



Configuring the Cisco Wideband SPA

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Specifying the Location for the Cisco Wideband SPA

For information on specifying the location of a Cisco Wideband SPA, see the [Identifying the Location of the Cisco Wideband SIP and Cisco Wideband SPA](#) section.

Specifying Narrowband Channels

A modular-cable interface is a narrowband interface associated with one downstream RF channel of the SPA. The same RF channel may be associated with an entirely independent bonding group, and the RF channel could be sharing RF bandwidth with this bonding group.

At the Cisco IOS command line, the **interface modular-cable** command is used to specify a narrowband channel.

Modular cable interfaces are similar to the downstream portion of cable interfaces and are displayed in the output of commands such as **show ip interface**, **show interfaces**, **show interface modular-cable**, and **show running-config**.

The following is sample output for the **show interface** command for a modular-cable interface:

```
Router# show interfaces

Modular-Cable 1/0/0:1 is up, line protocol is up
  Hardware is CMTS MC interface, address is 0011.9221.84be (bia 0011.9221.84be)
  MTU 1500 bytes, BW 539 Kbit, DLY 1000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation MCNS, loopback not set
  Keepalive set (10 sec)
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input never, output 1w3d, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    0 packets input, 0 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    40 packets output, 9968 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 output buffer failures, 0 output buffers swapped out
...
```



Note

When a SPA is inserted, 24 modular-cable interfaces are created for that SPA. These interfaces are hidden until they are configured and will not be displayed in the output of commands such as **show ip interface**, **show interfaces**, **show interface modular-cable**, and **show running-config**. See the [Hardware Status and Line Protocol Status for a Wideband-Channel and Modular-Cable Interface](#) section for information on the conditions when the line protocol is up for modular-cable interfaces.

Specifying Wideband Channels

At the Cisco IOS command line, the **interface wideband-cable** command is used to specify a wideband channel.

Wideband channels are similar to cable interfaces and are displayed in the output of commands such as **show ip interface**, **show interfaces**, and **show interface wideband-cable**. For example:

```
Router# show interfaces
...
Wideband-Cable1/0/0:0 is up, line protocol is up
  Hardware is Wideband CMTS Cable interface, address is 0012.001a.8896 (bia
0012.001a.8896)
  MTU 1500 bytes, BW 74730 Kbit, def 74730 Kbit DLY 1000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation MCNS, loopback not set
  Keepalive set (10 sec)
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input never, output 00:00:09, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  30 second input rate 0 bits/sec, 0 packets/sec
  30 second output rate 0 bits/sec, 0 packets/sec
    0 packets input, 0 bytes, 0 no buffer
    Received 0 broadcasts, 0 runs, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    17033 packets output, 1765690 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 output buffer failures, 0 output buffers swapped out
...
```

Hardware Status and Line Protocol Status for a Wideband-Channel and Modular-Cable Interface

When Cisco IOS commands that display the hardware status and line protocol status for a cable interface such as the **show interface wideband-cable** command displays a wideband-channel cable interface or the **show interface modular-cable** command displays a modular cable interface, the following applies:

- The hardware status for the cable interfaces will be up if a SPA is installed in a SIP and both the SIP and SPA are powered on.
- The line protocol for wideband-channel cable interfaces will be up under the following conditions:
 - The interface must be administratively up.
 - The interface must be associated with at least one RF channel.
 - The Gigabit Ethernet port of the SPA must be connected.
 - The RF channel frequency must be set for the RF channel.
 - MAC address of the next-hop interface or edge QAM device must be set for the RF channel.
 - IP address of the edge QAM device must be set for the RF channel.
 - UDP port number or DEPI remote session ID for the QAM device that is used for the RF channel must be set.

If the line protocol for a wideband-channel cable interface is up, all wideband-channel configuration information needed to successfully send data is present. However, additional configuration information may be needed to complete the Cisco Wideband SPA configuration process. See the [Configuring the Cisco Wideband SPA](#) chapter for configuration procedures.

The line protocol for modular-cable interfaces will be up under the following conditions:

- The interface must be administratively up.
- The upstream channels from the Cisco uBR10-MC5X20 cable interface line card must be associated with the modular-cable interface downstream channels in a given cable MAC domain.
- The total bandwidth allocated for the interface must be greater than or equal to 1 percent.
- The modular host must be configured on the modular cable controller for the corresponding SPA.
- If the modular-cable interface is a primary-capable channel, the DEPI remote ID must be configured for this channel. The UDP port number must not be configured in this case.



Note

RF channels that are non-primary-capable and used in a wideband interface can use either a DEPI remote ID or a UDP port number and the line protocol and status of this interface is always down.

- The following parameters must be set for the RF channel:
 - RF channel frequency
 - MAC address of the next-hop interface or edge QAM device
 - IP address of the edge QAM device
 - UDP port number or DEPI remote ID for the QAM device that is used for the RF channel
 - The Gigabit Ethernet port of the SPA must be connected.

Preprovisioning of the Cisco Wideband SPA and a SIP

Preprovisioning is an optional configuration task for the Cisco Wideband SPA on a SIP. Preprovisioning on the Cisco uBR10012 router allows you to configure the SIP and Cisco Wideband SPA without their physical presence.

For information on preprovisioning the Cisco Wideband SPA and a SIP, see the [Optional Configuration Tasks](#) section.

Entering Controller Configuration Mode for the Cisco Wideband SPA

The Cisco Wideband SPA is represented in the Cisco IOS software as a controller. You enable controller configuration by preprovisioning the Cisco Wideband SPA using the **card** command or by physically inserting the Cisco Wideband SPA in the SIP.

Following is an example of the **card** command:

```
card 1/0 2jacket-1
card 1/0/0 24rfchannel-spa-1
```


Note

This example shows the syntax supported prior to Cisco IOS Release 12.2(33)SCB.

To enter controller configuration mode for the Cisco Wideband SPA, use the **controller modular-cable** command. Most Cisco Wideband SPA configuration tasks are performed in controller configuration mode.

Setting General Configuration Values for the Cisco Wideband SPA

Some Cisco Wideband SPA configuration items affect all RF channels on the SPA. These general Cisco Wideband SPA configuration values are set in controller configuration mode as follows:


Note

In Cisco IOS Release 12.3(21)BC, annex and modulation parameters were set globally for each SPA. For Cisco IOS Releases 12.3(23)BC and 12.2(33)SCB, annex and modulation parameters are set for each RF channel.

- Use the **ip-address** command to set the IP address of the Cisco Wideband SPA FPGA. The IP address that is assigned to the Cisco Wideband SPA controller with the **ip-address** command is used as the source IP address for packets that are transmitted by the SPA.
- Use the **modular-host** command to specify the modular-host Cisco uBR10-MC5X20 line card that will be used for DOCSIS 3.0 Downstream Channel Bonding. The Cisco Wideband SPA itself does not support DOCSIS 3.0 Downstream Channel Bonding operations.


Note

A maximum of three SPA controllers can be hosted on a single cable interface line card. For more information on the **modular-host** command, see the [Cisco IOS CMTS Cable Command Reference](#).

To set these general Cisco Wideband SPA configuration values, complete the following steps:

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. Enter your password if prompted.

	Command or Action	Purpose
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	Use the appropriate command based on the Cisco IOS Release in use: <ul style="list-style-type: none"> • Cisco IOS Releases 12.3(23)BC and 12.2(33)SCA—controller modular-cable slot/subslot/bay • Cisco IOS Release 12.2(33)SCB—controller modular-cable slot/bay/port Example: Router(config)# controller modular-cable 1/0/1	Enters controller configuration mode to configure the SPA controller. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. • <i>subslot</i>—Specifies the subslot where the Cisco Wideband SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. • <i>bay</i>—Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). • <i>port</i>—Specifies the interface number on the SPA.
Step 4	ip-address ip-address Example: Router(config-controller)# ip-address 192.168.200.31	Sets the IP address of the Cisco Wideband SPA FPGA.
Step 5	modular-host subslot slot/subslot Example: Router(config-controller)# modular-host subslot 7/0	Specifies the modular-host line card that will be used for DOCSIS 3.0 Downstream Channel Bonding. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the line card resides. The valid values are 5 to 8. • <i>subslot</i>—Specifies the subslot for the line card. The valid values are 0 and 1.
Step 6	end Example: Router# end	Returns to privileged EXEC mode.

