binary exponential back-off with the initial backoff window and the maximum backoff window controlled by the CMTS. The Cisco uBR7200 series router specifies back-off window values for both data and initial ranging, and sends these values downstream as part of the Bandwidth Allocation Map (MAP) MAC message. The values are power-of-two values. For example, a value of 4 indicates a window between 0 and 15; a value of 10 indicates a window between 0 and 1023.

Cisco recommends that you use the automatic settings for data backoff.

Examples

The following example shows how to set the automatic data backoff values for port 2:

```
router(config-if)# cable upstream 2 data-backoff automatic
```

Related Commands

Command	Description
cable upstream range-backoff	Specifies automatic or configured initial ranging backoff calculation.
cable insertion-interval	Configures the interval between consecutive initial ranging slots on an upstream.

cable upstream differential-encoding

To enable differential encoding on upstream traffic to a specified cable interface, use the **cable upstream differential-encoding** command in cable interface configuration mode. To disable this function, use the **no** form of this command.

cable upstream *usport* **differential-encoding**

no cable upstream*usport* **differential-encoding**

Syntax Description

usport	Specifies the upstream port number.

Defaults

Enabled

Command Modes

Cable interface configuration

Command History

Release	Modification
Cisco IOS Release 12.1	This command was introduced.

Usage Guidelines

To verify whether or not upstream differential encoding is activated, enter the **show running-config** command and look for the cable interface configuration information. If upstream differential encoding is enabled, a differential encoding entry is displayed in the **show running-config** output. If upstream differential encoding is disabled, no differential encoding entry is displayed in the output.

If you are having trouble, make sure that the cable connections are not loose or disconnected; the cable modem card is firmly seated in its chassis slot; the captive installation screws are tight; you have entered the correct slot and port numbers; and you selected a valid frequency for your router.

Examples

The following example shows how to enable differential encoding for upstream port 2:

```
Router(config-if)# cable upstream 2 differential-encoding
```

cable upstream fec

To enable upstream forward error correction (FEC), use the **cable upstream fec** command in cable interface configuration mode. To disable FEC, use the **no** form of this command.

cable upstream *usport* **fec**

no cable upstream *usport* **fec**

Syntax Description

usport	Specifies the upstream port number.

Defaults

Enabled

Command Modes

Cable interface configuration

Command History

Release	Modification
11.3 XA	This command was introduced.

Usage Guidelines

The Cisco uBR7200 series uses forward error correction (FEC) to attempt to correct any upstream data that might have been corrupted. To use this feature, activate FEC on the upstream RF carrier. When FEC is activated, the Cisco uBR7200 series commands all cable modems on the network to activate FEC.

Examples

The following example shows how to activate upstream forward error correction:

```
router (config-if)# cable upstream 0 fec
```

Related Commands

Command	Description
cable upstream frequency	Enters a fixed frequency of the upstream RF carrier for an upstream port.
cable upstream power-level	Sets the input power level for the upstream RF carrier in decibels per millivolt (dBmV).
cable upstream scrambler	Enables the cable upstream scrambler.
cable upstream shutdown	Disables the upstream port.

cable upstream fec-strength

To override the forward error correction (FEC) setting specified in the modulation profile for this upstream channel, use the **cable upstream fec-strength** command in cable interface configuration mode. To restore the default value, use the **no** form of this command.

cable upstream *usport* **fec-strength** *t-bytes*

no cable upstream *usport* **fec-strength**

Syntax Description

usport	Specifies the upstream port number.
t-bytes	Overrides the FEC strength specified in the modulation profile for this upstream channel. Valid values are from 0 to 10, where: • 0 disables FEC. • 1 is the lowest FEC strength. • 10 is the highest FEC strength.

Defaults

No default behavior or values.

Command Modes

Cable interface configuration

Command History

Release	Modification
12.0(4)XI	This command was introduced.

