C H A P T E R **5**

Troubleshooting the System

This chapter contains troubleshooting information for various functions of your Cisco uBR7100 series CMTS, and includes the following sections:

Using a Cable Modem at the Headend to Verify Downstream Signals

You can use a Cisco uBR924 cable access router to verify the downstream signal originating from a Cisco uBR7100 series universal broadband router. Be sure you configure the Cisco uBR924 according to DOCSIS cable modem practices. To verify the downstream signal from a Cisco uBR7100 series universal broadband router using a Cisco uBR924, follow the procedure below:

Step 1   After the Cisco uBR924 is operational and you have an input signal between 0 and +5 dBmV, enter the **show controller c0 tuner** command.

Step 2   Scan the output for the value corresponding to the signal to noise (SNR) estimate variable. If this value is at least 35 dB, you have an optimized signal. If the value is less than 34 dB, adjust the upconverter at the cable headend.

Tip   The SNR estimate for a cable modem installed at a headend should be between 35 and 39 dB. Although the exact value displayed will vary from cable modem to cable modem, values collected on the same cable modem from measurement to measurement will be consistent. Maximizing SNR optimizes cable modem reliability and service quality.

Managing Cable Modems on the HFC Network

To manage cable modems connected to the network, perform the following tasks as appropriate:

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Caution   Cisco recommends using default values for most commands. Default settings are adequate for most systems.

Configuring Sync Message Interval

To specify the sync message interval between successive sync message transmissions from the Cisco uBR7100 series CMTS, use the following command in cable interface configuration mode.

Command	Purpose
CMTS01(config-if)# **cable sync-interval** *msec*	Specify the interval in milliseconds between successive sync message transmissions from the Cisco uBR7100 series CMTS. Valid values are from 1 to 200 msec. Default = 10 msec.
CMTS01(config-if)# **no cable sync-interval**	Return the sync message interval to its default value of 10 msec.

Verifying Sync Message Interval

To determine if a sync message interval is configured, enter the **show running-config** command and look for the cable interface configuration information. If the sync message interval is deactivated or reset to its default value, the `no sync interval` command line appears in the output.

Activating Cable Modem Authentication

The Cisco uBR7100 series CMTS can be configured to require all cable modems to return a known text string to register with the CMTS and gain access to the network. The text string can be from 1 to 80 characters in length. To activate cable modem authentication, use the following command in cable interface configuration mode.

Command	Purpose
CMTS01(config-if)# **cable shared-secret** [0|7] **authorization-key**	Enable cable modem authentication: • 0 specifies an unencrypted authentication key; • 7 specifies an encrypted authentication key.
CMTS01(config-if)# **no cable shared-secret**	Disable cable modem authentication.

Tip   Be sure you enter the correct slot and port number in the cable interface configuration mode. Verify that the cable modem is using BPI and that it is assigned to a QoS with privacy active. Verify that the cable interface configuration file contains a matching key.

Verifying Cable Modem Authentication

To determine if cable modem authentication is activated or deactivated, enter the **more system:running-config** command and look for the cable interface configuration information. If cable modem authentication is deactivated, it appears in this output as no cable secret-shared.

Activating Cable Modem Upstream Address Verification

Cable modem upstream address verification ensures that only cable modems that have received DHCP leases through the Cisco uBR7100 series CMTS can access the HFC network. The Cisco uBR7100 series CMTS discards all packets received from or for hosts that have not received DHCP-assigned addresses.

To activate cable modem upstream address verification, use the following cable interface configuration command.

Command	Purpose
CMTS01(config-if)# **cable source-verify** [dhcp]	Activate cable modem upstream verification. The **dhcp** option specifies that queries be sent to verify unknown IP addresses in upstream data packets.
CMTS01(config-if)# **no cable source-verify**	Return to the default upstream verification state.

Verifying Cable Modem Upstream Address Verification

To determine if cable modem upstream verification is activated or deactivated, enter the **more system:running-config** command and look for the no cable source-verify notation in the cable interface configuration information.

Tip Be sure you enter the correct slot and port number when you enter the cable interface configuration mode.

Note If the Cisco uBR7100 series router is reloaded or the ARP table is cleared, all hosts on the network will be forced to release and renew their IP addresses. Some systems might require restarting if the IP protocol stack is unable to renew using a broadcast IP address.

Configuring Dynamic Contention Algorithms (Cable Insertion Interval, Range, and Data Backoffs)

The Cisco uBR7100 series software includes:

- Algorithm that dynamically controls the rate of upstream contention slots —initial ranging and bandwidth requests.
- Algorithm that varies backoff parameters CMs use within each of the initial ranging and bandwidth request upstream contention subchannels.

These algorithms control the capacity of the contention subchannel and how efficiently a given contention subchannel capacity is utilized.

In high contention mode, the Cisco uBR7100 series MAC scheduler uses collision statistics and sustains a high frequency of initial ranging slots until it detects a steady ranging state. The CMTS dynamically varies the frequency of initial ranging slots using the data grant utilization on the upstream channels. The CMTS trades upstream bandwidth between data grants and initial ranging slots. The CMTS autodetects a high collision state and switches to low insertion interval mode after a steady state is achieved where few collisions occur.

The CMTS is careful when monitoring the ranging channel health to revert to a steady state. In steady state mode, data grants—grant utilization—receive preference over initial ranging slots.

Although the binary exponential backoff algorithm operates in a distributed fashion at different CMs, the CMTS provides centralized control for the backoff algorithm. To achieve this, it remotely monitors traffic load—the backlog developing on the contention channel—and then varies the backoff start and end specified in the MAPs for that upstream channel. This ensures colliding CMs are properly randomized in time.

The following cable interface commands are available to configure the dynamic contention algorithms:

[**no**] **cable insertion-interval** [*automatic* [*Imin* [*Imax*]]] | [*msecs*]

[**no**] **cable upstream** *port num* **range-backoff** [*automatic*] | [*start end*]

[**no**] **cable upstream** *port num* **data-backoff** [*automatic*] | [*start end*]

Tip System defaults are to have dynamic ranging interval enabled, dynamic ranging backoff enabled, and fixed data backoffs for each upstream of a cable interface.

The default `automatic` insertion interval setting enables the Cisco automatic initial ranging period algorithm where lower and upper default values of 50 msecs and 2 secs are used. The default `automatic` `range-backoff` enables the dynamic backoff algorithm.

To deviate from system defaults when modifying the dynamic contention algorithm, use one of the following commands in cable interface configuration mode.

Command	Purpose
CMTS01(config-if)# [no] cable insertion-interval automatic	Disable or enable the dynamic ranging interval algorithm. If lower and upper bounds for varying the period are not specified, the system uses default values of 50 msecs and 2 secs respectively.
CMTS01(config-if)# cable insertion-interval automatic min *25-2000*	Set the lower bound on the initial ranging period for the auto ranging algorithm.
CMTS01(config-if)# cable insertion-interval max *500-2000*	Set the upper bound on initial ranging period for the auto ranging algorithm.
CMTS01(config-if)# no cable insertion-interval	Reset fixed initial ranging period to default value of 500 msecs. Also invokes fixed initial ranging algorithm.
CMTS01(config-if)# cable insertion-interval *100-2000*	Enable fixed initial ranging period algorithm with specified fixed period (msecs).

Configuring the Dynamic Map Advance Algorithm

A CMTS administrator can enhance the upstream throughput from a cable modem connected to the Cisco uBR7100 series CMTS. The system employs a new algorithm that automatically tunes the lookahead time in MAPs based on several input parameters for the corresponding upstream channel. The use of dynamic/optimal lookahead time in MAPs significantly improves the per-modem upstream throughput.

⚠
Caution   Only a trained CMTS administrator should adjust these values.

To configure the dynamic map advance algorithm, use the following command in cable interface configuration mode.

Command	Purpose
CMTS01(config-if)# **cable map-advance dynamic [n]|static**	Specify a value to enhance the upstream throughput from a cable modem connected to the Cisco uBR7100 series router. The n parameter provides the safety factor for the dynamic map advance algorithm. This parameter is specified in usecs and controls the amount of extra lookahead time in MAPs to account for inaccuracies of the measurement system and software latencies. The default value is 1000 usecs.
	You can vary this between 500 to 1500 usecs. This parameter is a delta value added to the dynamic map-advance that the algorithm computes. Using larger safety factors increases the run time lookahead in MAPs, but reduces the upstream performance.
	Use the **static** keyword for the map advance command. The Cisco uBR7100 series router will use a fixed lookahead time in MAPs, regardless of the real propagation delay of the farthest cable modem on the network. This fixed lookahead time is computed based on the worst case parameters such as farthest DOCSIS propagation delay for the CMs.

⚠
Caution   Cisco recommends if you are adjusting the dynamic map advance algorithm that you do not reduce the safety factor below the default value of 1000 usecs in a production network, until you are confident that the reduced safety factor suffices for your deployment. The default value is chosen to be a safe operating point for the algorithm.

Configuring Per Modem Filters

You can configure the Cisco uBR7100 series router to filter incoming packets from individual hosts or cable modems based on the source Media Access Controller (MAC) or Internet Protocol (IP) address. Definition of filters follows standard Cisco IOS configuration practices for access lists and groups.

To configure per modem filters, use the following commands in cable interface configuration mode.

Command	Purpose
`CMTS01(config-if)# ` **`cable`** `{modem | host | device}` `{`*`macaddr ipaddr |`*`}` **`access group`** *`acl`*	Configure access lists to be specified on a per-interface and per-direction basis. The packets received from cable modems and individual hosts are filtered based on the cable modem or the host the packets are received from. Use *modem* if the device is a cable modem. Use *host* if the device is a CPE device attached to a cable modem.
	Define the filter to be applied to the device and a given address. The *macaddr* specifies the cable modem's or CPE device's unique MAC address.
	Use the *ipaddr* option to specify the CM or CPE device's current IP address.
	Use the *acl* option to assign the CM or CPE device to an access list. This defines the per-CM or per-host filter requirements implemented at the CMTS, rather than at the CM. Access list numbers are 1 to 99 for fast IP access lists, 100 to 199 for show extended IP access lists.
	✎ **Note** Access list numbers of 700 to 799 do not apply.

⚠
Caution   The system applies filters after the cable modem registers with the CMTS. Filter definitions are not saved across system reboots and must be applied each time a CM registers.

The software supports traps to alert CMTS administrators on CMs going offline or back online. This is a typical registration and login procedure:

1. The CM registers with the Cisco uBR7100 series CMTS.

2. The Cisco uBR7100 series CMTS sends traps to management systems in use for the network.

3. The management system sets per modem filters using SNMP or *rsh.*

4. The user logs in at the server.

5. The login server obtains required modem and CPE information from the Cisco uBR7100 series CMTS.

6. The login server sets per-CPE filter in the Cisco uBR7100 series CMTS. The per-CPE filter overrides the per modem filter settings.

7. If the CM goes offline for less than 24 hours, filters that have been defined using the Cisco uBR7100 series CMTS remain active. If a CM stays offline for more than 24 hours, the filter settings are reset.

8. If the user logs out or the login server detects that the user is not online, the login server sets default filters for the CM or the CPE device.

Configuring the Maximum Number of Hosts Attached to a Cable Modem

To specify the maximum number of hosts that can be attached to a subscriber's cable modem, use the following command in cable interface configuration mode.

Command	Purpose
CMTS01(config-if)# **cable max-hosts n**	Specify the maximum number of hosts that can be attached to a cable modem on this interface. Valid range is from 0 to 255 hosts. Default = 0.
CMTS01(config-if)# **no cable max-hosts**	Reset the allowable number of hosts attached to a cable modem to the default value of 0 hosts.

Configuring Cable Modem Registration Timeout

By default, registered cable modems that have no upstream activity for three minutes are timed out and disconnected from the Cisco uBR7100 series CMTS. This timeout interval can be decreased to 2 minutes or increased up to 60 minutes.

To specify the registration timeout interval for cable modems connected to the Cisco uBR7100 series CMTS, use the following command in cable interface configuration mode.