What to Do Next

Troubleshooting Tips

**Note**

Any line card in the chassis can be used as a guardian card, even if the line card is not configured. Do not remove the guardian card from the chassis when the active line card's cable interfaces is configured.

It is recommended to use the line card that is associated with the SPA where its cable interfaces are configured

The following example shows the line card can be used as a guardian card:

```
Router# interface Cable6/0/0
Router# downstream Modular-Cable 1/0/0 rf-channel 6-13
Router# controller Modular-Cable 1/0/0
Router(config-controller)# ip-address 192.168.200.31
Router(config-controller)# modular-host subslot 5/0
```

The following example shows the recommended configuration:

```
Router# interface Cable6/0/0
Router# downstream Modular-Cable 1/0/0 rf-channel 6-13
Router# controller Modular-Cable 1/0/0
Router(config-controller)# ip-address 192.168.200.31
Router(config-controller)# modular-host subslot 6/0
```

Configuring RF Channels for Narrowband

This section describes how to configure the RF channels for narrowband capability. Use the RF channel commands to configure the RF channel characteristics . For each RF channel, you must specify these configuration items:

- Narrowband channel that is associated with the RF channel
- Frequency
- Annex
- Modulation
- Interleave-depth
- IP address
- MAC address
- UDP port or DEPI remote ID

In addition to these required configuration items, each RF channel can have a description, though it is optional.

**Note**

Be certain to verify that the RF channel values set with `rf-channel` match the values configured on the the edge QAM device. Frequency, IP address, MAC address, and UDP port and DEPI remote ID must match what is configured on the edge QAM device. If any of these values are incorrect, the Cisco Wideband SPA will not successfully communicate with the edge QAM device.

By default, Cisco IOS software assigns a unique downstream channel ID to the RF channel. Use the **`rf-channel cable downstream channel-id`** command if you need to change the assigned RF channel ID.

**Note**

Each RF channel on the Cisco Wideband SPA can be mapped to a specific QAM port on an edge QAM device. Traffic from different Cisco Wideband SPAs cannot be mixed on the same QAM port.

To configure an RF channel for narrowband, complete the following steps:

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	Use the appropriate command based on the Cisco IOS Release in use: <ul style="list-style-type: none"> • Cisco IOS Releases 12.3(23)BC and 12.2(33)SCA—controller modular-cable slot/subslot/bay • Cisco IOS Release 12.2(33)SCB—controller modular-cable slot/bay/port Example: Router(config)# controller modular-cable 1/0/1	Enters controller configuration mode to configure the SPA controller. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. • <i>subslot</i>—Specifies the subslot where the Cisco Wideband SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. • <i>bay</i>—Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). • <i>port</i>—Specifies the interface number on the SPA.
Step 4	rf-channel rf-port frequency freq [annex {A B} modulation {64 256} [interleave-depth {8 12 16 32 64 128}]] Example: Router(config-controller)# rf-channel 1 frequency 699000000	Sets the frequency, annex, modulation, and interleave-depth of the RF channel. <ul style="list-style-type: none"> • <i>rf-port</i>—Specifies the RF channel physical port on the Wideband SPA FPGA. Allowed range is 0 to 23. Valid values for <i>rf-port</i> depend on the configuration set with the annex modulation command. • <i>freq</i>—Sets the center frequency for the RF channel. Allowed range is 55000000 to 1050000000 MHz. • annex {A B} (Optional)—Specifies the MPEG framing format for each RF channel: <ul style="list-style-type: none"> ◦ A—Annex A. The downstream is compatible with the European MPEG framing format specified in ITU-TJ.83 Annex A.

	Command or Action	Purpose
		<ul style="list-style-type: none"> ◦ B—Annex B. The downstream is compatible with the North American MPEG framing format specified in ITU-TJ.83 Annex B. • modulation {64 256}(Optional)—Specifies the modulation rate for each RF channel: • interleave-depth {8 12 16 32 64 128}(Optional)—Indicates the downstream interleave depth. The default value is 32.
Step 5	rf-channel <i>rf-port</i> ip-address <i>ip-address</i> mac-address <i>mac-address</i> { udp-port <i>portnum</i> depi-remote-id <i>session-id</i> } Example: Router(config-controller) # rf-channel 1 ip-address 192.168.200.30 mac-address 0011.920e.a9ff udp-port 49152	Specifies the following: <ul style="list-style-type: none"> • <i>rf-port</i>—Specifies the RF channel physical port on the Wideband SPA FPGA. Allowed range is 0 to 23. Valid values for <i>rf-port</i> depend on the configuration set with the annex modulation command. • <i>ip-address</i>—Specifies the IP address of the Gigabit Ethernet interface on the edge QAM device for this RF channel. • <i>mac-address</i>—Specifies the MAC address of the next-hop interface or of the edge QAM device for this RF channel. • <i>portnum</i>—(Optional) Specifies the UDP port number for the edge QAM device that will be used for this RF channel. Allowed range is 0 to 65535. • <i>session-id</i>—(Optional) Specifies the DEPI remote session ID to be used for encapsulation of frames in DOCSIS-MPT mode. <p>Note Primary-capable modular cable interfaces must use the DEPI remote ID. Non-primary-capable modular cable interfaces can use either a UDP port number or a DEPI remote ID.</p>
Step 6	rf-channel <i>rf-port</i> description <i>description</i> Example: Router(config-controller) # rf-channel 1 description Used for WB channel 0	Specifies the following: <ul style="list-style-type: none"> • <i>rf-port</i>—Specifies the RF channel physical port on the Wideband SPA FPGA. The valid range is from 0 to 23. Valid values for <i>rf-port</i> depend on the configuration set with the annex modulation command. • <i>description</i>—(Optional) Specifies a description for the RF channel.
Step 7	rf-channel <i>rf-port</i> cable downstream channel-id <i>channel-id</i> Example: Router(config-controller) # rf-channel 1 cable downstream channel-id 121	(Optional) Assigns a downstream channel ID to the RF channel. Cisco IOS software automatically assigns a unique downstream channel ID to the RF channel.

	Command or Action	Purpose
Step 8	exit Example: Router# exit	Returns to global configuration mode.
Step 9	Use the appropriate command based on the Cisco IOS Release in use: <ul style="list-style-type: none"> • Cisco IOS Releases 12.3(23)BC and 12.2(33)SCA—interface modular-cable slot/subslot/bay:nb-channel • Cisco IOS Release 12.2(33)SCB—interface modular-cable slot/bay/port:nb-channel Example: Router(config)# interface modular-cable 1/0/1:5	Enters interface configuration mode for a narrowband channel on the SPA. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. • <i>subslot</i>—Specifies the subslot where the Cisco Wideband SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. • <i>bay</i>—Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). • <i>port</i>—Specifies the interface number on the SPA.
Step 10	cable rf-bandwidth-percent percent_value Example: Router(config-if)# cable rf-bandwidth-percent 50	Specifies the bandwidth percent allocated for this interface.
Step 11	exit Example: Router# exit	Returns to global configuration mode.

RF Channel Bandwidth Allocation for Modular-Cable and Wideband-Cable Interfaces

During RF channel configuration, the bandwidth from each RF channel is statically partitioned between the modular-cable and wideband-cable interfaces.

Bandwidth Allocation for Modular-Cable Interfaces

Use the **cable rf-bandwidth-percent** command to allocate RF channel bandwidth to a modular-cable interface. If the RF channel is primary-capable, the total allocated percentage of the RF channel, including both, modular-cable interface and the wideband interfaces must not exceed 96 percent. The extra 4 percent of RF channel bandwidth is reserved for MAP and other MAC management messages traffic using this RF channel as its primary-capable downstream channel.