Examples

The following example shows how to configure the **cable upstream fec-strength** command:

```
router(config-if)# cable upstream 2 fec-strength 3
```

Related Commands

Command	Description
cable upstream fec	Enables the upstream FEC.
cable upstream channel-width	Specifies an upstream channel width for a headend router.
cable upstream hop algorithm	Configures the frequency hop algorithm for the upstream port of a headend router.
cable upstream modulation	Overrides modulation types specified in the modulation profile for the specified upstream channel.

cable upstream freq-adj averaging

To control power adjustments on a Cisco uBR7200 series by setting the frequency threshold, use the **cable upstream freq-adj averaging** interface configuration command. To disable power adjustments, use the **no** form of this command.

cable upstream *n* **freq-adj averaging** *% of frequency adjustment*

no cable upstream freq-adj averaging

Syntax Description

n	Specifies the upstream port number.
averaging	Specifies that a percentage of frequency adjustment packets is required to change the adjustment method from the regular power adjustment method to the noise power adjustment method.
% of frequency adjustment	Specifies the percentage of frequency adjustment packets required to switch from the regular power adjustment method to the noise power adjustment method. Valid range is from 10 to 100%.

Defaults

No default behavior or values.

Command Modes

Interface configuration

Command History

Release	Modification
12.0(7)T	This command was introduced.

Examples

The following example shows how to change the power adjustment method when the frequency adjustment packet count reaches 50 percent:

```
Router(config-if)# cable upstream 0 freq-adj averaging 50
```

Related Commands

Command	Description
cable upstream power-adjust	Controls power adjustment methods on the Cisco uBR7200 series.
show cable flap-list	Displays a list of cable modems that have exceeded the threshold number of power adjustments.
show cable modem	Displays cable modem configuration settings.

cable upstream frequency

To enter a fixed frequency of the upstream radio frequency (RF) carrier for an upstream port, use the **cable upstream frequency** command in cable interface configuration mode. To restore the default value for this command, use the **no** form of this command.

cable upstream *usport* **frequency** *up-freq-hz*

no cable upstream *usport* **frequency** *up-freq-hz*

Syntax Description

usport	Specifies the upstream port number on the cable modem card for which you want to assign an upstream frequency.
up-freq-hz	The upstream center frequency is configured to a fixed value. The valid upstream frequency range for the Cisco uBR-MC28C is 5 MHz to 42 MHz (5,000,000 to 42,000,000 Hz). If you wish to have the Cisco uBR7200 series dynamically specify the a center frequency for the given upstream interface, you do not enter any frequency value.

Defaults

Dynamic (not fixed frequency)

Command Modes

Cable interface configuration

Command History

Release	Modification
11.3 XA	This command was introduced.

Usage Guidelines

The upstream channel frequency of your RF output must be set to comply with the expected input frequency of your Cisco cable modem card. To configure an upstream channel frequency, you may:

- Configure a fixed frequency between 5 to 42 MHz for NTSC channel plans and enable the upstream port, or
- Create a global spectrum group, assign the interface to it, and enable the upstream port.

To configure the default upstream frequency (which is no fixed frequency), enter the **cable upstream** *usport* **frequency** command without specifying a center frequency.

Examples

The following example shows how to configure the upstream center frequency for port 0, located in slot 6, to 5,700,000 Hz:

```
Router(config-if)# cable upstream 0 frequency 5700000
```

The following example shows how to allow the Cisco uBR7200 series to dynamically specify a center frequency for the upstream port 0:

```
Router(config-if)# cable upstream 0 frequency
```

cable upstream minislot-size

To specify the minislot size (in ticks) for a specific upstream interface, use the **cable upstream minislot-size** command in cable interface configuration mode. To set the default minislot size of 8 if this is valid for the current channel width setting, use the **no** form of this command.

cable upstream *usport* **minislot-size** *size*

no cable upstream *usport* **minislot-size**

Syntax Description

usport	Specifies the upstream port number.
size	Specifies the minislot size in time ticks. Valid minislot sizes are: 2 (32 symbols), 4 (64 symbols), 8 (128 symbols), 16 (256 symbols), 32 (512 symbols), 64 (1024 symbols), and 128 (2048 symbols).

Defaults

The default settings vary, depending on the specified minislot sizes. The minislot size has a range of values between 2 and 128 and default values for these minislot sizes range between 4 and 64.

Command Modes

Cable interface configuration

Command History

Release	Modification
11.3(6) NA	This command was introduced.

Usage Guidelines

Caution Using values of 64 or 128 for higher symbol rates such as 1280 kilosymbols/second or 2560 kilosymbols/second can cause performance problems. Depending on your current setting's symbol rate, you should select the minislot size (in ticks) that yields a minislot size of 32 or 64 symbols.