Command	Purpose
CMTS01(config-if)# **cable registration-timeout** n	Specify the maximum number of minutes allowed to elapse with no upstream activity before terminating the connection. Valid range is from 2 to 60 minutes. Default = 3 minutes.

Clearing Cable Modem Reset

To remove a single cable modem (or all cable modems) from the station maintenance list and reset the cable modem (or all cable modems) on the network, use one of the following commands in cable interface configuration mode.

Command	Purpose
CMTS01(config-if)# **clear cable modem** *mac-addr* **reset**	Remove the CM with a specific MAC address from the station maintenance list and reset it.
CMTS01(config-if)# **clear cable modem** *ip-addr* **reset**	Remove the CM with a specific IP address from the station maintenance list and reset it.
CMTS01(config-if)# **clear cable modem all reset**	Remove all CMs from the station maintenance list and reset them.

Verifying Clear Cable Modem Reset

To determine if the **clear cable modem reset** command has removed a cable modem from the station maintenance list and forced it to start a reset sequence, enter the **show cable modem** command.

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Tip   Be sure you entered the correct cable modem IP address or MAC address when you typed the **clear cable modem reset** command. It might take up to 30 seconds for the cable modem to start the reset sequence.

![Note icon]

Note   The **clear cable modem reset** command is useful if an SNMP manager is not available, or if the cable modem is unable to obtain an IP address or respond to SNMP messages.

Clearing Cable Modem Counters

To clear the counters for the cable modem(s) in the station maintenance list, use one of the following commands in cable interface configuration mode.

Command	Purpose
CMTS01(config-if)# **clear cable modem** *mac-addr* **counters**	Clear the counters in the station maintenance list for the CM with a specific MAC address.
CMTS01(config-if)# **clear cable modem** *ip-addr* **counters**	Clear the counters in the station maintenance list for the CM with a specific IP address.
CMTS01(config-if)# **clear cable modem all counters**	Clear the counters in the station maintenance list for all CMs.

Verifying Clear Cable Modem Counters

To determine if the counters in the station maintenance list are cleared, enter one of the **following** commands. The station maintenance list counter is 0.

Command	Purpose
show cable modem *ip-address*	Displays the status of a cable modem identified by its IP address.
show cable modem *mac-address*	Displays the status of a cable modem identified by its MAC address.
show cable modem *interface-address*	Displays the status of all cable modems on a particular upstream.

Configuring Traffic Shaping

Configuring Downstream Rate Limiting and Shaping

To configure downstream rate limiting or shape downstream traffic, use the following command in cable interface configuration mode.

Command	Purpose
CMTS01(config-if)# [**no**] **cable downstream rate-limit token-bucket** [**shaping**] **weighted-discard** [expwt n]	Enables or disables rate limiting and traffic shaping on the downstream of a cable interface.

You can use this command in the following ways:

- To enable rate limiting on the given downstream port using the token bucket policing algorithm, enter the **cable downstream rate-limit token-bucket** command.

- To enable rate limiting on the given downstream port using the token bucket policing algorithm with traffic shaping, enter the **cable downstream rate-limit token-bucket shaping** command.

- To enable rate limiting on the given downstream port using the token bucket policing algorithm with a specific traffic shaping time granularity, enter the
  cable downstream rate-limit token-bucket shaping granularity 8 command.
  Acceptable values are 1, 2, 4, 8, or 16 msecs.

- To enable rate limiting on the given downstream port using the token bucket policing algorithm with a specific maximum traffic shaping buffering delay, enter the **cable downstream rate-limit token-bucket shaping granularity 8** command. Acceptable values are 128, 256, 512, or 1028 msecs.

- To remove rate limiting on the given downstream port, enter the
  cable downstream rate-limit token-bucket command.

- To enable rate limiting on the given downstream port using a weighted packet discard policing algorithm, and to assign a weight for the exponential moving average of loss rate value, enter the **cable downstream rate-limit weighted-discard 3** command. Acceptable values are 1, 2, 3, or 4.

Configuring Upstream Rate Limiting and Shaping

You can rate limit and shape traffic on a DOCSIS upstream channel. This delays the scheduling of the upstream packet, which in turn causes the packet to be buffered on the cable CPE device, instead of being dropped. This allows the user's TCP/IP stack to pace the application traffic appropriately and approach throughput commensurate with the subscriber's defined QoS levels.

To configure upstream rate limiting and shaping, use the following command in cable interface configuration mode.

Command	Purpose
`CMTS01(config-if)#` [**no**] **cable upstream** *n1* **rate-limit** [**token-bucket**]	Enables or disables DOCSIS rate limiting or shaping on an upstream channel. The *n1* argument depends on the number of upstream channels on the specific cable modem card.

The software supports:

- Generic calendar queuing routines

- New token bucket policing function

- Grant shaping application of the calendar queues

- Upstream rate shaping option to the token bucket keyword

- A default state change from 1 second burst policing to token bucket with shaping

Tip   Upstream grant shaping is per CM (SID). Shaping can be enabled or disabled for the token bucket algorithm.

Note   Before the introduction of this feature, the CMTS would drop bandwidth requests from a CM it detected as exceeding its configured peak upstream rate. Such request dropping affects the throughput performance of IP-based protocols such as FTP, TCP, and SMTP. With this feature, the CMTS can shape (buffer) the grants for a CM that is exceeding its upstream rate, rather than dropping the bandwidth requests.

```
CMTS01# show interface c1/0 sid 1 counters
Sid    Inpackets  Inoctets   Outpackets Outoctets  Ratelimit  Ratelimit
                                                    BWReqDrop  DSPktDrop
1      67859      99158800   67570      98734862   2579       0
```

Configuring Spectrum Management

Combining Blind Strategies and Time Scheduled Spectrum Management

Cisco uBR7100 series software supports combined blind and time scheduled spectrum management:

- Using blind spectrum management, the number of lost station management messages exceeding a configured threshold (default = 10) initiates an upstream channel frequency reassignment. The Cisco uBR7100 series software moves all CMs on the upstream port by sending UCD messages that contain the next frequency and input power level defined in the spectrum management group. The frequency change occurs rapidly without data loss and with minimal latency.

- Using time scheduled spectrum management, the upstream channel frequency reassignment process is initiated at a configured time of day or week.

With combined blind and time scheduled strategies, blind hop tables are given the capability for time-variant configuration. The frequency or subband list can change with time. Blind frequency hop is performed within the spectrum specified to be currently available. An example follows:

```
uBR(config)# cable spectrum-group 2 time Mon 09:00:00 frequency 10000000
uBR(config)# cable spectrum-group 2 time Tue 09:05:00 delete frequency 10000000
uBR(config)# cable spectrum-group 2 time Tue 09:00:00 frequency 5000000
uBR(config)# cable spectrum-group 4 time Fri 09:00:00 band 15000000 25000000
uBR(config)# cable spectrum-group 4 time Sat 09:00:00 delete band 15000000 25000000
```

Using Guided Frequency Hop

Using guided frequency hop, the upstream channel frequency is reassigned if a threshold number or percentage of CMs suddenly go offline. You can adjust the thresholds and assign explicit frequencies or frequency subbands and associated input power levels in the unified spectrum group table. The Cisco uBR7100 series CMTS locates the defined channel or a suitable channel and moves all CMs on the upstream port.

The following example shows that the Cisco uBR7100 series can force the CTMS to change the upstream to another frequency before the CMTS sends a message to increase output power levels. You can configure the frequency hop table so that the next entry has the same frequency, but a different power level:

```
uBR(config)# cable spectrum-group 2 frequency 20000000
uBR(config)# cable spectrum-group 2 frequency 20000000 2
uBR(config)# cable spectrum-group 2 frequency 20000000 -2
uBR(config)# cable spectrum-group 2 frequency 22000000
uBR(config)# cable spectrum-group 2 frequency 22000000 2
```

```
uBR(config)# cable spectrum-group 2 frequency 22000000 3
```

The order of the configuration commands defines the order which frequency or power level is changed. There is always a single allocation set per spectrum group, listing the currently available bands. In the case of a shared spectrum group, there is also a single free set and "in-use" set because there is a single RF domain. Otherwise, there are free and in-use sets for each upstream port because each upstream port has its own RF domain.

Sample output:

```
noisy1# show cable spec
Group   Frequency      Upstream      Weekly Scheduled              Power   Shared
No.     Band           Port          Availability                  Level   Spectrum
        (Mhz)                        From Time:   To Time:         (dBmV)

1       10.000- 0.000                                               1       No
1       11.000- 0.000                                               1       No
1       12.000- 0.000                                               1       No
1       13.000- 0.000                                               1       No
1       14.000- 0.000                                               1       No
2       10.000-15.000                                               2       No
2       10.208 [0.40]  Cable1/0 U1                                  2
3       20.000- 0.000                                               3       Yes
3       21.000- 0.000                                               3       Yes
3       22.000- 0.000                                               3       Yes
3       23.000- 0.000                                               3       Yes
3       24.000- 0.000                                               3       Yes
3        0.400 [0.80]  Cable1/0 U2                                  3
4       20.000-25.000                                               4       Yes
4       20.800 [1.60]  Cable1/0 U3                                  4
5       10.000- 0.000                                               5       No
5       11.000- 0.000                                               5       No
5       12.000- 0.000                                               5       No
5       13.000- 0.000                Mon 17:06:00   --- --:--:--    5       No
5       14.000- 0.000                Mon 17:08:00   --- --:--:--    5       No
5       13.000- 0.000                Mon 17:10:00   --- --:--:--    5       No
```

To display information about a specific interface or upstream port, enter the **show cable hop** *cable-if* [**upstream** *portnum*] command. Information lines describe the frequency hop status of an upstream port.

Table 5-1   show cable hop Command Parameters

Field	Description
Upstream Port	The upstream port for this information line
Port Status	Show "down" if frequency is unassigned, "admindown" if the port is shutdown, or the center frequency of the channel if the port is up
Poll Rate	The rate station maintenance polls are generated (msec)
Missed Poll Count	The number of missing polls
Min Poll Sample	The number of polls in the sample
Missed Poll Pcnt	The ratio of missing polls to the number of polls displayed as a percentage
Hop Thres Pcnt	The level that the missed poll percentage must exceed to trigger a frequency hop expressed as a percentage
Hop Period	The maximum rate which frequency hopping will occur (seconds)

Table 5-1   show cable hop Command Parameters (continued)

Field	Description
Corr FEC Errors	The number of correctable FEC errors on this upstream port
Uncorr FEC Errors	The number of uncorrectable FEC errors on this upstream port

Sample output:

```
noisy1# show cable hop
Upstream    Port        Poll Missed Min     Missed Hop   Hop     Corr    Uncorr
Port        Status      Rate Poll   Poll    Poll   Thres Period  FEC     FEC
                        (ms) Count  Sample  Pcnt   Pcnt  (sec)   Errors  Errors
Cable1/0/U0 down        1000 * * *  frequency not set    * * * 0          0
Cable1/0/U1 admindown   1000 * * *  interface is down    * * * 0          0
Cable1/0/U2 admindown   1000 * * *  interface is down    * * * 0          0
Cable1/0/U3 admindown   1000 * * *  interface is down    * * * 0          0
Cable1/0/U0 10.800 Mhz  1000 0      0       -----  100%  300   0          0
Cable1/0/U0 down        1000 * * *  frequency not set    * * * 0          0
```

Spectrum Management Debug and Test Commands

To enable display of frequency hopping debugging messages, enter:

```
debug cable freqhop
```

To enable display of spectrum management debugging messages, enter:

```
debug cable specmgmt
```

This command also enables display of channel width list and offer list for the
show cable spectrum-group command.