The default bandwidth percentage for a modular cable interface is set to zero. If the bandwidth is not allocated, then the RF channel cannot be used as a primary-capable channel and 100 percent of this RF channel bandwidth can be used for wideband interfaces.

Bandwidth Allocation for Wideband-Cable Interfaces

The total bandwidth allocation can be 100 percent if the RF channel is configured only for wideband interfaces.

The table below is an example to show that a single RF channel can be associated with multiple wideband channels as long as the total allocated bandwidth for the RF channel does not exceed 100 percent.

Table 1: Bandwidth Allocation for a Non-Primary-Capable RF Channel

RF Channel	Wideband Channel	Bandwidth Allocated
10	0	30 percent
10	1	30 percent
10	2	40 percent
Total Bandwidth Percent: 100 percent		

The table below is an example to show that a primary-capable RF channel can be associated with multiple narrowband and multiple wideband channels as long as the total allocated bandwidth for the RF channel does not exceed 96 percent. The extra 4 percent is used for MAP and MAC management traffic.

Table 2: Bandwidth Allocation for a Primary-Capable RF Channel

Narrowband Channel 10	Wideband Channel 0	Wideband Channel 1	Wideband Channel 2	Total Bandwidth Percent
35 percent	20 percent	25 percent	16 percent (4 percent is reserved for MMM)	96 percent

Configuring Modular-Cable Interfaces

Use the **interface modular-cable** command to enter the interface configuration mode for narrowband channels. From this mode, you can allocate bandwidth percentage to the narrowband interface.

Use the **cable rf-bandwidth-percent** command to assign bandwidth percentage to a modular-cable interface.

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable	Enables privileged EXEC mode.

	Command or Action	Purpose
	Example: Router> enable	Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	Use the appropriate command based on the Cisco IOS Release in use: <ul style="list-style-type: none"> • Cisco IOS Releases 12.3(23)BC and 12.2(33)SCA—interface modular-cable slot/subslot/bay:nb-channel • Cisco IOS Release 12.2(33)SCB—interface modular-cable slot/bay/port:nb-channel Example: Router(config)# interface modular-cable 1/0/1:5	Enters interface configuration mode for a narrowband channel on the SPA. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. • <i>subslot</i>—Specifies the subslot where the Cisco Wideband SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. • <i>bay</i>—Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). • <i>port</i>—Specifies the interface number on the SPA.
Step 4	cable rf-bandwidth-percent percent_value Example: Router(config-if)# cable rf-bandwidth-percent 50	Specifies the bandwidth percent allocated for this interface.
Step 5	exit Example: Router# exit	Returns to global configuration mode.

Configuring Fiber Nodes for Narrowband

Fiber node configuration is used mainly to configure a wideband channel. Configuring fiber nodes for narrowband is optional. Use the **cable fiber-node** command to configure the fiber nodes.

Configuring RF Channels for Wideband

A wideband channel is a logical grouping of one or more physical RF channels. By aggregating or “channel bonding” multiple RF channels, the wideband channel is capable of greater bandwidth capacity for downstream traffic than a single RF channel.

The number of RF channels that can be aggregated into a wideband channel is determined by the capability of the wideband cable modem.

- The Linksys WCM300-NA (WCM300-EURO for EuroDOCSIS and WCM300-JP for Japanese DOCSIS) wideband cable modem can receive a wideband channel consisting of up to eight downstream RF channels at 6 MHz per channel, or up to six downstream RF channels at 8 MHz per channel. The modem requires that the channels be received in a 50-MHz capture window.
- The Scientific Atlanta DPC2505 (EPC2505 for EuroDOCSIS) wideband cable modem can receive a wideband channel consisting of up to three downstream RF channels at either 6 MHz per channel or 8 MHz per channel.

- 1 Use the RF channel commands to configure RF channel characteristics. See the [Configuring RF Channels for Narrowband](#) section for information on RF channel configuration.
- 2 Use the `cable rf-channel` command to associate an RF channel with a wideband channel.

Optionally, you can use the command to assign a percent of the RF channel's bandwidth to the wideband channel. You can allocate some or all of an RF channel's bandwidth to a wideband channel. As long as an RF channel's total allocated bandwidth does not exceed 100 percent, an RF channel can be associated with multiple wideband channels on the same Cisco Wideband SPA.

To configure an RF channel for wideband, complete the following steps:

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	Use the appropriate command based on the Cisco IOS Release in use: <ul style="list-style-type: none"> • Cisco IOS Releases 12.3(23)BC and 12.2(33)SCA—controller modular-cable slot/subslot/bay • Cisco IOS Release 12.2(33)SCB—controller modular-cable slot/bay/port Example: Router(config)# controller modular-cable 1/0/1	Enters controller configuration mode to configure the SPA controller. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. • <i>subslot</i>—Specifies the subslot where the Cisco Wideband SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. • <i>bay</i>—Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). • <i>port</i>—Specifies the interface number on the SPA.

	Command or Action	Purpose
Step 4	<p>rf-channel <i>rf-port</i> frequency <i>freq</i> [annex {A B} modulation {64 256} [interleave-depth {8 12 16 32 64 128}]]</p> <p>Example: Router(config-controller)# rf-channel 1 frequency 699000000</p>	<p>Sets the frequency, annex, modulation, and interleave-depth of the RF channel.</p> <ul style="list-style-type: none"> • <i>rf-port</i>—Specifies the RF channel physical port on the Wideband SPA FPGA. Allowed range is 0 to 23. Valid values for <i>rf-port</i> depend on the configuration set with the annex modulation command. • <i>freq</i>—Sets the center frequency for the RF channel. Allowed range is 55000000 to 1050000000 MHz. • annex {A B} (Optional)—Specifies the MPEG framing format for each RF channel: <ul style="list-style-type: none"> ◦ A—Annex A. The downstream is compatible with the European MPEG framing format specified in ITU-TJ.83 Annex A. ◦ B—Annex B. The downstream is compatible with the North American MPEG framing format specified in ITU-TJ.83 Annex B. • modulation {64 256} (Optional)—Specifies the modulation rate for each RF channel: • interleave-depth {8 12 16 32 64 128} (Optional)—Indicates the downstream interleave depth. The default value is 32.
Step 5	<p>rf-channel <i>rf-port</i> ip-address <i>ip-address</i> mac-address <i>mac-address</i> {udp-port <i>portnum</i> depi-remote-id <i>session-id</i>}</p> <p>Example: Router(config-controller)# rf-channel 1 ip-address 192.168.200.30 mac-address 0011.920e.a9ff udp-port 49152</p>	<p>Specifies the following:</p> <ul style="list-style-type: none"> • <i>rf-port</i>—Specifies the RF channel physical port on the Wideband SPA FPGA. Allowed range is 0 to 23. Valid values for <i>rf-port</i> depend on the configuration set with the annex modulation command. • <i>ip-address</i>—Specifies the IP address of the Gigabit Ethernet interface on the edge QAM device for this RF channel. • <i>mac-address</i>—Specifies the MAC address of the next-hop interface or of the edge QAM device for this RF channel. • <i>portnum</i>—(Optional) Specifies the UDP port number for the edge QAM device that will be used for this RF channel. Allowed range is 0 to 65535. • <i>session-id</i>—(Optional) Specifies the DEPI remote session ID to be used for encapsulation of frames in DOCSIS-MPT mode. <p>Note Primary-capable modular cable interfaces must use the DEPI remote ID. Non-primary-capable modular cable interfaces can use either a UDP port number or a DEPI remote ID.</p>
Step 6	rf-channel <i>rf-port</i> description <i>description</i>	Specifies the following:

