



## Cable Commands: cable u through cable w

Revised: 19 June, 2013, OL-15510-16

### New Commands

Command	Cisco IOS Software Release
<b>cable upstream rate-adapt (global)</b>	12.3(23)BC2
<b>cable upstream rate-adapt (interface)</b>	12.3(23)BC2
<b>cable upstream attribute-mask</b>	12.2(33)SCB
<b>cable upstream threshold hysteresis</b>	12.3(23)BC7
<b>cable upstream equalization-error-recovery</b>	12.3(23)BC7
<b>cable upstream active-codes</b>	12.2(33)SCC
<b>cable upstream bonding-group</b>	12.2(33)SCC
<b>cable upstream codes-per-minislot</b>	12.2(33)SCC
<b>cable upstream max-codes-per-subframe</b>	12.2(33)SCC
<b>cable upstream max-interleave-step</b>	12.2(33)SCC
<b>cable upstream max-logical-chans</b>	12.2(33)SCC
<b>cable upstream ranging-poll</b>	12.2(33)SCC
<b>cable upstream resiliency</b>	12.2(33)SCC
<b>cable upstream spreading-interval</b>	12.2(33)SCC
<b>cable upstream qos wfq</b>	12.2(33)SCD2
<b>cable util-interval</b>	12.2(33)SCD2
<b>cable upstream dpon</b>	12.2(33)SCE
<b>cable upstream max-channel-power-offset</b>	12.2(33)SCE3
<b>cable upstream rate-limit-bwreq exempted-priority</b>	12.2(33)SCF
<b>cable upstream rf-adapt</b>	12.2(33)SCF
<b>cable upstream rf-adapt(logical channel)</b>	12.2(33)SCF
<b>cable upstream threshold rf-adapt</b>	12.2(33)SCF
<b>cable vrf-steering cable-modem</b>	12.2(33)SCF

Command	Cisco IOS Software Release
<b>cable upstream ext-power</b>	12.2(33)SCF2
<b>cable upstream chan-class-id</b>	12.2(33)SCH
<b>cable upstream rng-holdoff</b>	12.2(33)SCH
<b>cable udc-capability</b>	12.2(33)SCG5

#### Modified Commands

Command	Cisco IOS Software Release
<b>cable wideband auto-reset</b>	12.3(23)BC
<b>cable upstream modulation</b>	12.3(23)BC7
<b>cable upstream equalization-error-recovery</b>	12.2(33)SCB4
<b>cable upstream channel-width</b>	12.2(33)SCC
<b>cable upstream docsis-mode</b>	12.2(33)SCC
<b>cable upstream modulation-profile</b>	12.2(33)SCC
<b>cable upstream shutdown</b>	12.2(33)SCC
<b>cable upstream threshold</b>	12.2(33)SCC
<b>cable upstream max-ports</b>	12.2(33)SCE
<b>cable upstream ranging-init-technique</b>	12.2(33)SCE
<b>cable upstream connector</b>	12.2(33)SCE
<b>cable upstream rate-limit-ccf</b>	12.2(33)SCF
<b>cable upstream threshold</b>	12.2(33)SCF
<b>cable upstream threshold hysteresis</b>	12.2(33)SCF
<b>cable upstream load-balance group</b>	12.2(33)SCE4
<b>cable upstream resiliency</b>	12.2(33)SCG
<b>cable upstream docsis-mode</b>	12.2(33)SCG
<b>cable upstream channel-width</b>	12.2(33)SCG2
<b>cable upstream docsis-mode</b>	12.2(33)SCG2

# cable udc-capability

To enable the Upstream Drop Classifier (UDC) feature on cable modems, use the **cable udc-capability** command in interface configuration mode. To disable the UDC feature, use the **no** form of this command.

**cable udc-capability**

**no cable udc-capability**

**Syntax Description** This command has no arguments or keywords

**Command Default** Disabled.

**Command Modes** Interface configuration (config-if)

Command History	Release	Modification
	12.2(33)SCG5	This command was introduced.

**Usage Guidelines** This command is used in the MAC domain. When this command is used on a particular interface, the UDC feature for all the cable modems on that interface is enabled.

**Examples** The following example shows how to configure the **cable udc-capability** command:

```
Router# configure terminal
Router(config)# interface cable 7/1/0
Router(config-if)# cable udc-capability
```

**Associated Features** The **cable udc-capability** command is used to configure the Upstream Drop Classifier (UDC) feature on Cisco CMTS. For more information on the UDC feature, refer to the [Configuring Upstream Cable Interface Features on the Cisco CMTS Routers](#) guide.

Related Commands	Command	Description
	<b>show cable modem</b>	Displays information for the registered and unregistered cable modems.

# cable upstream active-codes

To specify the number of active codes that can be configured on an upstream channel, use the **cable upstream active-codes** command in cable interface configuration mode. To set the default value of active codes to 112 when ingress noise cancellation is enabled and to 128 when it is disabled, use the **no** form of this command.

**cable upstream** *n* **active-codes** *active-code*

**no cable upstream** *n* **active-codes**

<b>Syntax Description</b>	<i>n</i>	Specifies the upstream port. Valid values start with 0 for the first upstream port on the cable interface line card.
	<i>active-code</i>	Specifies the number of active codes. Valid values are from 64 to 128, with a default value of 112, when ingress noise cancellation is enabled; and a default value of 128, when ingress noise cancellation is disabled.

**Command Default** The active-code setting cannot be applied if the Synchronous Code Division Multiple Access (S-CDMA) is not configured.

**Command Modes** Interface configuration (config-if)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(33)SCC	This command was introduced.

**Usage Guidelines** This command is applicable only for S-CDMA channels. You should configure S-CDMA to apply the active-code setting.

**Examples** The following example sets the active code to 128 on upstream port 0:

```
Router(config)# interface cable 7/0/4
Router(config-if)# cable upstream 0 active-codes 128
Router(config-if)#
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>cable upstream codes-per-minislot</b>	Specifies the number of codes per minislot allowed on an upstream channel.
	<b>cable upstream spreading-interval</b>	Specifies the spreading interval for S-CDMA channels on an upstream channel.

# cable upstream admission-control

To specify the percentage overbooking rate that is allowed on an upstream channel, use the **cable upstream admission-control** command in cable interface configuration mode. To set overbooking rate to its default of 100 percent, use the **no** form of this command.

**cable upstream** *n* **admission-control** *percentage*

**no cable upstream** *n* **admission-control**

## Syntax Description

<i>n</i>	Specifies the upstream port. Valid values start with 0 for the first upstream port on the cable interface line card.
<i>percentage</i>	Specifies the percentage overbooking rate to limit overbooking. Valid values are from 10 to 1000 percent, with a default of 100 percent.

## Command Default

100 percent

## Command Modes

Interface configuration (cable interface only)

## Command History

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

## Usage Guidelines

This command limits the maximum number of CMs for a given upstream port by looking at the minimum guaranteed upstream bandwidth allocated to each CM. Cable modems providing residential services and commercial services can be given different weights according to their traffic needs. This command affects only whether CMs can register with the CMTS—it does not affect CMs that have already come online.

The CMTS uses the minimum guaranteed upstream bandwidth field from the CM's DOCSIS configuration file to calculate whether the CM can come online or not. If the CM's minimum guaranteed upstream bandwidth would exceed the total upstream bandwidth multiplied by the overbooking percentage specified by this command, the CM cannot come online on that upstream. The CM will attempt to find another upstream, and if it cannot register on any upstreams, it will attempt to lock on to a new downstream.



### Note

A CM with a guaranteed upstream bandwidth does not consume that bandwidth unless it has active traffic. By guaranteeing a CM a minimum upstream bandwidth, individual customers are assured of never being totally shut out from network access in a very high-traffic situation.

[Table 0-1](#) shows the approximate bandwidth for each upstream channel, depending on channel width, symbol rate, and modulation type, when admission control is used at 100 percent. When setting admission control to other values, scale the bandwidth values in [Table 0-1](#) accordingly, so as to plan for the maximum number of CMs effectively allowed per upstream port.

**Table 0-17 Admission Control Bandwidth Table**

Channel Width (KHz)	Symbol Rate (Ksym/sec)	QPSK Virtual Channel Bandwidth—100% limit (bits/sec)	16 QAM Virtual Channel Bandwidth—100% limit (bits/sec)
200	160	320,000	640,000
400	320	640,000	1,280,000
800	640	1,280,000	2,560,000
1600	1280	2,560,000	5,120,000
3200	2560	5,120,000	10,240,000

For example, with a 3.2 MHz channel width and QPSK modulation, the total bandwidth is approximately 5 Mbps. This is the maximum allowable bandwidth that can be allocated to CMs at the default admission rate of 100%. If each CM is allocated a minimum upstream bandwidth of 128 kbps, this means a maximum of 40 CMs will be allowed to come online.

To verify whether or not upstream admission control is configured and activated, use the **show interface** command for a cable upstream to display its configuration information. If upstream admission control is configured and enabled, the output contains an entry stating “CIR admission control enforced.” If upstream admission control is disabled, no admission control entry is displayed in the output.

**Note**

Setting the admission control limit to below the current total reserved bandwidth for the channel does not immediately force any CMs offline, but may prevent CMs from reconnecting if they drop offline at a later time. Increasing the admission control limit allows more CMs to connect.

When an upstream becomes overbooked, use the **test cable ucc** command to move a cable modem that is currently online from one upstream port to another. For example, the following example shows that the cable modem with the IP address of 10.128.1.128 is being moved from port C3/0/U0 to C3/0/U1:

```
Router# show cable modem 10.128.1.128
Interface  Prim Online   Timing Rec   QoS CPE IP address   MAC address
          Sid  State      Offset Power
Cable3/0/U0 101  online    1919   5.25  7   0   10.128.1.128   0030.1976.7067

Router# test cable ucc c3/0 101 1

Router# show cable modem 10.128.1.128
Interface  Prim Online   Timing Rec   QoS CPE IP address   MAC address
          Sid  State      Offset Power
Cable3/0/U1 101  online    1920   5.25  7   0   10.128.1.128   0030.1976.7067
```

**Examples**

The following example shows overbooking on upstream port 4 being limited to 125 percent:

```
Router(config)# interface cable 3/0
Router(config-if)# cable upstream 4 admission-control 125
Router(config-if)#
```

Use the **show interface cable upstream** command to display the current status of admission control on an interface. For example, the following command output shows that this upstream has allocated a total bandwidth of 2.5 Mbit/sec to those online CMs that were assigned a guaranteed upstream bandwidth in their DOCSIS configuration files.

This displays also shows that the admission control is being enforced at a subscription level of 125 percent. The Virtual channel BW field is computed by multiplying channel bandwidth by the admission control limit. The Admissions requests rejected counter shows the number of cable modems that attempted to register but were refused because of the admission control policy.

```
Router# show interface c3/0 u4
```

```
Cable3/0: Upstream 4 is up
  Received 11585 broadcasts, 11854 multicasts, 3222651 unicasts
  0 discards, 829 errors, 0 unknown protocol
  3246090 packets input, 5 uncorrectable
  557 noise, 0 microreflections
  Total Modems On This Upstream Channel : 69 (68 active)
  Default MAC scheduler
  Queue[Rng Polls] 0/64, fifo queueing, 0 drops
  Queue[Cont Mslots] 0/52, fifo queueing, 0 drops
  Queue[CIR Grants] 0/64, fair queueing, 0 drops
  Queue[BE Grants] 0/64, fair queueing, 0 drops
  Queue[Grant Shpr] 0/64, calendar queueing, 0 drops
  Reserved slot table currently has 0 CBR entries
  Req IEs 205196036, Req/Data IEs 0
  Init Mtn IEs 7604617, Stn Mtn IEs 422496
  Long Grant IEs 4848, Short Grant IEs 1646196
  Avg upstream channel utilization : 1%
  Avg percent contention slots : 94%
  Avg percent initial ranging slots : 1%
  Avg percent minislots lost on late MAPs : 0%
  Total channel bw reserved 2500000 bps
  CIR admission control enforced
  Subscription level 125%
  Virtual channel bw 6400000 bps
  Admission requests rejected 32
  Current minislot count : 5200298 Flag: 0
  Scheduled minislot count : 5200420 Flag: 0
```

```
Router#
```

If a CM is denied access due to the admission control policy, its entry in the **show cable modem** command output shows “reject(c)”:

```
Router# show cable modem
```

Interface	Prim Sid	Online State	Timing Offset	Rec Power	QoS	CPE	IP address	MAC address
Cable2/0/U0	1	online	2288	0.50	4	0	10.16.30.66	0010.7bb3.fb45
Cable2/0/U0	2	online	2288	0.50	4	0	10.16.30.68	0010.7bb3.fb7b
Cable2/0/U0	3	init(i)	2280	0.00	2	0	10.16.30.69	0010.9500.05e
.	.	.	.	.	.	.	.	.
Cable3/0/U1	113	online	3921	0.00	5	0	10.128.1.108	0030.9433.c38b
Cable3/0/U1	114	online	3920	0.25	6	0	10.128.1.87	0030.1976.6ebf
Cable3/0/U0	115	reject(c)	3922	0.25	2	0	10.128.1.75	0030.1976.703b
Cable3/0/U0	116	online	3919	0.75	5	0	10.128.1.57	0030.1976.6fa1

## Related Commands

Command	Description
<b>debug cable mac-scheduler</b>	Displays information for the MAC layer’s scheduler and admission control activities.
<b>debug cable us-adm-ctrl</b>	Displays debug messages for upstream admission control activity.

---

<b>show cable modem</b>	Displays statistics for a CM, including its upstream port and primary SID.
<b>show interface cable upstream</b>	Displays the interface configuration, which for an upstream includes the current admission control policy, if any.

---

# cable upstream attribute-mask

To specify an upstream attribute mask in hexadecimal format, use the **cable upstream attribute-mask** command in cable interface configuration mode. Use the **no** form of this command to set default value to upstream channel attribute mask.

**cable upstream attribute-mask** *attribute-mask*

**no cable upstream** *upstream attribute-mask attribute-mask*

## Syntax Description

<i>upstream</i>	Specifies the upstream port.
<b>attribute-mask</b> <i>attribute-mask</i>	Specifies the attribute mask bitmap in hexadecimal format. Example: 0-FFFFFFFF

## Command Default

If the router is not high availability (HA) supported and the upstream is not bonded, the default value for cable upstream attribute mask is 0x00.

If the router is HA supported, the default value is 0x20000000.

If the upstream channel is part of a bonding group, the default value is 0x80000000.

If the router is HA supported and the upstream channel is part of a bonding group, the default value is 0xA0000000.

## Command Modes

Interface configuration—cable interface only (config-if)

## Command History

Release	Modification
12.2(33)SCB	This command was introduced.

## Usage Guidelines

This command sets the attribute mask of upstream channel.

## Examples

The following example shows how to set upstream attribute mask in hexadecimal format:

```
Router(config-if)# cable upstream 0 attribute-mask ffff
```

## Related Commands

Command	Description
<b>clear cable modem attribute-masks</b>	This command clears the cable modem attribute masks.

# cable upstream bonding-group

To create a static upstream bonding group on a cable interface, use the **cable upstream bonding-group** command in cable interface configuration mode. To disable this configuration, use the **no** form of this command.

**cable upstream bonding-group** *id*

**no cable upstream bonding-group** *id*

<b>Syntax Description</b>	<i>id</i>	Bonding group ID on the cable interface. Valid values are from 1 to 65535.
<b>Command Default</b>	None	
<b>Command Modes</b>	Interface configuration (config-if)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(33)SCC	This command was introduced in Cisco IOS Release 12.2(33)SCC.

## Usage Guidelines

You can configure up to 32 static upstream bonding groups for each Media Access Control (MAC) domain. If you delete an upstream bonding group using the **no** form of the command, the Cisco CMTS router enforces the bonded upstream service flows associated with the deleted upstream bonding group to readmit.

Under the upstream bonding configuration submode, you can specify the following for an upstream bonding group:

- Upstream channels
- Bandwidth reservation
- Provisioned attribute masks



### Note

The changes made to the configuration, using the **attributes** command in the upstream bonding configuration submode, on the working line card are synchronized with the configuration on the protect line card only after exiting the configuration mode. Use the end command to exit to Privileged EXEC mode, before using the show running configuration command.

## Examples

The following example shows how to configure an upstream bonding group on a cable interface in slot 7, subslot 1, and port 0 on a Cisco uBR10012 router:

```
Router# configure terminal
Router(config)# interface cable 7/1/0
Router(config-if)# cable upstream bonding-group 235
```

Related Commands	Command	Description
	<b>upstream cable connector</b>	Specifies the upstream channel ports for a fiber node.
	<b>cable fiber-node</b>	Creates a fiber node and enters cable fiber-node configuration mode.

# cable upstream chan-class-id

To configure a channel class ID for a logical upstream channel on the CMTS router, use the **cable upstream chan-class-id** command in cable interface configuration mode. To disable the channel class ID configuration, use the **no** form of this command.

**cable upstream** *port-number* **chan-class-id** *id*

**no cable upstream** *port-number* **chan-class-id** *id*

## Syntax Description

<i>port-number</i>	Cable upstream port number. The valid range depends on the number of upstream channels configured in a MAC domain. For example, if the total number of upstream channels configured is 4, then the valid range for the upstream port number is from 0 to 3.
<i>id</i>	Channel class ID for the logical upstream channel in the hexadecimal format. The valid range is from 0 to ffffffff. The default value is 0.

## Command Default

None

## Command Modes

Interface configuration (config-if)

## Command History

Release	Modification
12.2(33)SCH	This command was introduced.

## Usage Guidelines

An upstream channel descriptor (UCD) message includes type, length, value (TLV) 18 and 19 for an upstream logical channel based on the channel class ID and ranging hold-off priority configuration. If a channel class ID is not configured, the UCD does not include TLV 18 and 19 irrespective of the ranging hold-off priority configuration.

## Examples

The following example shows how to configure a channel class ID for a logical upstream channel on a cable interface line card on the cisco uBR10012 router:

```
Router# config terminal
Router(config)# interface cable 5/0/0
Router(config-if)# cable upstream 0 chan-class-id ff
```

## Associated Features

The **cable upstream chan-class-id** command is associated with the [CM Steering on the Cisco CMTS Routers](#) feature.

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>cable load-balance exclude</b>	Excludes a cable modem or a group of cable modems from DOCSIS load balance.
	<b>cable upstream rng-holdoff</b>	Configures an upstream ranging hold-off priority value for an upstream logical channel on the CMTS router.
	<b>show cable modem verbose</b>	Displays information about the registered and unregistered cable modems connected to the CMTS router.

## 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 1,600,000 Hz, use the **no** form of this command.

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

**no cable upstream** *n* **channel-width**

### Syntax Description

<i>n</i>	Specifies the upstream port number. Valid values start with 0 for the first upstream port on the cable interface line card.
<i>first-choice-width</i>	Specifies the upstream channel width in hertz (Hz). Valid values for all cards are displayed in <a href="#">Table 18</a> .
<i>last-choice-width</i>	(Cisco uBR-MC16U/X, Cisco uBR-MC28U/X, and Cisco uBR-MC5X20S/U/H only)  The upstream channel width in hertz. The valid values are the same as those for the <i>first-choice-width</i> parameter, but for proper operation, the <i>last-choice-width</i> should be equal to or less than the <i>first-choice-width</i> value. Use this parameter with supported cards to enable symbol rate management algorithms.

### Command Default

The *first-choice-width* value and the *last-choice-width* value default to 1,600,000 Hz. When an upstream channel is configured to operate in DOCSIS 2.0 A-TDMA or DOCSIS 3.0 S-CDMA-mode, only three channel width options (1.6 Mhz, 3.2 Mhz, and 6.4 Mhz) are available.

### Command Modes

Interface configuration (config-if)

### Command History

Release	Modification
11.3(5)NA	This command was introduced.
12.0(4)XI	The <i>last-choice-width</i> argument was added.
12.2(11)CY, 12.2(11)BC3	Support was added for the Cisco uBR10-MC5X20S cable interface line card on the Cisco uBR10012 router.
12.2(15)CX	Support was added for the Cisco uBR-MC16U/X and Cisco uBR-MC28U/X cable interface line card, including DOCSIS 2.0 A-TDMA and mixed modulation profiles using 6.4 MHz channel widths.
12.2(15)BC2	Support was added for DOCSIS 2.0 A-TDMA and mixed modulation profiles using 6.4 MHz channel widths on the Cisco uBR-MC5X20S/U cable interface line cards.
12.3BC	This command was integrated into Cisco IOS Release 12.3BC.
12.2(33)SCA	This command was integrated into Cisco IOS Release 12.2(33)SCA.

Release	Modification
12.2(33)SCC	Support was added for Cisco UBR10-MC20X20V cable interface line card.
12.2(33)SCG2	Support was added for Copy and Paste Support for TDMA to A-TDMA Upgrade feature.

**Usage Guidelines**

The *last-choice-width* parameter is supported only by the Cisco uBR-MC16S, Cisco uBR-MC16U/X, Cisco uBR-MC28U/X, and Cisco uBR-MC5X20S/U cable interface line cards. When one of these particular cards is installed, the system attempts to increase the channel width from the smallest channel width value to the largest channel width value.

When you specify both channel width values, the smaller value is taken as the *last-choice-width* parameter and the larger value is taken as the *first-choice-width* parameter. In the event of noise in the channel, the symbol rate automatically steps down to a value that is lower than the *first-choice-width* and greater or equal to the *last-choice-width* to maintain a stable channel.

**Table 18 Supported Channel Widths and DOCSIS Modes for Cable Interfaces**

Cable Interface	Channel Width	DOCSIS 1.X (TDMA)	Mixed DOCSIS 1.X/2.0	DOCSIS 2.0 (A-TDMA)	DOCSIS 2.0 (S-CDMA)	DOCSIS 3.0 (S-CDMA)
Cisco uBR-MC16U/X <sup>1</sup> , Cisco uBR-MC28U/X	6.4 MHz 3.2 MHz 1.6 MHz 800 kHz 400 kHz 200 kHz	41 to 50 (default is 41)	141 to 150 (default is 141)	241 to 250 (default is 241)	N/A	N/A
Cisco uBR-MC5X20S/U/H	6.4 MHz 3.2 MHz 1.6 MHz 800 kHz 400 kHz 200 kHz	21 to 30 (default is 21)	121 to 130 (default is 121)	221 to 230 (default is 221)	N/A	N/A
Cisco uBR-MC20X20 <sup>2</sup>	6.4 MHz 3.2 MHz 1.6 MHz 800 kHz 400 kHz 200 kHz	21 to 30 (default is 21)	121 to 130 (default is 121)	221 to 230 (default is 221)	321 to 330 (default is 321)	1 to 400 (default is 381)

Cable Interface	Channel Width	DOCSIS 1.X (TDMA)	Mixed DOCSIS 1.X/2.0	DOCSIS 2.0 (A-TDMA)	DOCSIS 2.0 (S-CDMA)	DOCSIS 3.0 (S-CDMA)
Cisco uBR-MC88U	6.4 MHz 3.2 MHz 1.6 MHz 800 kHz 400 kHz 200 kHz	21 to 30 (default is 21)	121 to 130 (default is 121)	221 to 230 (default is 221)	321 to 330 (default is 321)	1 to 400 (default is 381)
Cisco uBR-MC3GX60V	6.4 MHz 3.2 MHz 1.6 MHz 800 kHz 400 kHz 200 kHz	21 to 30 (default is 21)	121 to 130 (default is 121)	221 to 230 (default is 221)	321 to 330 (default is 321)	1 to 400 (default is 381)

1. Supports 6,400,000 Hz (5,120,000) symbols/sec) while operating in the DOCSIS 2.0 (A-TDMA-only) mode.
2. The DOCSIS 3.0 S-CDMA modulation profiles do not support 200 kHz, 400 kHz, and 800 kHz channel widths. This applies to Cisco uBR-MC88U and Cisco uBR-MC3GX60V.

**Note**

The UBR-MC20X20V cable interface line card has three variants, UBR-MC20X20V-0D, UBR-MC20X20V-5D, and UBR-MC20X20V-20D. The UBR-MC20X20V-0D line card supports 20 upstreams and zero (no) downstreams. The UBR-MC20X20V-5D line card supports 20 upstreams and five downstreams, and the UBR-MC20X20V-20D line card supports 20 upstreams and 20 downstreams.

**Note**

In Cisco IOS Release 12.2(15)BC1 and later releases, changing the channel width could force a frequency hop, if the current frequency does not fit within the new channel width parameters, or if the system needs to reset the fixed frequency or shared frequency group parameters to match the new channel width.

**Caution**

In DOCSIS 1.X networks, do not change the channel width more than one step at a time on an interface that has cable modems that are currently online. The DOCSIS 1.X specifications require that cable modems remain online when the channel width is changed in single step increments (such as 800,000 to 1,600,000 Hz), but cable modems can go offline when you change the channel width in larger amounts (such as changing it from 800,000 to 3,200,000 Hz). To check if the DOCSIS 2.0 cable modems support changing the channel width by two steps, test each brand of modem before attempting it on a live network. Also, after changing the channel width, do not change the channel width again until all cable modems have performed their ranging adjustments for the new width (which could take up to a minute, depending on the number of cable modems).

**Note**

To specify only one channel width for the Cisco uBR-MC16U/X, Cisco uBR-MC28U/X, or Cisco uBR-MC5X20S/U/H card, specify the same value for both the *first-choice-width* and *last-choice-width* parameters. For example:

```
cable upstream 0 channel-width 800000 800000
```

When using this command to change channel-widths for an upstream interface on the Cisco uBR-MC5X20S cable interface line card, some DOCSIS 1.1 CMs can go offline if you do not change the minislot size to the corresponding value. See the following examples for the correct channel-width and minislot pairings:

```
Router(config-if)# cable upstream 0 channel-width 320000
Router(config-if)# cable upstream 0 minislot 4
```

```
Router(config-if)# cable upstream 0 channel-width 160000
Router(config-if)# cable upstream 0 minislot 8
```

```
Router(config-if)# cable upstream 0 channel-width 80000
Router(config-if)# cable upstream 0 minislot 16
```

```
Router(config-if)# cable upstream 0 channel-width 40000
Router(config-if)# cable upstream 0 minislot 32
```

```
Router(config-if)# cable upstream 0 channel-width 20000
Router(config-if)# cable upstream 0 minislot 64
```

**Note**

This limitation does not affect DOCSIS 1.1-compliant CMs. Also, in Cisco IOS Release 12.2(15)CX, Cisco IOS Release 12.2(15)BC2, and later releases, there is no need to manually change the minislot size on the Cisco uBR-MC16U/X, Cisco uBR-MC28C, and Cisco uBR-MC28U/X cards. These cards automatically change the minislot size when the channel width is changed, to produce 32 symbols per minislot.

**Note**

Starting with Cisco IOS 12.2(33)SCG2, when the channel-width value in the **cable upstream channel-width** command is specified as 6.4 MHz in the TDMA or mixed TDMA/A-TDMA mode, the DOCSIS mode automatically changes to A-TDMA-only (DOCSIS 2.0) mode.

**PacketCable Limitations**

The 200,000 Hz channel width cannot be used on:

- Upstreams that support PacketCable voice calls
- Upstreams that use Unsolicited Grant Service (UGS) or UGS with Activity Detection (UGS-AD) service flows.

Using this small channel width with voice and other UGS/UGS-AD service flows results in rejected calls because of “DSA MULTIPLE ERRORS”.

**Examples**

The following example shows the upstream port 2 on a Cisco uBR-MCXXC card being configured 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
Router(config-if)#
```

The following example shows the upstream port 2 on a Cisco uBR-MC16U/X, Cisco uBR-MC28U/X, or Cisco uBR-MC5X20S card being configured 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 200000
Router(config-if)#
```

The following example shows the upstream port 3 being configured 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
Router(config-if)#
```

The following example shows an upstream port on a Cisco uBR-MC16U/X, Cisco uBR-MC28U/X, Cisco uBR-MC5X20S, Cisco uBR-MC20X20V, Cisco uBR-MC88U or Cisco uBR-MC3GX60V card being configured with a channel width of 6.4 MHz, which is supported only in DOCSIS 2.0 A-TDMA-only mode:

```
Router(config-if)# cable upstream 0 channel-width 6400000
Router(config-if)#
```

The following example shows an upstream port on Cisco uBR-MC5X20H, Cisco uBR-MC20X20V, Cisco uBR-MC88U, Cisco uBR-MC3GX60V line cards being configured with a channel width of 6.4 MHz in DOCSIS 3.0 S-CDMA mode:

```
Router(config-if)# cable upstream 0 channel-width 6400000
Router(config-if)#
```

#### Related Commands

Command	Description
<b>cable upstream hopping blind</b>	Disables optimum frequency hopping on the Cisco uBR-MC16S and Cisco uBR-MC5X20S cable interface line cards.
<b>cable upstream minislot-size</b>	Specifies the minislot size for a specific upstream interface.
<b>cable upstream modulation-profile</b>	Overrides modulation types specified in the modulation profile for the specified upstream channel.
<b>cable upstream docsis-mode</b>	Configures an upstream to use either DOCSIS 1.x or DOCSIS 2.0 modulation profiles.