To force a frequency hop decision on the port or ports, enter:

test cable hop *cable-if* [*upstream portnum*]

show cable hop Command

You can use the following command to obtain specific upstream interface information:

show cable hop *cable-if* [**upstream** *portnum*]

Table 5-2   show cable hop Command Parameter Descriptions

Field	Description
Upstream Port	Upstream port for this information line
Port Status	Shows "down" if frequency is unassigned, "admindown" if the port is shutdown, or the center frequency of the channel if the port is up
Poll Rate	Rate that station maintenance polls are generated (msec)
Missed Poll Count	Number of missing polls
Min Poll Sample	Number of polls in the sample
Missed Poll Pcnt	Ratio of missing polls to the number of polls expressed as a percentage

Table 5-2   show cable hop Command Parameter Descriptions

Field	Description
Hop Thres Pcnt	Level that the missed poll percentage must exceed to trigger a frequency hop expressed as a percentage
Hop Period	Maximum rate which frequency hopping will occur (seconds)
Corr FEC Errors	Number of correctable FEC errors on this upstream port
Uncorr FEC Errors	Number of uncorrectable FEC errors on this upstream port

```
noisy1# show cable hop
Upstream    Port          Poll Missed Min    Missed Hop   Hop     Corr    Uncorr
Port        Status        Rate Poll   Poll   Poll   Thres Period  FEC     FEC
                          (ms) Count  Sample Pcnt   Pcnt  (sec)   Errors  Errors
Cable1/0/U0 down          1000 * * *   frequency not set   * * * 0        0
Cable1/0/U1 admindown     1000 * * *   interface is down   * * * 0        0
Cable1/0/U2 admindown     1000 * * *   interface is down   * * * 0        0
Cable1/0/U3 admindown     1000 * * *   interface is down   * * * 0        0
Cable1/0/U0 10.800 Mhz    1000 0       0       -----  100%  300    0        0
Cable1/0/U0 down          1000 * * *   frequency not set   * * * 0        0
```

You can use the following command to obtain specific upstream interface information:

show cable hop *cable-if* [**upstream** *portnum*]

Table 5-3   Upstream Port Field Parameter Descriptions

Field	Description
Upstream Port	Upstream port for this information line
Port Status	Shows "down" if frequency is unassigned, "admindown" if the port is shutdown, or the center frequency of the channel if the port is up
Poll Rate	Rate that station maintenance polls are generated (msec)
Missed Poll Count	Number of missing polls
Min Poll Sample	Number of polls in the sample
Missed Poll Pcnt	Ratio of missing polls to the number of polls expressed as a percentage
Hop Thres Pcnt	Level that the missed poll percentage must exceed to trigger a frequency hop expressed as a percentage
Hop Period	Maximum rate at which frequency hopping will occur (seconds)
Corr FEC Errors	Number of correctable FEC errors on this upstream port
Uncorr FEC Errors	Number of uncorrectable FEC errors on this upstream port

Sample output:

```
noisy1# show cable hop
Upstream    Port          Poll Missed Min    Missed Hop   Hop     Corr    Uncorr
Port        Status        Rate Poll   Poll   Poll   Thres Period  FEC     FEC
                          (ms) Count  Sample Pcnt   Pcnt  (sec)   Errors  Errors
Cable1/0/U0 down          1000 * * *   frequency not set   * * * 0        0
Cable1/0/U1 admindown     1000 * * *   interface is down   * * * 0        0
Cable1/0/U2 admindown     1000 * * *   interface is down   * * * 0        0
Cable1/0/U3 admindown     1000 * * *   interface is down   * * * 0        0
Cable1/0/U0 10.800 Mhz    1000 0       0       -----  100%  300    0        0
Cable1/0/U0 down          1000 * * *   frequency not set   * * * 0        0
```

Debug and Test Commands

To enable display of frequency hopping debugging messages, enter:

```
debug cable freqhop
```

To enable display of spectrum management debugging messages, enter:

```
debug cable specmgmt
```

To force a frequency hop decision on the port or ports, enter:

test cable hop *cable-if* I *portnum*

Polling Cable Modems

You can obtain operating statistics and determine the state of CMs on the network. The Cisco uBR7100 series CMTS supports polling of CMs to obtain parameter and status information on an ongoing basis. The following Cisco IOS commands have been added to support the feature:

- **cable modem remote** configures the router for the polling interval; the **no** version of this command disables the status polling.

- **show cable modem remote-query** displays the collected information: downstream receive power level, downstream signal to noise ratio, upstream power level, micro reflection in dB.

The Cisco uBR7100 series CMTS polls CMs on the network and caches the state information on the CMTS, allowing administrators to use SNMP to manage the system.

This section describes how you can enable this. See the following configuration tasks:

- "Enabling SNMP" section on page 5-15 (required)
- "Configuring Remote Modem Monitoring" section on page 5-15 (required)

Enabling SNMP

Command	Purpose
Router(config)# **snmp-server manager**	Opens the SNMP manager.
Router(config)# **snmp-server community** [Community String] [Permissions]	Defines user permissions.

Configuring Remote Modem Monitoring

Command	Purpose
Router(config)# **cable modem remote-query** [*polling interval*] [Community string]	Specifies how often SNMP polls the modem and allows you to configure access.

Verifying Remote Query Information

To display information from a queried modem, enter the **show cable modem remote-query** command.

```
R7732-01-uBR7246# show cable modem remote-query
IP address      MAC address     S/N    US     DS    Tx Time Micro (dB) Modem
                                Ratio  Power  Power Offset  Reflection State
5.108.1.2       0010.4bd7.ccf2  0.0    0.0    0.0   0       0          offline
5.109.1.2       0000.0000.0022  0.0    0.0    0.0   0       0          offline
```

```
5.110.1.2        0000.0000.0023   0.0      0.0      0.0   0          0   offline
5.108.1.5        0000.0000.0026   0.0      0.0      0.0   0          0   offline
5.108.1.4        0000.0000.0024   0.0      0.0      0.0   0          0   offline
5.108.1.3        0000.0000.0025   0.0      0.0      0.0   0          0   offline
```

Tip   To display debugging information, enter the **debug cable remote-query** command.

See the following for an example **debug** message of a successful poll of a CM:

```
Router# debug cable remote-query

remote-query debugging is on
.
For IP address 209.165.200.223
Nov 10 15:56:50.241: docsIfSignalQualityEntry.5.4 = 380
Nov 10 15:56:50.241: docsIfMibObjects.2.2.1.3.2 = 360
Nov 10 15:56:50.245: docsIfDownstreamChannelEntry.6.4 = -30
Nov 10 15:56:50.245: docsIfUpstreamChannelEntry.6.3 = 12422
Nov 10 15:56:50.249: docsIfSignalQualityEntry.6.4 = 0
Nov 10 15:56:50.477:
```

See the following for an example **debug** message when the waiting queue at the CMTS is empty:

```
SNMP proxy exec got event, but queue is empty
```

See the following for an example **debug** message when you try to modify the polling interval or community string while polling in is progress:

```
Community string if modified will not be reflected
```

Note   The polling interval is changed. To change the community string, you must reconfigure the **snmp-server community** command with the new `community` string.

Monitoring and Maintaining Remote Querying

Use the following **show** commands to gather status information about the specified modems.

Command	Purpose
Router# **show cable flap-list**	Displays statistics on the quality of the modem connection.
Router# **show cable modem**	Displays statistics on modem states.
Router# **show cable modem remote-query**	Displays statistics gathered by SNMP agents on modem states.
Router# **show interface cable**	Displays statistics on the quality of the cable interface.
Router# **show interface cable sid**	Displays statistics on the service IDs of the specified modems.

Understanding Show Command Responses

General show Commands

Key **show** commands include:

- **show cable modem**
- **show interface cable**
- **show cable qos profile**
- **show cable modulation profile**
- **show cable spectrum-group**

Additional or changed **show** commands include the following:

- The **show cable qos** command shows **cable qos-profile** *n* command, where the optional argument *n* can be used to display a specific profile.

- The **show int cx/y sid** command displays more complete Service ID (SID) status information.

- The **show cable modem** command displays a list of options for a single modem to be specified by entering either the RF CPE device IP address or MAC address:

  - SNR information for each CM on each interface

  - summary display of the total number of modems connected for each upstream channel

  - total number of registered and unregistered modems for the specified interface or upstream

  - total number of offline modems for the specified interface or upstream and status for each offline modem before it went offline

- The **show cable burst-profile** command has been removed. Its functions have been incorporated into the **show cable modulation-profile** command, which now includes an added option number that displays the modulation profile number.

- The **show cable flap-list** and **show cable modem** commands indicate when the Cisco uBR7100 series CMTS has detected an unstable return path for a particular modem and has compensated with a power adjustment. An asterisk (*) appears in the power adjustment field for a modem when a power adjustment has been made; an exclamation point appears when the modem has reached its maximum power transmit level and cannot increase its power level any further.

- The **show controller upstream** command is enhanced to display the following information on cable interfaces:

  - Upstream channel utilization in minislots

  - Contention slots

  - Initial ranging slots

  - Minislots lost due to the MAP interrupt being too late

You can also limit your search for modem status to specific cable interfaces.

show cable modem Command

The **show cable modem** command includes all DOCSIS states, and other useful troubleshooting information such as last received upstream RF power level and maximum number of provisioned customer premises equipment.

✎

Note DOCSIS CMs are required to pass through successive states during registration and provisioning. Using this information, you can isolate why a CM is offline or unavailable.

Specific added information includes the downstream receive power ratio, downstream SNR, upstream and downstream power levels, transmit timing offset, and micro reflections in decibels.

For each upstream channel, you can obtain the following information:

- Total number of modem(s)
- Number of active modem(s)
- Number of registered modem(s)
- Number of unregistered modem(s)
- Number of offline modem(s)
- Time the modem(s) went offline
- Status before the modem(s) went offline
- Receive power before the modem(s) went offline

Sample **show cable modem** command output follows:

```
Router# show cable modem

Interface     Prim Online      Timing Rec    QoS CPE IP address     MAC address
              Sid  State       Offset Power
Cable1/0/U0 1    online       2257    0.00  3   0   10.30.128.142  0090.8330.0217
Cable1/0/U0 2    online       2262  *-0.50  3   0   10.30.128.145  0090.8330.020f
Cable1/0/U0 3    online       2260    0.25  3   0   10.30.128.146  0090.8330.0211
Cable1/0/U0 4    online       2256   *0.75  3   0   10.30.128.143  0090.8330.0216
Cable1/0/U0 5    online       2265   *0.50  3   0   10.30.128.140  0090.8330.0214
Cable1/0/U0 6    online       2256    0.00  3   0   10.30.128.141  0090.8330.0215
Cable1/0/U0 7    online       4138  !-1.00  3   1   10.30.128.182  0050.7366.124d
Cable1/0/U0 8    online       4142  !-3.25  3   1   10.30.128.164  0050.7366.1245
Cable1/0/U0 9    online       4141  !-3.00  3   1   10.30.128.185  0050.7366.17e3
Cable1/0/U0 10   online       4142  !-2.75  3   0   10.30.128.181  0050.7366.17ab
Cable1/0/U0 11   online       4142  !-3.25  3   1   10.30.128.169  0050.7366.17ef
```

The output from the **show cable modem** command indicates when the Cisco uBR7100 series CMTS has detected an unstable return path for a particular CM and has compensated with a power adjustment. An asterisk (*) in the power adjustment field for a CM indicates that a power adjustment has been made. An exclamation point (!) indicates that the CM has reached its maximum power transmit level and cannot increase its power level any further.

Columns are described below:

- prim Sid column reveals the primary (lifeline) service identifier assigned to the CM.
- SID column is the service identifier.
- Online State column reveals the state of the modem; values include:
  - offline—CM considered offline.

- – offline time—the time the CM went offline; the format is the same as other **show cable modem** commands (month, day, time, and year).

- – init (r1)—CM sent initial ranging.

- – init (r2)—CM is ranging.

- – init (rc)—CM ranging complete.

- – init (d)—Dhcp request received.

- – init (i)—Dhcp reply received; IP address assigned.

- – init (o)—Option file transfer started.

- – init (t)—TOD exchange started.

- – online—CM registered, enabled for data.

- – online(d)—CM registered, but network access for the cable modem is disabled.