	Command or Action	Purpose
	Example: <pre>Router(config-controller)# rf-channel 1 description Used for WB channel 0</pre>	<ul style="list-style-type: none"> • <i>rf-port</i>—Specifies the RF channel physical port on the Wideband SPA FPGA. The valid range is from 0 to 23. Valid values for <i>rf-port</i> depend on the configuration set with the annex modulation command. • <i>description</i>—(Optional) Specifies a description for the RF channel.
Step 7	rf-channel rf-port cable downstream channel-id channel-id Example: <pre>Router(config-controller)# rf-channel 1 cable downstream channel-id 121</pre>	(Optional) Assigns a downstream channel ID to the RF channel. Cisco IOS software automatically assigns a unique downstream channel ID to the RF channel.
Step 8	exit Example: <pre>Router# exit</pre>	Returns to global configuration mode.
Step 9	Use the appropriate command based on the Cisco IOS Release in use: <ul style="list-style-type: none"> • Cisco IOS Releases 12.3(23)BC and 12.2(33)SCA—interface modular-cable slot/subslot/bay:nb-channel • Cisco IOS Release 12.2(33)SCB—interface modular-cable slot/bay/port:nb-channel Example: <pre>Router(config)# interface modular-cable 1/0/1:5</pre>	Enters interface configuration mode for a narrowband channel on the SPA. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. • <i>subslot</i>—Specifies the subslot where the Cisco Wideband SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. • <i>bay</i>—Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). • <i>port</i>—Specifies the interface number on the SPA.
Step 10	cable rf-bandwidth-percent percent_value Example: <pre>Router(config-if)# cable rf-bandwidth-percent 50</pre>	Specifies the bandwidth percent allocated for this interface.
Step 11	exit Example: <pre>Router# exit</pre>	Returns to global configuration mode.

Configuring Wideband-Channel Cable Interfaces

Use the **interface wideband-cable** command to enter the interface configuration mode for wideband channel.

From this mode, you can specify bandwidth percent for each cable RF channel that is added to the wideband interface. Each wideband-cable interface is a representation of a bonding group and allows you to create up to 32 bonding group IDs for each SPA. The Cisco IOS software automatically assigns a bonding group ID to each wideband-channel cable interface by default.

- Use the **cable bonding-group-id** command to configure bonding group IDs for wideband-cable interfaces.
- Use the **cable bundle** command to add the modular-cable interface to the cable bundle.
- Use the **cable rf-channel bandwidth-percent** command to associate RF channels with a wideband channel and to assign a percent of the RF channel's bandwidth to the wideband channel.

To configure a wideband-cable interface, complete the following steps:

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	Use the appropriate command based on the Cisco IOS Release in use: <ul style="list-style-type: none"> • Cisco IOS Releases 12.3(23)BC and 12.2(33)SCA—interface wideband-cable slot/subslot/bay:wb-channel • Cisco IOS Release 12.2(33)SCB—interface modular-cable slot/bay/port:wb-channel Example: Router(config)# interface modular-cable 1/0/1:5	Enters interface configuration mode for a wideband channel on the SPA. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. • <i>subslot</i>—Specifies the subslot where the Cisco Wideband SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. • <i>bay</i>—Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). • <i>port</i>—Specifies the interface number on the SPA.
Step 4	cable bundle n Example: Router(config-if)# cable bundle 1	Adds the modular cable interface to the cable bundle.
Step 5	cable rf-channel n bandwidth-percent percent_value Example: Router(config-if)# cable rf-channel 0 bandwidth-percent 50	Adds the RF channel to this wideband interface and specifies the RF channel bandwidth allocated for this channel. Note If you do not specify a bandwidth percent value, 100 percent of the RF channel bandwidth is allocated to the RF channel.

	Command or Action	Purpose
Step 6	cable bonding-group-id <i>n</i> Example: Router(config-if) # cable bonding-group-id 1	Assigns a bonding group ID to this wideband cable interface.
Step 7	exit Example: Router# exit	Returns to global configuration mode.

Configuring a Virtual Bundle

To configure two wideband cable interfaces and a CGD host interface as members of a the same virtual bundle, complete the following steps:

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	interface bundle <i>n</i> Example: Router(config) # interface bundle 1	Enters interface configuration mode so that a virtual bundle can be defined.
Step 4	ip address <i>address mask</i> Example: Router(config-if) # ip address 172.25.1.1 255.255.255.0	Configures an IP address and subnet mask for the virtual bundle.
Step 5	ip pim sparse-mode Example: Router(config-if) # ip pim sparse-mode	(Optional) For multicast, enables sparse mode protocol-independent multicast (PIM) for the virtual bundle.

	Command or Action	Purpose
Step 6	cable helper-address <i>address</i> Example: Router(config-if)# cable helper-address 10.0.0.0	(Optional) For the virtual bundle, specifies an IP address for an external Dynamic Host Configuration Protocol (DHCP) server.
Step 7	exit Example: Router# exit	Returns to global configuration mode.
Step 8	Use the appropriate command based on the Cisco IOS Release in use: <ul style="list-style-type: none"> • Cisco IOS Releases 12.3(23)BC and 12.2(33)SCA—interface wideband-cable <i>slot/subslot/bay:wb-channel</i> • Cisco IOS Release 12.2(33)SCB—interface modular-cable <i>slot/bay/port:wb-channel</i> Example: Router(config)# interface modular-cable 1/0/1:5	Enters interface configuration mode for a wideband channel on the SPA. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. • <i>subslot</i>—Specifies the subslot where the Cisco Wideband SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. • <i>bay</i>—Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). • <i>port</i>—Specifies the interface number on the SPA.
Step 9	cable bundle <i>n</i> Example: Router(config-if)# cable bundle 1	Adds the modular cable interface to the cable bundle.
Step 10	cable rf-channel <i>n</i> bandwidth-percent <i>percent_value</i> Example: Router(config-if)# cable rf-channel 0 bandwidth-percent 50	Adds the RF channel to this wideband interface and specifies the RF channel bandwidth allocated for this channel. Note If you do not specify a bandwidth percent value, 100 percent of the RF channel bandwidth is allocated to the RF channel.
Step 11	cable bonding-group-id <i>n</i> Example: Router(config-if)# cable bonding-group-id 1	Assigns a bonding group ID to this wideband cable interface.
Step 12	exit Example: Router# exit	Returns to global configuration mode.
Step 13	interface cable <i>slot/subslot/port</i> Example: Router(config)# interface cable 6/0/1	Enters interface configuration mode for the Channel Grouping Domain host line card. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the chassis slot number of the cable interface line card.

	Command or Action	Purpose
		<ul style="list-style-type: none"> • <i>subslot</i>—(Cisco uBR10012 only) Specifies the secondary slot number of the cable interface line card. Valid subslots are 0 or 1. • <i>port</i>—Specifies the downstream port number. Valid values for these arguments are dependent on your CMTS router and cable interface line card. See the hardware documentation for your router chassis and cable interface line card for supported slot and port numbering.
Step 14	cable bundle <i>n</i> Example: Router(config-if)# cable bundle 1	Adds the modular cable interface to the cable bundle.
Step 15	Use the appropriate command based on the Cisco IOS Release in use: <ul style="list-style-type: none"> • Cisco IOS Releases 12.3(23)BC and 12.2(33)SCA—downstream modular-cable slot/subslot/bay rf-channel rf channels [upstream grouplist] • Cisco IOS Release 12.2(33)SCB—downstream modular-cable slot/bay/port rf-channel rf channels [upstream grouplist] Example: Router(config-if)# downstream modular-cable 1/0/0 rf-channel 0 upstream 1	Specifies primary-capable channels from the SPA that are associated with the upstream channels from the host line card. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. • <i>subslot</i>—Specifies the subslot where the Cisco Wideband SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. • <i>bay</i>—Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). • <i>port</i>—Specifies the interface number on the SPA. • rf-channel rf channels—Range of RF channel physical ports on the SPA FPGA. • upstream grouplist—Specifies the number of upstreams with the modular cable downstream channel.
Step 16	exit Example: Router# exit	Returns to global configuration mode.