Examples

The following example shows how to set the minislot size on upstream port 4 to 16 (or 256 symbols):

```
router(config-if)# cable upstream 4 minislot-size 16
```

cable upstream modulation-profile

To assign a modulation profile to an interface, use the **cable upstream modulation-profile** interface configuration command. Use the **no** form of this command to assign the default primary modulation profile (profile #1) to the interface.

cable upstream *n* **modulation-profile** *primary-profile-number secondary-profile-number*

no cable upstream *n* **modulation-profile** *primary-profile-number secondary-profile-number*

Syntax Description

n	Port number on the cable modem slot.
primary-profile number	Default modulation profile added to the interface.
secondary-profile number	Additional modulation profile added to the interface.

Defaults

Primary modulation profile (profile #1).

Command Modes

Interface configuration

Command History

Release	Modification
11.3 NA	This command was first introduced.
12.0(7)XR2	This command was used.
12.1(3a)EC1	This command was modified to add the *primary-profile-number* and *secondary-profile-number.*

Usage Guidelines

You can configure modulation profiles with fixed upstream frequencies or on interfaces with assigned spectrum groups. The dynamic upstream modulation feature uses modulation profiles to track upstream signal quality. It checks that the upstream signal can support the configured modulation scheme, and adjusts to a more robust modulation scheme, if necessary. When return path conditions improve, it returns the upstream channel to the higher modulation scheme.

Examples

The following example shows how to assign the primary modulation profile 2 and the secondary modulation profile 1 to port (interface) 0:

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

cable upstream power-adjust

To control power adjustment methods on the Cisco uBR7200 series, use the **cable upstream power-adjust** command in interface configuration mode. To disable power adjustments, use the **no** form of this command.

cable upstream *n* **power-adjust** [**continue**] [**noise** *% of power adjustment*] [*threshold #*]

no cable upstream power-adjust

Syntax Description

n	Specifies the upstream port number.
continue	Specifies the regular power adjustment method (minimum power adjustments).
noise	Specifies that a percentage of power adjustment packets is required to change the adjustment method from the regular power adjustment method to the noise power adjustment method.
% of power adjustment	Specifies the percentage of power adjustment packets required to switch from the regular power adjustment method to the noise power adjustment method. Valid range is from 10 to 100%.
threshold #	Specifies the power adjustment threshold. The threshold range is from 0 to 10dB.

Defaults

No default behavior or values.

Command Modes

Interface configuration

Command History

Release	Modification
12.0(7)T	This command was introduced.

Examples

The following example shows how to change the power adjustment method when the percentage of power adjustment packets reaches 50 percent:

```
router(config-if)# cable upstream 0 power-adjust noise 50
```

Related Commands

Command	Description
cable upstream frequency	Configures a fixed frequency of the upstream RF carrier for an upstream port.

Command	Description
show cable flap-list	Displays a list of cable modems that have exceeded the threshold number of power adjustments.
show cable modem	Displays cable modem configuration settings.

cable upstream power-level

To set the input power level for the upstream radio frequency (RF) carrier in decibels per millivolt (dBmV), use the **cable upstream power-level** command in cable interface configuration mode. To restore the default value for this command, use the **no** form of this command.

cable upstream *usport* **power-level** *dbmv*

no cable upstream *usport* **power-level** *dbmv*

Syntax Description

usport	Specifies the upstream port number.
dbmv	Decibels per millivolt designating the upstream signal input power level. Valid range is –10 dBmV to 25 dBmV.

Defaults

0 dBmV

Command Modes

Cable interface configuration

Command History

Release	Modification
11.3 XA	This command was introduced.

Usage Guidelines

The Cisco uBR7200 series controls the output power levels of the cable modems to meet the desired upstream input power level. The nominal input power level for the upstream RF carrier is specified in decibels per millivolt (dBmV). The default setting of 0 dBmV is the optimal setting for the upstream power level.

The valid range for the input power level depends on the data rate. At 1.6 MHz, the valid range is –10 dBmV to 25 dBmV. Higher values cause the modems to increase their transmit power, achieving a greater carrier-to-noise ratio. If your power levels operate at greater than the maximum valid level, you must use an attenuator to bring the power level to within the valid range.