- – online(pk)—CM registered, BPI enabled and KEK assigned.

- – online(pt)—CM registered, BPI enabled and TEK assigned.

- – reject (m)—CM did attempt to register; registration was refused due to bad MIC.

- – reject (c)—CM did attempt to register; registration was refused due to bad COS.

- – reject (pk)—KEK modem key assignment rejected.

- – reject (pt)—TEK modem key assignment rejected.

- Rec Power column contains the nominal receive power in decibels for this SID.

> **Note**   An asterisk (*) means that the noise power adjustment method is active for this modem. An exclamation point (!) means that the modem has reached its maximum transmit power.

- The QoS column contains the service class assigned to the modem.

- The CPE column identifies the number of devices behind the modem.

- The Max CPE column identifies the maximum number of devices configured for the modem.

- The IP address reveals the modem's IP address.

- The MAC address reveals the modem's MAC address.

- The Concatenation column reveals if concatenation is enabled (yes) or disabled (no).

- The Rx SNR column reveals the SNR ratio level in dBmV as perceived by the CM.

> **Note**   This parameter is only meaningful for CMs. A CMTS returns a zero.

- The S/N Ratio column provides values for remote-queried modems.

- The US Power column reveals the transmit power level for the upstream channel in dBmV.

- The DS Power column reveals the received power level at the downstream modem in dBmV.

> **Note**   If the power level measurement is not supported, set this parameter to zero. Also, if the interface is down, this value will be the CMTS-configured value, the most current CM value, or zero.

- The Tx Timing Offset shows the current round trip time at the CM. The value is used to synchronize upstream transmission to the CMTS and is measured in units of 6.25 microseconds.

- The Micro (dB) Reflection column is the total microreflections including in-channel response as perceived on this interface, measured in Dbc below the signal level.

✎

Note   The value is not assumed to return an absolutely accurate value, but gives a rough indication of microreflections received on this interface.

- The Offline Time column reveals when a modem went offline.

- The Previous State column reveals the modem's status prior to going offline.

- The Rx Power column reveals the last receive power measurement for a modem that is offline before it went offline.

- SM Exhaust Count reveals the number of times the CMTS declared that modem offline. The modem can be marked offline for various reasons. Refer to the "show cable modem maintenance Command" section on page 5-21.

See the following sample for detailed output of the **show cable modem** command:

```
Router# show cable modem detail

Interface    SID  MAC address     Max CPE  Concatenation Rx SNR
Cable1/0/U0 1     0090.8330.0215 3         yes
Cable1/0/U0 2     0090.8330.0213 3         yes
Cable1/0/U0 3     0090.8330.0214 3         yes
Cable1/0/U0 4     0090.8330.0217 3         yes
Cable1/0/U0 5     0090.8330.020f 3         yes
Cable1/0/U0 6     0050.7366.17e3 3         no
Cable1/0/U0 7     0090.8330.0211 3         yes
Cable1/0/U0 8     0050.7366.17af 3         no
Cable1/0/U0 9     0090.8330.0216 3         yes
Cable1/0/U0 10    0050.7366.1801 3         no
Cable1/0/U0 11    0050.7366.124d 3         no
Cable1/0/U0 12    0050.7366.1241 3         no
Cable1/0/U0 13    0050.7366.17db 3         no
Cable1/0/U0 14    0050.7366.1239 3         no
Cable1/0/U0 15    0050.7366.17ab 3         no
Cable1/0/U0 1     0050.7366.1db1 3         no            26.50
Cable1/0/U1 2     0050.7318.e97f 3         no            23.87
Cable1/0/U1 3     0050.7318.e965 3         no            23.85
Cable1/0/U0 4     0050.7318.e931 3         no            26.72
Cable1/0/U1 5     0050.7318.e92d 3         no            23.31
Cable1/0/U1 6     0050.7318.e97b 3         no            23.85
Cable1/0/U0 7     0050.7366.1d8d 3         no            26.88
Cable1/0/U0 8     0050.7318.e953 3         no            26.54
Cable1/0/U1 9     0050.7366.1d9d 3         no            23.72
Cable1/0/U1 10    0050.7318.e96b 3         no            23.79
Cable1/0/U1 11    0050.7366.1d95 3         no            23.82
Cable1/0/U0 12    0050.7318.e93f 3         no            26.26
Cable1/0/U1 13    0050.7318.e96d 3         no            23.51
Cable1/0/U0 14    0050.7318.e941 3         no            26.69
Cable1/0/U0 15    0050.7366.1dcd 3         no            26.94
Cable1/0/U1 16    0050.7318.e939 3         no            23.98
Cable1/0/U0 17    0050.7366.1d8f 3         no            27.13
Cable1/0/U0 18    0050.7302.3da3 3         no            26.58
Cable1/0/U0 19    0050.7318.e93b 3         no            26.49
Cable1/0/U0 20    0050.7318.e901 3         no            26.68
Cable1/0/U1 21    0050.7366.1dbb 3         no            23.45
Cable1/0/U0 22    0050.7318.e957 3         no            26.35
```

```
Cable1/0/U0 23    0050.7318.e985 3          no              26.40
Cable1/0/U0 24    0050.7366.1dbd 3          no              26.69

Router# show cable modem cable 1/0 upstream 0

Interface     Prim Online     Timing Rec    QoS CPE IP address      MAC address
              Sid  State       Offset Power
Cable1/0/U0 1    offline     2264   -0.50  2   0   209.165.200.2    0090.8330.0214
Cable1/0/U0 2    offline     4137  !-3.50  2   0   209.165.200.9    0050.7366.17d3
Cable1/0/U0 3    init(d)     4136  !-2.50  2   0   209.165.200.0    0050.7366.17ab
Cable1/0/U0 4    init(d)     4138  !-4.75  2   0   209.165.200.0    0050.7366.1803
Cable1/0/U0 5    init(d)     4137  !-2.25  2   0   209.165.200.0    0050.7366.1801
Cable1/0/U0 6    init(o)     2251   -0.25  2   0   209.165.200.3    0090.8330.0213
Cable1/0/U0 7    offline     2264    0.75  2   0   209.165.200.4    0090.8330.020f
Cable1/0/U0 8    offline     2266   -0.50  2   0   209.165.200.5    0090.8330.0211
Cable1/0/U0 9    init(rc)    4662    1.00  2   0   209.165.200.0    00d0.bad3.c459

Router# show cable modem cable 1/0 upstream 0 unregistered

Interface     Prim Online     Timing Rec    QoS CPE IP address      MAC address
              Sid  State       Offset Power
Cable1/0/U0 1    offline     2264   -0.50  2   0   209.165.200.2    0090.8330.0214
Cable1/0/U0 2    offline     4137  !-3.50  2   0   209.165.200.9    0050.7366.17d3
Cable1/0/U0 3    init(d)     4136  !-2.75  2   0   209.165.200.0    0050.7366.17ab
Cable1/0/U0 4    init(d)     4137  !-3.25  2   0   209.165.200.0    0050.7366.1803
Cable1/0/U0 5    init(d)     4141  !-2.75  2   0   209.165.200.0    0050.7366.1801
Cable1/0/U0 6    offline     2251   -0.25  2   0   209.165.200.3    0090.8330.0213
Cable1/0/U0 7    offline     2254   -1.00  2   0   209.165.200.4    0090.8330.020f
Cable1/0/U0 8    offline     2248    0.00  2   0   209.165.200.5    0090.8330.0211
Cable1/0/U0 9    init(rc)    4665   -0.50  2   0   209.165.200.0    00d0.bad3.c459

Router# show cable modem cable 1/0 upstream 0 offline

Interface     MAC address    Prim Previous  Offline            Rx     Rx    SM
                             Sid  State     Time               Power  SNR   Exhaust
                                                                            Count
Cable1/0/U0 0050.7366.17d3 2    init(o)   Jan 16 20:30:26 !-3.50 ----- 1
Cable1/0/U0 0090.8330.0213 6    init(o)   Jan 16 20:30:55  -0.25 ----- 181
Cable1/0/U0 0090.8330.020f 7    init(o)   Jan 16 20:31:07  -1.00 ----- 181
Cable1/0/U0 0090.8330.0211 8    init(o)   Jan 16 20:31:23   0.00 ----- 181
```

show cable modem maintenance Command

When a cable modem is detected to be offline by the CMTS—no reply after 16 retries of station maintenance requests—the cable modem is marked offline. Besides marking the cable modem and SID state offline, the SID is removed immediately from the CMTS ranging list, and an aging timer is started to cleanup the SID completely if the cable modem does not attempt to come online within the next 24 hours.

Output fields are described below:

- The SM Exhausted Count value refers to the number of times a cable modem was dropped because it did not reply to station maintenance requests. A CM is removed from the station maintenance list after 16 times of periodic ranging opportunity without seeing the RNG_REQ from the modem.

- The SM Aborted Count value refers to the number of times the CM was dropped because its operational parameters were unacceptable. This includes such reasons as the power level is outside the acceptable range, or the timing offset keeps changing. The respective times in the command output indicate when this happened.

Following is a response to the **show cable modem maintenance** command:

```
uBR7100# show cable modem maintenance

Interface     SID    MAC Address       SM Exhausted        SM Aborted
                                       Count     Time      Count     Time
Cable1/0/U1   1      0010.7b6b.5e27    4    Apr 29 19:33:19   0
Cable1/0/U0   2      0010.7b6b.5e15    8    Apr 29 19:34:55   0
Cable1/0/U2   11     0050.731c.b025    1    Apr 29 16:43:39   0
Cable1/0/U0   13     0050.731c.b021    1    Apr 29 15:58:43   0
Cable1/0/U0   16     0050.731c.b009    1    Apr 29 15:58:28   0
Cable1/0/U0   20     0050.731c.bfed    1    Apr 28 14:36:22   0
Cable1/0/U2   24     0050.731c.b023    1    Apr 27 10:30:36   0
Cable1/0/U1   27     0050.731c.bfeb    1    Apr 28 14:54:53   0
Cable1/0/U2   28     0050.731c.bfdf    1    Apr 28 14:50:55   0
Cable1/0/U1   30     0050.7366.1a71    2    Apr 29 17:49:00   0
Cable1/0/U1   31     0050.7366.1bab    3    Apr 29 16:21:47   0
Cable1/0/U1   32     0050.731c.bfe7    0                      2    Jan 1  09:00:00
Cable1/0/U1   33     0050.731c.bfd3    4    Apr 29 15:09:28   0
Cable1/0/U2   35     0050.731c.b041    1    Apr 29 16:17:41   0
Cable1/0/U1   36     0050.7366.1ab9    2    Apr 29 16:53:26   0
```

show interface cable Command

To display cable interface information, use the **show interface cable** privileged EXEC command:

show interface cable *slot/port* [*downstream* | *upstream*]

See the following sample **show interface cable** command output for a cable modem located in slot 1/port 0:

```
Router# show interface cable 1/0

Cable1/0 is up, line protocol is up
  Hardware is BCM3210 FPGA, address is 00e0.1e5f.7a60 (bia 00e0.1e5f.7a60)
  Internet address is 1.1.1.3/24
  MTU 1500 bytes, BW 27000 Kbit, DLY 1000 usec, rely 255/255, load 1/255
  Encapsulation, loopback not set, keepalive not set
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 4d07h, output 00:00:00, output hang never
  Last clearing of "show interface" counters never
  Queuing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
       10908 packets input, 855000 bytes, 0 no buffer
       Received 3699 broadcasts, 0 runts, 0 giants, 0 throttles
       3 input errors, 3 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
       5412 packets output, 646488 bytes, 0 underruns
       0 output errors, 0 collisions, 13082 interface resets
       0 output buffer failures, 0 output buffers swapped out
```

Note   The **show interface upstream** command is enhanced to display details on the MAC scheduler state for an upstream port. Refer to the "Enhanced show interface upstream output Command" section on .