Following is an example that shows the basic configuration steps used for configuring wideband channels on a fiber node and all associated primary downstream channels as virtual bundle members.

```
Router> enable
Router# configure terminal
Router(config)# interface bundle 1
Router(config-if)# ip address 172.25.1.1 255.255.255.0
Router(config-if)# ip pim sparse-mode
Router(config-if)# cable helper-address 10.0.0.0
Router(config-if)# exit
Router(config)# interface wideband-cable slot/subslot/bay:wb-channel
```

```

Router(config)# interface wideband-cable 1/0/0:12
Router(config)# cable bundle 1
Router(config-if)# cable rf-channel 0 bandwidth-percent 90
Router(config-if)# cable rf-channel 1 bandwidth-percent 50
Router(config-if)# cable rf-channel 2
Router(config-if)# cable bonding-group-id 36
Router(config-if)# exit
Router(config)#
Router(config)# interface wideband-cable 1/0/0:13
Router(config)# cable bundle 1
Router(config-if)# cable rf-channel 1 bandwidth-percent 50
Router(config-if)# cable rf-channel 2
Router(config-if)# cable rf-channel 3
Router(config-if)# cable bonding-group-id 36
Router(config-if)# exit
Router(config)# interface cable 6/0/1
Router(config-if)# cable bundle 1
Router(config-if)# downstream modular-cable 1/0/0 rf-channel 0 upstream 1
Router(config-if)# exit
Router(config)#

```

What to Do Next

In a real deployment, additional commands may be used for virtual interface bundling. For detailed information on virtual interface bundling, see the [Cisco IOS CMTS Cable Software Configuration Guide, Release 12.2SC](#).

Configuring Fiber Nodes for Wideband

To configure a fiber node, complete the following steps:

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	cable fiber-node <i>fiber-node-id</i> Example: Router(config)# cable fiber-node 1	Enters cable fiber-node configuration mode for the specified fiber node.
Step 4	downstream cable <i>slot/subslot/port</i> Example: Router(config-fiber-node)# downstream cable 6/0/0	(Optional) Assigns a primary downstream channel from the line card for the fiber node. If the primary downstream channel for this fiber node is assigned from a SPA downstream, then this command is not required. <ul style="list-style-type: none"> <i>slot</i>—Specifies the chassis slot number of the cable interface line card. <i>subslot</i>—(Cisco uBR10012 only) Specifies the secondary slot number of the cable interface line card. Valid subslots are 0 or 1.

	Command or Action	Purpose
		<ul style="list-style-type: none"> <i>port</i>—Specifies the downstream port number.
Step 5	upstream cable <i>slot/subslot</i> connector <i>list-of-ports</i> Example: Router(config-fiber-node) # upstream cable 6/0 connector 0-3	Specifies the upstream ports that are connected to the fiber node. <ul style="list-style-type: none"> <i>slot/subslot</i>—The location of the cable interface line card containing the upstream port. <i>list-of-ports</i>—A range of physical port numbers on the cable interface line card. The <i>list-of-ports</i> can be one or more port numbers or a range of port numbers separated by a hyphen or combinations of both. The valid range is from 0 to 19.
Step 6	Use the appropriate command based on the Cisco IOS Release in use: <ul style="list-style-type: none"> Cisco IOS Releases 12.3(23)BC and 12.2(33)SCA—downstream modular-cable <i>slot/subslot/bay</i> rf-channel <i>rf channels</i> Cisco IOS Release 12.2(33)SCB—downstream modular-cable <i>slot/bay/port</i> rf-channel <i>rf channels</i> Example: Router(config-fiber-node) # downstream modular-cable 1/0/0 rf-channel 0-1	Specifies indicates the RF channels that are available for wideband channels on the fiber node or channels that will be used as primary-capable channels. <ul style="list-style-type: none"> <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. <i>subslot</i>—Specifies the subslot where the Cisco Wideband SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. <i>bay</i>—Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). <i>port</i>—Specifies the interface number on the SPA. rf-channel <i>rf channels</i>—Range of RF channel physical ports on the SPA FPGA.
Step 7	description <i>description</i> Example: Router(config-fiber-node) # description Branch Office 105	(Optional) Specifies a comment providing information about the fiber node.
Step 8	exit Example: Router# exit	Returns to global configuration mode.

Following example shows how to configure one fiber node so that it has all 24 RF channels from a Cisco Wideband SPA available for a wideband channel. In a real deployment, the number of RF channels that are used for a fiber node will vary depending on how many wideband channels are provisioned for the fiber node and how much bandwidth (number of RF channels) is required for the wideband channels.

```
Router> enable
Router# configure terminal
Router(config)# cable fiber-node 1
```

```

Router(config-fiber-node) # downstream cable 6/0/0
Router(config-fiber-node) # upstream cable 6/0 connector 0-3
Router(config-fiber-node) # downstream modular-cable 1/0/0 rf-channel 0-1
Router(config-fiber-node) # description Branch Office 105
Router(config-fiber-node) # exit
Router(config) #

```

Configuring Channel Grouping Domains

To configure channel group domains, do the following:

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	interface cable slot/subslot/port Example: Router(config) # interface cable 6/0/1	Enters interface configuration mode for the Channel Grouping Domain host line card. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the chassis slot number of the cable interface line card. • <i>subslot</i>—(Cisco uBR10012 only) Specifies the secondary slot number of the cable interface line card. Valid subslots are 0 or 1. • <i>port</i>—Specifies the downstream port number. Valid values for these arguments are dependent on your CMTS router and cable interface line card. See the hardware documentation for your router chassis and cable interface line card for supported slot and port numbering.
Step 4	Use the appropriate command based on the Cisco IOS Release in use: <ul style="list-style-type: none"> • Cisco IOS Releases 12.3(23)BC and 12.2(33)SCA—downstream modular-cable slot/subslot/bay rf-channel rf channels [upstream grouplist] • Cisco IOS Release 12.2(33)SCB—downstream modular-cable slot/bay/port rf-channel rf channels [upstream grouplist] 	Specifies primary-capable channels from the SPA that are associated with the upstream channels from the host line card. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. • <i>subslot</i>—Specifies the subslot where the Cisco Wideband SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. • <i>bay</i>—Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). • <i>port</i>—Specifies the interface number on the SPA. • rf-channel rf channels—Range of RF channel physical ports on the SPA FPGA.

	Command or Action	Purpose
	Example: <pre>Router(config-if)# downstream modular-cable 1/0/0 rf-channel 1 3 upstream 2-3</pre>	<ul style="list-style-type: none"> • upstream grouplist—Specifies the number of upstreams with the modular cable downstream channel. Note The Cisco IOS software automatically assigns a cable bundle to the modular cable interface when the downstream modular-cable rf-channel command is given in the MAC domain configuration.
Step 5	exit Example: <pre>Router# exit</pre>	Returns to global configuration mode.

The example below shows how to associate downstream RF channels 0 and 1 from the SPA slot 1, subslot 0, and bay 0 with upstream channels 0 and 1 from the host line card and downstream RF channels 1 and 3 from the SPA slot 1, subslot 0, and bay 0 with upstream channels 2 and 3 from the host line card.

```
Router> enable
Router# configure terminal
Router(config)# interface cable 5/0/0
Router(config-if)# downstream modular-cable 1/0/0 rf-channel 0-1 upstream 0-1
Router(config-if)# downstream modular-cable 1/0/0 rf-channel 1 3 upstream 2-3
Router(config-if)# exit
Router(config)#
```

Configuring Primary Downstream Channel Selection in a Fiber Node

To configure a fiber node configured with a primary downstream from the cable interface line card as well as a primary downstream from the SPA, do the following:

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: <pre>Router> enable</pre>	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	configure terminal Example: <pre>Router# configure terminal</pre>	Enters global configuration mode.