# cable upstream codes-per-minislot

To specify the number of codes-per-minislot allowed on an upstream channel, use the **cable upstream codes-per-minislot** command in cable interface configuration mode. To set the default values to the codes-per-minislot, which depend on the setting of the **cable upstream spreading-interval** command, use the **no** form of this command.

**cable upstream** *n* **codes-per-minislot** *code*

**no cable upstream** *n* **codes-per-minislot**

Syntax Description		
	<i>n</i>	Specifies the upstream port. Valid values start with 0 for the first upstream port on the cable interface line card.
	<i>code</i>	Specifies the number of codes-per-minislot. Valid values range from 2 to 32.

**Command Default** The codes-per-minislot setting cannot be applied if the Synchronous Code Division Multiple Access (S-CDMA) is not configured. The default value of codes-per-minislot depends on the setting of the **cable upstream spreading-interval** command.

**Command Modes** Interface configuration (config-if)

Command History	Release	Modification
	12.2(33)SCC	This command was introduced.

**Usage Guidelines** This command limits the maximum number of codes-per-minislot for a given upstream port. You should configure S-CDMA to apply the active-code setting.

**Examples** The following example sets the codes-per-minislot to 8 on the upstream port 0:

```
Router(config)# interface cable 7/1/0
Router(config-if)# cable upstream 0 codes-per-minislot 8
Router(config-if)#
```

Related Commands	Command	Description
	<b>cable upstream active-codes</b>	Specifies the number of active codes that can be configured on an upstream channel.
	<b>cable upstream spreading-interval</b>	Specifies the spreading interval for SCDMA on an upstream channel.

# cable upstream concatenation

To enable DOCSIS concatenation at the CMTS, use the **cable upstream concatenation** command in cable interface configuration mode. To turn off concatenation, use the **no** form of this command.

**cable upstream *n* concatenation**

**no cable upstream *n* concatenation**

<b>Syntax Description</b>	<i>n</i>	Specifies the upstream port number. Valid values start with 0 for the first upstream port on the cable interface line card.
---------------------------	----------	---

<b>Command Default</b>	Concatenation is enabled
------------------------	--------------------------

<b>Command Modes</b>	Interface configuration (cable interface only)
----------------------	--

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.0(7)XR2	This command was introduced.

<b>Usage Guidelines</b>	<p>Concatenation is part of DOCSIS 1.0 extension support. Concatenation provides for improved bandwidth efficiency but must be supported at both the headend CMTS and the CM.</p> <p>DOCSIS concatenation combines multiple upstream packets into one packet to reduce packet overhead and overall latency and increase transmission efficiency. Using concatenation, a DOCSIS CM 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.</p> <p>Concatenation support improves upstream per CM data throughput. The Cisco CMTS radio frequency (RF) line card driver can receive only one MAC frame in a data burst. Thus the CM must make explicit bandwidth requests for every packet it sends upstream. This limits the maximum upstream data throughput received by the CM due to the inherent request-to-grant round-trip latency of the hybrid fiber-coaxial (HFC) cable system incurred by every packet. To increase this per-CM upstream throughput, the Cisco CMTS driver has been enhanced to receive a concatenated burst of multiple MAC frames from the same CM.</p>
-------------------------	---



**Note**

Concatenation is not supported on the Cisco uBR-MC11 FPGA and Cisco uBR-MC16B cable interface line cards.

<b>Examples</b>	The following example shows how to enable concatenation for CMs on upstream port 2 on the cable interface in slot 3/0:
-----------------	--

```
Router(config)# interface c3/0
Router(config-if)# cable upstream 2 concatenation
```

# cable upstream connector

To map a MAC domain upstream port to a physical port on the Cisco cable interface line cards (Cisco uBR-MC5X20U/H, Cisco uBR-MC20X20V, Cisco uBR-MC88V, Cisco uBR-MC28U, or Cisco uBR-MC3GX60V), use the **cable upstream connector** command in cable interface configuration mode. To remove the mapping, use the **no** form of this command.

**cable upstream** *port connector physical-port shared*

**no cable upstream** *port connector physical-port shared*

Syntax Description	
<i>port</i>	Index of the MAC domain upstream. The index range is configured with the <b>cable upstream max-ports</b> <i>n</i> command, and the valid range is 0 to <i>n</i> -1.
<i>physical-port</i>	Index of the actual physical port to be mapped.  The valid range for Cisco uBR-MC520U/H, Cisco uBR-MC20X20V, and Cisco uBR-MC3GX60V cable line cards is from 0 to 19. The valid range for Cisco uBR-MC28U and Cisco uBR-MC88V cable line cards is from 0 to 7.
<b>shared</b>	Indicates that the connector is shared by multiple upstream ports.  <b>Note</b> This option is not valid for Cisco uBR-MC3GX60V cable interface line card on Cisco IOS Release 12.2(33)SCE and later releases. A connector becomes shared automatically when multiple upstream ports are mapped to it.

Command Default	
	By default, each MAC domain has four upstream ports allocated. For all the currently supported cable line cards—Cisco uBR-MC5X20U/H, Cisco uBR-MC20X20V, Cisco uBR-MC88V, Cisco uBR-MC28U, and Cisco uBR-MC3GX60V the default mapping is four upstream for each MAC domain.  For the Cisco uBR-MC5X20U/H and Cisco uBR-MC28U cable line cards, each MAC domain has one downstream and four upstreams. For the other cards, each MAC domain can have multiple downstreams.

Command Modes	
	Interface configuration (config-if)

Command History	Release	Modification
	12.2(15)BC1	This command was introduced to support the Cisco uBR-MC5X20S cable interface line card.
	12.2(15)BC2	Support was added for the Cisco uBR-MC5X20U card. Also, the entAliasMappingTable in the ENTITY-MIB was updated to show the mapping between the physical upstream connectors and the logical upstream connectors.
	12.2(33)SCE	Support for the <b>shared</b> keyword was removed.

**Usage Guidelines**

The **cable upstream connector** command maps a MAC domain upstream port to a particular physical RF port on the cable line card front panel. For all cable line cards except the Cisco uBR-MC3GX60V, the default mapping assigns one upstream port to one physical port. The default mapping of Cisco uBR-MC3GX60V cable line card assigns four upstream ports to one physical port. The physical ports are mapped sequentially in the order in which they appear on the front panel.

The **no** version of this command removes the upstream port mapping and shuts down the upstream port. The port must be remapped to another physical port before it can come online again.

**Tip**

Use the **cable upstream max-ports** command to set the maximum number of upstream ports per MAC domain before using the **cable upstream connector** command.

Table 19 and Table 20 show the default port mapping.

**Table 19** Default Upstream Port Assignments for the Cisco uBR-MC5X20U/H Cable Interface Line Card

		Physical Ports (upstream, as labeled on the card)																			
Physical Upstream Ports		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
MAC Domain 0 Upstream		0	1	2	3																
MAC Domain 1 Upstream						0	1	2	3												
MAC Domain 2 Upstream										0	1	2	3								
MAC Domain 3 Upstream														0	1	2	3				
MAC Domain 4 Upstream																		0	1	2	3

**Table 20** Default Upstream Port Assignments for the Cisco uBR-MC3GX60V Cable Interface Line Card

		Physical Ports (upstream, as labeled on the card)																			
Physical Upstream Ports		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
MAC Domain 0 Upstream		0-3																			
MAC Domain 1 Upstream			0-3																		
MAC Domain 2 Upstream				0-3																	
MAC Domain 3 Upstream					0-3																
MAC Domain 4 Upstream						0-3															
MAC Domain 5 Upstream							0-3														
MAC Domain 6 Upstream								0-3													
MAC Domain 7 Upstream									0-3												
MAC Domain 8 Upstream										0-3											
MAC Domain 9 Upstream											0-3										
MAC Domain 10 Upstream												0-3									
MAC Domain 11 Upstream													0-3								
MAC Domain 12 Upstream														0-3							
MAC Domain 13 Upstream															0-3						
MAC Domain 14 Upstream																0-3					

Each MAC domain can have up to 8 upstream ports. Each upstream port can be mapped to a physical port.

### Examples

The following example shows how to configure a MAC domain with 8 upstream ports:

```
Router# configure terminal
Router(config)# interface cable 8/1/0
Router(config-if)# cable upstream max-ports 8
Router(config-if)# cable upstream 0 connector 16
Router(config-if)# cable upstream 1 connector 17
Router(config-if)# cable upstream 2 connector 18
Router(config-if)# cable upstream 3 connector 12
Router(config-if)# cable upstream 4 connector 13
Router(config-if)# cable upstream 5 connector 14
Router(config-if)# cable upstream 6 connector 15
Router(config-if)# cable upstream 7 connector 11
Router(config-if)# exit
Router(config)# exit
Router#
```



#### Note

The "WARNING: This upstream will be removed from all the upstream channel bonding groups in the MAC Domain." warning message is displayed when you configure **no cable upstream connector** command.



#### Note

When an upstream is mapped to a physical upstream port (connector), it is also mapped to an internal upstream PHY receiver. In Cisco uBR-MC5X20U/H, Cisco uBR-MC20X20V, and Cisco uBR-MC88V cable line cards, each upstream PHY chip has two connectors and two receivers, and can support two upstreams. The two upstreams can be mapped in four ways:

- Straight mapping:
 

```
upstream1 =>connector1 =>receiver1;
upstream2 =>connector2 =>receiver2;
```
- Share A mapping:
 

```
upstream1 =>connector1 =>receiver1;
upstream2 =>connector1 =>receiver2;
```
- Share B mapping:
 

```
upstream1 =>connector2 =>receiver1;
upstream2 =>connector2 =>receiver2;
```
- Crossed mapping:
 

```
upstream1 =>connector2 =>receiver1;
upstream2 =>connector1 =>receiver2;
```

The card hardware only supports the first three mappings, and does not support crossed mapping. During normal configuration, certain configuration sequence can cause crossed mapping. When that happens, the connector command will fail, and the CNR-NOXC error message is displayed. To fix the cross mapping, remove all existing upstream connector configurations in these two connectors, and re-provision them.

### Related Commands

<b>Command</b>	<b>Description</b>
<b>cable upstream max-ports</b>	Configures the maximum number of upstreams on a downstream (MAC domain) on a Cisco uBR-MC5X20S cable interface line card.

# cable upstream data-backoff

To specify automatic or fixed start and stop values for 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 n data-backoff { automatic | start end }
```

```
no cable upstream n data-backoff
```

## Syntax Description

<i>n</i>	Specifies the upstream port number. Valid values start with 0 for the first upstream port on the cable interface line card.
<b>automatic</b>	Specifies automatic data backoff start and stop values. It enables dynamic variation in the <i>start</i> and <i>end</i> values.
<i>start</i>	Binary exponential algorithm. Sets the start value for data backoff. Valid values are from 0 to 15. The default value is 3.
<i>end</i>	Binary exponential algorithm. Sets the end value for data backoff. Valid values are from 0 to 15. The default value is 5.

## Command Default

The default cable upstream data-backoff values are 3 5.

## Command Modes

Interface configuration (cable interface only)

## Command History

Release	Modification
12.1 T	This command was introduced.
12.1(5)EC1	Support was added for the Cisco uBR7100 series router.
12.2(4)BC1	Support was added for the Cisco uBR10012 router.

## Usage Guidelines

The DOCSIS-specified method of contention resolution for CMs used to send data or requests on the upstream channel is a truncated binary exponential backoff with the initial backoff window and the maximum backoff window controlled by the CMTS. The Cisco CMTS 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 specified in this command are exponential 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. If you decide to manually specify the data-backoff values, use the following formula as a guideline for the *start* and *end* binary exponents:

$$0.33 = (2^{**stop} - 2^{**start}) / n$$

where *n* is the number of CMs on the upstream. Choose *start* and *stop* values that come closest to the value of 0.33 (which is the optimal probability to transmit on a contention-based system).

**Examples**

The following example shows how to set the automatic data backoff values for upstream 2 on a cable interface card:

```
Router# configure terminal
Router(config)# interface cable 3/0
Router(config-if)# cable upstream 2 data-backoff automatic
Router(config-if)#
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>cable insertion-interval</b>	Configures the interval between consecutive initial ranging slots on an upstream.
<b>cable upstream range-backoff</b>	Specifies automatic or configured initial ranging backoff calculation.
<b>show controllers cable</b>	Displays the backoff window setting for the configured upstream port.

# cable upstream description

To assign a label to an upstream, use the **cable upstream description** command in cable interface configuration mode. To remove the label from the upstream, use the **no** form of this command.

```
cable upstream n description label
```

```
no cable upstream n description
```

## Syntax Description

<i>n</i>	Specifies the upstream port number. Valid values start with 0 for the first upstream port on the cable interface line card.
<i>label</i>	An arbitrary string, up to 80 characters long, that describes this upstream for management and tracking purposes. If the string contains any spaces, enclose the string within quotes.

## Command Default

No description is assigned to upstreams

## Command Modes

Interface configuration (cable interface only)

## Command History

Release	Modification
11.3 NA	This command was introduced.

## Usage Guidelines

Use the **cable upstream description** command to assign arbitrary labels to the upstreams on the cable interfaces. These labels can contain any information that identifies the upstream and that could aid in network management or troubleshooting.



### Tip

Use the **show interface cable upstream** command to display the labels that are assigned to a particular upstream.

## Examples

The following example shows how to assign descriptions to the first two upstreams on the cable interface in slot 3:

```
Router# configure terminal
Router(config)# interface cable 3/0
Router(config-if)# cable upstream 0 description "SJ-Node1-Upstream 0"
Router(config-if)# cable upstream 1 description "SJ-Node1-Upstream 1 (Unused)"
Router(config-if)#
```

## Related Commands

Command	Description
<b>show interface cable</b>	Displays the current configuration and status of a cable interface.

## 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 *n* differential-encoding**

**no cable upstream *n* differential-encoding**

<b>Syntax Description</b>	<i>n</i>	Specifies the upstream port number. Valid values start with 0 for the first upstream port on the cable interface line card.
---------------------------	----------	---

<b>Command Default</b>	Enabled
------------------------	---------

<b>Command Modes</b>	Interface configuration (cable interface only)
----------------------	--

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.1	This command was introduced.

<b>Usage Guidelines</b>	<p>To verify whether or not upstream differential encoding is activated, enter the <b>show running-config</b> command and look for the cable interface configuration information. If upstream differential encoding is enabled, a differential encoding entry is displayed in the output of the <b>show running-config</b> command. If upstream differential encoding is disabled, no differential encoding entry is displayed in the output.</p>
-------------------------	---

If you are having trouble, make sure that the cable connections are not loose or disconnected; the cable interface line 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.

<b>Examples</b>	The following example shows how to enable differential encoding for upstream port 2:
-----------------	--

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

# cable upstream docsis-mode

To configure an upstream to use DOCSIS 1.x, DOCSIS 2.0 or DOCSIS 3.0 modulation profiles, use the **cable upstream docsis-mode** command in cable interface configuration mode. To reset the upstream to its default configuration, use the **no** form of this command.

```
cable upstream n docsis-mode {atdma | scdma | scdma-d3 | tdma | tdma-atdma}
```

```
no cable upstream n docsis-mode {atdma | scdma | scdma-d3 | tdma | tdma-atdma}
```

## Syntax Description

<i>n</i>	Specifies the upstream port. Valid values start with 0 for the first upstream port on the cable interface line card.
<b>atdma</b>	Configures the upstream only for DOCSIS 2.0 Advanced Time Division Multiple Access (A-TDMA) modulation profiles.
<b>scdma</b>	Configures the upstream for DOCSIS 2.0 Synchronous Code Division Multiple Access (S-CDMA) modulation profiles only.
<b>scdma-d3</b>	Configures the upstream for DOCSIS 3.0 S-CDMA modulation profiles. The <b>scdma-d3</b> option uses channel type 4SR mode.
<b>tdma</b>	Configures the upstream only for DOCSIS 1.0/DOCSIS 1.1 Time Division Multiple Access (TDMA) modulation profiles (default).
<b>tdma-atdma</b>	Configures the upstream for both A-TDMA and TDMA operations (mixed mode). If you are using abbreviations at the command line, you must specify at least the <b>tdma</b> to select the mixed mode. If you choose a shorter abbreviation, you select TDMA-only mode.

## Command Default

All upstreams are configured ATDMA-only mode.

## Command Modes

Interface configuration (config-if)

## Command History

Release	Modification
12.2(15)CX	This command was introduced to support DOCSIS 2.0 A-TDMA and mixed modulation profiles on the Cisco uBR-MC16U/X and Cisco uBR-MC28U/X cable interface line card on the Cisco uBR7246VXR router.
12.2(15)BC2	Support was added for the Cisco uBR-MC5X20S/U cable interface line cards on the Cisco uBR10012 router.
12.3BC	This command was integrated into Cisco IOS Release 12.3BC.
12.2(33)SCA	This command was integrated into Cisco IOS Release 12.2(33)SCA.
12.2(33)SCC	This command was modified with the addition of <b>scdma</b> and <b>scdma-d3</b> keyword options and support was added for the Cisco UBR-MC20X20V cable interface line card on the Cisco uBR10012 router.
12.2(33)SCG	The command default was changed from TDMA to ATDMA.
12.2(33)SCG2	Support was added for the Copy and Paste Support for TDMA to A-TDMA upgrade feature.

**Usage Guidelines**

The DOCSIS 2.0 specification builds on the existing TDMA to support advanced modulation profiles that increase potential upstream bandwidth. The A-TDMA profiles support higher QAM rates of up to 64-QAM and wider channel widths of up to 6.4 MHz (5.12 Msymbols).

**Note**

The advanced hardware-based spectrum management features for the Cisco uBR-MC16S/U/X, Cisco uBR-MC28U/X, and Cisco uBR-MC5X20S/U cards are supported only in the DOCSIS 1.0/1.1 TDMA-only mode. They cannot be used in the mixed or A-TDMA-only modes.

**Note**

Starting with Cisco IOS Release 12.2(33)SCG and later, the default upstream DOCSIS mode is ATDMA only.

The DOCSIS 2.0 specification allows an upstream to be configured in one of the following three modes:

- A-TDMA only mode—Upstreams only support cable modems that register using A-TDMA modulation profiles. The CMTS does not allow DOCSIS 1.0 and DOCSIS 1.1 cable modems to register and come online on these upstreams. The Cisco uBR-MC5X20S/U, Cisco uBR-MC16U/X, and Cisco uBR-MC28U/X cards also support 6,400,000 Hz (5,120,000 symbols/sec) when operating in DOCSIS 2.0 (A-TDMA-only) mode.

Changing the DOCSIS mode to A-TDMA only mode automatically changes the symbol rate to 5.12 megasymbols per second and the channel width to 6.4 MHz. It also automatically disables the dynamic upstream modulation.

**Note**

Starting with Cisco IOS 12.2(33)SCG2, when the channel-width value in the **cable upstream channel-width** command is specified as 6.4 MHz in the TDMA or mixed TDMA/A-TDMA mode, the DOCSIS mode automatically changes to A-TDMA-only (DOCSIS 2.0) mode.

Changing DOCSIS mode to A-TDMA only mode will not automatically change the symbol rate to 5.12 megasymbols per second and the channel width to 6.4 MHz. The symbol rate and channel width before the DOCSIS mode change are maintained after the change.

In addition, the following are required to support the DOCSIS 2.0 A-TDMA features:

- Cable modems must be DOCSIS 2.0 compliant.
- The DOCSIS configuration file for the cable modem must either omit the DOCSIS 2.0 Enable field (TLV 39), or it must set TLV 39 to 1 (enable). If you set TLV 39 to 0 (disable), a DOCSIS 2.0 CM uses the TDMA mode.
- The upstream must be configured for either A-TDMA-only or mixed TDMA/A-TDMA mode.
- TDMA-only mode—Upstreams only support cable modems that register using TDMA modulation profiles. DOCSIS 2.0 cable modems can register on these upstreams only by using a DOCSIS 1.0/DOCSIS 1.1 modulation profile (which typically would happen only when a DOCSIS 2.0 cable modem cannot find an A-TDMA channel in its DOCSIS domain).

Changing the DOCSIS mode to TDMA-only mode automatically changes the symbol rate to 1.28 megasymbols per second and the channel width to 3.2 MHz. It also automatically disables the dynamic upstream modulation.

- Mixed mode—Upstreams support both DOCSIS 1.0/DOCSIS 1.1 cable modems using TDMA modulation profiles and DOCSIS 2.0 cable modems using A-TDMA modulation profiles. (The maximum channel width in mixed mode is 3.2 MHz.)

Changing the DOCSIS mode to mixed mode also automatically changes the symbol rate to 1.28 megasymbols per second and the channel width to 3.2 MHz. Dynamic upstream modulation is also automatically disabled.



---

**Note** Mixed mode upstreams do not support the 6.4 MHz channel width.

---

The DOCSIS 3.0 specification allows an upstream to be configured in one of the following modes:

- SCDMA-d3 mode—Upstreams only support cable modems that register using DOCSIS 3.0 S-CDMA modulation profiles.
- SCDMA mode—Upstreams only support cable modems that register using DOCSIS 2.0 S-CDMA modulation profiles.



**Note**

---

The DOCSIS 3.0 option **scdma-d3** (4SR) is available only when the CMTS is configured to operate in the global modulation profile format and is not available in the default mode. This option is available only for the Cisco UBR-MC20X20V cable interface line card, and not for other legacy line cards.

---

Refer to the **cable upstream channel-width** command for valid values of supported channel widths and DOCSIS modes for cable interfaces.



**Note**

---

Changing the DOCSIS Mode for an Upstream Port Forces the Cable Modems on That Upstream to Go Offline and Reregister

---

When you switch the DOCSIS mode of an upstream between the TDMA-only and mixed TDMA/A-TDMA modes, cable modems that are currently online on that upstream are taken offline and are forced to reregister. This helps the CMTS to determine the capabilities of the cable modems on the new channels.

If you change an upstream port to A-TDMA only mode, DOCSIS 1.x cable modems will not be able to come online on that upstream. If you change an upstream to TDMA only mode, DOCSIS 2.0-compliant cable modems are expected to attempt to come online on another upstream that is configured for A-TDMA or mixed mode. If no such upstreams are configured, or if the cable modem is configured to use only that particular upstream, it comes online in the DOCSIS 1.x mode.



**Note**

---

DOCSIS 2.0-compliant cable modems that are already online on a TDMA-only upstream do not automatically reregister on another upstream that has been configured for mixed-mode operations. The cable modem must either be reset or the CMTS must send an Upstream Channel Change (UCC) message to instruct the cable modem to move to the new channel.

---

If you change an upstream port to the mixed TDMA/A-TDMA mode, and some cable modems remain offline, or appear to come online but cannot pass traffic, upgrade the modem software to a DOCSIS-compliant software version.



**Note**

---

The cable physical plant must support the higher upstream bandwidths and symbol rates to be able to use the A-TDMA or mixed mode modulation profiles.

---

**Examples**

The following example configures the first four upstreams for the first downstream on the Cisco uBR-MC28U/X cable interface line card in slot 5/0. The first two upstreams are configured for A-TDMA mode and the last two upstreams are configured for mixed TDMA/A-TDMA mode.

```
Router# config terminal
Router(config)# interface cable 5/0/0
Router(config-if)# cable upstream 0 docsis-mode atdma
%%Docsis mode set to ATDMA only, 1.x CMs will go offline.
%%The following defaults will be set:
%%Channel Width 6.4MHz
%%Minislot Size 1 tick
%%Modulation Profile 241

Router(config-if)# cable upstream 1 docsis-mode atdma
%%Docsis mode set to ATDMA only, 1.x CMs will go offline.
%%The following defaults will be set:
%%Channel Width 6.4MHz
%%Minislot Size 1 tick
%%Modulation Profile 241

Router(config-if)# cable upstream 2 docsis-mode tdma-atdma
%%Docsis mode set to DOCSIS2.0 Mixed Mode.

Router(config-if)# cable upstream 3 docsis-mode tdma-atdma
%%Docsis mode set to DOCSIS2.0 Mixed Mode.

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

The following example shows the abbreviations needed to configure TDMA-only and mixed TDMA/A-TDMA modes.