Table 5-4   show interface cable Command Field Descriptions

Field	Description
Cable slot/port is up/...administratively down	Indicates whether the interface hardware is currently active or taken down by the administrator.
line protocol is up/...administratively down	Indicates whether the software processes that handle the line protocol believe the interface is usable or if it has been taken down by the administrator.
hardware	Hardware type and address.
Internet address	Internet address followed by subnet mask.
MTU	Maximum Transmission Unit (MTU) of the interface.
BW	Bandwidth of the interface in kilobits per second.
DLY	Delay of the interface in microseconds.
rely	Reliability of the interface as a fraction of 255, calculated as an exponential average over 5 minutes. (For example, 255/255 is 100% reliability).
load	Load on the interface as a fraction of 255, calculated as an exponential average over 5 minutes. (For example, 255/255 is complete saturation.)
Encapsulation	Encapsulation method assigned to this interface.
ARP type	Type of Address Resolution Protocol (ARP) and timeout value assigned.
Last input	Number of hours, minutes, and seconds since the last packet was successfully received by an interface.
output	Number of hours, minutes, and seconds since the last packet was successfully transmitted by an interface.
Last clearing of "show interface" counters	Time when the counters that measure cumulative statistics, such as number of bytes transmitted and received, were last reset to zero.
Queuing strategy	Displays the type of queuing configured for this interface. In the example output, the type of queuing configured is First In First Out (FIFO).
Output queue	Number of packets in the output queue. The format of this number is A/B where A indicates the number of packets in the queue, and B indicates the maximum number of packets allowed in the queue.
drops	Indicates the number of packets dropped due to a full queue.
input queue/drops	Number of packets in the input queue. The format of this number is A/B where A indicates the number of packets in the queue, and B indicates the maximum number of packets allowed in the queue.
drops	Indicates the number of packets dropped due to a full queue.
Five minute input rate Five minute output rate	Average number of bits and packets transmitted per second in the last five minutes.
packets input	Total number of error-free packets received by the system.
bytes input	Total number of bytes, including data and MAC encapsulation, in the error-free packets received by the system.

Table 5-4   show interface cable Command Field Descriptions (continued)

Field	Description
no buffer	Number of received packets discarded because there was no buffer space in the main system.
Received broadcast	Total number of broadcast or multicast packets received by the interface.
runts	Number of packets that are discarded because they are smaller than the medium's minimum packet size.
giants	Number of packets that are discarded because they exceed the medium's maximum packet size.
input errors	Includes runts, giants, no buffers, CRC, frame, overrun, and ignored counts.
CRC	Indicates the number of times the cyclic redundancy checksum generated by the originating LAN station or far-end device does not match the checksum calculated from the data received.
frame	Number of packets received incorrectly (with a CRC error and a non-integer number of octets).
overrun	Number of times the receiver hardware was unable to forward received data to a hardware buffer because the input rate exceeded the receiver's ability to handle the data.
ignored	Number of received packets ignored by the interface because the interface hardware ran low on internal buffers.
packets output	Total number of messages transmitted by the system.
bytes	Total number of bytes, including data and MAC encapsulation, transmitted by the system.
underruns	Number of times the transmitter ran faster than the receiving device could handle.
output errors	Sum of all errors that prevented the final transmission of packets out of the interface being examined.
interface resets	Number of times an interface has been completely reset.
output buffer failures	Number of times the output buffer has failed.
output buffer swapped out	Number of times the output buffer has been swapped out.

See the following sample output for the downstream cable interface from the
show interface cable downstream command:

```
Router# show interface cable 1/0 downstream

Cable1/0: Downstream is up
    111947771 packets output, 1579682655 bytes, 0 discarded
    0 output errors
```

Table 5-5   show interface cable downstream Command Field Descriptions

Field	Description
Cable	Indicates the location of the downstream interface.
Downstream is up/...administratively down	Indicates the administrative state of the interface.
packets output	Total number of packets transmitted out of this interface.
bytes	Total number of bytes transmitted out of this interface.
discarded	Total number of packets discarded.
output errors	Sum of all errors that prevented downstream transmission of packets out of this interface.

See the following sample output for the upstream cable interface for upstream cable interface 0 from the **show interface cable upstream** command:

```
Router# show interface cable 1/0 upstream 0

Cable1/0: Upstream 0 is up
    Received 16873 broadcasts, 0 multicasts, 73310 unicasts
    0 discards, 89053 errors, 0 unknown protocol
    90183 packets input, 1 uncorrectable
    89042 noise, 0 microreflections
    Total Modems On This Upstream Channel : 8 (4 active)
    Default MAC scheduler
    Queue[Rng Polls]  0/20, fifo queuing, 0 drops
    Queue[Cont Mslots]  0/104, fifo queuing, 0 drops
    Queue[CIR Grants]  0/20, fair queuing, 0 drops
    Queue[BE Grants]  0/30, fair queuing, 0 drops
    Queue[Grant Shpr]  0/30, calendar queuing, 0 drops
    Reserved slot table currently has 0 CBR entries
    Req IEs 134469315, Req/Data IEs 0
    Init Mtn IEs 385879, Stn Mtn IEs 131059
    Long Grant IEs 10766, Short Grant IEs 15895
    Avg upstream channel utilization : 1%
    Avg percent contention slots : 97%
    Avg percent initial ranging slots : 0%
    Avg percent minislots lost on late MAPs : 0%
    Total channel bw reserved 0 bps
    CIR admission control not enforced
    Current minislot count   : 6676390    Flag: 0
    Scheduled minislot count : 6676545    Flag: 0
```

Table 5-6 describes the fields shown in the **show interface cable upstream** display.

Table 5-6   show interface cable upstream Command Field Descriptions

Field	Description
Cable	Indicates the location of the upstream interface.
Upstream is up/...administratively down	Indicates the administrative state of the upstream interface.
Received broadcasts	Number of broadcast packets received through this upstream interface.
multicasts	Number of multicast packets received through this upstream interface.

Table 5-6   show interface cable upstream Command Field Descriptions (continued)

Field	Description
unicasts	Number of unicast packets received through this interface.
discards	Number of packets discarded by this interface.
errors	Sum of all errors that prevented upstream transmission of packets through this interface.
unknown protocol	Number of packets received that were generated using a protocol unknown to the Cisco uBR7100 series.
packets input	Number of packets received through this upstream interface that were free from errors.
corrected	Number of error packets received through this upstream interface that were corrected.
uncorrectable	Number of error packets received through this upstream interface that could not be corrected.
noise	Number of upstream packets corrupted by line noise.
microreflections	Number of upstream packets corrupted by microreflections.
Guaranteed-rate service queue depth	Number of bandwidth requests queued up in the Guarantee-rate queue. This queue is only available to modems that have a reserved minimum upstream rate in their class of service.
Best-effort service queue depth	Number of bandwidth requests queued up in the Best-effort queue. This queue is available to all modems that do not have any reserved rate on the upstream.
Total Modems On This Upstream Channel	Number of cable modems currently sharing this upstream channel. This field also shows how many of these modems are active.
Current Total Bandwidth Reserved	Total amount of bandwidth reserved by all modems sharing this upstream channel that require bandwidth reservation. The class of service for these modems specifies some nonzero value for the guaranteed-upstream rate. When one of these modems is admitted on the upstream, this field value is incremented by this guaranteed-upstream rate value.
CIR admission control (formerly: Current Admission Control Status)	Indicates the status of admission control on the upstream channel ENFORCED status allows users to enable admission control on a per port basis. This controls how limited bandwidth is allocated. NOT ENFORCED status indicates that there is no admission control. Every modem that registers with a class of service specifying a minimum upstream rate is admitted by the CMTS regardless of how much aggregate bandwidth is actually available. Users enable admission control by using the admission control CLI.
Default MAC scheduler	Indicates the status of the MAC scheduler as being in default mode as opposed to Automated Test Procedure (ATP).
Queue[Rng Polls]	The MAC scheduler queue showing the number of ranging polls.
Queue[Cont Mslos]	The MAC scheduler queue showing the number of forced contention request slots in MAPS.

Table 5-6   show interface cable upstream Command Field Descriptions (continued)

Field	Description
Queue[CIR Grants]	The MAC scheduler queue showing the number of CIR grants pending.
Queue[BE Grants]	The MAC scheduler queue showing the number of BE grants pending.
Queue[Grant Shpr]	The MAC scheduler queue showing the number of grants that have been buffered for traffic shaping.
drops	Number of packets dropped.
Reserved slot table currently has 0 CBR entries	Number of CBR sessions active on an upstream channel at any given time.
Req IEs	The running counter of request IEs sent in MAPS.
Req/Data IEs	The counter of request/data IEs sent in MAPS.
Init Mtn IEs	The counter of Initial Maintenance IEs.
Stn Mtn IEs	Number of station maintenance (ranging poll) IEs.
Long Grant IEs	Number of long grant IEs.
Short Grant IEs	Number of short grant IEs.
Avg upstream channel utilization	Indicates on average what percent of the upstream channel bandwidth is being used.
Avg percent contention slots	Indicates on average what percent of slots are in contention state.
Avg percent initial ranging slots	Indicates on average what percent of slots are in initial ranging state.
Avg percent minislots lost on late MAPs	Indicates on average what percent of slots are lost because a MAP interrupt was too late.
Current minislot count (formerly: Last Minislot Stamp [current_time_base])	Indicates the current minislot count at the CMTS. FLAG indicates the timebase reference. This field is used only by developers.
Scheduled minislot count (formerly: Last Minislot Stamp [scheduler_time_base])	Indicates the furthest minislot count allocated at the indicated time. FLAG indicates the timebase reference. This field is used only by developers.

Enhanced show interface upstream output Command

The **show interface cable upstream** command displays detailed MAC scheduler state information for the upstream port. The example below illustrates the new display:

```
cmts# show interface cable 1/0 upstream 0

Cable1/0:Upstream 0 is up
    Received 13 broadcasts, 0 multicasts, 110 unicasts
    0 discards, 106 errors, 0 unknown protocol
    123 packets input, 0 uncorrectable
    106 noise, 0 microreflections
    Total Modems On This Upstream Channel :3 (3 active)
    Default MAC scheduler
    Queue[Rng Polls]  0/20, fifo queuing, 0 drops
    Queue[Cont Mslots]  0/104, fifo queuing, 0 drops
```

```
Queue[CIR Grants]  0/20, fair queuing, 0 drops
Queue[BE Grants]   0/30, fair queuing, 0 drops
Queue[Grant Shpr]  0/30, calendar queuing, 0 drops
Reserved slot table currently has 2 CBR entries
Req IEs 280185, Req/Data IEs 0
Init Mtn IEs 800, Stn Mtn IEs 49
Long Grant IEs 26, Short Grant IEs 15
Avg upstream channel utilization :1%
Avg percent contention slots :97%
Avg percent initial ranging slots :1%
Avg percent minislots lost on late MAPs :0%
Total channel bw reserved 192000 bps
CIR admission control not enforced
Current minislot count   :1165412    Flag:1
Scheduled minislot count :1176227    Flag:1
```

New items in the display include:

- Detailed slot queue statistics—Queue [CIR Grants] 0/20, fair queuing, 0 drops in the previous example, meaning that the queue for CIR-service grants has a current depth of 0, and a maximum depth of 20. Weighted fair queuing shows grants in this queue.

- CBR slot scheduling table state—The reserved slot table in the previous example has 2 CBR entries. This shows that at the time the command was issued, the MAC scheduler had admitted 2 CBR slots in the reserved slot table.

- Counters for each type of upstream slot scheduled in the MAPs for this upstream channel—The "Init Mtn IEs 800" means that the MAC scheduler has added 800 initial maintenance information elements (slots) at the time the **show** command was issued.

- MAC scheduling statistics—Display what percentage of the upstream bandwidth is utilized for each type of slot on an average.

show interface cable sid Command

To display per-SID counters for bandwidth requests, use the **show interface cable** privileged EXEC command:

show interface cable *interface* **sid** [*sid*] **counters verbose**

Data transport over the RF link uses the registered SID address, rather than the Ethernet address. This allows multiple hosts to access the network by using a single cable modem.