	Command or Action	Purpose
Step 3	cable fiber-node <i>fiber-node-id</i> Example: Router(config)# cable fiber-node 1	Enters cable fiber-node configuration mode for the specified fiber node.
Step 4	downstream cable <i>slot/subslot/port</i> Example: Router(config-fiber-node)# downstream cable 6/0/0	(Optional) Assigns a primary downstream channel from the line card for the fiber node. If the primary downstream channel for this fiber node is assigned from a SPA downstream, then this command is not required. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the chassis slot number of the cable interface line card. • <i>subslot</i>—(Cisco uBR10012 only) Specifies the secondary slot number of the cable interface line card. Valid subslots are 0 or 1. • <i>port</i>—Specifies the downstream port number.
Step 5	Use the appropriate command based on the Cisco IOS Release in use: <ul style="list-style-type: none"> • Cisco IOS Releases 12.3(23)BC and 12.2(33)SCA—downstream modular-cable <i>slot/subslot/bay rf-channel rf channels</i> • Cisco IOS Release 12.2(33)SCB—downstream modular-cable <i>slot/bay/port rf-channel rf channels</i> Example: Router(config-fiber-node)# downstream modular-cable 1/0/0 rf-channel 0-1	Specifies indicates the RF channels that are available for wideband channels on the fiber node or channels that will be used as primary-capable channels. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. • <i>subslot</i>—Specifies the subslot where the Cisco Wideband SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. • <i>bay</i>—Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). • <i>port</i>—Specifies the interface number on the SPA. • rf-channel <i>rf channels</i>—Range of RF channel physical ports on the SPA FPGA.
Step 6	upstream cable <i>slot/subslot connector list-of-ports</i> Example: Router(config-fiber-node)# upstream cable 6/0 connector 0-3	Specifies the upstream ports that are connected to the fiber node. <ul style="list-style-type: none"> • <i>slot/subslot</i>—The location of the cable interface line card containing the upstream port. • <i>list-of-ports</i>—A range of physical port numbers on the cable interface line card. The <i>list-of-ports</i> can be one or more port numbers or a range of port numbers separated by a hyphen or combinations of both. The valid range is from 0 to 19.
Step 7	exit Example: Router# exit	Returns to global configuration mode.


```

Router> enable
Router# configure terminal
Router(config)# cable fiber-node 1
Router(config-fiber-node)# downstream cable 6/0/0
Router(config-fiber-node)# downstream modular-cable 1/0/0 rf-channel 0-3
Router(config-fiber-node)# downstream cable 6/0/1
Router(config-fiber-node)# downstream modular-cable 1/0/0 rf-channel 4-7
Router(config-fiber-node)# upstream cable 6/0 connector 0-7
Router(config-fiber-node)# exit
Router(config)#

```

Enabling Auto-Reset Mode on the CMTS

Use the **cable wideband auto-reset** 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 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.

For a fully configured wideband CMTS, wideband cable modems can 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. 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 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.

A wideband deployment typically enables wideband auto-reset mode. To enable wideband auto-reset mode, complete the following steps:

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	cable wideband auto-reset Example: Router(config)# cable wideband auto-reset	Enables wideband auto-reset mode on the CMTS.

	Command or Action	Purpose
Step 4	end Example: Router# end	Returns to privileged EXEC mode.

Configuring Primary and Secondary Bonded Channels

Configuration of primary and secondary bonded (wideband) channels with the **cable bonding-group-id** command applies only to channels that will be received by the Linksys WCM300-NA, WCM300-EURO and WCM300-JP cable modems.



Note

The **cable bonding-group-id** command is not used for wideband channels that will be received by the Scientific Atlanta DPC2505 (EPC2505 for EuroDOCSIS) wideband cable modem.

For wideband channels used by the Linksys WCM300 wideband cable modem, a wideband channel is configured either as a primary bonded channel or a secondary bonded channel. The **cable bonding-group-id** command defines whether a wideband channel is a primary bonded channel or secondary bonded channel.

- A primary bonding group is a primary bonded channel. When the **cable bonding-group-id** command is issued, the absence of the **secondary** keyword indicates a primary bonding group. For example: cable bonding-group-id 105
- A secondary bonding group is a secondary bonded channel. When the **cable bonding-group-id** command is issued, the use of the **secondary** keyword indicates a secondary bonding group. For example: cable bonding-group-id 105 secondary

The primary bonded channel is the wideband channel that a Linksys WCM300 cable modem first successfully registers on and is the channel on which it receives its unicast data. In addition to joining a primary bonded channel, a Linksys WCM300 cable modem may join up to two secondary bonded channels simultaneously in order to receive multicast data streams. The wideband cable modem selects secondary bonded channels to acquire using type, length, value (TLV) encodings from the DOCSIS configuration file.

If a wideband channel is specified as a primary or secondary bonded channel in the DOCSIS configuration file, the channel must be identically specified as a primary or secondary bonded channel in the CMTS active, running configuration file.

- If a wideband channel is configured to be a primary bonded channel or by default is a primary bonded channel, the wideband cable modem will not register using it as one of its secondary bonded channels.
- If a wideband channel is configured to be a secondary bonded channel, the wideband cable modem will not register using it as its primary bonded channel.

For detailed information on how the Linksys WCM300 wideband cable modem selects primary and secondary bonded channels, see the [Cisco DOCSIS 3.0 Downstream Solution Design and Implementation Guide](#).

**Tip**

When a wideband channel is defined on the Cisco Wideband SPA, Cisco IOS software configures the wideband channel as a primary bonding group (primary bonded channel) and assigns a default ID to the bonding group. If a wideband channel is to be used as a secondary bonded channel, use the **cable bonding-group-id** command with the **secondary** keyword to specify that the channel is a secondary bonded channel.

To specify that a wideband channel is a primary or secondary bonded channel, complete the following steps:

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	Use the appropriate command based on the Cisco IOS Release in use: <ul style="list-style-type: none"> • Cisco IOS Releases 12.3(23)BC and 12.2(33)SCA—interface wideband-cable slot/subslot/bay:wb-channel • Cisco IOS Release 12.2(33)SCB—interface modular-cable slot/bay/port:wb-channel Example: Router(config)# interface modular-cable 1/0/1:5	Enters interface configuration mode for a wideband channel on the SPA. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. • <i>subslot</i>—Specifies the subslot where the Cisco Wideband SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. • <i>bay</i>—Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). • <i>port</i>—Specifies the interface number on the SPA.
Step 4	cable bonding-group-id id-num [secondary] Example: Router(config-if)# cable bonding-group-id 105	Specifies a bonding-group ID and whether the wideband channel is a primary bonding group or secondary bonding group. If you omit the secondary keyword, the group is a primary bonding group.
Step 5	end Example: Router# end	Returns to privileged EXEC mode.

Selecting Primary Downstream Channels by Narrowband and Wideband Cable Modems

Each primary downstream channel from the SPA can be configured to carry narrowband as well as wideband traffic. Each SPA RF channel can be shared by the associated modular-cable interface as well as the wideband interfaces. Depending on the type of wideband-capable modems used, this allows support for bonding of two to eight RF channels from the same SPA to deliver higher-speed throughput data. This section describes how a modem selects the primary downstream channel that is used for MAC management traffic.

Primary Downstream Channel Selection for Wideband Cable Modems

The wideband-capable cable modems or modems that have bonded services are forced to register on the primary-capable channel that is part of a wideband channel's set of RF channels (downstream bonding group) using the **cable service attribute ds-bonded downstream-type bonding-enabled [enforce]** command. This command forces a downstream bonding-capable modem to initialize on a bonded primary-capable downstream channel.



Note

Enabling primary channel selection for wideband cable modems will not affect existing modems in the system.

Primary Downstream Channel Selection for Narrowband Modems

Primary downstream channel selection for narrowband modems provides the flexibility to restrict narrowband modems on specific types of downstream channels.