```
Router# config terminal
Router(config)# interface cable 4/0

Router(config-if)# cable upstream 0 docsis-mode tdm
%%Docsis mode set to DOCSIS1.0 TDMA Mode.

Router(config-if)# cable upstream 1 docsis-mode tdma-
%%Docsis mode set to DOCSIS2.0 Mixed Mode.

Router(config-if)#
```

The following examples configures the SCDMA and SCDMA-d3 modes.

```
Router# config terminal
Router(config-if)# cable upstream 0 docsis-mode scdma
%interface Cable7/1/0 U0 Docsis mode set to DOCSIS2.0 SCDMA
%modulation profile set to 321
Router(config-if)#

Router# config terminal
Router(config-if)# cable upstream 0 docsis-mode scdma-d3
%interface Cable7/1/0 U0 Docsis mode set to DOCSIS3.0 SCDMA (1.x and 2.0 CMs wi)
%modulation profile set to 381
Router(config-if)#
SLOT 7/1: Jul 10 22:04:24.356: %UBR10000-6-PREAMLENADJUST: initial burst's prea.
SLOT 7/1: Jul 10 22:04:24.356: %UBR10000-6-PREAMLENADJUST: station burst's prea.
Router(config-if)# end
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>cable modulation-profile</b>	Defines a modulation profile for use on the router.
<b>cable modulation-profile global-scheme</b>	Defines a global modulation profile for use on the router.
<b>cable upstream channel-width</b>	Specifies an upstream channel width for an upstream port.
<b>cable upstream equalization-coefficient</b>	Enables the use of a DOCSIS 1.1 pre-equalization coefficient on an upstream.
<b>cable upstream maintain-psd</b>	Requires DOCSIS 2.0 CMs on an A-TDMA-only upstream to maintain a constant power spectral density after a modulation rate change.
<b>cable upstream modulation-profile</b>	Assigns one or two modulation profiles to an upstream port.
<b>show cable modulation-profile</b>	Displays the modulation profile information for a Cisco CMTS.
<b>show interface cable mac-scheduler</b>	Displays the current time-slot scheduling state and statistics.

# cable upstream dpon

To enable the DOCSIS Passive Optical Network (DPON) for a MAC domain on the Cisco CMTS router, use the **cable upstream dpon** command in interface configuration mode. To disable one or more DPONs for the MAC domains, use the **no** form of this command.

**cable upstream dpon**

**no cable upstream dpon**

**Syntax Description** This command has no arguments or keywords.

**Command Default** D-PON is not enabled.

**Command Modes** Interface configuration (config-if)

## Command History

Release	Modification
12.2(33)SCE	This command was introduced.

## Usage Guidelines

Configuring D-PON for a MAC domain enables D-PON for all MAC domains on that line card. However, only a single MAC domain can be used within a D-PON fiber node. This is to ensure proper scheduling of the upstream and to prevent multiple Optical Network Terminals (ONTs) from transmitting upstream data at the same time.

You should configure the **cable upstream ranging-init-technique 2** command to prevent the use of additional broadcast initial ranging opportunities for the non-DPON reference upstream channels.

When you shutdown an upstream channel, the D-PON associated with that MAC domain will stop working. To enable D-PON again, you must manually shut down and enable the MAC domain using the **shutdown** and **no shutdown** command.

## Examples

The following example shows how to enable D-PON on a Cisco CMTS router:

```
Router# configure terminal
Router(config)# interface cable 7/0/1
Router(config-if)# cable upstream dpon
Router(config-if)# shutdown
Router(config-if)# no shutdown
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>cable upstream ranging-init-technique</b>	Configures the initial ranging technique for the modem in the MTC-mode.
<b>interface cable</b>	Specifies a cable interface.
<b>show interface cable mac-scheduler</b>	Displays the current time-slot scheduling state and statistics.

# cable upstream equalization-coefficient

To enable the use of a DOCSIS 1.1 or 2.0 pre-equalization coefficient on an upstream port, use the **cable upstream equalization-coefficient** command in cable interface configuration mode. To disable the use of the pre-equalization coefficient, use the **no** form of this command.

**cable upstream *n* equalization-coefficient**

**no cable upstream *n* equalization-coefficient**

## Syntax Description

<i>n</i>	Specifies the upstream port number. Valid range is from 0 to 7 for upstream ports in the cable interface line card.
----------	---

## Command Default

Pre-equalization coefficient is disabled.

## Command Modes

Interface configuration (cconfig-if)

## Command History

Release	Modification
12.2(4)BC1	This command was introduced.
12.2(15)CX	Support was added for the Cisco uBR-MC16U/X and Cisco uBR-MC28U/X cable interface line card, including DOCSIS 2.0 A-TDMA and mixed modulation profiles.
12.2(15)BC2	Support was added for DOCSIS 2.0 A-TDMA and mixed modulation profiles on the Cisco uBR-MC5X20S/U cable interface line cards.
12.3(23)BC6	Support was added for updated default modulation profiles for use with pre-equalization on the Cisco uBR-MC5X20S/U/H cable interface line cards.
12.2(33)SCB	Support was added for updated default modulation profiles for use with pre-equalization on the Cisco uBR-MC5X20S/U/H cable interface line cards.

## Usage Guidelines

The DOCSIS 1.1 and 2.0 specifications allow a CMTS to specify a pre-equalization coefficient in the DOCSIS ranging response (RNG-RSP) MAC management messages it forwards to the cable modems (CM)s. When this is enabled, a CM can engage in transmit-side equalization (pre-equalization) to mitigate the effects of certain impairments in the cable plant, such as in-channel tilt, and group delay.

These impairments are more significant with higher order modulation formats such as 64-QAM or 16-QAM, and near the first octave break-point of the diplex filters (34 MHz to 38 MHz). This break-point exists predominantly as a time-domain group delay issue, and becomes severe for longer amplifier cascades.

Each amplifier causes the DOCSIS upstream signal to traverse two diplex filters. All diplex filter frequency splits (5-42 MHz, 5-65 MHz, or 5-88 MHz) share this characteristic, which is not visible in a frequency response measurement or sweep test.

**Note**

For more information about the use of pre-equalization, see the DOCSIS 2.0 RFI specification section 6.2.15, Transmit Pre-Equalizer, and section 8.3.6 Ranging Response (RNG-RSP) MAC Management Messages.

DOCSIS 1.1 specifies the Type 4 type length value (TLV), and an 8-tap equalizer. DOCSIS 2.0 adds the Type 9 TLV, and increases the equalizer to support 24 taps to compensate for more complex impairments.

The **cable upstream equalization-coefficient** command configures the CMTS to send Type 4 TLV or Type 9 TLVs in the DOCSIS RNG-RSP MAC management messages to the CMs.

The **no** form of the command disables the CMTS from sending Type 4 TLV or Type 9 TLVs in the DOCSIS RNG-RSP MAC management messages to the CMs.

After the CMTS stops sending pre-equalization TLVs to the CM, the CM must retain these values until the modem's cable interface resets, or a modification is made to the upstream channel descriptor (UCD), which would make the stored equalization coefficients invalid.

**Tip**

You can reset the cable modem's interface by:

- Power cycling the cable modem
- Resetting the cable modem from the CMTS using the **clear cable modem** command

```
Router# clear cable modem aaaa.bbbb.cccc reset
```

You can reset the equalizer coefficient of all CMs on an upstream by:

- Changing the upstream center frequency. A 16-kHz or 32-kHz change is sufficient and unlikely to take many CMs offline.
- Briefly changing the periodic ranging messages in the modulation profile between 16-QAM and Quadrature Phase Shift Keying (QPSK), or 64-QAM and 16-QAM.

A CMTS operating in a pure DOCSIS 2.0 upstream mode sends equalizer data supporting 24 taps to all modems during initial ranging.

The **cable up 0 docsis-mode atdma** command configures a DOCSIS 2.0-only upstream mode on the CMTS.

A CMTS operating in a DOCSIS 1.1 or mixed TDMA-ATDMA upstream mode sends equalizer data supporting 8 taps to all modems during initial ranging. The CMTS cannot send data supporting 24 taps until it is notified by the CM, that it is DOCSIS 2.0 compliant in the Registration Request (REG-REQ) message, immediately preceding the online state.

This can be configured on the CMTS using the **cable up 0 docsis-mode tdma-atdma** command.

When a CM receives a Type 4 TLV in the RNG-RSP MAC management message from the CMTS, it must combine the previously stored values with the new values from the CMTS. Under certain HFC plant conditions, a dynamic impairment occurs that require the CM to adjust its main equalizer tap. The DOCSIS standard specifies a convolution function that is sometimes unable to adjust for dynamic impairments. The result, is a CM whose signal-to-noise ratio (SNR) value as received by the CMTS, is quite low compared to other CMs on the same upstream.

In a mixed modulation profile, where station maintenance is of a lower order modulation format than the data grants, it is possible for the modem to enter a steady state where the SNR estimate is:

- Below the required estimate for data grants to be processed by the CMTS
- Above the requirement for station maintenance

This results in a modem that responds to DOCSIS Layer 2 pings, but not to Layer 3 traffic. The following commands can be used to check status:

- **ping docsis** {*cm-mac address* | *cm ip address*}—succeeds
- **ping ip** {*cm IP address* | *CPE IP address*}—fails

A cable modem whose SNR estimate is in this condition may enter the expired(pt) state when baseline privacy interface plus (BPI+) is enabled. A modulation profile where station maintenance and data grants are of the same order modulation, prevents this condition.

The CMTS may be configured to enable cable upstream pre-equalization on a per upstream port basis, and may be configured to disable the sending of upstream equalization-coefficients on a per modem MAC address or Organizational Unique Identifier (OUI) basis, using the related global exclude commands.



#### Note

Some DOCSIS 2.0 compliant CMs / embedded media terminal adapters (EMTA)s have been known to report as DOCSIS 1.1 compliant to the CMTS, unless connected to a DOCSIS 2.0 format upstream. These CMs are treated by the CMTS as DOCSIS 1.1, and only send 8-tap equalizer coefficients. A firmware or SNMP set may be used on these cable modems to enable the proper reporting of DOCSIS 2.0 compliance under a DOCSIS 1.1-style upstream (for example, 3.2 MHz, 16-QAM, TDMA format).

Some older DOCSIS cable modem firmware versions will incorrectly process the transition from 8 to 24 taps when in a mixed TDMA-ATDMA mode, and will experience degrading or low SNR MER as displayed with **show cable modem phy** command. Upgrade the CM firmware, and temporarily move these modems to a pure DOCSIS 1.1 or 2.0 channel or disable pre-equalization for these devices with the exclude command.

#### Examples

The example shows how to enable the use of the pre-equalization coefficient on upstream port 0 in the cable interface line card in slot 5/1 on the Cisco uBR10012 router, while excluding the equalization coefficient messaging to a modem with MAC address aaaa.bbbb.cccc, and all modems with the OUI of 00aa.bb:

```
Router# configure terminal
Router# cable pre-equalization exclude aaaa.bbbb.cccc
Router# cable pre-equalization exclude 00aa.bb
Router(config)# interface cable 5/1/0
Router(config-if)# cable upstream 0 equalization-coefficient
Router(config-if)#
```

#### Related Commands

Command	Description
<b>show cable modem phy</b>	Displays the physical layer RF parameters of the cable modem, including USSNR estimate (MER).
<b>show cable modem docsis version</b>	Displays the DOCSIS version of a cable modem, and the upstream DOCSIS mode— TDMA or ATDMA.

Command	Description
<b>show cable modem</b> [ <b>verbose</b> ]	Displays detailed information about the cable modem. Lines with the string Equalizer describe modem specific equalizer data.
<b>debug cable range</b>	Debugging commands to display the equalizer coefficients being sent by the CMTS to the cable modem in the DOCSIS RNG-RSP MAC management messages.
<b>debug cable interface</b> { <i>interface</i> } { <i>cm-mac-address</i> }[ <b>verbose</b> ]	Debugging commands to display the equalizer coefficients being sent by the CMTS to the cable modem in the DOCSIS RNG-RSP MAC management messages.
 <b>Caution</b>	Certain debug settings can produce a very large amount of data on a production router, and should be used with caution. Specifying the CM mac-address will dramatically reduce the amount of data produced.

# cable upstream equalization-error-recovery

To enable the pre-equalizer direct load mechanism on an upstream port, use the **cable upstream equalization-error-recovery** command in cable interface configuration mode.

**cable upstream** *port number* **equalization-error-recovery**

**no cable upstream** *port number* **equalization-error-recovery**

<b>Syntax Description</b>	<i>port number</i>	Specifies an upstream port number on a cable interface. Valid range is 0 to 7.
---------------------------	--------------------	--

<b>Command Default</b>	This command is enabled by default.
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<b>Command Modes</b>	Interface configuration (config-if)
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.3(23)BC7	This command was introduced.
	12.2(33)SCB4	This command was integrated into Cisco IOS Release 12.2(33)SCB4.

<b>Usage Guidelines</b>	The pre-equalizer direct load mechanism is enabled by default. However, to use this direct load mechanism, you must enable the pre-equalization coefficient on an upstream port using the <b>cable upstream equalization-coefficient</b> command.
-------------------------	---

The **cable upstream equalization-error-recovery** command enables the CMTS to send Type-Length-Value (TLV) Type 9 in the DOCSIS RNG-RSP MAC management messages. This mechanism helps CMs come online when TLV Type 4 convolved method causes CMs to go offline.



## Note

The TLV Type 9, called pre-equalizer direct load, supports only the DOCSIS 2.0 or 3.0-certified modems. When a CM receives TLV Type 9, the CM replaces its data with the new data provided in the DOCSIS RNG-RSP MAC management messages.

<b>Examples</b>	The example shows how to enable the pre-equalizer direct load mechanism on a cable interface line card in slot 8/0 on the Cisco uBR10012 router.
-----------------	--

```
Router# configure terminal
Router(config)# interface cable 8/0/0
Router(config-if)# cable upstream 0 equalization-error-recovery
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>show cable modem</b>	Displays information for the registered and unregistered CMs.
	<b>cable upstream equalization-coefficient</b>	Enables the use of a DOCSIS 1.1 or 2.0 pre-equalization coefficient on an upstream port.
	<b>show cable modem calls</b>	Displays displays voice call information for a particular CM, identified either by its IP address or MAC address.

# cable upstream ext-power

To enable the DOCSIS extended transmit power support on the Cisco CMTS, use the **cable upstream ext-power** command in interface configuration mode. To disable DOCSIS extended transmit power support, use the **no** form of this command.

**cable upstream ext-power**

**no cable upstream ext-power**

**Syntax Description** This command has no arguments or keywords.

**Command Default** DOCSIS extended transmit power support is enabled.

**Command Modes** Interface configuration (config-if)

Release	Modification
12.2(33)SCF2	This command was introduced.

**Examples** The following example shows how to enable DOCSIS extended transmit power support on the Cisco CMTS:

```
Router# configure terminal
Router(config)# interface cable 7/0/0
Router(config-if)# cable upstream ext-power
Router(config-if)# end
```

**Associated Features** The **cable upstream ext-power** command is used to configure the following feature:

- [Upstream Channel Bonding](#)

Command	Description
<b>show cable modem extended-power</b>	Displays the list of cable modems that are transmitting at an extended power level.

# 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 *n* fec**

**no cable upstream *n* fec**

<b>Syntax Description</b>	<i>n</i>	Specifies the upstream port number. Valid values start with 0 for the first upstream port on the cable interface line card.
---------------------------	----------	---

<b>Command Default</b>	Enabled
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<b>Command Modes</b>	Interface configuration (cable interface only)
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	11.3 XA	This command was introduced.

<b>Usage Guidelines</b>	The Cisco CMTS uses FEC to attempt to correct any upstream data that might have been corrupted. To use this feature, you need to activate FEC on the upstream RF carrier. When FEC is activated, the Cisco CMTS commands all CMs on the network to activate FEC.
-------------------------	--

<b>Examples</b>	The following example shows how to activate upstream forward error correction:
-----------------	--

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

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>cable upstream frequency</b>	Enters a fixed frequency of the upstream RF carrier for an upstream port.
	<b>cable upstream power-level</b>	Sets the input power level for the upstream RF carrier in decibels per millivolt (dBmV).
	<b>cable upstream scrambler</b>	Enables the cable upstream scrambler.
	<b>cable upstream shutdown</b>	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 *n* fec-strength *t-bytes***

**no cable upstream *n* fec-strength**

## Syntax Description

<i>n</i>	Specifies the upstream port number. Valid values start with 0 for the first upstream port on the cable interface line card.
<i>t-bytes</i>	Overrides the FEC strength specified in the modulation profile for this upstream channel. Valid values are from 0 to 10, where: <ul style="list-style-type: none"> <li>0 disables FEC.</li> <li>1 is the lowest FEC strength.</li> <li>10 is the highest FEC strength.</li> </ul>

## Command Default

No default behavior or values

## Command Modes

Interface configuration (cable interface only)

## Command History

Release	Modification
12.0(4)XI	This command was introduced.
12.1T	This command was deprecated and removed.

## 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
<b>cable upstream channel-width</b>	Specifies an upstream channel width for a headend cable router.
<b>cable upstream fec</b>	Enables the upstream FEC.
<b>cable upstream hopping blind</b>	Disables optimum frequency hopping on the Cisco uBR-MC16S and Cisco uBR-MC5X20S/U cable interface line cards.
<b>cable upstream modulation-profile</b>	Overrides modulation types specified in the modulation profile for the specified upstream channel.

# cable upstream fragmentation

To enable fragmentation of DOCSIS frames on a particular upstream, use the **cable upstream fragmentation** command in cable interface configuration mode. To disable fragmentation, use the **no** form of this command.

**cable upstream *n* fragmentation**

**no cable upstream *n* fragmentation**

## Syntax Description

<i>n</i>	Specifies the upstream port number. Valid values start with 0 for the first upstream port on the cable interface line card.
----------	---

## Command Default

By default, fragmentation is enabled for all upstream ports on ASIC line cards (Cisco uBR-MC11C, Cisco uBR-MC12C, Cisco uBR-MC14C, Cisco uBR-MC16C, Cisco uBR-MC16S, and Cisco uBR-MC28C) and disabled for all upstream ports on old FPGA line cards.



### Note

Cisco IOS Release 12.1 CX supports the Multiple Grant Mode of DOCSIS 1.1 fragmentation.

## Command Modes

Interface configuration (cable interface only)

## Command History

Release	Modification
12.1(4)CX	This command was introduced.
12.2(4)BC1	Support for this command was added to the Release 12.2 BC train.

## Usage Guidelines

This command enables and disables DOCSIS layer 2 fragmentation, which reduces run-time jitter experienced by constant bit rate (CBR) slots on the corresponding upstream. Disabling fragmentation increases the run-time jitter, but also reduces the fragmentation reassembly overhead for fragmented MAC frames. For ports running CBR traffic, fragmentation should be enabled (the default).



### Note

Do not confuse DOCSIS Layer 2 fragmentation with IP Layer 3 fragmentation.

## Examples

The following command shows DOCSIS fragmentation being enabled on upstream 0 on the cable interface in slot 2/0:

```
Router# configure terminal
Router(config)# interface c2/0
Router(config-if)# cable upstream 0 fragmentation
Router(config-if)#
```

Related Commands	Command	Description
	<b>cable default-phy-burst</b>	Specifies a value for the upstream Maximum Traffic Burst parameter for CMs that do not specify their own value.
	<b>cable upstream fragment-force</b>	Specifies that a cable interface line card should fragment DOCSIS frames on an upstream when the frame exceeds a particular size.

# cable upstream fragment-force

To specify that a cable interface line card should fragment DOCSIS frames on an upstream when the frame exceeds a particular size, use the **cable upstream fragment-force** command in cable interface configuration mode. To disable the forcing of fragmentation, use the **no** form of this command.

**cable upstream *n* fragment-force** [*fragment-threshold* [*number-of-fragments*] ]

**no cable upstream *n* fragment-force**

## Syntax Description

<i>n</i>	Specifies the upstream port number. Valid values start with 0 for the first upstream port on the cable interface line card.
<i>fragment-threshold</i>	(Optional) Number of bytes for the threshold at which DOCSIS frames are fragmented. The valid value ranges from 1,500 to 3,500 bytes, with the default value of 2,000 bytes.  For Cisco uBR10-MC5X20S cable interface line card running Cisco IOS Release 12.3(23)BC1, the valid value ranges from 0 to 1,987 bytes, with the default value of 1,600 bytes.
<i>number-of-fragments</i>	(Optional) Number of fragments that the cable interface line card should create when fragmenting DOCSIS frames. The card attempts to create this many equal-sized fragments when fragmenting. The valid value ranges from 1 to 10 fragments, with the default value of 3 fragments.  The <i>number-of-fragments</i> option has been deprecated. See Usage Guidelines section for more details.

## Command Default

Fragmentation is enabled.

## Command Modes

Interface configuration (config-if)

## Command History

Release	Modification
12.2(15)BC2	This command was introduced.
12.3(21a)BC	This command was modified and the <i>number-of-fragments</i> option has been deprecated.
12.2(33)SCB	This command was integrated into Cisco IOS Release 12.2(33)SCB.

## Usage Guidelines

DOCSIS 1.1 allows the CMTS to fragment DOCSIS frames to improve performance, especially in networks that combine real-time traffic, such as voice, with data traffic. The **cable upstream fragment-force** command allows you to specify the size of frames that should be fragmented, as well as the number of fragments that should be created when fragmenting.

**Tip**

This command takes effect only when fragmentation has been enabled on the upstream using the **cable upstream fragmentation** command (which is the default configuration).

In the default configuration, the Cisco CMTS fragments DOCSIS frames that are 2,000 bytes or larger in size, and it fragments these frames into equally-sized fragments. Starting from Cisco IOS Release 12.2(21a)BC, 12.2(33)SCB, and later releases, the larger frames are fragmented by the threshold. Instead of dividing frames into equal number of fragments as before, the concatenated frames are cut into many fragments, as defined in the threshold size, with the last one being the shortest. For example, the previous form of the **cable upstream fragment-force** command fragments a concatenated frame of 9000 into 5 frames of 1800. The new form of the **cable upstream fragment-force** command fragments a concatenated frame of 9000 into frames of 2000, 2000, 2000, 2000, and 1000.

Do not use a fragment size greater than 1,600 bytes on the Cisco uBR10-MC5X20S cable interface line card running Cisco IOS Release 12.3(23)BC1. Do not use a fragment size greater than 2,000 bytes on the Cisco uBR10-MC5X20U cable interface line card, and do not use a fragment size greater than 3,500 bytes on all other cable interface line cards, unless otherwise instructed by a Cisco TAC engineer.

When using DOCSIS concatenation, you might need to change the **cable default-phy-burst** command from its default size, so that multiple frames can be concatenated into a maximum-sized burst. If you set the **cable default-phy-burst** command to zero, the max burst then becomes the lowest of 255 mini-slots, the maximum concatenated burst setting in the DOCSIS configuration file, or the value of the long data grant burst that is specified in the upstream's profile.

When you set the **cable default-phy-burst** command to zero, the CMTS fragments large requests into big chunks and the cable modems will not be able to register on specific groupings of upstream interfaces due to the large fragment size. We recommend the use of a fragment size of 2,000 bytes, if you want to set the **cable default-phy-burst** command to zero to provide upstream speed of above 5 Mbps.

**Caution**

Ensure that the *number-of-fragments* parameter is large enough to keep the size of each fragment of a maximum-sized burst less than the 1,600 bytes or 2,000 bytes or 3,500 bytes specified above. If fragments are too large, the cable modem might not be able to come online or pass traffic.

**Note**

The *number-of-fragments* option has been deprecated from Cisco IOS Release 12.2(21a)BC, 12.2(33)SCB, and later releases.

**Note**

Do not confuse DOCSIS Layer 2 fragmentation with IP Layer 3 fragmentation.

**Examples**

The following example shows how to enable DOCSIS fragmentation on frames that are 1,500 bytes or larger, using four fragments per frame:

```
Router# configure terminal
Router(config)# interface c2/0
Router(config-if)# cable upstream 0 fragment-force 1500 4
Router(config-if)#
```

The following example shows how to disable the forced fragmentation of DOCSIS frames on an upstream. This also resets the *fragment-threshold* parameter to default value.

```
Router# configure terminal
Router(config)# interface c5/1/0
Router(config-if)# no cable upstream 0 fragment-force
Router(config-if)#
```

#### Cisco IOS Release 12.2(21a)BC, 12.2(33)SCB and Later

The following example shows how to enable DOCSIS fragmentation on frames that are 2,000 bytes or larger:

```
Router# configure terminal
Router(config)# interface c2/0
Router(config-if)# cable upstream 0 fragment-force 2000
Router(config-if)#
```

Related Commands	Command	Description
	<b>cable default-phy-burst</b>	Specifies a value for the upstream Maximum Traffic Burst parameter for CMs that do not specify their own value.
	<b>cable upstream fragmentation</b>	Enables fragmentation of DOCSIS frames on a particular upstream.

# cable upstream freq-adj averaging

To specify the percentage of frequency adjustment packets that is required to change the adjustment method from the regular power-adjustment method to the noise power-adjustment method, use the **cable upstream freq-adj averaging** command in cable interface configuration mode. To disable power adjustments, use the **no** form of this command.

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

**no cable upstream *n* freq-adj averaging**

Syntax Description		
<i>n</i>		Specifies the upstream port number. Valid values start with 0 for the first upstream port on the cable interface line card.
<i>% of frequency adjustment</i>		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 percent.

**Command Default** No default behavior or values

**Command Modes** Interface configuration (cable interface only)

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
	<b>cable upstream power-adjust</b>	Controls power-adjustment methods on the Cisco CMTS.
	<b>show cable flap-list</b>	Displays a list of CMs that have exceeded the threshold number of power adjustments.
	<b>show cable modem</b>	Displays CM 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 *n* frequency *up-freq-hz***

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

## Syntax Description

<i>n</i>	Specifies the upstream port number on the cable interface line card for which you want to assign an upstream frequency. Valid values start with 0 for the first upstream port on the cable interface line card.
<i>up-freq-hz</i>	The upstream center frequency is configured to a fixed Hertz (Hz) value. The valid upstream frequency range is 5 MHz (5000000 Hz) to 42 MHz (42000000 Hz), 55 MHz (55000000 Hz), or 65 MHz (65000000 Hz), depending on the cable interface line card being used. If you wish to have the Cisco CMTS dynamically specify a center frequency for the given upstream interface, do not enter any frequency value.