Note   Use the **verbose** option to provide SID details.

See the following display output for the **verbose** keyword extension for SID 1:

```
Router# show interface c1/0 sid 1 counters verbose

Sid                         : 1
Input packets               : 39
Input octets                : 15964
Output packets              : 30
Output octets               : 8796
BW requests received        : 40
Grants issued               : 40
Rate exceeded BW request drops : 0
Rate exceeded DS packet drops  : 0
```

See the following display output for the **verbose** keyword extension for all SIDs on the specified interface:

```
Router# show interface c1/0 sid counters verbose

    Sid                          : 1
    Input packets                : 39
    Input octets                 : 15964
    Output packets               : 30
    Output octets                : 8796
    BW requests received         : 40
    Grants issued                : 40
    Rate exceeded BW request drops : 0
    Rate exceeded DS packet drops  : 0
    Sid                          : 2
    Input packets                : 0
    Input octets                 : 0
    Output packets               : 0
    Output octets                : 0
    BW requests received         : 0
    Grants issued                : 0
    Rate exceeded BW request drops : 0
    Rate exceeded DS packet drops  : 0
    Sid                          : 3
    Input packets                : 0
    Input octets                 : 0
    Output packets               : 0
    Output octets                : 0
    BW requests received         : 0
    Grants issued                : 0
    Rate exceeded BW request drops : 0
    Rate exceeded DS packet drops  : 0
```

See the following display for the SIDs connected to the specified interface:

```
Lab-CMTS# show inter cab 1/0 sid

Sid  Prim Type Online    Admin  QoS Create   IP Address      MAC Address
     Sid       State     Status     Time
23        stat init(d)   enable 2   04:00:54  209.165.200.0   0050.7366.17ab
24        stat init(d)   enable 2   04:00:58  209.165.200.0   0050.7366.1803
25        stat init(rc)  enable 2   04:01:05  209.165.200.0   00d0.bad3.c459
26        stat init(d)   enable 2   04:01:10  209.165.200.0   0050.7366.1801
27        stat offline   enable 2   04:01:31  209.165.200.225 0090.8330.0213
28        stat offline   enable 2   04:01:59  209.165.200.226 0090.8330.0211
29        stat offline   enable 2   04:02:07  209.165.200.227 0090.8330.0214
30        dyn  init(o)   enable 2   04:03:09  209.165.200.228 0090.833
```

See the following connection information for all SIDs on the specified interface:

```
Router# show interface c1/0 sid connectivity

Sid   1st time    Times %online    Online time             Offline time
      online      Online            min    avg    max     min    avg    max
1     15:37:24    1      99.73   00:00  1h45m  1h45m  00:17  00:17  00:17
2     15:37:24    1      99.73   00:00  1h45m  1h45m  00:17  00:17  00:17
3     15:37:24    1      99.73   00:00  1h45m  1h45m  00:17  00:17  00:17
```

See the following connection information for SID 1 on the specified interface:

```
Router# show interface c1/0 sid 1 connectivity

Sid   1st time    Times %online    Online time             Offline time
      online      Online            min    avg    max     min    avg    max
1     15:37:24    1      99.72   00:00  1h41m  1h41m  00:17  00:17  00:17
```

See the following display for the counters of the SIDs connected to the specified interface:

```
Router# show interface c1/0 sid counters

    Sid   Inpackets  Inoctets   Outpackets Outoctets  Ratelimit  Ratelimit
                                                       BWReqDrop  DSPktDrop
    1     40         16586      31         9160        0          0
    2     0          0          0          0           0          0
    3     0          0          0          0           0          0
```

See the following display for the counters of SID 1 on the specified interface:

```
Router# show interface c1/0 sid 1 counters

    Sid   Inpackets  Inoctets   Outpackets Outoctets  Ratelimit  Ratelimit
                                                       BWReqDrop  DSPktDrop
    1     39         15964      30         8796        0          0
```

Table 5-7 describes the fields shown in the output for the **show interface cable sid** displays.

Table 5-7   show interface cable sid Command Field Descriptions

Field	Description
Sid	Service identification number.
Prim Sid	The primary service identifier assigned to the modem.
Type	Indicates this SID was created statically at the time of registration or dynamically by the exchange of dynamic service messages between the CM and CMTS.
Online State	"Online" means the modem owning this SID is processing traffic. "Offline" means the modem owning this SID is not processing traffic.
Admin Status	"Disable" means that the SID has been turned off. "Enable" is the normal state.
QoS	Quality of service.
Create time	When the SID was created, number of seconds since the system booted.
Input octets (Inoctets)	Number of octets received by using this SID.
Input packets (Inpackets)	Number of packets received by using this SID.
Output octets (Outoctets)	Number of octets sent from this SID.
Output packets (Outpackets)	Number of packets sent from this SID.
IP address	IP address of the modem owning this SID.
MAC address	MAC address of the modem owning this SID.
BW requests received	Number of bandwidth requests received by this SID.
Grants issued	Number of bandwidth requests granted by this SID.
Rate exceeded BW request drops	Number of bandwidth requests not granted by this SID.
Rate exceeded DS packet drops	Number of downstream packets lost by this SID.
Ratelimit BWReqDrop	Number of bandwidth requests not granted by this SID.
Ratelimit DSPktDrop	Number of downstream packets lost by this SID.

Table 5-7   show interface cable sid Command Field Descriptions (continued)

Field	Description
1st time online	Time at which the modem with this SID connected.
Times online	Number of times the modem with this SID has connected.
% online	Percentage of time the modem with this SID has been connected.
Online time	Minimum, average, and maximum number of hours and minutes the modem with this SID has been connected.
Offline time	Minimum, average, and maximum number of hours and minutes the modem with this SID has been disconnected.

show cable qos profile Command

Following is a response to the **show cable qos profile** command. The display shows ToS specifications:

```
uBR7100# show cable qos profile

Service Prio Max        Guarantee Max        Max tx TOS  TOS   Create   B
class        upstream  upstream  downstream burst  mask value by       priv
>            bandwidth bandwidth bandwidth                              enab
1      0     0         0         0          0      0x0  0x0   cmts(r)  no
2      0     64000     0         1000000    0      0x0  0x0   cmts(r)  no
3      0     1000      0         1000       0      0x0  0x0   cmts     no
4      3     256000    0         512000     0      0x0  0x0   cm       no
5      5     1000000   0         10000000   0      0x0  0x0   cm       no
6      3     256000    0         512000     0      0x0  0x0   cm       yes
```

Note   The "r" in the "Create by" column means the first two classes of service the CMTS creates are reserved for CMs that are not online.

Displays upstream packet discards, errors, error-free packets, correctable and uncorrectable errors, noise and micro-reflection statistics:

```
show  interface slot/downstream-port upstream
```

Troubleshooting Cable Flap Lists

The Cisco uBR7100 series maintains a database of flapping cable modems to assist in locating cable plant problems. The flapping cable interface detector tracks the upstream and downstream performance of all cable modems on the network, without impacting throughput and performance, or creating additional packet overhead on the broadband network. The cable interface flap list keeps track of:

- the cable interface MAC address
- up and down transitions
- registration events
- missed periodic ranging packets
- upstream power adjustments
- the physical interface on the Cisco uBR7100 series CMTS

Note Although this is a Cisco proprietary CMTS feature, it is compatible with all DOCSIS-compliant cable modems. Unlike SNMP, the flap list uses zero bandwidth.

The flap list collects the following station maintenance statistics:

- Detects interface up/down flap; the reinsertion counter counts the number of times a cable interface comes up and inserts into the network. This helps identify potential problems in the downstream because improperly provisioned cable modems tend to try to reestablish a link repeatedly.

- Detects intermittent upstream; the keepalive hits versus misses is the number of times cable modems do not respond or do not respond to the MAC layer keepalive messages. If there are a number of misses, this points to a potential problem in the upstream.

- Lists cable interface MAC addresses sorted by flap rate or most recent flap time.

- Shows power adjustment statistics during station maintenance polling; this represents the number of times the CMTS tells a cable interface to adjust the transmit power more than 3 dB. If constant power adjustments are detected, this usually indicates a problem with an amplifier. By looking at the cable modems in front and behind various amplifiers, you can find the source of failure.

The cable system administrator typically:

- Sets up a script to periodically poll the flap list, for example, every 15 minutes

- Uses the resulting data to perform trend analysis to identify the cable modems that are consistently in the flap list

- Queries the billing and administrative database for cable interface MAC address-to-street address translation and generates a report

These reports can be given to the Customer Service Department or the cable plant's Operations and Maintenance Department. Using these reports, maintenance personnel can quickly discern how characteristic patterns of flapping cable modems, street addresses, and flap statistics can indicate which amplifier or feeder lines are faulty. The reports also help you quickly discern whether problems exist in your downstream or upstream path, and whether the problem is ingress noise or equipment related.

Default values for the following flap-list configuration commands are:

- **cable flap-list miss-threshold**—6 seconds

- **cable flap-list power-adjust**—2 dB

- **cable flap-list insertion-time**—180 seconds

Note Since the cable flap list was originally developed, polling mechanisms have been enhanced to have an increased rate of 1/sec when polls are missed. Cable modems go offline faster than the frequency hop period. This can cause the frequency to stay fixed while cable modems go offline. To compensate for this, as appropriate, you can reduce the hop period to 10 seconds.

Tip The system supports automatic power adjustments. The **show cable flap-list** and **show cable modem** commands indicate when the Cisco uBR7100 series CMTS has detected an unstable return path for a particular modem, and has compensated with a power adjustment. An asterisk (*) appears in the power adjustment field for a modem when a power adjustment has been made; an exclamation point (!) appears when the modem has reached its maximum power transmit level and cannot increase its power level any further.

The following tips and scenarios allow you to use the flap list in the most effective way:

- If a subscriber's cable interface shows a lot of flap list activity, it is having communication problems.

- If a subscriber's cable interface shows little or no flap list activity, it is communicating reliably; the problem is probably in the subscriber's computer equipment or in the connection to the cable interface.

- The top 10% most active cable interfaces in the flap list are most likely to have difficulties communicating with the headend.

- Cable modems with more than 50 power adjustments per day have a suspect upstream path.

- Cable modems with approximately the same number of hits and misses and with a lot of insertions have a suspect downstream path (for example, low level into the cable interface).

- All cable interfaces incrementing the insertion at the same time indicates a provisioning server failure.

- Cable modems with high CRC errors have bad upstream paths or in-home wiring problems.

- Correlating cable interfaces on the same physical upstream port with similar flap list statistics can quickly resolve outside plant problems to a particular node or geography.

- Monitoring the flap list cannot affect cable interface communications.

- The flap list should be saved to a database computer and cleared at least once each day.

- Important upstream performance data can be obtained by tracking flap list trend data.

- Important installation quality control and performance data is directly available from the flap list.