The primary downstream channel selection for narrowband modems can be done in one of two ways:

- Potential non-bonding-capable modems that access the CMTS with INIT-RNG-REQ at initialization can be redirected to a specified downstream frequency using the **cable service attribute non-ds-bonded legacy-ranging downstream-type frequency** command.
- The non-bonding-capable modems can be forced to register only on DOCSIS 1.0 /2.0 (non-bonded) downstream channel on the CMTS using the **cable service attribute non-ds-bonded downstream-type bonding-disabled** command.

Both these options can be configured simultaneously. If the cable modem is a narrowband modem and accesses the CMTS with legacy initial ranging, then the option of registering the modem based on a specific downstream channel frequency will override the option where the modem is allowed to register only on narrowband channels.



Note

Enabling primary downstream channel selection for wideband modems will not affect existing modems in the system.

**Note**

If the **frequency** keyword option is used and if the frequency is modified, then the new frequency setting will only impact new modems trying to initialize after the frequency is modified. To enforce the downstream channel selection policy on existing modems, each modem has to be manually reset either globally or at the individual primary downstream channel level using the **clear cable modem** command.

Primary Downstream Channel Selection for Voice-Enabled Services

By default, all primary-capable narrowband downstream channels on the SPA and on the cable interface line card are voice-enabled.

To restrict voice services only to downstream channels on the cable interface line card, use the **cable service attribute voice-enabled downstream-type HA-capable** command.

To provide higher system availability for voice services, the voice-enabled services can be restricted only to downstreams from the cable interface line card by configuring only the cable interface line card downstream channels as voice-capable. The CMTS attempts to register or move voice modems to the hosting cable interface line card downstream channel in the same load balancing group.

For more information on primary downstream channel selection, see the [Cisco DOCSIS 3.0 Downstream Solution Design and Implementation Guide](#).

Cisco Wideband SPA Configuration Examples

Controller Configuration Example

The following example shows the configuration for the controller of the Cisco Wideband SPA located in slot 1, subslot 0, bay 0. Only RF channels 0 to 17 have been configured and associated with wideband channels.

**Note**

This example shows the syntax supported prior to Cisco IOS Release 12.2(33)SCB.

```
controller Modular-Cable 1/0/0
annex B modulation 256qam 0 23
modular-host subslot 5/0
rf-channel 0 cable downstream channel-id 24
rf-channel 0 frequency 699000000
rf-channel 0 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49192
rf-channel 1 cable downstream channel-id 25
rf-channel 1 frequency 705000000
rf-channel 1 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49193
rf-channel 2 cable downstream channel-id 26
rf-channel 2 frequency 711000000
rf-channel 2 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49194
rf-channel 3 cable downstream channel-id 27
rf-channel 3 frequency 717000000
rf-channel 3 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49195
rf-channel 4 cable downstream channel-id 28
rf-channel 4 frequency 723000000
rf-channel 4 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49196
rf-channel 5 cable downstream channel-id 29
rf-channel 5 frequency 729000000
rf-channel 5 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49197
rf-channel 6 cable downstream channel-id 30
rf-channel 6 frequency 735000000
rf-channel 6 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49198
```

```

rf-channel 7 cable downstream channel-id 31
rf-channel 7 frequency 741000000
rf-channel 7 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49199
rf-channel 8 cable downstream channel-id 32
rf-channel 8 frequency 747000000
rf-channel 8 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49200
rf-channel 9 cable downstream channel-id 33
rf-channel 9 frequency 753000000
rf-channel 9 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49201
rf-channel 10 cable downstream channel-id 34
rf-channel 10 frequency 759000000
rf-channel 10 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49202
rf-channel 11 cable downstream channel-id 35
rf-channel 11 frequency 765000000
rf-channel 11 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49203
rf-channel 12 cable downstream channel-id 36
rf-channel 12 frequency 771000000
rf-channel 12 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49204
rf-channel 13 cable downstream channel-id 37
rf-channel 13 frequency 777000000
rf-channel 13 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49205
rf-channel 14 cable downstream channel-id 38
rf-channel 14 frequency 783000000
rf-channel 14 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49206
rf-channel 15 cable downstream channel-id 39
rf-channel 15 frequency 789000000
rf-channel 15 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49207
rf-channel 16 cable downstream channel-id 40
rf-channel 16 frequency 795000000
rf-channel 16 ip-address 10.30.4.100 mac-address 0090.f00b.0037 udp-port 49172
rf-channel 17 cable downstream channel-id 41
rf-channel 17 frequency 801000000
rf-channel 17 ip-address 10.30.4.100 mac-address 0090.f00b.0037 udp-port 49173
rf-channel 18 cable downstream channel-id 42
rf-channel 19 cable downstream channel-id 43
rf-channel 20 cable downstream channel-id 44
rf-channel 21 cable downstream channel-id 45
rf-channel 22 cable downstream channel-id 46
rf-channel 23 cable downstream channel-id 47

```

Wideband Channel Configuration Example

The following example shows how a wideband channel is configured. In this example, wideband channel Wideband-Cable1/0/0:0 is a member of virtual bundle interface 1.



Note

This example shows the syntax supported prior to Cisco IOS Release 12.2(33)SCB.



Note

The assignment of a bonding group ID is only needed for the Linksys WCM300 cable modem.

```

interface Wideband-Cable1/0/0:0
no ip address
load-interval 30
cable bundle 1
cable bonding-group-id 24
cable rf-channel 0
cable rf-channel 1

```

Virtual Bundle Configuration Example

The wideband channel and its associated primary channels on the fiber node must belong to the same virtual bundle interface. The following example shows how virtual bundle interface 1 is configured.

```
interface Bundle1
 ip address 10.11.68.200 255.255.0.0
 ip pim sparse-mode
 cable match address 102 downstream Wideband-Cable1/0/0:1 bpi-enable
 cable arp filter request-send 3 2
 cable arp filter reply-accept 3 2
```

Cable Fiber Node Configuration Example

The following example shows how cable fiber node 1 is configured.

```
cable fiber-node 1
 downstream Cable5/0/1
 downstream Modular-Cable 1/0/0 rf-channel 0 - 3
 upstream cable 5/0 connector 4
 upstream cable 5/0 connector 5
```

Channel Grouping Domain Configuration Example

The following example shows how the primary downstream channel located at slot/subslot/port 5/0/1 is configured. In this example, the primary downstream channel is a member of virtual bundle interface (cable bundle) 1 (as are the wideband channels on the fiber node, such as the wideband channel Wideband-Cable1/0/0:0).



Note

This example shows the syntax supported prior to Cisco IOS Release 12.2(33)SCB.

```
interface Cable5/0/1
 no ip address
 load-interval 30
 downstream Modular-Cable 1/0/0 rf-channel 0 - 3 upstream 0-2
 no cable packet-cache
 cable bundle 1
 cable downstream channel-id 120
 cable downstream annex B
 cable downstream modulation 256qam
 cable downstream interleave-depth 32
 cable downstream frequency 561000000
 no cable downstream rf-shutdown
 cable downstream rf-power 50
 cable upstream max-ports 4
 cable upstream 0 connector 4
 cable upstream 0 frequency 11400000
 cable upstream 0 docsis-mode tdma
 cable upstream 0 channel-width 1600000 1600000
 cable upstream 0 minislot-size 4
 cable upstream 0 power-level 0
 cable upstream 0 range-backoff 3 6
 cable upstream 0 modulation-profile 21
 no cable upstream 0 shutdown
 cable upstream 1 connector 5
 cable upstream 1 frequency 13000000
 cable upstream 1 docsis-mode tdma
 cable upstream 1 channel-width 1600000 1600000
 cable upstream 1 minislot-size 4
 cable upstream 1 power-level 0
 cable upstream 1 range-backoff 3 6
 cable upstream 1 modulation-profile 21
 no cable upstream 1 shutdown
```

```

cable upstream 2 connector 6
cable upstream 2 frequency 14600000
cable upstream 2 docsis-mode tdma
cable upstream 2 channel-width 1600000 1600000
cable upstream 2 minislot-size 4
cable upstream 2 power-level 0
cable upstream 2 range-backoff 3 6
cable upstream 2 modulation-profile 21
no cable upstream 2 shutdown
cable upstream 3 connector 7
cable upstream 3 frequency 16200000
cable upstream 3 docsis-mode tdma
cable upstream 3 channel-width 1600000 1600000
cable upstream 3 minislot-size 4
cable upstream 3 power-level 0
cable upstream 3 range-backoff 3 6
cable upstream 3 modulation-profile 21
no cable upstream 3 shutdown

```

Modular Cable Interface Configuration Example

The following example shows how a modular cable interface is configured. In this example, the modular cable interface slot/subslot/bay:narrowband channel 1/0/0:2 is configured. The cable rf-bandwidth-percent command specifies that 40 percent of the bandwidth is reserved for this interface.