## Command Default

Dynamic (not fixed frequency)

## Command Modes

Interface configuration (cable interface only)

## Command History

Release	Modification
11.3 XA	This command was introduced.
12.0(13)SC	Support for the higher EuroDOCSIS upstream range (5 to 65 MHz) was introduced for the Cisco uBR-MC16E cable interface line card.
12.1(4)EC, 12.2(4)BC1	Support for the higher EuroDOCSIS upstream range (5 to 65 MHz) was introduced for the Cisco uBR7111E and Cisco uBR7114E routers.
12.2(15)BC2	The allowable range of frequencies that you can select with this command is determined by the configuration of the <b>upstream freq-range</b> command.

## Usage Guidelines

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

- Configure a fixed frequency between the allowable ranges and enable the upstream port, or
- Create a global spectrum group, assign the interface to it, and enable the upstream port.

The allowable range for the upstream channel frequency depends on the cable interface line card and Cisco IOS software release being used. See [Table 21](#) for the currently supported values.

**Table 21 Allowable Frequency Range for the cable upstream frequency Command**

Frequency Range	Supported Cable Interfaces	Minimum Cisco IOS Releases
5 to 42 MHz	All supported cable interfaces	All releases supported for the Cisco CMTS
5 to 55 MHz	Cisco uBR-MC16U/X, Cisco uBR-MC28U/X, Cisco uBR-MC5X20U	Cisco IOS Release 12.2(15)BC2
5 to 65 MHz	Cisco uBR-MC16E, Cisco uBR-MC16U/X, Cisco uBR-MC28U/X, Cisco uBR-MC5X20U, Cisco uBR7111E and Cisco uBR7114E routers	Cisco IOS Release 12.0(13)SC, 12.1(4)EC, and 12.2(4)BC1

**Note**

In Cisco IOS Release 12.2(15)BC2 and later releases, the allowable range of frequencies that you can select with the **cable upstream frequency** command is determined by the configuration of the **upstream freq-range** command.

**Tip**

If both a Cisco uBR-MC16E cable interface line card and a Cisco uBR-MC16C and/or a Cisco uBR-MC16S cable interface line card are present in the chassis, a spectrum group in the 42 MHz to 65 MHz range should not be assigned.

To configure the default upstream frequency (which is no fixed frequency), enter the **cable upstream n 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
Router(config-if)# exit
Router(config)# exit
Router# show running-config | include frequency
cable upstream 0 frequency 5696000
Router#
```

**Note**

Cisco cable interface line cards always program the upstream's center frequency in 16 KHz increments, and this is the frequency displayed by the lines added to the router's configuration and by the **show controllers cable upstream** command. For example, if you use the **cable upstream frequency** command to specify a center frequency of 27 MHz (**cable upstream x frequency 27000000**), the actual center frequency will be 27.008 MHz, which is the next highest 16 KHz boundary. The configuration file will therefore show the line **cable upstream 0 frequency 27008000**.

The following example shows how to configure the upstream center frequency to a frequency (54,700,000 Hz) within the extended Japanese frequency range:

```
Router# configure terminal
Router(config)# upstream freq-range japanese
```

```
Router(config)# interface cable 3/0
Router(config-if)# cable upstream 0 frequency 54000000
Router(config-if)# exit
Router(config)# exit
Router#
```

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

```
Router(config-if)# no cable upstream 0 frequency
```

The following command example from Cisco IOS Release 12.3 BC illustrates the allowable upstream frequency range in Hz:

```
Router(config-if)# cable upstream 3 frequency ?
<50000000-550000000> Upstream Frequency in Hz
```

#### Related Commands

Command	Description
<b>cable spectrum-group (global configuration)</b>	Creates spectrum groups, which contain one or more upstream frequencies.
<b>show controllers cable</b>	Displays information about the cable interface, including the upstream center frequency.
<b>upstream freq-range</b>	Configures the Cisco CMTS router for the range of frequencies that are acceptable on upstreams.

# cable upstream hopping blind

To override hop decisions, use the **cable upstream hopping blind** command in cable interface configuration mode. To stop blind hopping, enter the **no** form of this command.

**cable upstream *n* hopping blind**

**no cable upstream *n* hopping blind**

<b>Syntax Description</b>	<i>n</i>	Specifies the upstream port for which blind frequency hopping will be activated. Valid values start with 0 for the first upstream port on the cable interface line card.
---------------------------	----------	--

<b>Command Default</b>	Disabled (hopping is optimized)
------------------------	---------------------------------

<b>Command Modes</b>	Interface configuration (cable interface only)
----------------------	--

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.0(7)XR2	This command was introduced.

<b>Usage Guidelines</b>	Enter this command to override the hardware spectrum manager's decision to optimize hopping.
-------------------------	--



**Note**

Do not use this command unless you have a specific reason to disable optimum hopping configurations. For example, if you are experimenting with a Cisco uBR-MC16S or Cisco uBR-MC5X20S/U card, you can use this command to enforce blind hopping on individual upstream channels.

<b>Examples</b>	The following example shows how to specify hopping blind on the upstream port 0:
-----------------	--

```
Router(config-if)# cable upstream 0 hopping blind
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>cable monitor</b>	Configures preset modulation profiles that you can apply to one or more upstream cable interfaces when you identify and configure spectrum groups.
	<b>cable spectrum-group (global configuration)</b>	Configures spectrum management characteristics for the given spectrum group.
	<b>cable upstream channel-width</b>	Specifies the channel width of the given upstream cable interface.
	<b>cable upstream frequency</b>	Specifies the center frequency for a given upstream cable interface.

<b>Command</b>	<b>Description</b>
<b>cable upstream power-level</b>	Specifies the upstream cable interface receive power level in dBmV.
<b>cable upstream shutdown</b>	Activates or shuts down a specified upstream cable interface.

## cable upstream hop-priority

To configure the priority of the corrective actions to be taken when a frequency hop is necessary due to ingress noise on the upstream, use the appropriate **cable upstream hop-priority** command in cable interface configuration mode.

**cable upstream *n* hop-priority frequency modulation channel-width**

**cable upstream *n* hop-priority modulation frequency channel-width**

**cable upstream *n* hop-priority frequency channel-width modulation**

Syntax Description		
	<i>n</i>	Specifies the upstream port. Valid values start with 0 for the first upstream port on the cable interface line card.
	<b>frequency, modulation, channel-width</b>	Specifies the priority of corrective actions to be taken when ingress noise occurs on a downstream.
	<b>Note</b>	The <b>channel-width</b> option must come after the <b>frequency</b> option, either immediately or after the <b>modulation</b> option, as shown in the above examples.

**Command Default** The default priority is **frequency, modulation, and channel-width**.

**Command Modes** Interface configuration (cable interface only)

Command History	Release	Modification
	12.1(7)CX1	This command was introduced for Cisco uBR7200 series routers using the Cisco uBR-MC16S cable interface line card.
	12.2(8)BC2	Support was added for the Cisco uBR10012 router and the Cisco uBR-LCP2-MC16S cable interface line card.
	12.2(11)CY, 12.2(11)BC3	Support was added for the Cisco uBR10-MC5X20S cable interface line card on the Cisco uBR10012 router.
	12.2(15)BC2	Support was added for the Cisco uBR10-MC5X20U cable interface line card on the Cisco uBR10012 router.

**Usage Guidelines** This command specifies the priority of the corrective actions that should be taken when a frequency hop is necessary to correct excessive ingress noise on an upstream. For example, if the upstream on a Cisco uBR-MC16S card is set for the default settings (**frequency, modulation, and channel-width**), the following occurs when the upstream noise exceeds the CNR threshold value for the current modulation profile:

1. The Cisco uBR-MC16S changes to a new frequency, if a clean frequency is available in its spectrum group.

2. If no clean frequency is available, the Cisco uBR-MC16S uses the Dynamic Upstream Modulation feature to switch the upstream to the secondary modulation profile.
3. If the noise levels still exceed the CNR threshold value for the secondary modulation profile, and if the upstream has been configured for a range of channel widths, the Cisco uBR-MC16S narrows the channel width of the upstream by half. If the noise levels are still excessive, the channel width is again cut in half, and this process continues until a clean upstream is found or the bandwidth is reduced to the minimum channel width that has been configured using the **cable upstream channel-width** command.

Allowable DOCSIS channel widths are 3.2 MHz, 1.6 MHz, 800 KHz, 400 KHz, and 200 KHz. If the channel width drops to 200 KHz, but the noise still exceeds the SNR threshold, the CMs go offline.



**Note** The default specifies only a single channel width of 1.6 MHz. If this is not changed to specify a range of allowable channel widths (using the **cable upstream channel-width** command), the Cisco uBR-MC16S does not attempt to change the channel width.

To use the Dynamic Upstream Modulation feature, you must first create two modulation profiles (using the **cable modulation-profile** command) and assign them to the upstream (using the **cable upstream modulation-profile** command).

### Examples

The following example shows that when ingress noise on the upstream exceeds the threshold allowed for the primary modulation profile, the Cisco uBR-MC16S line card should first switch to the secondary modulation profile, then try frequency hopping, and if that fails to correct problem, to finally try narrowing the channel width:

```
Router(config)# interface cable 3/0
Router(config-if)# cable upstream 0 hop-priority modulation frequency channel-width
Router(config-if)# exit
Router(config)#
```

### Related Commands

Command	Description
<b>cable modulation-profile</b>	Creates a cable modulation profile.
<b>cable upstream channel-width</b>	Configures an upstream for a range of allowable channel widths.
<b>cable upstream modulation-profile</b>	Configures an upstream for one modulation profile (static profile) or two modulation profiles (Dynamic Upstream Modulation).
<b>show cable hop</b>	Displays the current hop period and threshold for an upstream, along with other statistics.
<b>show cable modulation-profile</b>	Displays the cable modulation profiles that have been created.

# cable upstream ingress-noise-cancellation

To configure how often a cable interface line card should train its noise-cancellation circuitry so as to adjust to noise levels on the upstream, use the **cable upstream ingress-noise-cancellation** command in cable interface configuration mode. To disable the ingress noise cancellation feature, use the **no** form of this command.

**cable upstream *n* ingress-noise-cancellation *interval***

**no cable upstream *n* ingress-noise-cancellation**

Syntax Description		
	<i>n</i>	Upstream port number. Valid values start with 0 for the first upstream port on the cable interface line card.
	<i>interval</i>	Triggering interval, in milliseconds. The valid range is 10 to 3000 milliseconds, with a default value of 100 milliseconds.

**Command Default** The default interval is 100 milliseconds.

**Command Modes** Interface configuration (config-if)

Command History	Release	Modification
	12.2(15)CX	This command was introduced for the Cisco uBR-MC16U/X and Cisco uBR-MC28U/X cable interface line cards on the Cisco uBR7246VXR router.
	12.3(17b)BC4	Support was added for the Cisco uBR10-MC5X20H broadband processing engine on the Cisco uBR10012 router.
	12.2(33)SCA	This command was integrated into Cisco IOS Release 12.2(33)SCA. Support for the Cisco uBR7225VXR router was added.
	12.2(23)BC10 and later 12.2(33)SCB11 and later 12.2(33)SCC6 and later 12.2(33)SCD6 and later 12.2(33)SCE and later 12.2(33)SCF and later	The default interval was changed to 100 milliseconds.

## Usage Guidelines



### Note

This command is available only on the Cisco uBR10-MC5X20H BPE, Cisco uBR-MC16U/X, and Cisco uBR-MC28U/X cable interface line cards. It cannot be used on other cable interface line cards.

Cable interface line cards, such as the Cisco uBR-MC28U/X cards, contain advanced hardware-based noise cancellation circuitry that digitally removes in-channel impairments such as ingress, common path distortion, and certain types of impulse noise. To configure how often these line cards should train their noise cancellation circuitry, so as to adapt to changes in the noise types and levels, use the **cable upstream ingress-noise-cancellation** command.

When you enable ingress noise cancellation on an upstream, the Cisco CMTS periodically schedules a 256-symbol idle slot on the upstream channel. The *interval* option specified in the **cable upstream ingress-noise-cancellation** command determines how often this idle slot is generated.

The default for BPE cards is for the card to train its circuitry every 100 milliseconds. The smaller the triggering interval, the faster the card can adjust to changes in ingress noise, which makes the upstream more robust to noise problems, but at the cost of decreasing bandwidth on the upstream channel. To determine the bandwidth cost, in percentage of raw bandwidth, use the following formula:

$$(256 / \textit{interval}) / \textit{channel-symbol-rate}$$

where *interval* is the time period in milliseconds specified by the **cable upstream ingress-noise-cancellation** command, and *channel-symbol-rate* is the symbol rate in kilohertz. For example, if the upstream is using a 2.56 MHz channel rate and a noise cancellation interval of 10 milliseconds, the bandwidth cost is 1% of the total raw bandwidth:

$$(256 / 10) / 2560 = 0.01 \text{ (1\% of bandwidth)}$$

### Broadband Processing Engine Support

The **cable upstream ingress-noise-cancellation** command is required on the Cisco uBR10-MC5X20H broadband processing engine (BPE) to enable ingress noise cancellation.

The Cisco uBR10-MCX520S/U BPEs have ingress noise cancellation capability enabled by default, so no configuration of ingress noise cancellation is available in the Cisco IOS software for these cards.

However, for configuration compatibility in support of high availability among Cisco uBR10-MC5X20S/U/H cards, the Cisco IOS software will accept configuration of the **cable upstream ingress-noise-cancellation** command for these BPEs without generating any warning or error when synchronizing the configuration.

### Examples

The following example shows how to configure the first upstream on a Cisco uBR-MC16U/X or Cisco uBR-MC28U/X card to perform ingress noise cancellation every 300 milliseconds:

```
interface cable 5/0
 cable upstream 0 ingress-noise-cancellation 300
```

### Related Commands

<b>cable modulation-profile</b>	Defines a modulation profile for use on the router.
<b>cable upstream channel-width</b>	Specifies an upstream channel width for an upstream port.
<b>cable upstream docsis-mode</b>	Configures an upstream to use either DOCSIS 1.x or DOCSIS 2.0 modulation profiles.
<b>cable upstream frequency</b>	Enters a fixed frequency of the upstream RF carrier for an upstream port.
<b>cable upstream minislot-size</b>	Specifies the minislot size (in ticks) for a specific upstream interface.
<b>cable upstream modulation-profile</b>	Assigns one or two modulation profiles to an upstream port.
<b>cable upstream power-level</b>	Sets the input power level for the upstream RF carrier in decibels per millivolt (dBmV).

<b>show cable hop</b>	Displays CM configuration settings.
<b>show cable modulation-profile</b>	Displays the modulation profile information for a Cisco CMTS.
<b>show interface cable mac-schedule</b>	Displays the current time-slot scheduling state and statistics.
<b>show interface cable sid</b>	Displays cable interface information.

# cable upstream load-balance group

To assign an upstream to a load-balance group, use the **cable upstream load-balance group** command in interface configuration mode. To remove an upstream from a load-balance group, use the **no** form of this command.

**cable upstream** *uport* **load-balance group** *n*

**no cable upstream** *uport* **load-balance group** *n*

## Syntax Description

<i>uport</i>	Specifies the upstream port that should be assigned to the load-balance group. Upstream port values start with 0 and end with a value that depends on the number of upstream ports on the cable interface line card.
<i>n</i>	Specifies the number of the load-balance group to which the upstream should be assigned. In Cisco IOS Release 12.2(33)SCE3 and earlier, the valid range is from 1 to 80. In Cisco IOS Release 12.2(33)SCE4 and later, the valid range is from 1 to 256.

## Command Default

An upstream is not assigned to any load-balance groups. If you use the **cable load-balance group (interface configuration)** command to assign a downstream interface to a load-balance group, all its upstreams are automatically assigned to the same group until you use the **cable upstream load-balance group** command to reassign an upstream to a different group.

## Command Modes

Interface configuration (cable interface only)

## Command History

Release	Modification
12.2(15)BC1	This command was introduced for the Cisco uBR7246VXR and Cisco uBR10012 routers.
12.2(33)SCE4	The valid range for the load balance group was changed.

## Usage Guidelines

After you have used the **cable load-balance group (global configuration)** command to initially create and configure a load-balance group, use the **cable upstream load-balance group** command to assign this load-balance group to an upstream. This enables the cable interface to begin participating in load-balancing operations.



### Tip

Use the **cable load-balance group (interface configuration)** command to assign this load-balance group to a downstream.

The following rules apply when creating and assigning load-balance groups:

- A downstream or upstream can belong to only one load-balance group.

- All downstreams and upstreams in a load-balance group must share physical radio frequency (RF) connectivity to the same group of cable modems. Downstreams can be in a separate load-balance group than upstreams, but all downstreams or all upstreams that have the same RF physical connectivity must be members of the same load-balance group. You cannot distribute downstreams or upstreams that share physical connectivity across multiple load-balance groups.
- Load balancing is done only on a per-chassis basis—all interfaces in a load-balance group must be in the same chassis.

### Examples

The following example shows how to assign the first four upstreams for cable interface 5/1 to load balance group 14:

```
Router# config terminal
Router(config)# interface cable 5/1/0
Router(config-if)# cable upstream 0 load-balance group 14
Router(config-if)# cable upstream 1 load-balance group 14
Router(config-if)# cable upstream 2 load-balance group 14
Router(config-if)# cable upstream 3 load-balance group 14
Router(config-if)#
```

### Associated Features

The **cable upstream load-balance group** command is used to configure the following feature:

[Load Balancing and Dynamic Channel Change on the Cisco CMTS Routers](#)

### Related Commands

Command	Description
<b>cable load-balance exclude</b>	Excludes a particular cable modem, or all cable modems from a particular vendor, from one or more types of load-balancing operations.
<b>cable load-balance group (global configuration)</b>	Creates and configures a load-balance group.
<b>cable load-balance group (interface configuration)</b>	Assigns a downstream to a load-balance group.
<b>cable load-balance group interval</b>	Configures the frequency of the load-balancing policy updates.
<b>cable load-balance group policy ugs</b>	Configures how the Cisco CMTS should load balance cable modems with active unsolicited grant service (UGS) service flows.
<b>cable load-balance group threshold</b>	Configures the threshold values that a load-balance group should use for load-balancing operations.
<b>clear cable load-balance</b>	Clears the counters or state machine used to track load-balancing operations.
<b>show cable load-balance</b>	Displays real-time statistical and operational information for load-balancing operations.

# cable upstream maintain-psd

To require DOCSIS 2.0 CMs on an A-TDMA-only upstream to maintain a constant power spectral density (PSD) after a modulation rate change, use the **cable upstream maintain-psd** command in cable interface configuration mode. To return to the default behavior, so that CMs do not need to maintain their power spectral density, use the **no** form of this command.

**cable upstream** *uport* **maintain-psd**

**no cable upstream** *uport* **maintain-psd**

## Syntax Description

<i>uport</i>	Specifies the upstream port to be configured. Upstream port values start with 0 and end with a value that depends on the number of upstream ports on the cable interface line card.
--------------	---

## Command Default

Cable modems are not required to maintain their power spectral density after a modulation rate change (**no cable upstream maintain-psd**)



### Note

In Cisco IOS Release 12.2(15)BC2 and later releases, this command is automatically removed from the configuration when you configure an upstream for a TDMA-only or mixed TDMA/A-TDMA configuration.

## Command Modes

Interface configuration (cable interface only)

## Command History

Release	Modification
12.2(15)CX	This command was introduced to support DOCSIS 2.0 operations on the Cisco uBR-MC16U/X and Cisco uBR-MC28U/X cable interface line card.
12.2(15)BC2	Support was added for DOCSIS 2.0 operations on the Cisco uBR-MC5X20S/U cable interface line cards.

## Usage Guidelines

Use this command to specify whether DOCSIS 2.0 CMs should maintain their power spectral density when the Cisco CMTS changes their upstream modulation rate in an upstream channel descriptor (UCD) message. When you configure an upstream with the **cable upstream maintain-psd** command, the Cisco CMTS sets TLV 15 (Maintain Power Spectral Density) to ON in the UCD messages it sends to the CMs on that upstream.

When TLV 15 is on, and when the new UCD specifies a new upstream modulation rate for the CM, the CM must change its transmit power level to keep its power spectral density as close as possible to what it was before the modulation rate change. The CM must maintain this power spectral density until the CMTS sends a power adjustment command in a Ranging-Response (RNG-RSP) message.

The default configuration (**no cable upstream maintain-psd**) configures TLV 15 to OFF, and CMs are not required to maintain their power spectral density after a modulation rate change. However, per the DOCSIS specifications, the CMs continue to maintain constant total input power on the upstream.

**Note**

This command affects only DOCSIS 2.0 CMs that are online an upstream that is configured for the DOCSIS 2.0 A-TDMA-only mode. This command has no effect on DOCSIS 1.0 and DOCSIS 1.1 CMs, which will continue to maintain constant total input power on the upstream, per the DOCSIS 1.x specifications.

**Examples**

The following example shows how to configure four upstreams on a cable interface line card to require cable modems to maintain a constant power spectral density after a modulation rate change.

```
Router# configure terminal
Router(config)# interface cable c6/1/0
Router(config-if)# cable upstream 0 maintain-psd
Router(config-if)# cable upstream 1 maintain-psd
Router(config-if)# cable upstream 2 maintain-psd
Router(config-if)# cable upstream 3 maintain-psd
Router(config-if)# exit
Router(config)# exit
Router#
```

The following example shows how to configure an upstream for the default behavior, which is that CMs are not required to maintain a constant power spectral density after a modulation rate change, but do continue to maintain constant total input power levels on the upstream.

```
Router# configure terminal
Router(config)# interface cable c5/1/0
Router(config-if)# no cable upstream 0 maintain-psd
Router(config-if)# exit
Router(config)# exit
Router#
```

**Related Commands**

Command	Description
<b>cable upstream docsis-mode</b>	Configures an upstream to use either DOCSIS 1.x or DOCSIS 2.0 modulation profiles.

# cable upstream max-channel-power-offset

To set the power budget offset value on the Cisco CMTS router for the reduced upstream channel set assignment, use the **cable upstream max-channel-power-offset** command in cable interface configuration mode. To disable this configuration, use the **no** form of this command.

**cable upstream max-channel-power-offset** *dB-value*

**no cable upstream max-channel-power-offset** *dB-value*

<b>Syntax Description</b>	<i>dB-value</i>	Decibel value for the upstream channel transmit power. The range is from 1 to 6. The default is 3.
---------------------------	-----------------	--

**Command Default** The power budget offset is configured with the default value of 3 dB.

**Command Modes** Interface configuration (config-if)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS Release 12.2(33)SCE3	This command was introduced.

**Usage Guidelines** The threshold value specified for the power budget offset (max-channel-power-offset) must be less than the power threshold value (power-adjust continue) that determines the value of the Ranging Status field in the Ranging Response (RNG-RSP) messages that the Cisco CMTS router sends to the cable modem. You can specify the power threshold value using the **cable upstream power-adjust** command.