Caution If you increase the input power level, the cable modems on your HFC network increase their transmit power level. This might cause an increase in the carrier-to-noise ratio on the network. Be careful if you adjust this parameter. You might violate the upstream return laser design parameters.

You should not adjust your input power level by more than 5 dB in a 30-second interval. If you *increase* the power level by more than 5 dB within 30 seconds, cable modem service on your network will be disrupted. If you *decrease* the power level by more than 5 dB within 30 seconds, cable modems on your network will be forced offline.

When you run **cable upstream 0 power-level**, Cisco recommends that the adjacent channel not have a large variation. The recommended maximum input power variance is 5 to 6 dBmV.

Examples

The following example shows how to set the input power level for upstream port 0 to -5 dBmV:

```
router(config-if)# cable upstream 0 power-level -5
```

Related Commands

Command	Description
cable upstream fec	Enables the upstream FEC.
cable upstream frequency	Enters a fixed frequency of the upstream RF carrier for an upstream port.
cable upstream scrambler	Enables the cable upstream scrambler.
cable upstream shutdown	Disables the upstream port.

cable upstream range-backoff

To specify automatic or configured initial ranging backoff calculation, use the **cable upstream range-backoff** command in cable interface configuration mode. To set default values, use the **no** form of this command.

cable upstream *usport* **range-backoff** {**automatic** | *start end*}

no cable upstream *usport* **range-backoff**

Syntax Description

usport	Specifies the upstream port number.
automatic	Specifies the fixed data backoff start and end values.
start	Binary exponential algorithm. Sets the start value for initial ranging backoff. Valid values are from 0 to 15.
end	Binary exponential algorithm. Sets the end value for initial ranging backoff. Valid values are from 0 to 15.

Defaults

automatic

Command Modes

Cable interface configuration

Command History

Release	Modification
12.1 T	This command was introduced.

Usage Guidelines

The DOCSIS-specified method of contention resolution for cable modems used to send data or requests on the upstream channel is a truncated binary exponential back-off with the initial backoff window and the maximum backoff window controlled by the CMTS. The Cisco uBR7200 series router specifies backoff window values for both data and initial ranging, and sends these values downstream as part of the Bandwidth Allocation Map (MAP) MAC message. The values are power-of-two values. For example, a value of 4 indicates a window between 0 and 15; a value of 10 indicates a window between 0 and 1023.

The **automatic** setting is optimized for a maximum of 250 cable modems per upstream port. Set manual values for data backoff windows only when operating with more than 250 cable modems per upstream port.

Examples

The following example shows how to set the range backoff to **automatic** for upstream port 2:

```
router(config-if)# cable upstream 2 range-backoff automatic
```

Related Commands

Command	Description
cable upstream data-backoff	Specifies automatic or fixed start and stop values for data backoff.
cable insertion-interval	Configures the interval between consecutive initial ranging slots on an upstream.

cable upstream rate-limit

To set DOCSIS rate limiting for an upstream port on a cable modem card, use the **cable upstream rate-limit** command in cable interface configuration mode. To disable DOCSIS rate limiting for the upstream port, use the **no** form of this command.

cable upstream *usport* **rate-limit** [**token-bucket** [**shaping**]]

no cable upstream *usport* **rate-limit**

Syntax Description

usport	Specifies the upstream port number.
token-bucket shaping	(Optional) Enables rate limiting for the specified upstream cable interface using the token bucket policing algorithm. The **shaping** option enables token bucket shaping.

Defaults

Token bucket algorithm with traffic shaping.

Command Modes

Cable interface configuration

Command History

Release	Modification
11.3(6)NA	This command was introduced.
11.3(9)NA	The **shaping** keyword was added.

Usage Guidelines

Upstream rate limiting allows upstream bandwidth requests from rate-exceeding cable modems to be buffered without incurring TCP-related timeouts and retransmits. This enables the Cisco uBR7200 series to enforce the peak upstream rate for each cable modem without degrading overall TCP performance for the subscriber CPEs. Upstream grant shaping is per cable modem (SID).

When the **token-bucket** algorithm is configured, the Cisco uBR7200 series automatically drops packets in violation of allowable upstream bandwidth.

Use of the default value (the upstream port's rate limit) enforces strict DOCSIS-compliant rate limiting. Cisco highly recommends to using the default setting of **token-bucket** with the **shaping** option.