Following is a sample response to the **show cable flap** command:

```
uBR7100# show cable flap

Mac Addr        CableIF Ins   Hit    Miss    CRC   P-Adj   Flap    Time
0010.9500.461f C1/0 U1 56  18857    887     0      1     116 Jun 1  14:09:12
0010.9500.446e C1/0 U1 38  18686   2935     0      1      80 Jun 2  19:03:57
0010.9500.38ec C1/0 U2 63  18932   1040     0      8     138 Jun 2  23:50:53
0010.9500.4474 C1/0 U2 65  18913   1053     0      3     137 Jun 2  09:30:09
0010.9500.4672 C1/0 U2 56  18990   2327     0      6     124 Jun 2  10:44:14
0010.9500.38f0 C1/0 U2 50  18964   2083     0      5     111 Jun 2  20:46:56
0010.9500.e8cb C1/0 U2  0   6537    183     0      1       5 Jun 2  22:35:48
0010.9500.38f6 C1/0 U3 50  19016   2511     0      2     104 Jun 2  07:46:31
0010.9500.4671 C1/0 U3 43  18755   3212     1      1      89 Jun 1  19:36:20
0010.9500.38eb C1/0 U0 57  36133   1608     0      6     126 Jun 2  20:04:58
0010.9500.3ce2 C1/0 U0 44  35315   1907     0      4      99 Jun 2  16:42:47
0010.9500.e8d0 C1/0 U2  0  13213    246     0      1       5 Jun 3  04:15:30
0010.9500.4674 C1/0 U2 56  36037   2379     0      4     121 Jun 3  00:34:12
0010.9500.4677 C1/0 U2 40  35781   2381     0      4      91 Jun 2  12:14:38
0010.9500.4614 C1/0 U2 40  21810   2362     0    502     586 Jun 2  21:43:02
0010.9500.3be9 C1/0 U2 63  22862    969     0      0     128 Jun 1  14:09:03
0010.9500.4609 C1/0 U2 55  22723   2127     0      0     112 Jun 1  14:08:02
0010.9500.3cb8 C1/0 U2 49  22607   1378     0      0     102 Jun 1  14:08:58
0010.9500.460d C1/0 U3 46  22477   2967     0      2      96 Jun 2  17:03:48
0010.9500.3cba C1/0 U3 39  22343   3058     0      0      81 Jun 1  14:13:16
0010.9500.3cb4 C1/0 U3 38  22238   2936     0      0      79 Jun 1  14:09:26
0010.9500.4612 C1/0 U3 38  22306   2928     0      0      79 Jun 1  14:09:29
```

The command line with an arrow next to it reveals a cable interface that is continuously flapping. A high flap rate indicates that the cable interface is power adjusting frequently. This can indicate a problem with an amplifier. The number reveals the number of times the CMTS instructed the cable interface to adjust the transmit power more than 3 dB.

Cable modems are automatically added to the flap list when any of the following conditions are detected:

- When the cable modem re-registers more frequently than the user-specified insertion time.

- When intermittent keepalive messages are detected between the CMTS and the cable modem.

- When the cable modem's upstream transmit power is adjusted beyond the user-specified power threshold.

Displaying the Flap List

The flap list can be queried either using the standard Simple Network Management (SNMP) API or the CLI. Using any third party SNMP Management Information Base (MIB) browser, you can query the *ccsFlapTable* in the CISCO-CABLE-SPECTRUM-MIB, a proprietary extension to the DOCSIS MIBs.

Using the **show cable flap list** command, the flap list statistics are accessed. Refer to the following example. Each of the columns in the display are described in Table 5-8:

```
        MAC ID      CableIF    Ins  Hit    Miss   CRC  P-Adj   Flap    Time
0010.7b6b.60ad C1/0 U0      0   14386   1390    1    38      41   Nov 24 21:34:24
0010.7b6b.65a3 C1/0 U0      0   14503   1264    1    33      37   Nov 24 21:28:09
0010.7b6b.6b9d C1/0 U0      0   14060   1726    3    40      43   Nov 24 21:18:36
```

Table 5-8   Flap List Statistics Description

Statistic	Description
MAC ID	MAC-layer address of a cable modem. The first six digits indicate the vendor ID of the cable modem manufacturer, followed by six digits indicating a unique host address. Each cable modem's MAC address is unique.
Cable IF	The physical upstream interface on the Cisco uBR7100 series CMTS. It denotes the cable modem card slot number, the downstream port number on the RF line card and the upstream port number on the same cable modem card. The flap list data can be sorted based on the upstream port number which is useful when isolating reverse path problems unique to certain combining groups.

Table 5-8   Flap List Statistics Description (continued)

Statistic	Description
Insertions	Link insertion is the process whereby a modem performs an initial maintenance procedure to establish link with the CMTS. The **Ins** column is the flapping modem's insertion count and indicates the number of times the RF link was abnormally re-established. An abnormality is detected when the time between link re-establishment attempts is less than the user-configurable parameter.
	Normal modem activity uses the following sequence below.
	• Initial link insertion is followed by a keepalive loop between the CMTS and cable modem and is called station maintenance.
	• Power-on
	• Initial maintenance
	• Station maintenance
	• Power-off
	When the link is broken, initial maintenance is repeated to re-establish the link.
	• Initial maintenance @ Time T1
	• Station maintenance
	• Init maintenance @ Time T2
	The ***Ins*** and ***Flap*** counters in the flap list are incremented whenever T2 – T1 < N where N is the insertion-time parameter configured in *<cable flap-list insertion-time>*.
	A high **Ins** number indicates:
	• Intermittent downstream sync loss
	• DHCP or modem registration problems

Table 5-8   Flap List Statistics Description (continued)

Statistic	Description
Hit and Miss	The **HIT** and **MISS** columns are keepalive polling statistics between the Cisco uBR7100 series and the cable modem. The station maintenance process occurs for every modem approximately every 25 seconds. When the CMTS receives a response from the modem, the event is counted as a **Hit**. If the CMTS does not receive a response from the cable modem, the event is counted as a **Miss.** A cable modem will fail to respond either because of noise or if it is down. Modems which only log **Misses** and zero **Hits** are assumed to be powered off. **Misses** are not desirable since this is usually an indication of a return path problem; however, having a small number of misses is normal. The flap count is incremented if there are *M* consecutive misses where *M* is configured in the *cable flap miss-threshold* parameter. The parameter value ranges from 1 to 12 with a default of 6. Ideally, the **HIT** count should be much greater than the **Miss** counts. If a modem has a **HIT** count much less than its **MISS** count, then registration is failing. Noisy links cause the **MISS/HIT** ratio to deviate from a nominal 1% or less. High **Miss** counts can indicate: • Intermittent upstream possibly due to noise • Laser clipping • Common-path distortion • Ingress or interference • Too much or too little upstream attenuation
Cyclical Redundancy Check (CRC)	This statistic tracks the **CRC** error counter per modem. **CRC** errors are usually an indication of noise on a plant. A low count can be always be expected but a high **CRC** number calls for some the plant troubleshooting. The **CRC** counter indicates: • Intermittent upstream • Laser clipping • Common-path distortion • Impulsive noise or interference

Table 5-8   Flap List Statistics Description (continued)

Statistic	Description
Power Adjustments (P-Adj)	The station maintenance poll in the CMTS constantly adjusts the modem transmit power, frequency, and timing. The **P-Adj** column indicates the number of times the modem's power adjustment exceeded the threshold value. The power adjustment threshold may be set using the *<cable flap power threshold >* parameter with a value range of 0 to 10 dB and a default value of 2 dB. Tuning this threshold is recommended to decrease irrelevant entries in the flap list. Power Adjustment values of 2 dB and below will continuously increment the **P-Adj** counter. The modem transmitter step size is 1.5 dB, whereas the headend may command 0.25 dB step sizes. Power adjustment flap strongly suggests upstream plant problems such as: • Amplifier degradation • Poor connections • Thermal sensitivity • Attenuation problem
Flap	The **Flap** counter indicates the number of times the modem has flapped. This counter is incremented when one of the following events is detected: • Unusual modem insertion or reregistration attempts. The **Flap** and the **Ins** counters are incremented when the modem tries to reestablish the RF link with the CMTS within a period of time that is less than the user-configurable insertion interval value. • Abnormal Miss/Hit ratio. The **Flap** counter is incremented when *N* consecutive Misses are detected after a Hit where *N* can be user-configurable with a default value of 6. • Unusual power adjustment. The **Flap** and **P-adj** counters are incremented when the modem's upstream power is adjusted beyond a user-configurable power level.
Time	**Time** is the timestamp indicating the last time the modem flapped. The value is based on the clock configured on the local Cisco uBR7100 series CMTS. If no time is configured, this value is based on the current uptime of the Cisco uBR7100 series CMTS. When a cable modem meets one of the three flap list criteria, the **Flap** counter is incremental and **Time** is set to the current time.

Troubleshooting with the Flap List

This section includes suggestions on how to interpret different network conditions based on the flap list statistics:

• **Condition 1:** Low miss/hit ratio (< 2% for MC16 card), low insertion, low P-adj, low flap counter and old timestamp.
  Analysis: This exhibits an optimal network situation.

• **Condition 2:** High ratio of misses over hits (> 10%).
  Analysis: Hit/miss analysis should be done after the "Ins" count stops incrementing. In general, if the hit and miss counts are about the same order of magnitude, the upstream can be experiencing noise. If the miss count is greater, then the modem is probably dropping out frequently and not

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

- **Condition 3:** Relatively high power adjustment counter.
  Analysis: Indicates the power adjustment threshold is probably set at default value of 2 dB adjustment. The modem transmitter step size is 1.5 dB, but the headend can command 0.25 dB step sizes. Tuning your power threshold to 6 dB is recommended to decrease irrelevant entries in the flap list. The power adjustment threshold can be set using *cable flap power threshold <0-10 dB>* from the Cisco IOS global configuration mode. A properly operating HFC network with short amplifier cascades can use a 2 to 3 dB threshold.

- **Condition 4:** High P-Adj and CRC errors.
  Analysis: This condition can indicate that the fiber node is clipping the upstream return laser. Evaluate the modems with the highest CRC count first. If the modems are not going offline (Ins = 0), this will not be noticed by subscribers. However, they could receive slower service due to dropped IP packets in the upstream. This condition also results in input errors on the Cisco uBR7100 series router cable interface.

- **Condition 5:** High insertion rate.
  Analysis: If link re-establishment happens too frequently, the modem is usually having a registration problem. This is indicated by a high Ins counter which tracks the **Flap** counter.

Setting Cable Flap List Aging

You can specify the number of days to record and retain flapping activity on cable interfaces currently in the flap list table. This value is known as the age of the flap list. The valid range is from 1 to 60 days.

To set the age of the cable flap list, use the following command in global configuration mode.

Command	Purpose
CMTS01(config)# **cable flap-list aging days**	Specifies the number of days to record and retain flapping activity for the cable modems connected to this Cisco uBR7100 series CMTS.

Verifying Cable Flap List Aging

To verify that cable flap list aging is set, enter the **show cable flap list** command:

```
CMTS01# show cable flap list
Mac Addr        CableIF    Ins    Hit    Miss    CRC   P-Adj   Flap    Time
0010.7b6b.5d1d C1/0 U0      0     688    169      0      0       3 Nov 5  12:28:50
0010.7b6b.5e15 C1/0 U0      1     707    185      0      0       5 Nov 5  12:29:52
0010.7b6b.5e27 C1/0 U0      1     707    198      0      0       5 Nov 5  12:29:55
0010.7b6b.5d29 C1/0 U0      1     709    205      0      0       5 Nov 5  12:29:52
0010.7b6b.5e2b C1/0 U0      1     710    204      0      0       7 Nov 5  12:30:16
```

Setting Cable Flap List Insertion Time

You can set the cable flap list insertion time. When a cable interface makes an insertion request more frequently than the amount of insertion time defined by this command, the cable interface is placed in the flap list for activity recording. The valid range is from 60 to 86400 seconds.

To set the cable flap list insertion time, use the following command in global configuration mode.

Command	Purpose
CMTS01(config)# **cable flap-list insertion-time** *seconds*	Specifies the insertion time in seconds. Any cable modem that makes an insertion request more frequently than this period of time is placed in the flap list.

Verifying Cable Flap List Insertion Time

To verify cable flap list insertion time, enter the **show cable flap list** command:

```
CMTS01# show cable flap list
Mac Addr        CableIF    Ins    Hit    Miss    CRC    P-Adj    Flap    Time
0010.7b6b.5d1d C1/0 U0      0      688    169     0      0        3 Nov 5  12:28:50
0010.7b6b.5e15 C1/0 U0      1      707    185     0      0        5 Nov 5  12:29:52
0010.7b6b.5e27 C1/0 U0      1      707    198     0      0        5 Nov 5  12:29:55
0010.7b6b.5d29 C1/0 U0      1      709    205     0      0        5 Nov 5  12:29:52
0010.7b6b.5e2b C1/0 U0      1      710    204     0      0        7 Nov 5  12:30:16
```

Setting Cable Flap List Power Adjustment Threshold

You can specify the power adjustment threshold that will cause a flap list event to be recorded. When the power adjustment of a cable interface meets or exceeds the threshold, the cable interface is placed in the flap list. The valid range is from 1 to 10 dBmV.