**Examples** The following example shows how to enable the Cisco CMTS router to reduce the channel set assignment based on the total power budget of the cable modem in Cisco IOS Release 12.2(33)SCE3:

```
Router# configure terminal
Router(config)# interface cable 7/0/0
Router (config-if)# cable upstream max-channel-power-offset 5
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>cable tx-power-headroom</b>	Specifies the extended transmit power on the Cisco CMTS router.
	<b>show cable modem</b>	Displays transmit power values for each assigned upstream channel along with cable modem details.

# cable upstream max-codes-per-subframe

To specify the upper limit to override the maximum value of codes-per-subframe defined in the individual modulation profile setting for an upstream channel, use the **cable upstream max-codes-per-subframe** command in cable interface configuration mode. To specify the default value of 2 to maximum codes-per-subframe, use the **no** form of this command.

**cable upstream** *n* **max-codes-per-subframe** *code*

**no cable upstream** *n* **max-codes-per-subframe**

## Syntax Description

<i>n</i>	Specifies the upstream port. Valid values start with 0 for the first upstream port on the cable interface line card.
<i>code</i>	Specifies the number of codes-per-subframe. Valid values range from 1 to 128, with a default value of 2.

## Command Default

The maximum codes per subframe setting cannot be applied if the Synchronous Code Division Multiple Access (S-CDMA) is not configured.

## Command Modes

Interface configuration (config-if)

## Command History

Release	Modification
12.2(33)SCC	This command was introduced.

## Usage Guidelines

This command is applicable only for S-CDMA channels. You should configure S-CDMA to apply the the maximum codes-per-subframe setting. The number of codes-per-subframe should not exceed the number of active codes.

## Examples

The following example sets the number of codes-per-subframe to 128 on the upstream port 0:

```
Router(config)# interface cable 7/0/4
Router(config-if)# cable upstream 0 max-codes-per-subframe 128
Router(config-if)#
```

## Related Commands

Command	Description
<b>cable upstream active-codes</b>	Specifies the number of active codes allowed on an upstream channel.
<b>cable upstream codes-per-minislot</b>	Specifies the number of codes-per-minislot allowed on an upstream channel.
<b>cable upstream spreading-interval</b>	Specifies the spreading interval for S-CDMA on an upstream channel.

# cable upstream max-interleave-step

To specify the upper limit to override the maximum interleave step for each burst defined in the modulation profile for the upstream channel, use the **cable upstream max-interleave-step** command in cable interface configuration mode. To specify the default interleave step size of 1, use the **no** form of this command.

**cable upstream** *n* **max-interleave-step** *max-interleave-step*

**no cable upstream** *n* **max-interleave-step**

Syntax Description		
	<i>n</i>	Specifies the upstream port. Valid values start with 0 for the first upstream port on the cable interface line card.
	<i>max-interleave-step</i>	Specifies the maximum number of interleave steps. Valid values range from 1 to 31, with a default value of 1.

**Command Default** The maximum interleave step setting cannot be applied if the Synchronous Code Division Multiple Access (S-CDMA) feature is not configured.

**Command Modes** Interface configuration (config-if)

Command History	Release	Modification
	12.2(33)SCC	This command was introduced.

**Usage Guidelines** This command is applicable only for S-CDMA channels and the command limits the maximum number of interleave steps for a given upstream port. The *max-interleave-step* value should be less than the *spreading-interval* value specified using the **cable upstream spreading-interval** command.

**Examples** The following example sets the number of interleave steps to 31 on the upstream port 0:

```
Router(config)# interface cable 7/0/4
Router(config-if)# cable upstream 0 max-interleave-steps 31
Router(config-if)#
```

Related Commands	Command	Description
	<b>cable upstream active-codes</b>	Specifies the number of active codes that can be configured on an upstream channel.
	<b>cable upstream codes-perminislot</b>	Specifies the number of codes-per-minislot allowed on an upstream channel.

---

<b>cable upstream max-codes-per-subframe</b>	Specifies the upper limit and the maximum value of codes-per-subframe defined in the individual modulation profile setting for an upstream channel.
<b>cable upstream spreading-interval</b>	Specifies the spreading interval for SCDMA on an upstream channel.

---

# cable upstream max-logical-chans

To specify the number of logical channels on a physical port, use the **cable upstream max-logical-chans** command in cable interface configuration mode. To disable the use of multiple logical channels, use the **no** form of this command.

**cable upstream *n* max-logical-chans *code***

**no cable upstream *n* max-logical-chans**

## Syntax Description

<i>n</i>	Specifies the upstream port. Valid values start with 0 for the first upstream port on the cable interface line card.
<i>code</i>	Specifies the number of logical channels per port. Valid values are 1 and 2.

## Command Default

The maximum logical channels setting cannot be applied if the Synchronous Code Division Multiple Access (S-CDMA) is not configured.

## Command Modes

Interface configuration (config-if)

## Command History

Release	Modification
12.2(33)SCC	This command was introduced.

## Usage Guidelines

The **cable upstream max-logical-chans** command limits the number of logical channels per port on an upstream channel. The default value is 1.

When two logical channels are configured through **cable upstream max-logical-chans** command, both logical channels are mapped to the same physical port specified and the physical upstream bandwidth is shared between the two logical channels. However, from the cable modem perspective, each logical channel appears as an independent upstream channel.

When multiple logical channels are configured, the upstream related commands are categorized into two groups: physical port level and logical channel level.

### Physical Port Level

Physical port level commands use the format of **cable upstream *n***, where *n* denotes the physical port number.

### Logical Channel Level

Logical channel level commands use the format of **cable upstream *n m***, where *n* denotes the physical port number, and *m* denotes the logical channel index number of 0 or 1.



### Note

Multiple logical channels and Spectrum groups cannot be configured on the same upstream port.

The following commands are supported at the logical channel level:

- **cable upstream active-codes**
- **cable upstream attribute-mask**
- **cable upstream codes-per-minislot**
- **cable upstream concatenation**
- **cable upstream data-backoff**
- **cable upstream description**
- **cable upstream differential-encoding**
- **cable upstream docsis-mode**
- **cable upstream equalization-coefficient**
- **cable upstream fec**
- **cable upstream fragment-force**
- **cable upstream fragmentation**
- **cable upstream freq-adjust**
- **cable upstream max-codes-per-subframe**
- **cable upstream max-interleave-step**
- **cable upstream modulation-profile**
- **cable upstream power-adjust**
- **cable upstream range-backoff**
- **cable upstream rate-adapt**
- **cable upstream rate-limit**
- **cable upstream scheduling type**
- **cable upstream scrambler**
- **cable upstream shutdown**
- **cable upstream spreading-interval**
- **cable upstream threshold**
- **cable upstream unfrag-slot-jitter**



#### Note

The above logical channel level commands are not available at the physical port level, when logical channels are configured. However, the **cable upstream shutdown** and **cable upstream threshold** commands operate both at the physical and at the logical channel level.

The physical upstream port level commands such as **cable upstream frequency** and **cable upstream channel-width** affects all logical channels configured under a physical port.

#### Examples

The following example sets two logical channels on the upstream port 0:

```
Router(config)# interface cable 7/0/4
Router(config-if)# cable upstream 0 max-logical-chans 2
Router(config-if)#
```

Related Commands	Command	Description
	<b>cable upstream attribute-mask</b>	Specifies the upstream attribute mask in hexadecimal format.
	<b>cable upstream codes-per-minislot</b>	Specifies the number of codes-per-minislot allowed on an upstream channel.
	<b>cable upstream concatenation</b>	Enables DOCSIS concatenation at the CMTS.
	<b>cable upstream data-backoff</b>	Specifies automatic or fixed start and stop values for data backoff.
	<b>cable upstream description</b>	Assigns arbitrary labels to the upstreams on the cable interfaces.
	<b>cable upstream differential-encoding</b>	Enables differential encoding on upstream traffic to a specified cable interface.
	<b>cable upstream docsis-mode</b>	Configures an upstream to use DOCSIS 1.x or DOCSIS 2.0 or DOCSIS 3.0 modulation profiles.
	<b>cable upstream equalization-coefficient</b>	Enables the use of a DOCSIS 1.x or DOCSIS 2.0 or DOCSIS 3.0 pre-equalization coefficient on an upstream port.
	<b>cable upstream fec</b>	Enables upstream forward error correction.
	<b>cable upstream fragment-force</b>	Specifies that a cable interface line card should fragment DOCSIS frames on an upstream when the frame exceeds a particular size.
	<b>cable upstream fragmentation</b>	Enables fragmentation of DOCSIS frames on a particular upstream.
	<b>cable upstream freq-adjust</b>	Specifies the percentage of frequency adjustment packets that is required to change the adjustment method from the regular power-adjustment method to the noise power-adjustment method.
	<b>cable upstream max-codes-per-subframe</b>	Specifies the upper limit to override the maximum value of codes-per-subframe defined in the individual modulation profile setting of an upstream channel.
	<b>cable upstream max-interleave-step</b>	Specifies the upper limit to override the maximum interleave step for each burst defined in the modulation profile for the upstream channel.
	<b>cable upstream modulation-profile</b>	Assigns up to three modulation profiles to an upstream port.
	<b>cable upstream power-adjust</b>	Controls power-adjustment methods on the Cisco CMTS.
	<b>cable upstream range-backoff</b>	Specifies automatic or configured initial ranging backoff calculation.
	<b>cable upstream rate-adapt</b>	Enables and configures upstream utilization optimization.
	<b>cable upstream rate-limit</b>	Specifies DOCSIS rate limiting for an upstream port on a cable interface line card.
	<b>cable upstream scheduling type</b>	Enables various scheduler modes.
	<b>cable upstream scrambler</b>	Enables the cable upstream scrambler.
	<b>cable upstream shutdown</b>	Disables the upstream port.
	<b>cable upstream spreading-interval</b>	Specifies the spreading interval for S-CDMA on an upstream channel.
	<b>cable upstream threshold</b>	Configures the upstream for the CNR or SNR and FEC threshold values to be used in determining the allowable noise levels.
	<b>cable upstream unfrag-slot-jitter</b>	Specifies how much jitter can be tolerated on the corresponding upstream due to unfragmentable slots.

# cable upstream max-ports

To configure the maximum number of upstreams on a MAC domain on a cable interface line card, use the **cable upstream max-ports** command in cable interface configuration mode. To reset the card to its default value of 4 upstreams per MAC domain, use the **no** form of this command.

**cable upstream max-ports** *n*

**no cable upstream max-ports**

## Syntax Description

*n* The valid range is 0 to 8, with a default of 4.

## Command Default

4

## Command Modes

Interface configuration (cable interface only)

## Command Modes

Release	Modification
12.2(15)BC1	This command was introduced to support the Cisco uBR-MC5X20S cable interface line card.
12.2(15)BC2	Support was added for the Cisco uBR-MC5X20U cable interface line card.
12.2(33)SCE	The minimum number of max-ports supported was changed from 1 to 0.

## Usage Guidelines

Use this command to specify how many upstreams a MAC domain will support on the cable interface line card, before using the **cable upstream connector** command to assign upstreams to physical ports on the card. The MAC domains on a card can be configured for different maximum upstream values.

After using this command, the valid range for upstreams on that cable interface will be from 0 to one less than the maximum port value. For example, if you use the **cable upstream max-ports 6** command to specify a maximum of 6 upstreams for the MAC domain, the valid range for upstreams will be 0 to 5.

The total of max-ports on each interface should not be greater than the total number of upstream channels in the line card. For example, the Cisco uBR-MC3GX60V line card that has a total of 60 upstream channels can have a maximum of 60 max-ports and the Cisco UBR-MC20X20V line card that has a total of 20 upstream channels can have a maximum of 20 max-ports.

If the max-port exceeds the number of upstream channels on a line card, the total number of ports that can be unshut is limited to the actual number of channels available on the line card and the remaining ports remain as shutdown.

The **cable upstream connector** command fails when all the upstream channels are mapped. For example, with Cisco uBR-MC3GX60V line card, if 60 upstream ports are mapped to connectors, adding more upstream ports to connectors fail. When you configure a total of 120 ports and unshut the first 60 ports but map the last 60 ports to connectors, none of the ports work because the port is either shutdown or has no connector mapped to it.

### Examples

The following example shows how to configure all MAC domains on a Cisco uBR-MC5X20S card for a maximum number of 6 upstreams.

```
Router# configure terminal
Router(config)# interface cable c6/1/0
Router(config-if)# cable upstream max-ports 1
Router(config-if)# interface cable c6/1/1
Router(config-if)# cable upstream max-ports 2
Router(config-if)# interface cable c6/1/2
Router(config-if)# cable upstream max-ports 3
Router(config-if)# interface cable c6/1/3
Router(config-if)# cable upstream max-ports 6
Router(config-if)# interface cable c6/1/4
Router(config-if)# cable upstream max-ports 8
Router(config-if)# exit
Router(config)# exit
Router#
```

### Related Commands

Command	Description
<b>cable upstream connector</b>	Maps an upstream port to a physical port on the cable interface line card for use with a particular downstream.

## 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 reset the minislot size to the default for the current channel width setting, use the **no** form of this command.

**cable upstream *n* minislot-size *size***

**no cable upstream *n* minislot-size**

### Syntax Description

<i>n</i>	Specifies the upstream port number. Valid values start with 0 for the first upstream port on the cable interface line card.
<i>size</i>	Specifies the minislot size in time ticks. Valid minislot sizes are: <ul style="list-style-type: none"> <li><b>1</b>—(32 symbols at 6.4MHz channel width) Supported by the Cisco uBR-MC16U/X, Cisco uBR-MC28U/X and Cisco uBR-MC5X20S/U cable interface line cards when operating in Advanced TDMA (A-TDMA) DOCSIS 2.0 only mode.</li> <li><b>2</b> (32 symbols at at 3.2 MHz channel width)</li> <li><b>4</b> (64 symbols at 3.2 MHz channel width)</li> <li><b>8</b> (128 symbols at 3.2 MHz channel width)</li> <li><b>16</b> (256 symbols at 3.2 MHz channel width)</li> <li><b>32</b> (512 symbols at 3.2 MHz channel width)</li> <li><b>64</b> (1024 symbols at 3.2 MHz channel width)</li> <li><b>128</b> (2048 symbols at 3.2 MHz channel width)</li> </ul>

### Command Default

The default settings vary, depending on the upstream's channel width. The default values were changed in Cisco IOS Release 12.2(15)BC1 and later releases to better optimize data and voice traffic on the upstream. [Table 22 on page 75](#) lists the default minislot values for each channel width for Cisco IOS releases before and after Cisco IOS Release 12.2(15)BC1.

### Command Modes

Interface configuration (cable interface only)

### Command History

Release	Modification
11.3(6) NA	This command was introduced.
12.2(15)CX	Support was added for the Cisco uBR-MC16U/X and Cisco uBR-MC28U/X cable interface line cards, including support for minislot size of 1 to support DOCSIS 2.0 A-TDMA and mixed modulation profiles.

Release	Modification
12.2(15)BC1	The default minislot size was reduced to optimize the upstream for data and Voice-over-IP (VoIP) traffic. The previous defaults produced 16 bytes per minislot when using QPSK modulation and a 1.6 MHz channel width, and the new defaults produce 8 bytes per minislot with the same configuration.
12.2(15)BC2	Support was added for the minislot size of 1 to support DOCSIS 2.0 A-TDMA and mixed modulation profiles on the Cisco uBR-MC5X20S/U cable interface line cards.

### Usage Guidelines

The minislot size determines the minimum amount of information that can be transmitted on the upstream. How much a particular minislot size can contain depends on the modulation profile and channel width being used, with higher-bandwidth settings allowing larger amounts of data.

Because DOCSIS specifications require that the minislot size contain at least 32 symbols, you might need to change the minislot size whenever you change the channel width or modulation of an upstream, to meet the DOCSIS requirements.



#### Note

In Cisco IOS Release 12.2(15)CX, Cisco IOS Release 12.2(15)BC2, and later releases, manually changing the minislot size is not needed on the Cisco uBR-MC16U/X, Cisco uBR-MC28C, and Cisco uBR-MC28U/X cards, because these cards automatically change the minislot size when the channel width is changed, to produce 32 symbols per minislot, as required by the DOCSIS specifications.

Table 22 lists the default minislot sizes for each channel width for Cisco IOS releases before and after Cisco IOS Release 12.2(15)BC1.

**Table 22** Default Minislot Sizes

Releases Earlier than Cisco IOS Release 12.2(15)BC1 (creates 64 symbols and 16 bytes per minislot)		Cisco IOS Release 12.2(15)BC1 and Later Releases (creates 32 symbols and 8 bytes per minislot)	
Channel Width	Default Minislot Size (in Ticks)	Channel Width	Default Minislot Size (in Ticks)
0.2 MHz	64	0.2 MHz	32
0.4 MHz	32	0.4 MHz	16
0.8 MHz	16	0.8 MHz	8
1.6 MHz	8	1.6 MHz	4
3.2 MHz	4	3.2 MHz	2
		6.4 MHz (DOCSIS 2.0 only)	1 <sup>1</sup>

1. You must be using a 6.4 MHz channel width if using a minislot size of 1 tick. Otherwise, you will violate the DOCSIS requirements that each minislot should contain 32 symbols.

### Increasing the Minislot Size for High Bandwidth Users

The DOCSIS specifications allow a maximum burst limit of 255 minislots, which could require increasing the minislot size from the default values if you are offering service level agreements (SLAs) that offer guaranteed upstream speeds of 2 Mbps or greater, or if you are allowing maximum concatenation bursts greater than 2000 bytes. This is because the default minislot sizes might not accommodate the largest bursts that are possible with these configurations.

The default minislot sizes provide for 8 or 16 bytes per minislot, depending on Cisco IOS release. If the default setting provides 8 bytes per minislot, then the maximum possible burst is 8 bytes \* 255 minislots, or 2040 total bytes, which might not be sufficient for certain users with high guaranteed upstream speeds. You should increase the minislot size to accommodate the expected maximum burst transmissions, adding in approximately 10 percent for overhead.



#### 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:

```
Router# configure terminal
Router(config)# interface cable 3/0
Router(config-if)# cable upstream 4 minislot-size 16
Router(config-if)# exit
Router(config)# exit
Router#
```

#### Related Commands

<b>cable modulation-profile</b>	Defines a modulation profile for use on the router.
<b>cable upstream channel-width</b>	Specifies an upstream channel width for an upstream port.
<b>cable upstream docsis-mode</b>	Configures an upstream to use either DOCSIS 1.x or DOCSIS 2.0 modulation profiles.
<b>cable upstream equalization-coefficient</b>	Enables the use of a DOCSIS 1.1 pre-equalization coefficient on an upstream.
<b>cable upstream modulation-profile</b>	Assigns one or two modulation profiles to an upstream port.
<b>show cable hop</b>	Displays CM configuration settings.
<b>show cable modulation-profile</b>	Displays the modulation profile information for a Cisco CMTS.
<b>show interface cable mac-schedule</b>	Displays the current time-slot scheduling state and statistics.
<b>show interface cable sid</b>	Displays cable interface information.

## cable upstream modulation-profile

To assign up to three modulation profiles to an upstream port, use the **cable upstream modulation-profile** command in cable interface configuration mode. To set the upstream modulation profile to the single default profile based on the DOCSIS-mode setting of the upstream, use the **no** form of this command.

**cable upstream *n* modulation-profile** *primary-profile-number* [*secondary-profile-number*]  
[*tertiary-profile-number*]

**no cable upstream *n* modulation-profile** *primary-profile-number* [*secondary-profile-number*]  
[*tertiary-profile-number*]

Syntax Description	
<i>n</i>	Specifies the upstream port number. Valid values start with 0 for the first upstream port on the cable interface line card.
<i>primary-profile number</i>	Specifies the number identifying the primary modulation profile for the upstream port. The primary modulation profile is used when the upstream is operating with nominal noise conditions. The valid values depend on the cable interface being used and the mode of operation.  See <a href="#">Table 23</a> for a list of valid ranges according to cable interface and modulation type.
<i>secondary-profile-number</i>	(Optional) Specifies the secondary modulation profile for the upstream port, which is used when noise on the upstream increases to the point that the primary modulation profile can no longer be used. The valid values are the same ranges as the primary modulation profile.  The secondary modulation profile should specify a more robust performance profile (in terms of coping with noise) than the primary profile. The secondary profile is used for both basic and advanced dynamic modulation.
<i>tertiary-profile-number</i>	(Optional) Specifies the tertiary modulation profile for the upstream port, which is used when noise on the upstream increases to the point that the secondary modulation profile can no longer be used.  The tertiary modulation profile is only available for the basic dynamic modulation. You cannot use the tertiary modulation profile when a spectrum group is defined for the upstream.

**Command Default** Default modulation profiles are created, using profile numbers 1, 21, 41, 101, 121, 201, 221, 241, 321, and 381 depending on the DOCSIS mode and the cable interface line cards being used. See [Table 23](#) for a list of the valid ranges for the individual cable interface cards.

**Command Modes** Interface configuration (config-if)

Command History	Release	Modification
	11.3 NA	This command was first introduced.
	12.0(7)XR2 and 12.1(1a)T1	This command was introduced into the Cisco IOS Release 12.0 and Release 12.1 trains, replacing the previous version of the <b>cable upstream modulation-profile</b> command.
	12.1(3a)EC1	This command was modified to add the optional <i>secondary-profile-number</i> parameter to enable the Dynamic Upstream Modulation feature.
	12.1(5)EC	This command was introduced for the Cisco uBR7100 series universal broadband routers.
	12.1(7)CX1	This command was enhanced for the Cisco uBR-MC16S line card.
	12.2(4)BC1	Support for this command was added for the Cisco IOS Release 12.2 BC train.
	12.2(8)BC2	Support for this command was added for the Cisco uBR-MC16S and Cisco uBR-LCP2-MC16S line cards.
	12.2(11)CY, 12.2(11)BC3	Support was added for the Cisco uBR10-MC5X20S cable interface line card on the Cisco uBR10012 router.
	12.2(15)CX	Support was added for the Cisco uBR-MC16U/X and Cisco uBR-MC28U/X cable interface line card, including DOCSIS 2.0 ATDMA and mixed modulation profiles.
	12.2(15)BC2	Support was added for DOCSIS 2.0 ATDMA and mixed modulation profiles on the Cisco uBR-MC5X20S/U/H cable interface line cards.
	12.2(33)SCA	This command was integrated into Cisco IOS Release 12.2(33)SCA.
	12.3(23)BC7	This command was modified to add the optional <i>tertiary-profile-number</i> parameter to enable Three Step Dynamic Upstream Modulation feature.
	12.2(33)SCC	Support was added for DOCSIS 2.0 S-CDMA and DOCSIS 3.0 S-CDMA modulation profiles using 1.6 MHz, 3.2 MHz, and 6.4 MHz channel widths on the Cisco UBR-MC20X20V cable interface line card.

### Usage Guidelines

The **cable upstream modulation-profile** command assigns up to three modulation profiles to an upstream port, depending on the type of cable interface and Cisco IOS software release being used. The third modulation profile is only available for the basic dynamic modulation and is unavailable when a spectrum group is defined for the upstream.

#### Static Modulation Profile (single profile)

The **cable upstream modulation-profile** command assigns a single modulation profile to an upstream port on the Cisco uBR7100 series routers and on all cable interface line cards that are available for the Cisco CMTS routers. This modulation profile affects all CMs and set-top boxes that are using that upstream port.

#### Dynamic Upstream Modulation (up to three profiles)

The **cable upstream modulation-profile** command assigns up to three modulation profiles to an upstream port to use the Dynamic Upstream Modulation feature. You must assign at least two profiles to activate the Dynamic Upstream Modulation feature. This feature operates differently, depending on the Cisco IOS software release and the cable interface line card that is providing the upstream port:

- The upstream port is on a Cisco uBR7100 series router or on a Cisco uBR-MC28U/X, or Cisco uBR-MC16U/X line card that is used on Cisco CMTS router running Cisco IOS Release 12.3(23)BC7 or later release.

When using the Dynamic Upstream Modulation feature, the primary modulation profile is the default profile. The line card monitors the signal-to-noise ratio (SNR) value and forward error correction (FEC) counters for the upstream, to track the upstream signal quality. For a dual modulation profile, the line card monitors the SNR value, carrier-to-noise ratio (CNR) value, and FEC counters to track the upstream signal quality.

When the noise on the upstream exceeds the threshold(s) for the primary profile, the upstream switches to the secondary profile in a dual modulation profile. Whereas, in a three modulation profile setup, the upstream can switch from primary profile to the secondary profile or directly to the tertiary profile based on the SNR, and FEC counter thresholds. Two separate thresholds are used for switching between the primary profile and the secondary profile and from secondary profile to the tertiary profile.

When the noise conditions improve (defined as a SNR value that is 3 dB greater than the threshold value and FEC counters that are below the threshold values), the upstream automatically switches back to the primary modulation profile. For a Three Step Dynamic Upstream Modulation, the user can configure the threshold values and FEC counters for the upgrade. However, there is no direct upgrade from tertiary profile to the primary profile. The upgrade follows a sequential order, from tertiary profile to secondary profile and then to the primary profile.

For example, in a dual modulation profile, the primary modulation profile could be configured for 16-QAM (or mixed 16-QAM and QPSK) operation and the secondary profile for QPSK operation. If noise conditions on the upstream threaten to force CMs offline, the upstream switches to the secondary profile to implement QPSK operation. When the noise ingress conditions are solved, the upstream switches back to 16-QAM operation.

In a Three Step Dynamic Upstream Modulation, the primary modulation profile could be configured for 64-QAM operation, the secondary modulation profile for 16-QAM operation (or mixed 64-QAM and 16-QAM), and the tertiary modulation profile for QPSK. If the noise conditions increase, the upstream switches to the secondary profile to implement 16-QAM (or mixed profile) operation and then to the tertiary modulation profile to implement QPSK operation. When the noise ingress conditions are improved, the upstream switches back to 16-QAM operation (or mixed 64-QAM and 16-QAM), and then to the 64-QAM operation, on further improvement of noise conditions.



---

**Note** For more information on this form of the Dynamic Upstream Modulation feature, see the chapter, *Spectrum Management for the Cisco Cable Modem Termination System*, in the *Cisco CMTS Feature Guide*.

---

When Dynamic Upstream Modulation is enabled and spectrum groups are configured on the same interface, the line cards respond to excessive noise by first switching to the secondary modulation profile. If the noise conditions worsen, the line card changes the modulation or frequency hopping in an attempt to find a new upstream channel, and if that fails, the line card reduces the channel width.



---

**Note** The default priority of switching modulation profile is frequency (F), modulation (M), and channel-width (C). However, it is user configurable and can be changed to MFC or FCM.

---

- The upstream port is on a Cisco uBR-MC16U/X line card that is used on Cisco CMTS routers using Cisco IOS Release 12.1(7)CX1 or later release, or on a Cisco uBR-MC5X20S/U/H line card.

The Dynamic Upstream Modulation feature on the Cisco uBR-MC16U/X line card is identical to other line cards except that the spectrum management hardware onboard the Cisco uBR-MC16U/X or Cisco uBR-MC5X20S/U/H line card uses the CNR value (you can use only the CNR value for a dual profile configuration) in conjunction with the SNR value. The CNR value is a more accurate description of noise conditions on the upstream. Because of this, these line cards switch back to the primary modulation profile when noise conditions improve to a CNR value that is only 3 dB greater than the threshold value (assuming FEC counters are also below the threshold values).



**Note** If the Cisco CMTS router is running Cisco IOS Release 12.1(3a)EC1 or a later Cisco IOS release, the Dynamic Upstream Modulation feature on the Cisco uBR-MC16U/X line card operates the same as it does on the other line cards.

When Dynamic Upstream Modulation is enabled and spectrum groups are configured on the same interface, the line cards take corrective action in response to excessive noise, as determined by the **cable upstream hop-priority** command (either frequency hopping or changing to the secondary modulation profile). If the noise conditions worsen, the line card takes the second corrective action that has been defined, and if that fails, the line card takes the last corrective action.



**Note**

The Dynamic Upstream Modulation feature uses the SNR, CNR, and FEC thresholds for 64-QAM, 16-QAM, and QPSK operation to determine when to switch modulation profiles. We recommend the use of 64-QAM, 16-QAM, and QPSK for primary, secondary, and tertiary profiles in a Three Step Dynamic Upstream Modulation.

For dual profile configuration, we recommend the use of 16-QAM or mixed 16-QAM and QPSK modulation for primary profile and QPSK modulation for the secondary profile. However, this is optional. Both modulation profiles can be either QPSK or QAM. It is not mandatory that one is QAM and the other QPSK, but modulation profile switchover is tied to the QAM and QPSK thresholds.



**Tip**

Modulation profiles must be first created using the **cable modulation-profile** command before they can be assigned using the **cable upstream modulation-profile** command.

### Modulation Profile Ranges

The valid range for modulation profiles depends on the cable interface used and the type of modulation profile created.

Table 23 lists the valid ranges according to cable interface and modulation type.

**Table 23 Supported Channel Widths and DOCSIS Modes for Cable Interfaces**

Cable Interface	DOCSIS 1.X (TDMA)	Mixed DOCSIS 1.X/2.0	DOCSIS 2.0 (A-TDMA)	DOCSIS 3.0 (S-CDMA)
Cisco uBR-MC16U/X <sup>1</sup> , Cisco uBR-MC28U/X	41 to 50 (default is 41)	141 to 150 (default is 141)	241 to 250 (default is 241)	N/A
Cisco uBR10-MC5X20S/U/H	21 to 30 (default is 21)	121 to 130 (default is 121)	221 to 230 (default is 221)	N/A
Cisco UBR-MC20X20V <sup>2</sup>	21 to 30 (default is 21)	121 to 130 (default is 121)	221 to 230 (default is 221)	1 to 400 (default is 381)

1. Supports 6,400,000 Hz (5,120,000) symbols/sec) while operating in DOCSIS 2.0 (A-TDMA-only) mode.

2. The UBR-MC20X20V cable interface line card has three variants, UBR-MC20X20V-0D, UBR-MC20X20V-5D, and UBR-MC20X20V-20D. The UBR-MC20X20V-0D line card supports 20 upstreams and zero (no) downstreams. The UBR-MC20X20V-5D line card supports 20 upstreams and five downstreams, and the UBR-MC20X20V-20D line card supports 20 upstreams and 20 downstreams.

In addition to the legacy modulation profile number schemes, the new global modulation profile scheme introduced in Cisco IOS Release 12.2(33)SCC, allows you to assign any modulation profile number to any DOCSIS-mode up to 400, without any restrictions.

The global modulation profile mode allows you to create and configure DOCSIS 3.0 channel type 4SR (**scdma-d3**). When an upstream's DOCSIS mode is changed into scdma-d3, it is initially assigned to the system created default modulation profile as shown in [Table 23](#).

**Note**

Though you can assign any number between 1 to 400 to any modulation profile, the default modulation profile number assigned to an upstream channel for a given channel type will remain the same. That is, modulation profile numbers 21, 121, 221, 321, and 381 will be applicable for TDMA, mixed, A-TDMA, S-CDMA, and DOCSIS 3.0 S-CDMA channel types.

All the existing and previously defined modulation profiles are converted to the new format. However, all the newly created modulation profiles, which are outside of the legacy number space range, will be lost when you revert to the legacy modulation profile.

For more details on the new global modulation profile scheme, refer to the **cable modulation-profile global-scheme** command.

**Examples**

The following example assigns the primary modulation profile 2, the secondary modulation profile 1, and the tertiary modulation profile 4 to the upstream port 0 on the cable interface line card in slot 3. This automatically enables the Dynamic Upstream Modulation feature for all CMs using that upstream.