Examples

The following example shows how to configure the token bucket filter algorithm with traffic shaping on upstream port 4:

```
router(config-if)# cable upstream 4 rate-limit token-bucket
```

Related Commands

Command	Description
cable downstream rate-limit	Enables DOCSIS rate limiting on downstream traffic.

cable upstream scrambler

To enable the cable upstream scrambler, use the **cable upstream scrambler** command in cable interface configuration mode. To restore the default configuration value for this command, use the **no** form of this command.

cable upstream *usport* **scrambler**

no cable upstream *usport* **scrambler**

Syntax Description

usport	Specifies the upstream port number.

Defaults

Disabled

Command Modes

Cable interface configuration

Command History

Release	Modification
11.3 XA	This command was introduced.

Usage Guidelines

This command causes cable modems to enable their pseudo-random scrambler circuitry to improve the robustness of the upstream receiver on the line card.

The scrambler on the upstream radio frequency (RF) carrier enables cable modems on the HFC network to use built-in scrambler circuitry for upstream data transmissions. The scrambler circuitry improves reliability of the upstream receiver on the cable modem card. The upstream scrambler is activated by default and should not be disabled under normal circumstances.

Caution Scrambler must be activated for normal operation. Deactivate only for prototype modems that do not support scrambler.

Examples

The following example shows how to activate the upstream scrambler:

```
router(config-if)# cable upstream 0 scrambler#
```

Related Commands

Command	Description
cable upstream fec	Enables the upstream FEC.
cable upstream frequency	Enters a fixed frequency of the upstream RF carrier for an upstream port.
cable upstream power-level	Sets the input power level for the upstream RF carrier in decibels per millivolt (dBmV).
cable upstream shutdown	Disables the upstream port.

cable upstream shutdown

To disable the upstream port, use the **cable upstream shutdown** command in cable interface configuration mode. To enable the upstream port, use the **no** form of this command.

cable upstream *usport* **shutdown**

no cable upstream *usport* **shutdown**

Syntax Description

usport	Specifies the upstream port number.

Defaults

Upstream port enabled

Command Modes

Cable interface configuration

Command History

Release	Modification
11.3 XA	This command was introduced.

Examples

The following example shows how to disable the upstream port:

```
router(config-if)# cable upstream 0 shutdown
```

cable upstream timing-adjust

To enable upstream timing adjustment for a specified cable interface, use the **cable upstream timing-adjust** cable interface configuration command. To return to the default values, use the **no** form of this command.

cable upstream *usport* **timing-adjust** {**continue** sec | **threshold** *sec*}

no cable upstream *usport* **timing-adjust** {**continue** sec | **threshold** *sec*}

Syntax Description

usport	Specifies the upstream port number.
continue *sec*	Sets the minimum timing adjustment that sets **continue** ranging status in section. The range for *sec* is 2 to 64 seconds. Default value is 2 seconds.
threshold *sec*	Sets the timing adjustment threshold in seconds. Valid threshold value is 1 to 32 seconds. Default is 1 second.

Defaults

2 seconds for **continue** and 1 second for **threshold**.

Command Modes

Cable interface configuration mode

Command History

Release	Modification
11.3 NA	This command was introduced.

Usage Guidelines

To verify whether or not upstream timing adjustment is configured and activated, enter the **show running-config** command and look for the cable interface configuration information. If upstream timing adjustment is enabled, either or both of the **continue** and **threshold** timing adjustment entries are displayed in the **show running-config** output. If both the **continue** and **threshold** upstream timing adjustments are disabled, no timing adjustment entry is displayed in the **show running-config** output.

If you are having trouble, make sure that the cable connections are not loose or disconnected; the cable modem card is firmly seated in its chassis slot; the captive installation screws are tight; and you have entered the correct slot and port numbers.

Note The **cable timing-adjust** command is applicable only on the Cisco 12.1(12)SC and 12.1(3)T Releases. It is deprecated on the 12.1(3a)EC1 Release.

Examples

The following example shows how to set the upstream time adjustment ranging value to 5 seconds:

```
CMTS01(config-if)# cable upstream 0 time-adjust continue 5
```

The following example shows how to set the upstream time adjustment threshold value to the default of 12 seconds:

```
CMTS01(config-if)# cable upstream 0 time-adjust threshold 12
```