Note

This example shows the syntax supported prior to Cisco IOS Release 12.2(33)SCB.

```

interface Modular-Cable 1/0/0:2
no ip address
cable bundle 1
cable rf-bandwidth-percent 40

```

Wideband Cable Interface Configuration Examples

The example below shows a three-channel wideband cable interface using Cisco uBR10-MC5X20 local downstream as the primary downstream. In this example, cable rf-channel 2, cable rf-channel 3, and cable rf-channel 4 are added to the wideband cable interface slot/subslot/bay: wideband channel 1/0/0:0. This wideband interface is capable of 3-channel bonding as well a 2-channel bonding.



Note

The following examples show the syntax supported prior to Cisco IOS Release 12.2(33)SCB.

```

interface Wideband-Cable 1/0/0:0
no ip address
load-interval 30
cable bundle 1
cable bonding-group-id 25
cable rf-channel 2 bandwidth-percent 20
cable rf-channel 3 bandwidth-percent 30
cable rf-channel 4

```

The example below shows the **downstream cable** command used in the fiber node configuration assigning the Cisco uBR10-MC5X20 downstream as the primary-capable downstream channel.

```

Router# configure terminal
Router(config)# cable fiber-node 5
Router(config-fiber-node)# downstream cable 6/0/0
downstream modular-cable 1/0/0 rf-channel 2
upstream cable 5/0 connector 0

```


The example below shows a wideband interface with a SPA RF channel 0 as a primary-capable channel. This interface is capable of 3-channel bonding.

```
Router# configure terminal
Router (config)# interface cable 5/1/0
Router(config-if)# downstream modular-cable 1/0/0 rf-channel 0 upstream 0-1 4-5
interface Wideband-Cable 1/0/0:1
no ip address
load-interval 30
cable bundle 1
cable bonding-group-id 25
cable rf-channel 0
cable rf-channel 1
cable rf-channel 2
```

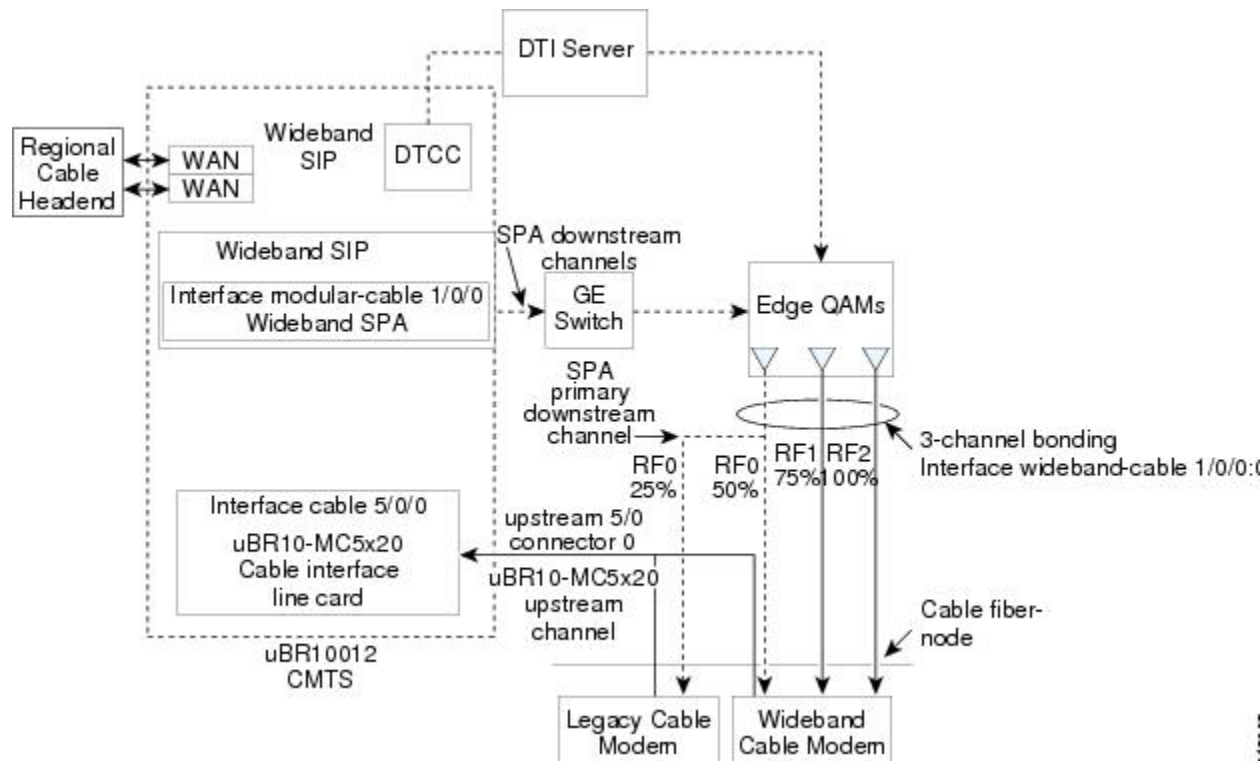
The example below shows a modular-cable interface capable of registering narrowband modems on a SPA RF channel.

```
Router# configure terminal
Router (config)# interface cable 5/1/0
Router(config-if)# downstream modular-cable 1/0/0 rf-channel 2 upstream 0-1 4-5

interface Modular-Cable 1/0/0:2
no ip address
cable bundle 1
cable rf-bandwidth-percent 40
```

Sample Wideband and Modular-Cable Interface Configuration

Figure 1: Sample Wideband and Modular-Cable Interface Configuration



Wideband Cable Interface Configuration

Channel Bonding: Three RF channels, RF0, RF1 and RF2 from the SPA residing in slot 1, subslot 0, and bay 0 are bonded to form the wideband cable interface 1/0/0:0.

- 50 percent of the total bandwidth of RF channel 0 is reserved for this wideband interface.
- 75 percent of the total bandwidth of RF channel 1 is reserved for this wideband interface.
- 100 percent of the bandwidth of RF channel 2 is reserved for this wideband interface.

Primary Downstream Channel: RF channel 0, which is associated with upstream 0, connector 0 from the Cisco uBR10-MC5X20 line card, serves as the primary downstream channel that is used for SYNCs, MAPs, and MAC management traffic.



Note

This example shows the syntax supported prior to Cisco IOS Release 12.2(33)SCB.

The wideband interface is configured as follows:

```
Router(config)# interface wideband-cable 1/0/0:0
Router(config-if)# cable bundle 1
Router(config-if)# cable rf-channel 0 bandwidth-percent 50
Router(config-if)# cable rf-channel 1 bandwidth-percent 75
Router(config-if)# cable rf-channel 2
Router(config-if)# cable bonding-group-id 1
Router(config-if)# exit
```

Modular-Cable Interface Configuration

RF channel 0, which is the narrowband channel, is associated with upstream 0, connector 0 from the Cisco uBR10-MC5X20 line card.



Note

This example shows the syntax supported prior to Cisco IOS Release 12.2(33)SCB.

The modular-cable interface is configured as follows:

```
Router(config)# interface modular-cable 1/0/0:0
Router(config-if)# cable rf-bandwidth-percent 50
Router(config-if)# exit
```