```
Router(config)# interface cable 3/0
Router(config-if)# cable upstream 0 modulation-profile 2 1 4
Router(config-if)#
```

The following example assigns the primary modulation profile 2 and the secondary modulation profile 1, to the upstream port 0 on the cable interface line card in slot 3. This automatically enables the Dynamic Upstream Modulation feature for all CMs using that upstream.

```
Router(config)# interface cable 3/0
Router(config-if)# cable upstream 0 modulation-profile 2 1
Router(config-if)#
```

**Related Commands**

Command	Description
<b>cable modulation-profile</b>	Creates a cable modulation profile.
<b>cable modulation-profile global-scheme</b>	Defines a global modulation profile for use on the router.

Command	Description
<b>cable upstream hop-priority</b>	Determines the order of the corrective actions to be taken when ingress noise exceeds the allowable value for an upstream.  This command is related to the <b>cable upstream modulation-profile</b> command only when using advanced dynamic modulation configuration, that is, when spectrum group is defined for the upstream channel.
<b>show cable modulation-profile</b>	Displays the cable modulation profiles that have been created.

# cable upstream power-adjust

To control power-adjustment methods on the Cisco CMTS, use the **cable upstream power-adjust** command in cable interface configuration mode. To return to the default values, use the **no** form of this command.

```
cable upstream n power-adjust { continue pwr-level | noise perc-pwr-adj | threshold value }
```

```
no cable upstream n power-adjust { continue | noise | threshold }
```

## Syntax Description

<i>n</i>	Specifies the upstream port number. Valid values start with 0 for the first upstream port on the cable interface line card.
<b>continue</b> <i>pwr-level</i>	Specifies the power threshold value that determines the value of the Ranging Status field in the Ranging Response (RNG-RSP) messages that the CMTS sends to the CM. The valid range is from 2 to 15 dB, with a default of 4 dB.
<b>threshold</b> <i>value</i>	Specifies the power adjustment threshold. The threshold range is from 0 to 10 dB, with a default of 1 dB.
<b>noise</b> <i>perc-pwr-adj</i>	Specifies the percentage of power adjustment packets that is required to change the adjustment method from the regular power-adjustment method to the noise power-adjustment method, which uses an averaging algorithm to smooth out wide jumps in the power level. The valid range is 10 to 100 percent, with a default of 30 percent.

## Command Default

The **continue** option defaults to 4 dB, the **noise** option defaults to 30 percent, and the **threshold** option defaults to 1 dB.

## Command Modes

Interface configuration (cable interface only)

## Command History

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

## Usage Guidelines

When a CM comes online, it sets itself for the optimal power level, as determined by the CMTS. As the CMTS periodically polls each CM, the CMTS examines the CM's power level and orders the CM to adjust its power level to adapt to current total attenuation between it and the CMTS. These power adjustments can be required because of temperature variations, upstream frequency hopping, or increased attenuation that has been added either intentionally or unintentionally. The **cable upstream power-adjust** command controls how the CMTS makes these power adjustments.



### Note

To set the upstream power level on the CMTS, see [cable upstream power-level, page 87](#).

### Setting the threshold Option

The **threshold** option specifies the allowable range between the target upstream power for a CM and the actual receive power that the CMTS is measuring for that CM. If the CM receive power level is above or below the target power level by a value that is greater than the **threshold** option, the CMTS will command the CM to change its power level. When the CMTS receive power level for a CM falls within the **threshold** range of the target power level, the CMTS stops commanding the CM to change its power level.

For example, the default **threshold** value of 1 dB means that the CM must be 1 dB above or below its target power range before the CMTS will command it to change its power level. If the CM is within 1 dB of its target power level, the CMTS does not adjust the CM's power level.



#### Note

The **threshold** parameter can be set from 0 dB to 10 dB with a default of 1 dB. However, do not set the **threshold** to 0 dB because this means that the CMTS will command all CMs to continually change their power levels until the CMTS measures the power levels at exactly 0 dBmV. Cisco recommends that you set the **threshold** parameter to a minimum of its default value of 1 dB so that the CMs do not change their power levels continually for minuscule RF plant variations.

### Setting the continue Option

The **continue** option specifies the maximum allowable range for the CM's power level, in relation to its target power level. The CM can operate even at its maximum transmit power level, as long as it is within the **continue** range. The **continue** parameter can be set from 2 dB to 15 dB, with a default of 4 dB. For example, with the value of 2 dB, the CM can operate within 2 dB of its target power level, even if it is transmitting at its maximum power level.

The **continue** option works together with the **threshold** option to control the CM's operation. If the CM is within the **threshold** range, the CMTS sets the Ranging Status field of its RNG-RSP messages to SUCCESS. If the CM is outside the **threshold** range, but within the **continue** range, the CMTS sets the Ranging Status field to CONTINUE.



#### Note

Cisco recommends designing the network so that CMs are at least 6 dB from the CM's maximum transmit power level. This will accommodate new services, changing modulation schemes, different channel widths, customer-installed passives, temperature variations, and other non-linearities. DOCSIS specifies a minimal power range of +8 dBmV to +55 dBmV for 16-QAM operation and +8 dBmV to +58 dBmV maximum power level for QPSK operation. Cisco CMs typically have a maximum power level of +60 dBmV, which exceeds the DOCSIS standards.



#### Tip

If a number of CMs are transmitting close to their maximum transmit power, try increasing the **continue** range to allow the CMTS to continue adjusting the CM's power levels. This situation can happen when systems use high value taps, such as 29 dB taps, in the design of the plant.



#### Note

When the CM requires 16 successive power adjustments that are greater than the value of the **continue** option, the CMTS re-initializes the CM and starts to rescan downstream carriers, as per the DOCSIS specification.

### Determining if the CM has Reached Its Maximum Power Level

Per the DOCSIS specification, the CMTS does not adjust the CM power level by commanding the CM to set itself to an absolute power level. Instead, the CMTS changes the CM power levels by commanding the CM to make relative power adjustments, using increments of  $\pm 0.25$  dB (or multiples thereof).

If the CMTS commands a CM to adjust its power level by a particular amount, but the measured power level afterwards shows that the CM has made a smaller adjustment than requested, the **show cable flap-list** and **show cable modem** commands show an exclamation point (!) for that particular CM. This typically indicates that the CM has reached its maximum power level.

If the CM has not reached its maximum power level, but the **show cable flap-list** and **show cable modem** commands still show an exclamation point (!) for that CM, the problem could be a fault in the upstream path of the cable network. This fault is typically found as amplifier misalignment, where one upstream amplifier is adjusted with too much input attenuation, and the next has too little. The amplifier with too little attenuation enters non-linear operation and begins serious intermodulation.

Another possible cause is a faulty CM or a faulty connection between the CM and cable network. For example, a faulty coaxial cable or bad F-connector could also create noise problems.



#### Note

---

A CM that shows an exclamation point (!) in the **show cable flap-list** and **show cable modem** displays is typically more prone to packet loss than other CMs.

---

### Setting the noise Option

The **noise** option specifies that when the number of power adjustments beyond the threshold amount exceeds a certain percentage of the total Ranging Requests for a CM, the CMTS switches into its noise power-adjustment method. The noise power-adjustment method uses an averaging algorithm to make power adjustments for a particular CM, so that if a modem is experiencing wide swings in its power levels (known as “bouncing”), the CMTS averages the power levels before sending a power adjustment to the CM. The CMTS returns to the normal power adjust method after receiving ten Ranging Request messages with power adjustments below the threshold value.

For example, the **cable upstream power-adjust noise 30** command instructs the CMTS that when 30 percent (3 out of the last 10) of the Ranging Responses for a particular CM resulted in a power adjustment beyond the threshold level, the CMTS begins using power averaging for that CM to adjust its power level.



#### Tip

---

The **cable upstream power-adjust noise** command is typically not needed during normal operations, but it can help in certain situations where the cable plant is experiencing ingress noise and other interference that is forcing many CMs to frequently re-range. If the **show cable flap-list** and **show cable modem** commands show a large number of CMs with asterisks (\*), experiment with the **noise** option, so that the CMTS will average its CM power readings before sending any power adjustments to the CMs.

---



#### Note

---

When a CM is in power averaging mode, the **show cable flap-list** and **show cable modem** commands shows an asterisk (\*) for that particular CM.

---

### Examples

The following example shows the commands needed so that the CMTS will begin using the power averaging adjustment method when 50 percent of Ranging Requests result in a power adjustment beyond the threshold level of 2 dB:

## ■ cable upstream power-adjust

```
Router(config)# interface c6/0
Router(config-if)# cable upstream 0 power-adjust threshold 2
Router(config-if)# cable upstream 0 power-adjust noise 50
Router(config-if)#
```

### Related Commands

Command	Description
<b>cable upstream frequency</b>	Configures a fixed frequency of the upstream RF carrier for an upstream port.
<b>cable upstream power-level</b>	Sets the input power level for the upstream radio frequency (RF) carrier.
<b>show cable flap-list</b>	Displays a list of CMs that have exceeded the threshold number of power adjustments.
<b>show cable modem</b>	Displays CM 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 *n* power-level *dbmv***

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

## Syntax Description

<i>n</i>	Specifies the upstream port number. Valid values start with 0 for the first upstream port on the cable interface line card.
<i>dbmv</i>	Decibels per millivolt designating the upstream signal input power level. Valid range is -16 dBmV to +26 dBmV, depending on the cable interface and the upstream's symbol rate (channel width).

## Command Default

0 dBmV

## Command Modes

Interface configuration (cable interface only)

## Command History

Release	Modification
11.3 XA	This command was introduced.
12.2(15)BC1	The allowable range of power levels was changed so that it depends on the upstream's channel width.

## Usage Guidelines

The Cisco CMTS controls the output power levels of the CMs 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, as expressed as the symbol rate and channel width. [Table 24](#) shows the valid power levels for each allowable rate, as given in the DOCSIS specification. Higher (more positive) values cause the CMs to increase their transmit power, achieving a greater carrier-to-noise ratio (CNR).

**Table 24 Allowable DOCSIS Power Levels**

Symbol Rate (Symbols per second)	Channel Width (Hz)	Allowable Power Range (dBmV)
160,000	200,000	-16 to +14
320,000	400,000	-13 to +17
640,000	800,000	-10 to +20
1,280,000	1,600,000	-7 to +23

Table 24 Allowable DOCSIS Power Levels

Symbol Rate (Symbols per second)	Channel Width (Hz)	Allowable Power Range (dBmV)
2,560,000	3,200,000	-4 to +26
5,120,000 <sup>1</sup>	6,400,000	-1 to +29 (max. valid value for DOCSIS is +26)

1. The 5.12 MSymbols/sec symbol rate and 6.4 MHz channel width are supported only on upstreams that are configured for DOCSIS 2.0 A-TDMA-only operation.



**Note** Some cable interfaces might allow smaller ranges of either -10 to +10 or -10 to +25 dBmV.



**Tip**

You can use inline attenuators to force CMs to transmit at higher power levels and to achieve a higher CNR value on the network.



**Caution**

If you increase the input power level or add inline attenuators before the CMTS, the CMs on your HFC network increase their transmit power level. Be careful if you adjust this parameter. You might violate the upstream return laser design parameters or exceed the CM's maximum transmit power level.



**Note**

Do 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, you will disrupt CM service on your network. If you *decrease* the power level by more than 5 dB within 30 seconds, the CMs on your network will be forced to re-range.



**Tip**

When setting upstream power levels, Cisco recommends that the adjacent channels of equal bandwidth not have a large variation. The recommended maximum input power variance is 5 to 6 dB.

### Examples

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

```
Router(config)# interface cable 5/1/0
Router(config-if)# cable upstream 0 power-level -5
Router(config-if)#
```

### Related Commands

Command	Description
<b>cable upstream fec</b>	Enables the upstream FEC.
<b>cable upstream frequency</b>	Enters a fixed frequency of the upstream RF carrier for an upstream port.
<b>cable upstream power-adjust</b>	Controls how the CMTS adjusts the CM power level so that the CMs reach the target transmit power setting.
<b>cable upstream shutdown</b>	Disables the upstream port.

## cable upstream qos wfq

To configure weighted fair queuing (WFQ) parameters for optimum bandwidth utilization for upstream service flows on a cable interface, use the **cable upstream qos wfq** command in cable interface configuration mode. To disable this configuration, use the **no** form of this command.

```
cable upstream qos wfq {class | activity | weights priority0-priority7}
```

```
no cable upstream qos wfq {class | activity | weights priority0-priority7}
```

### Syntax Description

<b>class</b>	Enables class-based weighted fair queuing.
<b>activity</b>	Enables activity-based weighted fair queuing.
<b>weights</b> <i>priority0-priority7</i>	Specifies custom weight values for all the eight service flow priorities in a service class. By default, the weight of a priority is equal to “priority+1.” For example, priority 0 has a weight of 1 and priority 1 has a weight of 2.  You must specify custom weight values for all the eight service flow priorities (0 to 7) when you modify the default weights of priorities. The valid range is from 1 to 255.

### Command Default

None

### Command Modes

Cable interface configuration (config-if)

### Command History

Release	Modification
12.2(33)SCD2	This command was introduced in Cisco IOS Release 12.2(33)SCD2.

### Examples

The following example shows how to configure WFQ parameters on a cable interface in slot 7, subslot 1, and port 0 on a Cisco uBR10012 router:

```
Router# configure terminal
Router(config)# interface cable 7/1/0
Router(config-if)# cable upstream qos wfq class
Router(config-if)# cable upstream qos wfq activity
Router(config-if)# cable upstream qos wfq weights 10 20 30 40 50 60 70 80
```

### Related Commands

Command	Description
<b>show interface cable mac-scheduler</b>	Displays the current scheduling state, statistics, and WFQ parameters configured on a cable interface.

# 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 n range-backoff { automatic | start end }
```

```
no cable upstream n range-backoff
```

## Syntax Description

<i>n</i>	Specifies the upstream port number. Valid values start with 0 for the first upstream port on the cable interface line card.
<b>automatic</b>	Specifies the fixed data backoff start and end values.  <b>Note</b> The <b>automatic</b> setting is not supported on Cisco uBR-MC5X20S/U cable interface line cards, which should use manually configured ranging backoff instead.
<i>start</i>	Binary exponential algorithm. Sets the start value for initial ranging backoff. Valid values are from 0 to 15.
<i>end</i>	Binary exponential algorithm. Sets the end value for initial ranging backoff. Valid values are from 0 to 15.

## Command Default

Ranging backoff is enabled with the **automatic** setting

## Command Modes

Interface configuration (cable interface only)

## Command History

Release	Modification
12.1 T	This command was introduced.

## Usage Guidelines

The DOCSIS-specified method of contention resolution for CMs 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 CMTS 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 CMs per upstream port. Set manual values for data backoff windows only when operating with more than 250 CMs per upstream port. (The **automatic** setting is not supported on Cisco uBR-MC5X20S/U cable interface line cards, which should use manually configured ranging backoff instead.)



### Tip

Use the **show controllers cable upstream** command to display the current Ranging Backoff settings.

---

**Examples**

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

```
Router(config)# interface cable 4/0
Router(config-if)# cable upstream 2 range-backoff automatic
Router(config-if)#
```

---

**Related Commands**

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

# cable upstream ranging-init-technique

To configure the initial ranging technique for the modem in the Multiple Transmit Channel (MTC) mode, use the **cable upstream ranging-init-technique** command in interface configuration mode. To disable the ranging initialization technique, use the **no** form of this command.

**cable upstream ranging-init-technique** {1-4}

**no cable upstream ranging-init-technique**

## Syntax Description

1-4	Type of ranging. <ul style="list-style-type: none"> <li>• 1—broadcast</li> <li>• 2—unicast</li> <li>• 3—broadcast or unicast</li> <li>• 4—direct use</li> </ul>
-----	---

## Command Default

The default option is 1—broadcast

## Command Modes

Interface configuration (config-if)

## Command History

Release	Modification
12.2(33)SCC	This command was introduced.

## Usage Guidelines

The ranging initialization technique is used when the modem transitions from a single channel to the multiple transit channel mode (MTC-mode), for the initial ranging on the newly added channels during registration.

Use the default value of 1 for initial ranging.

## Examples

The following example shows how to configure the initial ranging for the modem in the MTC-mode:

```
Router# configure terminal
Router(config)# interface cable 7/0/1
Router(config-if)# cable upstream ranging-init-technique 1
```

## Related Commands

Command	Description
<b>cable mtc-mode</b>	Enables the MTC-mode for a MAC interface.
<b>interface cable</b>	Specifies a cable interface.

# cable upstream ranging-poll

To change the default ranging poll interval (20 seconds) on upstream channels, use the **cable upstream ranging-poll** command in cable interface configuration mode. To disable this configuration, use the **no** form of this command.

**cable upstream ranging-poll** [*interval value* | **t4-multiplier** *timeout-value*]

**no cable upstream ranging-poll** [*interval value* | **t4-multiplier** *timeout-value*]

## Syntax Description

<b>interval</b> <i>value</i>	(Optional) Specifies the ranging poll interval in milliseconds. Valid values are from 20000 to 30000. The default value is 20000.
<b>t4-multiplier</b> <i>timeout-value</i>	(Optional) Specifies T4 timeout multiplier value for the cable modems that are in the MTC mode. The valid range is from 1 to 10. The default value is 0.

## Command Default

The CMTS uses the T4 timeout value of the modem. For example, if the T4 timeout of the modem is 90 seconds, the CMTS uses 3 as T4 multiplier.

## Command Modes

Interface configuration (config-if)

## Command History

Release	Modification
12.2(33)SCC	This command was introduced in Cisco IOS Release 12.2(33)SCC.

## Usage Guidelines

T4 multiplier is the T4 timeout multiplier value for cable modems that are in the MTC mode. The default value is derived from the number of channels in the modem transmit channel set. You can change the default T4 multiplier value using the **cable upstream ranging-poll** command in cable interface configuration mode.

The T4 timeout multiplier values range is from 1 to 10. If the T4 multiplier value is equal to 1, the cable modem will T4 time out in 30 seconds (that is,  $1 \times 30 = 30$ ). If you change the T4 multiplier to 4, then the new T4 timeout value will be 120 seconds (that is,  $4 \times 30 = 120$ ).



### Note

If the T4 timeout multiplier is not configured from the range (1 - 10), the default value is 0. In default setting, the CMTS uses the T4 timeout value of modem as T4 timeout value. For example, if the T4 timeout of the modem is 90 seconds, then the CMTS applies 3 as the T4 multiplier.

In the MTC mode, you can increase the T4 timeout value in order to reduce the router overhead associated with processing of ranging request (RNG-REQ) slots and ranging response (RNG-RSP) messages. If an RNG-RSP message does not contain a T4 timeout multiplier value, then the cable modem uses the default T4 timeout value.

**Note**

---

We recommend that you do not modify the default ranging poll interval unless required. With the default configuration, a DOCSIS 2.0 cable modem in non-MTC mode performs ranging on one upstream channel every 20 seconds.

---

**Note**

---

The default T4 timeout value, defined in Annex B of the DOCSIS 3.0 specification CM-SP-MULPIv3.0, is 30 seconds. If the T4 timeout multiplier is not configured from the range (1 - 10) for DOCSIS 3.0, then the Annex B default value of 30 seconds is used as T4 timeout value.

---

---

**Examples**

The following example shows how to change the default ranging poll interval and the T4 timeout multiplier value on a cable interface line card:

```
Router# configure terminal
Router(config)# interface cable 7/1/0
Router(config-if)# cable upstream ranging-poll interval 24000 t4-multiplier 4
```

---

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>cable mtc-mode</b>	Enables the Multiple Transmit Channel mode (MTC) for a MAC interface.

---

## cable upstream rate-adapt (global)

To globally enable upstream utilization optimization on all cable modem upstream flows, use the **cable upstream rate-adapt** command in global configuration mode. To disable global upstream utilization optimization, use the **no** form of this command.

**cable upstream rate-adapt** [**local** | **priority** *value* | **rate** *number*]

**no cable upstream rate-adapt** [**local** | **priority** *value* | **rate** *number*]

### Syntax Description

<b>local</b>	(Optional) Specifies upstream utilization optimization is enabled on a specific upstream.
<b>priority</b> <i>value</i>	(Optional) Specifies upstream utilization optimization is enabled if an upstream flow meets or exceeds a defined priority. The valid range is 0–7.
<b>rate</b> <i>number</i>	(Optional) Specifies upstream utilization optimization is enabled if an upstream flow meets or exceeds the set minimum max-rate of the flow. The valid range is 0–30000000.

### Command Default

Upstream utilization optimization is globally disabled.

### Command Modes

Global configuration (config)

### Command History

Release	Modification
12.3(23)BC2	This command was introduced.
12.2(33)SCB	This command was integrated into Cisco IOS Release 12.2(33)SCB. Support for the Cisco uBR7225VXR router was added.

### Usage Guidelines

If upstream utilization optimization is globally enabled, activated service flows are configured for upstream utilization optimization. The command also turns on local upstream utilization optimization so specific local upstreams can be configured to be rate-adapt enabled. Using the **priority** or **rate** option allows you to restrict upstream utilization optimization to service flows that meet or exceed specified levels for priority or rate.

### Examples

The following example enables upstream utilization optimization globally on all upstream flows.

```
Router(config)# cable upstream rate-adapt
```

### Related Commands

Command	Description
<b>cable upstream rate-adapt (interface)</b>	Enables and configures upstream utilization optimization locally.
<b>show cable rate-adapt</b>	Displays the global and local upstream utilization optimization configuration parameters.

## cable upstream rate-adapt (interface)

To enable and configure upstream utilization optimization locally, use the **cable upstream rate-adapt** command in cable interface configuration mode. To disable upstream utilization optimization on the specified upstream flow, use the **no** form of this command.

**cable upstream** *port* **rate-adapt** [**bc** *slots* | **duration** *milliseconds* | **fcms-off** | **priority** *value* | **rate** *number*]

**no cable upstream** *port* **rate-adapt** [**bc** *slots* | **duration** *milliseconds* | **fcms-off** | **priority** *value* | **rate** *number*]

### Syntax Description

<i>port</i>	Identifies the specific upstream flow to be optimized and configured.
<b>bc</b> <i>slots</i>	(Optional) Specifies the number of broadcast contention minislots (BCS). MAPs that have gaps are filled with BCS. You can override the default of 10 with a larger or smaller number using the <b>bc</b> option. The valid range is 0–80. The default is 10 BCS.
<b>duration</b> <i>milliseconds</i>	(Optional) Specifies the length of time, in milliseconds, that a flow rate-adapts. This keyword overrides the default duration. The default is 1. The valid range is 0–2000.
<b>fcms-off</b>	(Optional) Disables the forced broadcast contention minislot at the end of a filled MAP.
<b>priority</b> <i>value</i>	(Optional) Specifies the minimum priority required to enable rate-adapt on a flow. This keyword overrides any globally configured rate-adapt priority. The valid range is 0–7.
<b>rate</b> <i>number</i>	(Optional) Specifies the minimum max-rate required to enable rate-adapt on a flow. This keyword overrides any globally configured rate-adapt rate. The valid range is 0–30000000.

### Command Default

Upstream utilization optimization is not enabled on a local upstream.

### Command Modes

Interface configuration—cable interface only (config-if)

### Command History

Release	Modification
12.3(23)BC2	This command was introduced.
12.2(33)SCB	This command was integrated into Cisco IOS Release 12.2(33)SCB. Support for the Cisco uBR7225VXR router was added.

### Usage Guidelines

If eligible, local upstream flows can utilize upstream utilization optimization.

**Examples**

The following example enables and configures rate-adapt on upstream 0 with a priority of 6 and a rate of 200.

```
Router(config-if)# cable upstream 0 rate-adapt priority 6 rate 200
```

**Related Commands**

Command	Description
<b>cable upstream rate-adapt (global)</b>	Enables upstream utilization optimization globally on all cable modem upstream flows.
<b>show cable rate-adapt</b>	Displays the global and local upstream utilization optimization configuration parameters.

# cable upstream rate-limit

To set DOCSIS rate limiting for an upstream port on a cable interface line 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 *n* rate-limit [token-bucket [shaping]]**

**no cable upstream *n* rate-limit**

## Syntax Description

<i>n</i>	Specifies the upstream port number. Valid values start with 0 for the first upstream port on the cable interface line card.
<b>token-bucket shaping</b>	(Optional) Enables rate limiting for the specified upstream cable interface using the token-bucket policing algorithm. The <b>shaping</b> option enables token-bucket shaping.

## Command Default

Token-bucket algorithm with traffic shaping

## Command Modes

Interface configuration (cable interface only)

## Command History

Release	Modification
11.3(6)NA	This command was introduced for the Cisco uBR7246VXR universal broadband routers.
11.3(9)NA	The <b>shaping</b> keyword was added.

## Usage Guidelines

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

When the **token-bucket** algorithm is configured, the Cisco CMTS 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.



### Note

This command is specific to the Cisco uBR7225VXR routers only.

## 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 shaping
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>cable downstream rate-limit</b>	Enables DOCSIS rate limiting on downstream traffic.

## cable upstream rate-limit-bwreq exempted-priority

To configure the service flow priority of the bandwidth requests that should be exempted from being throttled by the upstream (US) bandwidth request rate limiting (BRRL) feature, use the **cable upstream rate-limit-bwreq exempted-priority** command in global configuration mode. To reset the exempted priority to the default value, use the **no** form of this command.

**cable upstream rate-limit-bwreq exempted-priority** *priority*

**no cable upstream rate-limit-bwreq**

<b>Syntax Description</b>	<i>priority</i>	Service flow priority.  Bandwidth requests with this service flow priority value (and above) are exempted from being throttled by the BRRL feature. For example, if the priority value is set to 3, then bandwidth requests with priority 3, 4, 5, 6, and 7 are exempted. The valid range is from 0 to 7.
---------------------------	-----------------	---

**Command Default** All bandwidth requests are throttled by the BRRL feature.

**Command Modes** Global configuration (config)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(33)SCF	This command was introduced.

**Usage Guidelines** The upstream BRRL feature throttles incoming bandwidth requests in order to control CPU consumption by the US scheduler.

The **cable upstream rate-limit-bwreq exempted-priority** command enables you to configure an exempted priority. Any best effort (BE) service flow bandwidth requests received with this configured priority or above, is exempted from BRRL and is therefore not dropped even if high CPU consumption by the US scheduler is observed. For example, if the configured exempted priority is 4, any bandwidth request with priority 4, 5, 6, or 7 is not dropped even if high CPU consumption is observed.

Exempted service flow priority is a platform level configuration and is applicable to all line cards. If the exempted priority is set to value zero, all the BE bandwidth requests are exempted from being throttled by the BRRL feature.

**Examples** The following example shows how to configure a BRRL exempted service flow priority to value 5:

```
Router# configure terminal
Router(config)# cable upstream rate-limit-bwreq exempted-priority 5
```

# cable upstream rate-limit-ccf

To configure rate limiting parameters for upstream bonded service flows on a Cisco uBR10-MC5X20H cable interface line card, use the **cable upstream rate-limit-ccf** command in global configuration mode. To disable this configuration, use the **no** form of this command.

```
cable upstream rate-limit-ccf [aggregated-burst value | aggregated-throughput value |
cpu-burst value | cpu-threshold value]
```

```
no cable upstream rate-limit-ccf [aggregated-burst value | aggregated-throughput value |
cpu-burst value | cpu-threshold value]
```

## Syntax Description

<b>aggregated-burst</b> <i>value</i>	(Optional) Specifies the burst rate for aggregated throughput-based rate limiting in bits. The valid range is from 0 to 250000000. The default value is 8000000.
<b>aggregated-throughput</b> <i>value</i>	(Optional) Specifies the throughput value for throughput-based rate limiting in bits per second (bps). The valid range is from 0 to 540000000. The default value is 115000000.
<b>cpu-burst</b> <i>value</i>	(Optional) Specifies the CPU burst for Continuous Concatenation and Fragmentation (CCF) in percentage. The valid range is from 0 to 100. The default value is 10.
<b>cpu-threshold</b> <i>value</i>	(Optional) Specifies the CPU threshold for CCF in percentage. The valid range is from 0 to 100. The default value is 50.

## Command Default

None

## Command Modes

Global configuration (config)

## Command History

Release	Modification
12.2(33)SCC	This command was introduced in Cisco IOS Release 12.2(33)SCC.

## Examples

The following example shows how to configure rate limiting parameters for upstream bonded service flows on a Cisco uBR10012 router:

```
Router# configure terminal
Router(config)# cable upstream rate-limit-ccf
Router(config)# cable upstream rate-limit-ccf aggregated-burst 25000
Router(config)# cable upstream rate-limit-ccf aggregated-throughput 540000
Router(config)# cable upstream rate-limit-ccf cpu-burst 30
Router(config)# cable upstream rate-limit-ccf cpu-threshold 60
```

## Related Commands

<b>Command</b>	<b>Description</b>
<b>show cable rate-limit-ccf</b>	Displays information about rate limiting criteria configured on a Cisco uBR10-MC5X20H cable interface line card.

# cable upstream resiliency

To configure cable upstream resiliency on a cable interface line card, use the **cable upstream resiliency** command in cable interface configuration mode. To disable the configuration, use the **no** form of this command.

**cable upstream resiliency** { **channel-down-detect** *number* | **modem-offline-detect** *number* | **on-failure** { **disable-channel** | **extended-ranging** | **reset-modem** } | **sf-move** **RTPS** }

**no cable upstream resiliency** { **channel-down-detect** *number* | **modem-offline-detect** *number* | **on-failure** { **disable-channel** | **extended-ranging** | **reset-modem** } | **sf-move** **RTPS** }

## Syntax Description

<b>channel-down-detect</b> <i>number</i>	Specifies the threshold (number of consecutive ranging misses) to determine if a channel is down. The valid values are from 8 to 64.
<b>modem-offline-detect</b> <i>number</i>	Specifies the threshold (number of consecutive ranging misses) to determine if a CM is offline. The valid values are from 4 to 16.
<b>on-failure</b>	Allows you to specify what should be done if the channel is down and the CM is offline.
<b>disable-channel</b>	Allows the CMTS to mark the channel as unusable when a failure is detected.
<b>extended-ranging</b>	Allows the CMTS to continue ranging when a failure is detected.
<b>reset-modem</b>	Enforces the CM to go offline when a failure is detected.
<b>sf-move</b>	Moves the upstream service flows on an impaired upstream channel to another good upstream channel in the transmit channel set of the cable modem without resetting the cable modem.
<b>RTPS</b>	Moves Real-time Polling Service (RTPS) type service flows.

## Command Default

By default, the threshold to determine if a channel is down is not enabled, the CMTS is set to continue ranging when a failure is detected and the threshold to determine if a CM is offline is set to 8.

## Command Modes

Interface configuration (config-if)

## Command History

Release	Modification
12.2(33)SCC	This command was introduced in Cisco IOS Release 12.2(33)SCC.
12.2(33)SCG	This command was modified. The <b>sf-move RTPS</b> keyword was added.

## Examples

The following example shows how to configure upstream resiliency with different keywords on a cable interface in slot 5, subslot 1, and port 0 on a Cisco uBR10012 router:

```
Router# configure terminal
Router(config)# interface cable 5/1/0
Router(config-if)# cable upstream resiliency channel-down-detect 30
Router(config-if)# cable upstream resiliency modem-offline-detect 16
Router(config-if)# cable upstream resiliency on-failure disable-channel
Router(config-if)# cable upstream resiliency sf-move RTPS
```

The following example shows how to configure RTPS type service flow move on a cable interface in slot 7, subslot 0, and port 0 in Cisco IOS Release 12.2(33)SCG:

```
Router#show run all | i sf-move

no cable upstream resiliency sf-move RTPS

Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface cable 7/0/0
Router(config-if)#cable upstream resiliency sf-move RTPS
Router(config-if)#end
Router#

Router#show run interface cable 7/0/0 | i sf-move

cable upstream resiliency sf-move RTPS
Router#
```

#### Associated Features

The `cable upstream resiliency` command is used to configure the [Upstream Channel Bonding](#) feature.

#### Related Commands

Command	Description
<code>interface cable</code>	Configures cable interface.

# cable upstream rf-adapt

To enable RF adaptation on the physical upstream channel, use the **cable upstream rf-adapt** command in cable interface configuration mode. To disable the RF adaptation, use the **no** form of this command.

**cable upstream** *port* **rf-adapt**

**no cable upstream** *port* **rf-adapt**

## Syntax Description

<i>port</i>	Upstream port number. The valid values start with 0 for the first upstream port on the cable interface line card and ends with a value that depends on the number of upstream ports supported by the cable interface line card.
-------------	---

## Command Default

By default, RF adaptation is disabled.

## Command Modes

Interface configuration (config-if)

## Command History

Release	Modification
12.2(33)SCF	This command was introduced.

## Usage Guidelines

The **cable upstream port rf-adapt** command is available only when the maximum number of logical channels configured using the **cable upstream max-logical-chans** command is greater than 1.

## Examples

The following example shows how to enable RF adaptation on cable interface 8/0/0:

```
Router(config)# interface cable 8/0/0
Router(config-if)# cable upstream 0 max-logical-chans 2
Router(config-if)# cable upstream 0 rf-adapt
```

## Related Commands

Command	Description
<b>cable rf-adapt timer</b>	Configures timers for RF adaptation.
<b>cable upstream rf-adapt (logical channel)</b>	Configures the primary upstream logical channel and secondary upstream logical channel.
<b>cable upstream threshold</b>	Configures the upstream for the signal-to-noise ratio (SNR) and forward error correction (FEC) threshold values to be used in determining the allowable noise levels.
<b>cable upstream threshold hysteresis</b>	Configures the hysteresis value to be used in conjunction with the dynamic modulation upgrade thresholds.

<b>Command</b>	<b>Description</b>
<b>cable upstream threshold rf-adapt</b>	Configures the upstream RF adaptation threshold value, which prevents excessive relocation of modems from the primary upstream channel to the secondary upstream channel.
<b>show cable modem rf-adapt</b>	Displays the RF adaptation history.
<b>show cable rf-adapt</b>	Displays the downgrade and upgrade candidate lists.

## cable upstream rf-adapt (logical channel)

To specify the primary upstream logical channel and the secondary upstream logical channel, use the **cable upstream port logical-channel-index rf-adapt [primary | secondary]** command in cable interface configuration mode. To reset to the default settings, use the **no** form of this command.

**cable upstream port logical-channel-index rf-adapt [primary | secondary]**

**no cable upstream port logical-channel-index rf-adapt [primary | secondary]**

### Syntax Description

<i>port</i>	Upstream port number. The valid values start with 0 for the first upstream port on the cable interface line card and ends with a value that depends on the number of upstream ports supported by the cable interface line card..
<i>logical-channel-index</i>	Logical channel index. The valid values are 0 or 1.
<b>primary</b>	(Optional) Assigns the logical channel as primary for RF adaptation. By default, logical channel 0 is set as primary.
<b>secondary</b>	(Optional) Assigns the logical channel as secondary for RF adaptation. By default, logical channel 1 is set as secondary.

### Command Default

Uses the default configuration. Logical channel 0 is primary and logical channel 1 is secondary.

### Command Modes

Interface configuration (config-if)

### Command History

Release	Modification
12.2(33)SCF	This command was introduced.

### Usage Guidelines

It is recommended that logical channel 0 is set as primary, and logical channel 1 is set as secondary.

### Examples

The following example shows how to configure primary and secondary logical channels:

```
Router> enable
Router# configure terminal
Router(config)# interface cable 8/0/0
Router(config-if)# cable upstream 0 max-logical-chans 2
Router(config-if)# cable upstream 0 rf-adapt
Router(config-if)# cable upstream 0 1 rf-adapt primary
Router(config-if)# cable upstream 0 0 rf-adapt secondary
```

Related Commands	Command	Description
	<b>cable rf-adapt timer</b>	Configures timers for RF adaptation.
	<b>cable upstream rf-adapt</b>	Enables RF adaptation on the physical upstream channel.
	<b>cable upstream threshold</b>	Configures the upstream for the signal-to-noise ratio (SNR) and forward error correction (FEC) threshold values to be used in determining the allowable noise levels.
	<b>cable upstream threshold hysteresis</b>	Configures the hysteresis value to be used in conjunction with the dynamic modulation upgrade thresholds.
	<b>cable upstream threshold rf-adapt</b>	Configures the upstream RF adaptation threshold value, which prevents excessive relocation of modems from the primary upstream channel to the secondary upstream channel.
	<b>show cable modem rf-adapt</b>	Displays the RF adaptation history.
	<b>show cable rf-adapt</b>	Displays the downgrade and upgrade candidate lists.

# cable upstream rng-holdoff

To hold off a cable modem from initial ranging (init rl) on a logical upstream channel on the CMTS router, use the **cable upstream rng-holdoff** command in cable interface configuration mode. To disable the ranging hold-off, use the **no** form of this command.

**cable upstream** *port-number* **rng-holdoff** *priority*

**no cable upstream** *port-number* **rng-holdoff** *priority*

## Syntax Description

<i>port-number</i>	Cable upstream port number. The valid range depends on the number of upstream channels configured in a MAC domain. For example, if the total number of upstream channels configured is 4, then the valid range for the upstream port number is from 0 to 3.
<b>rng-holdoff</b> <i>priority</i>	Specifies the ranging hold-off priority value in the hexadecimal format. The valid range is from 0 to ffffffff. The default value is 0.

## Command Default

None

## Command Modes

Interface configuration (config-if)

## Command History

Release	Modification
12.2(33)SCH	This command was introduced.

## Usage Guidelines

An upstream channel descriptor (UCD) message includes type, length, value (TLV) 18 and 19 for an upstream logical channel based on the channel class ID and ranging hold-off priority configuration. If a ranging hold-off priority value is not configured, the value of TLV 18 becomes zero. If an upstream channel class ID is configured and a ranging hold-off priority value is not configured, the UCD message includes TLV 18 and 19, and the value of TLV 18 becomes zero.

## Examples

The following example shows how to specify a ranging hold-off priority value for a logical upstream channel on a cable interface line card on the cisco uBR10012 router:

```
Router# config terminal
Router(config)# interface cable 5/0/0
Router(config-if)# cable upstream 0 rng-holdoff ff
```

## Associated Features

The **cable upstream rng-holdoff** command is associated with the [CM Steering on the Cisco CMTS Routers](#) feature.

Related Commands	Command	Description
	<b>cable load-balance exclude</b>	Excludes a cable modem or a group of cable modems from DOCSIS load balance.
	<b>cable upstream chan-class-id</b>	Configures a channel class ID for a logical upstream channel on the CMTS router.
	<b>show cable modem verbose</b>	Displays information about the registered and unregistered cable modems connected to the CMTS router.

# cable upstream scheduling type

To enable various scheduler modes, use the **cable upstream scheduling type** command in interface configuration mode (cable interface only). To disable this feature, use the **no** form of this command.

**cable upstream *n* scheduling type [ugs | rtps] mode [llq | docsis]**

**no cable upstream *n* scheduling type [ugs | rtps] mode [llq | docsis]**

## Syntax Description

<b><i>n</i></b>	Specifies the upstream port. Valid values start with 0 for the first upstream port on the cable interface line card.
<b>ugs</b>	(Optional) Selects scheduling for UGS.
<b>rtps</b>	(Optional) Selects scheduling for rtPS.
<b>mode</b>	Enables the selection of packet-based Low Level Queueing (LLQ) or TDM-based DOCSIS scheduling.
<b>llq</b>	(Optional) Selects LLQ scheduling.
<b>docsis</b>	(Optional) Selects DOCSIS scheduling.

## Command Default

The only default is **docsis**.

## Command Modes

Interface configuration —cable interface only (config-if)

## Command History

Release	Modification
12.3(13)BC	This command was introduced.
12.2(33)SCA	This command was integrated into Cisco IOS Release 12.2(33)SCA. Support for the Cisco uBR7225VXR router was added.

## Usage Guidelines

Any combination of **ugs**, **rtps**, **llq**, and **docsis** is allowed.

Note the following restrictions:

- To ensure proper operation, Call Admission Control (CAC) must be enabled. When the Low Latency Queueing (LLQ) option is enabled, it is possible for the upstream path to be filled with so many calls that it becomes unusable, making voice quality unacceptable. CAC must be used to limit the number of calls to ensure acceptable voice quality, as well as to ensure traffic other than voice traffic.
- Even if CAC is not enabled, the default (DOCSIS) scheduling mode blocks traffic after a certain number of calls.

## Examples

The following example shows how to enable LLQ-type (packet-based) scheduling for UGS services on upstream port 4 on a Cisco CMTS interface:

```
Router(config-if)# cable upstream 4 scheduling type ugs mode llq
```

The following example shows how to enable standard DOCSIS (TDM-based) scheduling for rtPS services on upstream port 4 on a Cisco CMTS interface:

```
Router(config-if)# cable upstream 4 scheduling type rtps mode docsis
```

---

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show interface cable mac-scheduler</b>	Use this command to confirm whether LLQ scheduling is enabled.

---

# 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 *n* scrambler**

**no cable upstream *n* scrambler**

## Syntax Description

<i>n</i>	Specifies the upstream port number. Valid values start with 0 for the first upstream port on the cable interface line card.
----------	---

## Command Default

Disabled

## Command Modes

Interface configuration (cable interface only)

## Command History

Release	Modification
11.3 XA	This command was introduced.

## Usage Guidelines

This command causes CMs 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 CMs 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 interface line 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 CMs 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
<b>cable upstream fec</b>	Enables the upstream FEC.
<b>cable upstream frequency</b>	Enters a fixed frequency of the upstream RF carrier for an upstream port.

<b>Command</b>	<b>Description</b>
<b>cable upstream power-level</b>	Sets the input power level for the upstream RF carrier in decibels per millivolt (dBmV).
<b>cable upstream shutdown</b>	Disables the upstream port.

# cable upstream shutdown

To disable a single upstream physical or logical channel port, use the **cable upstream shutdown** command in cable interface configuration mode. To enable the upstream port, use the **no** form of this command.

## Physical Channel

**cable upstream *n* shutdown**

**no cable upstream *n* shutdown**

## Logical Channel

**cable upstream *n m* shutdown**

**no cable upstream *n m* shutdown**

Syntax Description	<i>n</i>	Specifies the upstream port number. Valid values start with 0 for the first upstream port on the cable interface line card.
	<i>m</i>	Specifies the logical channel index of 0 or 1.

**Command Default** Upstream port is enabled

**Command Modes** Interface configuration (config-if)

Command History	Release	Modification
	11.3 XA	This command was introduced.
	12.3BC	This command was integrated into Cisco IOS Release 12.3BC.
	12.2(33)SCA	This command was integrated into Cisco IOS Release 12.2(33)SCA.
	12.2(33)SCC	This command was modified with the addition of logical channel index.

**Usage Guidelines** The **cable upstream shutdown** command shuts down a single upstream physical or logical port without affecting any of the other upstream or downstream ports on the cable interface.



### Note

The **cable upstream shutdown** command exists at both physical and logical channel level with minor variations in the command syntax.

When multiple logical channels are configured, the upstream related CLIs are categorized into two groups: physical port level and logical channel level. Logical channel level commands use the format of **cable upstream *n m* shutdown**, where *n* denotes the physical port number, and *m* denotes the logical channel index number.

When multiple logical channels are configured, the **cable upstream shutdown** command at the physical level shuts down the upstream physical port and all the logical channels configured under that physical port. To shut down the entire interface, use the **shutdown** command in cable interface configuration mode.

---

**Examples**

The following example shows how to disable the upstream port for the physical channel:

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

The following example shows how to disable the upstream port for the logical channel:

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

---

**Related Commands**

Command	Description
<b>shutdown</b>	Shuts down (disables) an interface and all of its ports.

# cable upstream snr-polling

To configure how often cable interface cards with hardware spectrum management should poll an upstream to determine its Carrier-to-Noise Ratio (CNR), use the **cable upstream snr-polling** command in cable interface configuration mode.

**cable upstream** *n* **snr-polling** *interval-in-ms*



## Note

This command can be used only on upstreams on the Cisco uBR-MC16S cable interface line cards.

## Syntax Description

<i>n</i>	Specifies the upstream port number. Valid values start with 0 for the first upstream port on the cable interface line card.
<i>interval-in-ms</i>	The valid range is 1000 to 25000 milliseconds, with a default of 15000 milliseconds.

## Command Default

5000 milliseconds

## Command Modes

Interface configuration (cable interface only)

## Command History

Release	Modification
12.1(7)CX1	This command was introduced for Cisco CMTS routers using the Cisco uBR-MC16S cable interface line card.
12.2(8)BC2	Support was added for the Cisco uBR10012 router and the Cisco uBR-LCP2-MC16S cable interface line card.

## Usage Guidelines

The Cisco uBR-MC16S cable interface line cards contain digital signal processors (DSPs) that perform hardware spectrum management. Use the **cable upstream snr-polling** command to determine how often that hardware should examine an upstream's signal to determine the current CNR value.

## Examples

The following example shows how to configure the sixth upstream on a Cisco uBR-MC16S cable interface card so that the DSP samples the upstream signal every 10 seconds (10,000 milliseconds):

```
Router(config)# interface cable 3/0
Router(config-if)# cable upstream 5 snr-polling 10000
Router(config-if)#
```

## Related Commands

Command	Description
<b>cable modulation-profile</b>	Creates a cable modulation profile.
<b>cable upstream modulation-profile</b>	Configures an upstream for one modulation profile (static profile) or two modulation profiles (Dynamic Upstream Modulation).

Command	Description
<b>show cable hop</b>	Displays the current hop period and threshold for an upstream, along with other statistics.
<b>show cable modulation-profile</b>	Displays the cable modulation profiles that have been created.

# cable upstream spectrum-group

To assign a spectrum group to a single upstream on a cable interface line card, use the **cable upstream spectrum-group** command in interface configuration mode. To remove a spectrum group from an upstream, use the **no** form of this command.

**cable upstream** *n* **spectrum-group** *group-number*

**no cable upstream** *n* **spectrum-group** *group-number*

## Syntax Description

<i>n</i>	Specifies the upstream port number. Valid values start with 0 for the first upstream port on the cable interface line card.
<i>group-number</i>	Specifies the spectrum group for which you are specifying a parameter value or specifies the number of the spectrum group you wish to remove from your router configuration. Valid range is from 1 to 32, or from 1 to 40, depending on the Cisco IOS software release.

## Command Default

No default behavior or values.

## Command Modes

Interface configuration

## Command History

Release	Modification
11.3 NA	This command was introduced.
12.2(15)BC2	The maximum number of spectrum groups was increased from 32 to 40 groups per router.

## Usage Guidelines

This command assigns a spectrum group to a single upstream on the cable interface line card. To configure the spectrum groups, use the set of **cable spectrum-group** commands in global configuration mode.



### Note

You can also spectrum groups to all of the upstreams on the cable interface using the **cable spectrum-group (interface configuration)** command.

## Examples

The following example shows how to assign spectrum group 12 to the first upstream on the cable interface line card in slot 5/0:

```
Router(config)# interface cable 5/0
Router(config-if)# cable upstream 0 spectrum-group 12
Router(config-if)# exit
Router(config)#
```

Related Commands	Command	Description
	<b>cable modulation-profile</b>	Configures preset modulation profiles that you can apply to one or more upstream cable interfaces when you identify and configure spectrum groups.
	<b>cable spectrum-group (global configuration)</b>	Creates and configures a spectrum group.
	<b>cable spectrum-group (interface configuration)</b>	Assigns a spectrum group to all of the upstreams on a cable interface line card.
	<b>cable spectrum-group hop period</b>	Sets the minimum frequency-hop interval for a cable spectrum group.
	<b>cable spectrum-group hop threshold</b>	Specifies a hop threshold for a cable spectrum group.
	<b>cable spectrum-group shared</b>	Specifies the upstream ports in a spectrum group can share the same upstream frequency.
	<b>cable upstream hopping blind</b>	Disengages the advanced spectrum management features of the Cisco uBR-MC16S and Cisco uBR-MC5X20S/U cable interface line cards by enabling blind frequency hopping behavior.

# cable upstream spreading-interval

To specify the spreading interval for Synchronous Code Division Multiple Access (S-CDMA) channels on an upstream channel, use the **cable upstream spreading-interval** command in cable interface configuration mode. To set the spreading interval value to its default setting, use the **no** form of this command.

**cable upstream** *n* **spreading-interval** *spreading-interval*

**no cable upstream** *n* **spreading-interval**

Syntax Description		
	<i>n</i>	Specifies the upstream port. Valid values start with 0 for the first upstream port on the cable interface line card.
	<i>spreading-interval</i>	Specifies the spreading interval for S-CDMA channels. Valid values range from 1 to 32, with a default value of 16.

**Command Default** The spreading-interval setting cannot be applied if S-CDMA is not configured.

**Command Modes** Interface configuration (config-if)

Command History	Release	Modification
	12.2(33)SCC	This command was introduced.

**Usage Guidelines** This command is applicable only for S-CDMA channels. You should configure S-CDMA to apply the spreading-interval.

**Examples** The following example sets the spreading interval to 32 on the upstream port 0:

```
Router(config)# interface cable 7/0/4
Router(config-if)# cable upstream 0 spreading-interval 32
Router(config-if)#
```

Related Commands	Command	Description
	<b>cable upstream active-codes</b>	Specifies the number of active codes that can be configured on an upstream channel.
	<b>cable upstream codes-per-minislot</b>	Specifies the number of codes-per-minislot allowed on an upstream channel.

## cable upstream threshold

To configure the upstream for the carrier-to-noise ratio (CNR) or signal-to-noise ratio (SNR) and forward error correction (FEC) threshold values to be used in determining the allowable noise levels, use the **cable upstream threshold** command in cable interface configuration mode. To return to the default values, use the **no** form of the command.

### Cisco IOS Releases 12.2(8)BC2 and Earlier

```
cable upstream n threshold cnr-profile1 cnr-threshold1 cnr-profile2 cnr-threshold2
corr-fec fec-corrected uncorr-fec fec-uncorrected
```

```
no cable upstream n threshold cnr-profile1 cnr-threshold1 cnr-profile2 cnr-threshold2
corr-fec fec-corrected uncorr-fec fec-uncorrected
```

### Cisco IOS Releases 12.3(23)BC, 12.2(33)SCA and Later

#### Physical Channel

```
lcable upstream n threshold {cnr-profiles cnr-threshold1 cnr-threshold2 | snr-profiles
snr-threshold1 snr-threshold2 | hysteresis hysteresis-value | corr-fec fec-corrected |
uncorr-fec fec-uncorrected}
```

```
no cable upstream n threshold {cnr-profiles | snr-profiles | hysteresis | corr-fec | uncorr-fec}
```

#### Logical Channel

```
cable upstream n m threshold {snr-profiles snr-threshold1 snr-threshold2 | corr-fec fec-corrected
| uncorr-fec fec-uncorrected}
```

```
no cable upstream n m threshold {snr-profiles | corr-fec | uncorr-fec}
```

### Syntax Description

<i>n</i>	Upstream port number. The valid values range from 0 to 3.
<i>m</i>	Logical channel index of 0 or 1.
<b>cnr-profiles</b>	Specifies the CNR threshold in dB.
<i>cnr-threshold1</i>	CNR threshold for the primary modulation profile specified for the upstream.  The valid values range from 5 to 35 dB, with a default value of 25 dB.  To bypass both the primary and secondary CNR thresholds, set the first parameter ( <i>cnr-threshold1</i> ) to 0. This disallows the second parameter ( <i>cnr-threshold2</i> ), enabling you to bypass both the CNR thresholds.
<i>cnr-threshold2</i>	CNR threshold for the secondary modulation profile specified for the upstream.  The valid values range from 5 to 35 dB, with a default value of 15 dB. The secondary threshold value must be lesser than the primary threshold.  If the first parameter ( <i>cnr-threshold1</i> ) is set to 0, then the second parameter ( <i>cnr-threshold2</i> ) is not allowed.
<b>snr-profiles</b>	Specifies the SNR threshold in dB.

<i>snr-threshold1</i>	<p>SNR threshold for the primary modulation profile specified for the upstream. This value is also used by the Cable Modem Upstream RF Adaptation feature.</p> <p>The valid values range from 5 to 35 dB, with a default value of 25 dB.</p> <p>You can bypass the primary SNR threshold (<i>snr-threshold1</i>) by setting it to 0.</p>
<i>snr-threshold2</i>	<p>SNR threshold for the secondary modulation profile specified for the upstream.</p> <p>The valid values range from 5 to 35 dB, with a default value of 15 dB. The secondary threshold value must be lesser than the primary threshold.</p> <p>Though, you can bypass the primary SNR threshold (<i>snr-threshold1</i>) by setting it to 0, you must enter the second parameter (<i>snr-threshold2</i>).</p>
<b>hysteresis</b> <i>hysteresis-value</i>	<p>Specifies the hysteresis value to be used in conjunction with the dynamic modulation upgrade thresholds.</p> <p>The threshold is specified in dB, with a valid range of 0 to 10 dB, and a default value of 3 dB.</p> <p>You can bypass the <b>hysteresis</b> threshold by setting the value to 0.</p>
<b>corr-fec</b> <i>fec-corrected</i>	<p>Specifies the allowable number of correctable FEC errors for the upstream.</p> <p>The <i>fec-corrected</i> parameter is given as a percentage of total packets received on the upstream during the polling period, with a valid range of 1 to 30, and a default of 3.</p> <p>You can bypass the <b>corr-fec</b> threshold by setting the value to 0.</p>
<b>uncorr-fec</b> <i>fec-uncorrected</i>	<p>Specifies the allowable number of uncorrectable FEC errors for the upstream.</p> <p>The <i>fec-uncorrected</i> parameter is given as a percentage of total packets received on the upstream during the polling period, with a valid range of 1 to 30, and a default of 1.</p> <p>You can bypass the <b>uncorr-fec</b> threshold by setting the value to 0.</p>

**Command Default** Uses the default values.

**Command Modes** Interface configuration (config-if)

Command History	Release	Modification
	12.1(7)CX1	This command was introduced for Cisco CMTS routers using the Cisco uBR-MC16S cable interface line card.
	12.2(8)BC2	Support was added for the Cisco uBR10012 router and the Cisco uBR-LCP2-MC16S cable interface line card. Also, the ranges and defaults for the correctable and uncorrectable FEC error thresholds were changed.

Release	Modification
12.3BC	This command was integrated into Cisco IOS Release 12.3BC.
12.2(33)SCA	This command was integrated into Cisco IOS Release 12.2(33)SCA.
12.2(33)SCC	This command was modified with the addition of <b>snr-profiles</b> keyword option and support was added for Cisco uBR-MC5X20H cable interface line card. Also, this command is used at both physical and logical channel level with slight variations in the command syntax for the uBR10012 router.

### Usage Guidelines

Separate CNR or SNR thresholds are assigned to the primary and secondary modulation profiles. Both profiles, however, are assigned the same correctable and uncorrectable FEC values.



#### Note

The uncorrectable FEC error count includes packets that have header checksum errors and “no unique word detected” errors.

The **hysteresis** keyword of the **cable upstream threshold** command configures a hysteresis value to prevent upstream channels from becoming unstable and continuously changing between modulation profiles.

- The hysteresis value is used in dynamic modulation, frequency hopping, and dynamic channel-width changes.
- The hysteresis value is used in conjunction with CNR or SNR thresholds to determine channel configuration upgrade criteria for both advanced and basic spectrum management features.

The range and defaults for the correctable and uncorrectable FEC error thresholds were changed in Cisco IOS Release 12.2(8)BC2.

From Cisco IOS Release 12.2(33)SCC onwards, you can configure two logical channels on a single physical port for the uBR10012 router. When you configure logical channels, the upstream related commands are categorized into two groups: physical port level and logical channel level.

#### Physical Port Level

Physical port level commands use the format of **cable upstream *n***, where *n* denotes the physical port number.

#### Logical Channel Level

Logical channel level commands use the format of **cable upstream *n m***, where *n* denotes the physical port number, and *m* denotes the logical channel index number of 0 or 1.

The following restrictions and conditions applies to both physical and logical channel configurations:

- You can bypass both the primary and secondary CNR thresholds by setting the first parameter to 0. This disallows the second parameter, enabling you to bypass both the CNR thresholds.
- If you provide the primary CNR threshold, then you must enter the secondary CNR threshold also.
- You can bypass the primary SNR threshold by setting it to 0. However, you must enter the second parameter. This is required as each threshold is used independently in Three Step Dynamic Upstream Modulation feature.
- You can bypass the **hysteresis**, **corr-fec**, and **uncorr-fec** thresholds by setting their values to 0.

- For normal plant use, we recommend that the uncorrectable FEC threshold remain at its default of 1 percent to avoid an unacceptable number of errors on the channel.

## Examples

### Cisco IOS Releases 12.2(8)BC2 and Earlier

The following example shows upstream 5 configured with the CNR threshold for the primary modulation profile set to 20 dB, the CNR threshold for the secondary modulation profile set to 10 dB, the correctable FEC error rate set to 5 percent of total packets received on the upstream, and the uncorrectable FEC error rate set to 1 percent of total packets received on the upstream:

```
Router(config)# interface cable 3/0
Router(config-if)# cable upstream 5 threshold cnr-profile1 20 cnr-profile2 10 corr-fec 5
uncorr-fec 1
Router(config-if)#
```

### Cisco IOS Releases 12.3(23)BC, 12.2(33)SCA and Later

The following example shows upstream 5 configured with the CNR threshold for the primary modulation profile set to 20 dB, the CNR threshold for the secondary modulation profile set to 10 dB, the correctable FEC error rate set to 5 percent of total packets received on the upstream, and the uncorrectable FEC error rate set to 1 percent of total packets received on the upstream:

```
Router(config)# interface cable 3/0
Router(config-if)# cable upstream 5 threshold cnr-profiles 20 10
Router(config-if)# cable upstream 5 threshold corr-fec 5
Router(config-if)# cable upstream 5 threshold uncorr-fec 1
Router(config-if)#
```

The following example shows upstream 5 configured with the SNR threshold for the primary modulation profile set to 20 dB, the SNR threshold for the secondary modulation profile set to 10 dB, the correctable FEC error rate set to 5 percent of total packets received on the upstream, and the uncorrectable FEC error rate set to 1 percent of total packets received on the upstream:

```
Router(config)# interface cable 3/0
Router(config-if)# cable upstream 5 threshold snr-profiles 20 10
Router(config-if)# cable upstream 5 threshold corr-fec 5
Router(config-if)# cable upstream 5 threshold uncorr-fec 1
Router(config-if)#
```

### SNR Example on the Cisco uBR10012 Router Only

The following example shows upstream 5 and logical channel 1 configured with the SNR threshold for the primary modulation profile set to 20 dB, the SNR threshold for the secondary modulation profile set to 10 dB, the correctable FEC error rate set to 5 percent of total packets received on the upstream, and the uncorrectable FEC error rate set to 1 percent of total packets received on the upstream:

```
Router(config)# interface cable 7/0/0
Router(config-if)# cable upstream 5 1 threshold snr-profiles 20 10
Router(config-if)# cable upstream 5 1 threshold corr-fec 5
Router(config-if)# cable upstream 5 1 threshold uncorr-fec 1
Router(config-if)#
```

Related Commands	Command	Description
	<b>cable modulation-profile</b>	Creates a cable modulation profile.
	<b>cable modulation-profile global-system</b>	Creates a global cable modulation profile that allows to assign any number from 1 to 400 for modulation profiles, irrespective of the DOCSIS mode.
	<b>cable upstream hop-priority</b>	Determines the order of the corrective actions to be taken when ingress noise exceeds the allowable value for an upstream.
	<b>cable upstream modulation-profile</b>	Configures an upstream for one modulation profile (static profile) or two modulation profiles (dynamic upstream modulation).
	<b>cable upstream threshold rf-adapt</b>	Configures the upstream RF adaptation threshold value, which prevents excessive relocation of modems from the primary upstream channel to the secondary upstream channel.
	<b>show cable hop</b>	Displays the current hop period and threshold for an upstream, along with other statistics.
	<b>show cable modulation-profile</b>	Displays the cable modulation profiles that have been created.

# cable upstream threshold hysteresis

To configure a hysteresis value to be used in conjunction with the dynamic modulation upgrade thresholds, use the **cable upstream threshold hysteresis** command in cable interface configuration mode. To use the default hysteresis value, use the **no** form of this command.

**cable upstream *n* threshold hysteresis *hysteresis-in-dB***

**no cable upstream *n* threshold hysteresis**

## Syntax Description

<i>n</i>	Specifies the upstream port number. Valid values start with 0 for the first upstream port on the cable interface line card.
<i>hysteresis-in-dB</i>	Specifies the hysteresis value to be used in conjunction with the dynamic modulation upgrade thresholds. The valid values are from 0 to 10 dB.

## Command Default

The default value of hysteresis is 3 dB.

## Command Modes

Interface configuration (cable interface only)

## Command History

Release	Modification
12.3(23)BC7	This command was first introduced.

## Usage Guidelines

The **cable upstream threshold hysteresis** command can be used to configure a hysteresis value to prevent upstream (US) channels from becoming unstable and continuously changing between modulation profiles.

- The hysteresis value is used in dynamic modulation, frequency hopping, and dynamic channel-width changes.
- The hysteresis value is used in conjunction with carrier-to-noise ratio (CNR) or signal-to-noise ratio (SNR) thresholds to determine channel configuration upgrade criteria for both advanced and basic spectrum management features.
- The hysteresis value is used for cable modem upstream RF adaptation upgrades from the secondary to the primary upstream channel.

## Examples

The following example configures a hysteresis value to be used in conjunction with the SNR and CNR thresholds for dynamic modulation upgrade.

```
Router(config)# interface cable 3/0
Router(config-if)# cable upstream 0 threshold hysteresis 5
Router(config-if)#
```

Related Commands	Command	Description
	<b>cable modulation-profile</b>	Creates a cable modulation profile.
	<b>cable upstream hop-priority</b>	Determines the order of the corrective actions to be taken when ingress noise exceeds the allowable value for an upstream.  <b>Note</b> This command is related to the <b>cable upstream threshold hysteresis</b> command only when using advanced dynamic modulation configuration, that is, when spectrum group is defined for the upstream channel.
	<b>cable upstream threshold</b>	Configures the upstream for the carrier-to-noise ratio (CNR) or signal-to-noise ratio (SNR) and forward error correction (FEC) threshold values to be used in determining the allowable noise levels.
	<b>cable upstream threshold rf-adapt</b>	Configures the upstream RF adaptation threshold value, which prevents excessive relocation of modems from the primary upstream channel to the secondary upstream channel.
	<b>show cable modulation-profile</b>	Displays the cable modulation profiles that have been created.

## cable upstream threshold rf-adapt

To configure the upstream RF adaptation threshold value, which prevents excessive relocation of modems from the primary upstream channel to the secondary, use the **cable upstream threshold rf-adapt** command in cable interface configuration mode. To use the default rf-adapt value, use the **no** form of this command.

**cable upstream** *port* **threshold rf-adapt** *threshold1-in-percent*

**no cable upstream** *port* **threshold rf-adapt**

Syntax Description		
	<i>port</i>	Upstream port number. The valid values start with 0 for the first upstream port on the cable interface line card and ends with a value that depends on the number of upstream ports supported by the cable interface line card.
	<i>threshold1-in-percent</i>	RF adaptation threshold value in percentage. The valid range is from 1 to 50. The value 0 indicates the RF adaptation threshold is bypassed. The default value is 10 percent.

**Command Default** The default value is 10 percent.

**Command Modes** Interface configuration (config-if)

Command History	Release	Modification
	12.2(33)SCF	This command was introduced.

**Usage Guidelines** The rf-adapt threshold represents a percentage of affected modems relative to the total modem population on a given upstream channel. If the rf-adapt threshold is bypassed, then it is ignored while determining if a downgrade candidate should be relocated. The rf-adapt threshold is applied only to the physical channel and is used to prevent relocation of modems that are downgrade candidates.

The rf-adapt value is used by the upstream RF adaptation application to prevent the relocation of more than *x*% of the total modem population on that upstream channel, during PHY layer impairment.

**Examples** The following example shows how to configure the rf-adapt threshold for cable modem upstream RF adaptation.

```
Router(config)# interface cable 8/0/0
Router(config-if)# cable upstream 0 threshold rf-adapt 25
```

Related Commands	Command	Description
	<b>cable rf-adapt timer</b>	Configures timers for RF adaptation.
	<b>cable upstream rf-adapt</b>	Enables RF adaptation on the physical upstream channel.
	<b>cable upstream rf-adapt (logical channel)</b>	Configures the primary upstream logical channel and secondary upstream logical channel.
	<b>cable upstream threshold</b>	Configures the upstream for the signal-to-noise ratio (SNR) and forward error correction (FEC) threshold values to be used in determining the allowable noise levels.
	<b>cable upstream threshold hysteresis</b>	Configures the hysteresis value to be used in conjunction with the dynamic modulation upgrade thresholds.
	<b>show cable modem rf-adapt</b>	Displays the RF adaptation history.
	<b>show cable rf-adapt</b>	Displays the downgrade and upgrade candidate lists.

# cable upstream timing-adjust

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

```
cable upstream n timing-adjust { continue sec | threshold sec }
```

```
no cable upstream n timing-adjust { continue sec | threshold sec }
```

## Syntax Description

<i>n</i>	Specifies the upstream port number. Valid values start with 0 for the first upstream port on the cable interface line card.
<b>continue</b> <i>sec</i>	Sets the minimum timing adjustment that sets <b>continue</b> ranging status in seconds. The range for <i>sec</i> is 2 to 64 seconds. Default value is 2 seconds.
<b>threshold</b> <i>sec</i>	Sets the timing adjustment threshold in seconds. Valid threshold value is 1 to 32 seconds. Default is 1 second.

## Command Default

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

## Command Modes

Interface configuration (cable interface only)

## Command History

Release	Modification
11.3 NA	This command was introduced.
12.0(12)SC	This command was supported on the 12.0 SC release.
12.1(3)T	This command was supported on the 12.1 T release.
12.1(3a)EC	This command was removed and no longer supported on the 12.1 EC and later releases (including those releases, such as 12.1 CX, that are based on the 12.1 EC train).

## 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 interface line 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 Cisco IOS Release 12.0(12)SC and Cisco IOS Release 12.1(3)T. It is deprecated and removed on Cisco IOS Release 12.1(3a)EC, 12.1(4)CX, and later releases.

---

**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 threshold value to the default of 12 seconds:

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

# cable upstream unfrag-slot-jitter

To control how much jitter can be tolerated on the corresponding upstream due to unfragmentable slots, use the **cable upstream unfrag-slot-jitter** command in cable interface configuration mode. To disallow all jitter, use the **no** form of this command.

```
cable upstream n unfrag-slot-jitter [limit jitter | cac-enforce]
```

```
no cable upstream n unfrag-slot-jitter [limit jitter | cac-enforce]
```

## Syntax Description

<i>n</i>	Specifies the upstream port number. Valid values start with 0 for the first upstream port on the cable interface line card.
<b>limit</b> <i>jitter</i>	Specifies the allowable jitter limit caused by unfragmentable slots, in microseconds (0 to 4,294,967,295).
<b>cac-enforce</b>	Rejects service flows requesting jitter less than the fragmentable slot jitter.

## Command Default

By default, the limit is 0 microseconds and the **cac-enforce** option is enabled.

## Command Modes

Interface configuration (cable interface only)

## Command History

Release	Modification
12.1(4)CX	This command was introduced.
12.2(4)BC1	Support was added to the Release 12.2 BC train.

## Usage Guidelines

This command controls how much jitter due to unfragmented slots is to be tolerated on each port. If the specified value for the tolerated limit is less than the size of a maximum unfragmentable slot, the MAC scheduler automatically blocks the slots in the scheduling table so that the unfragmentable slot can be accommodated in the blocked space and avoid causing excessive jitter to CBR slots.

The **cac-enforce** option enforces the rule that service flows requesting run-time jitter less than unfragmentable slot jitter should be rejected.

## Examples

The following example shows the jitter being set to 10 milliseconds (10,000 microseconds) for upstream port 0 on cable interface 2/0:

```
Router# configure terminal
Router(config)# interface c2/0
Router(config-if)# cable upstream 0 unfrag-slot-jitter limit 10000
Router(config-if)#
```

# cable util-interval

To set the load and utilization interval of upstream and downstream physical channels, use the **cable util-interval** command in global configuration mode. To remove the utilization interval, use the **no** form of this command.

**cable util-interval** *interval*

**no cable util-interval** *interval*

## Syntax Description

<i>interval</i>	Utilization interval for the upstream and downstream channels. The valid range is from 1 to 86400 seconds.
-----------------	--

## Command Default

The utilization interval is not set by default.

## Command Modes

Global configuration (config)

## Command History

Release	Modification
12.2(33)SCD2	This command was introduced.

## Usage Guidelines

The **cable util-interval** command configures the same value as the **docsIfCmtsChannelUtilizationInterval** and **ccwbRFChanUtilInterval** objects.

The unit of *interval* is seconds and it is not recommended to set a smaller value as it may cause frequent utilization calculation that will consume more resources on both, the PRE and cable line card.

A value between 60 to 300 seconds or greater is recommended.

## Examples

The following example shows how to set the utilization interval for the upstream and downstream channels:

```
Router# configure terminal
Router(config)# cable util-interval 22
Router(config)#
```

## Related Commands

Command	Description
<b>show running-config</b>	Displays the running configuration for each of the cable interfaces.

## cable vc-map

To map a cable modem to a particular permanent virtual connection (PVC) on an Asynchronous Transfer Mode (ATM) interface, use the **cable vc-map** command in global configuration mode. To remove this mapping, use the **no** form of this command.

**cable vc-map** *mac-address atm-interface vpi/vci* [*cust-name*]

**no cable vc-map** *mac-address*

**no cable vc-map customer** *cust-name*

Syntax Description		
<i>mac-address</i>	Specifies the hardware (MAC) address for the cable modem whose traffic is to be mapped.	
<i>atm-interface</i>	Specifies the outbound ATM interface to which this cable modem should be mapped.	
<i>vpi/vci</i>	Specifies the virtual path identifier (VPI) and virtual channel identifier (VCI) on the ATM interface to which this cable modem should be mapped.	
<i>cust-name</i>	(Optional) Identifies the customer for this PVC. The <i>cust-name</i> can be any arbitrary alphanumeric string, up to 127 characters long.	
<b>customer</b> <i>cust-name</i>	(Optional) Deletes all PVCs belong to this customer. The <i>cust-name</i> can be any arbitrary alphanumeric string, up to 127 characters long.	

**Command Default** No default behavior or values

**Command Modes** Global configuration

Command History	Release	Modification
	12.2(11)BC3	This command was introduced for Cisco uBR7100 series and Cisco uBR7246VXR universal broadband routers.
	12.2(15)BC2	Support for the <b>customer</b> option was added.

**Usage Guidelines** This command maps a cable modem, on the basis of its hardware (MAC) address, to a particular PVC on an ATM interface.



**Note**

To use this command, you must first enable the use of Layer 2 tunnels, using the **cable l2-vcn-service atm-vc** command. Then use the **cable vc-map** command to enable the mapping of individual cable modems to specific PVCs.

**Examples**

The following example shows how to enable the use of Layer 2 tunnels and then map specific CMs to specific PVCS:

```
Router# config terminal
Router(config)# cable l2-vpn-service atm-vc
Router(config)# cable vc-map 0007.0e03.69f9 ATM2/0 1/1
Router(config)# cable vc-map 0010.7bed.9c95 ATM2/0 1/2
Router(config)# exit
Router#
```

The following example shows the same configuration as above, but with the addition of a customer name that identifies the customer that is using each particular PVC:

```
Router# config terminal
Router(config)# cable l2-vpn-service atm-vc
Router(config)# cable vc-map 0007.0e03.69f9 ATM2/0 1/1 ENTERPRISE-CO1
Router(config)# cable vc-map 0010.7bed.9c95 ATM2/0 1/2 ENTERPRISE-CO2
Router(config)# exit
Router#
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>cable l2-vpn-service atm-vc</b>	Enables the use of Layer 2 tunnels for the Customer Premises Equipment (CPE) traffic that is behind cable modems, so that individual CPE traffic can be routed to a particular PVC on an ATM interface.
<b>debug cable l2-vpn</b>	Displays debugging messages for the Layer 2 mapping of cable modems to a particular PVC on an ATM interface.
<b>show cable l2-vpn vc-map</b>	Displays the mapping of one or all cable modems to PVCs on the ATM interfaces.

# cable vrf-steering cable-modem

To steer or direct the cable modems to the first sub-bundle interface that is configured to use the virtual routing and forwarding (VRF) instance, use the **cable vrf-steering cable-modem** command in the cable subinterface configuration mode. To disable this feature, use the **no** form of this command.

**cable vrf-steering cable-modem** *vrf-name*

**no cable vrf-steering cable-modem** *vrf-name*

## Syntax Description

<i>vrf-name</i>	VRF instance name.
-----------------	--------------------

## Command Default

Configure a sub-bundle using the **ip vrf forwarding** command first to enable this command.

## Command Modes

Subinterface configuration (config-if)

## Command History

Release	Modification
12.2(33)SCF	This command was introduced.

## Examples

The following example shows how to direct the cable modems to the specified VRF:



### Note

Create an ACL and route-map to steer the CPEs from the CM interface to the global interface before you steer the CM to the first sub-bundle interface. Use the **ip access-list extended** *access-list name* and **route-map** *route map name* **permit** commands to create an ACL and route-map respectively on the Cisco uBR10012 routers. Use **ip policy route-map** *route map name* command to attach the route-map to the CM's subbundle interface.

```
Router(config-if)#cable vrf-steering cable-modem vrf-a
```

## Related Commands

Command	Description
<b>cable source-route</b>	Configures the VRF source route on the cable modem's subinterface configuration mode.
<b>ip vrf</b>	Defines a VRF instance and enters the interface configuration mode.
<b>show ip arp vrf</b>	Displays which VRF contains a specific cable modem in the ARP table.

# cable wideband auto-reset

To enable wideband auto-reset mode on the CMTS, use the **cable wideband auto-reset** command in global configuration mode. To disable wideband auto-reset mode, use the **no** form of this command.

**cable wideband auto-reset**

**no cable wideband auto-reset**

**Syntax Description** This command has no keywords or arguments.

**Command Default** Wideband auto-reset mode is disabled.

**Command Modes** Global configuration (config)

## Command History

Release	Modification
12.3(21)BC	This command was introduced for the uBR10012 router.
12.3(23)BC	This command was updated.
12.2(33)SCA	This command was integrated into Cisco IOS release 12.2(33)SCA.

## Usage Guidelines

Use this command to enable wideband auto-reset mode on the CMTS. If wideband auto-reset mode is enabled, wideband cable modems registered on a cable interface as traditional DOCSIS modems (DOCSIS 1.x/2.0 modems) are auto-reset when the cable interface becomes wideband-capable. When a wideband cable modem auto-resets, it deregisters on the CMTS as a traditional DOCSIS cable modem and immediately attempts to re-register as a wideband cable modem.

A cable interface is considered wideband-capable when at least one fully configured and operational wideband channel has been associated with the interface's traditional DOCSIS (narrowband) channel.

For a fully configured wideband CMTS, wideband cable modems may register as traditional DOCSIS modems for a variety of reasons, such as cable interface line card boot order or line card online insertion and removal (OIR). Rather than defer wideband cable modem registration, wideband cable modems are permitted to register as traditional DOCSIS modems.

If a wideband-capable modem registers as a traditional DOCSIS modem, it registers on a primary downstream channel that has been assigned with the **downstream cable** command to the modem's fiber node if the fiber node is configured. If the modem's fiber node is not configured, the wideband-capable modem can register on any downstream channel that is visible to it (as a traditional cable modem does).



### Note

In Cisco IOS Release 12.3(21)BC, the primary downstream channel is a traditional DOCSIS downstream channel for the fiber node. Beginning in Cisco IOS Release 12.3(23)BC, either an RF channel from the SPA or a Cisco uBR10-MC5X20 downstream channel serves as a primary channel in a fiber node. Beginning in Cisco IOS Release 12.3(23)BC if the primary downstream channel for this fiber node is assigned from a SPA downstream, then the **downstream cable** command is not required.

When and if a cable interface becomes wideband capable, wideband cable modems that have registered as traditional DOCSIS modems are reset for CMTS routers with wideband auto-reset mode enabled. These modems are only reset when the interface first becomes wideband-capable and are not reset again if they subsequently fail to register as wideband cable modems.

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**Examples**

The following example shows how to enable wideband auto-reset mode:

```
Router# configure terminal  
Router(config)# cable wideband auto-reset
```

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**Related Commands**

Command	Description
<b>cable bundle</b>	Configures a cable interface to belong to a virtual bundle interface.
<b>downstream cable</b>	Assigns a primary downstream channel for a fiber node.