> **Note**   A power adjustment threshold of less than 2 dBmV might cause excessive flap list event recording. Cisco recommends setting this threshold value to 3 dBmV or higher.

To set the power adjustment threshold for flap-list events, use the following command in global configuration mode.

Command	Purpose
CMTS01(config)# **cable flap-list power-adjust threshold** *dbmv*	Specifies the minimum power adjustment that will constitute a flap-list event.

Verifying Cable Flap List Power Adjustment Threshold

To verify the cable flap list power adjustment threshold, enter the **show cable flap list** command:

```
CMTS01# show cable flap list
Mac Addr        CableIF    Ins    Hit    Miss    CRC    P-Adj    Flap    Time
0010.7b6b.5d1d C1/0 U0      0      688    169     0      0        3 Nov 5  12:28:50
0010.7b6b.5e15 C1/0 U0      1      707    185     0      0        5 Nov 5  12:29:52
0010.7b6b.5e27 C1/0 U0      1      707    198     0      0        5 Nov 5  12:29:55
0010.7b6b.5d29 C1/0 U0      1      709    205     0      0        5 Nov 5  12:29:52
0010.7b6b.5e2b C1/0 U0      1      710    204     0      0        7 Nov 5  12:30:16
```

Setting Cable Flap List Miss Threshold

You can specify the miss threshold for recording a flap-list event. A miss is the number of times a cable modem does not acknowledge a MAC layer keepalive message from a cable interface card. An 8% miss rate is normal for the Cisco cable interface cards. When the number of misses exceeds the threshold, the cable interface is placed in the flap list.

✎

Note   A high miss rate can indicate intermittent upstream problems, fiber laser clipping, or common-path distortion.

To set the miss threshold for recording a flap-list event, use the following command in global configuration mode.

Command	Purpose
CMTS01(config)# **cable flap-list miss-threshold** *misses*	Specifies the number of MAC layer keepalive misses that will result in the cable modems being place in the flap list.

Verifying Cable Flap List Miss Threshold

To verify the cable flap list miss threshold, enter the **show cable flap list** command:

```
CMTS01# show cable flap list
Mac Addr        CableIF    Ins    Hit    Miss    CRC    P-Adj    Flap    Time
0010.7b6b.5d1d C1/0 U0       0    688    169      0       0       3 Nov 5  12:28:50
0010.7b6b.5e15 C1/0 U0       1    707    185      0       0       5 Nov 5  12:29:52
0010.7b6b.5e27 C1/0 U0       1    707    198      0       0       5 Nov 5  12:29:55
0010.7b6b.5d29 C1/0 U0       1    709    205      0       0       5 Nov 5  12:29:52
0010.7b6b.5e2b C1/0 U0       1    710    204      0       0       7 Nov 5  12:30:16
```

Setting Cable Flap List Size

You can specify the maximum number of cable interfaces that can be listed in the cable flap list tables. The valid range is from 1 to 8192 cable interfaces. The default is 8192 cable interfaces.

To specify the maximum number of cable modems that can be recorded in the flap list, use the following command in global configuration mode.

Command	Purpose
CMTS01(config)# **cable flap-list size** *number*	Specifies the maximum size of the flap list.

Verifying Cable Flap List Size

To verify the cable flap list size, enter the **show cable flap list** command:

```
CMTS01# show cable flap list
Mac Addr        CableIF    Ins    Hit    Miss    CRC    P-Adj    Flap    Time
0010.7b6b.5d1d C1/0 U0       0    688    169      0       0       3 Nov 5  12:28:50
0010.7b6b.5e15 C1/0 U0       1    707    185      0       0       5 Nov 5  12:29:52
0010.7b6b.5e27 C1/0 U0       1    707    198      0       0       5 Nov 5  12:29:55
0010.7b6b.5d29 C1/0 U0       1    709    205      0       0       5 Nov 5  12:29:52
0010.7b6b.5e2b C1/0 U0       1    710    204      0       0       7 Nov 5  12:30:16
```

Clearing Cable Flap List

To remove a single cable modem from the flap list or to remove all cable modems from the flap list, use one of the following commands in global configuration mode.

Command	Purpose
CMTS01(config)# **clear cable flap-list** m*ac-addr*	Clears the entries in the cable flap list for the cable modem with this MAC address.
CMTS01(config)# **clear cable flap-list all**	Clears the entries for all cable modems in the flap list.

Customizing Other Flap List Values and Related Commands

The following displays flap list with different sorting options:

show cable modem flap-list [*cable n | sort-flap | sort-time | sort-interface*]
The following sets the threshold value for link establishment:

[**no**] **cable flap-list insertion-time** *sec*

Note   A modem is tagged as flapping if the insertion time exceeds this value. Its value can be set from 60 to 86400 seconds with a default of 180 seconds.

The following sets the number of consecutive missed station maintenance (RNG-RSP) messages that must be missed for a flap event to occur. Value ranges from 1 to 2 with a default of 6 seconds. The hits and miss counters are not affected:

[**no**] **cable flap-list miss-threshold** *miss-threshold*

The following clears the counters for a cable modem (or all cable modems) in the station maintenance list:

clear cable modem *{mac-addr | ip-addr | all}* **counters**

The following displays the QoS, modem status, In and Out octets, IP and MAC addresses per SID:

show int cable slot/port **sid**

The following drops the modem's RF link by removing a modem from the keep-alive polling list. This forces the modem to reset:

clear cable-modem *{mac-addr | ip-addr | all}* **reset**

The following uses a MAC layer ping to determine if the cable modem is online. It uses smaller data units on the wire than a standard IP ping, resulting in lower overhead. This command works even if the IP layer in the modem is down or has not completed registration:

ping DOCSIS cable-modem *mac-addr | IP address*

The following displays the timing offset, receive power, and QoS values by cable interface, SID, and MAC address:

show cable modem *[ip-address | MAC-address]*

The following displays the current allocation table and frequency assignments:

show cable spectrum-group *[spectrum group number]*

The following displays maximum, average, and minimum% online time and offline times for a given SID on a given Cisco uBR7100 series router interface:

show int *slot/port* **sid connectivity**

The following command displays input and output rates, input errors, CRC, frames, overruns, underruns, collisions, interface resets. High input errors in the CMTS retrieved from this query suggests noisy upstream. In older versions of the chassis, loose midplane and line card screws caused a similar problem:

show interface *slot/downstream-port*

Performing Amplitude Averaging

The Cisco uBR7100 series CMTS uses an averaging algorithm to determine the optimum power level for a cable modem with low carrier-to-noise ratio that is making excessive power adjustments—known as flapping. To avoid dropping flapping cable modems, the Cisco uBR7100 series CMTS averages a configurable number of RNG-REQ messages before it makes power adjustments. By compensating for a potentially unstable return path, the Cisco uBR7100 series CMTS maintains connectivity with affected cable modems. You can interpret these power adjustments, however, as indicating unstable return path connections.

The **show cable flap-list** and **show cable modem** commands are expanded to indicate which paths the Cisco uBR7100 series CMTS is making power adjustments and which modems have reached maximum transmit power settings. These conditions indicate unstable paths that should be serviced.

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

```
Router# show cable flap-list

MAC Address     Upstream     Ins    Hit    Miss   CRC    P-Adj Flap   Time
 0010.7bb3.fd19  Cable1/0/U1  0      2792   281    0      *45   58     Jul 27 16:54:50
 0010.7bb3.fcfc  Cable1/0/U1  0      19     4      0      !43   43     Jul 27 16:55:01
 0010.7bb3.fcdd  Cable1/0/U1  0      19     4      0      *3    3      Jul 27 16:55:01
```

The asterisk (*) indicates that the CMTS is using the power adjustment method on this modem. An exclamation point (!) indicates that the modem has reached maximum transmit power.

Output of the **show cable modem** command appears below:

```
Router# show cable modem

 Interface    Prim Online   Timing Rec    QoS CPE IP address     MAC address
              Sid  State    Offset Power
 Cable1/0/U0 1     online   2257   0.00   3   0   10.30.128.142  0090.8330.0217
 Cable1/0/U0 2     online   2262   *-0.50 3   0   10.30.128.145  0090.8330.020f
 Cable1/0/U0 3     online   2260   0.25   3   0   10.30.128.146  0090.8330.0211
 Cable1/0/U0 4     online   2256   *0.75  3   0   10.30.128.143  0090.8330.0216
 Cable1/0/U0 5     online   2265   *0.50  3   0   10.30.128.140  0090.8330.0214
 Cable1/0/U0 6     online   2256   0.00   3   0   10.30.128.141  0090.8330.0215
 Cable1/0/U0 7     online   4138   !-1.00 3   1   10.30.128.182  0050.7366.124d
 Cable1/0/U0 8     online   4142   !-3.25 3   1   10.30.128.164  0050.7366.1245
 Cable1/0/U0 9     online   4141   !-3.00 3   1   10.30.128.185  0050.7366.17e3
 Cable1/0/U0 10    online   4142   !-2.75 3   0   10.30.128.181  0050.7366.17ab
 Cable1/0/U0 11    online   4142   !-3.25 3   1   10.30.128.169  0050.7366.17ef
```

Similar to the **show cable flap-list** display, the * symbol in the **show cable modem** output indicates that the CMTS is using the power adjustment method on this CM. The ! symbol indicates that the CM has reached maximum transmit power.

This section documents the commands pertaining to amplitude averaging:

- **cable upstream power-adjust noise**
- **cable upstream frequency-adjust averaging**

Enabling or Disabling Power Adjustment

To enable or disable the power adjustment capability, use the following commands:

cable upstream *n* **power-adjust** {**threshold** [*threshold #*] | **continue** [*tolerable value*] | **noise** [*% of power adjustment*]}

no cable upstream power-adjust

Table 5-9   Cable Upstream Power Adjust Syntax Descriptions

Syntax	Description
n	Specifies the upstream port number.
threshold #	Specifies the power adjustment threshold. The threshold range is from 0 to 10 dB. The default is 1 dB.
tolerable value	Determines if the status of the RNG-RSP should be set to CONTINUE or SUCCESS. The range is from 2 to 15 dB. The default is 2 dB.
% of power adjustment	Specifies the percentage of power adjustment packets required to switch from the regular power adjustment method to the noise power adjustment method. Range is from 10 to 100 percent. The default is 30 percent.

Note   The threshold default is 1 dB. The tolerable value default is 2 dB. The power adjustment is 30 percent.

Caution   Default settings are adequate for system operation. Amplitude averaging is an automatic procedure. In general, Cisco does not recommend you adjust values. Cisco does recommend, however, that you clean up your cable plant should you encounter flapping cable modems.

Note   In some instances, you might adjust certain values:

If CMs cannot complete ranging because they have reached maximum power levels, you might try to set the *tolerable value* CONTINUE field to a larger value than the default of 2 dB. Values larger than 10 dB on "C" versions of cable modem cards, or 5 dB on FPGA versions, are not recommended.

If the flap list shows CMs with a large number of power adjustments, but the CMs are not detected as "noisy," you might try to decrease the percentage for "noisy." If you think too many CMs are unnecessarily detected as "noisy," you might try to increase it.

Setting Frequency Threshold to Affect Power Adjustment

To control power adjustment methods by setting the frequency threshold, use the **cable upstream freq-adj averaging** interface configuration command. To disable power adjustments, use the **no** form of this command.

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

no cable upstream freq-adj averaging

Table 5-10   Cable Upstream Freq-adj Averaging Syntax Descriptions

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

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
```

Setting Downstream Test Signals

This feature provides configuration commands that allow you to create downstream test signals. Both Pseudo Random Bit Stream (PRBS) and unmodulated carrier test signals are now supported.

A PRBS test signal is a random data pattern that has been modulated to look like a real data stream. An unmodulated test signal is a continuous sine wave that looks like a carrier wave on the downstream transmission.

See the following required tasks to create PRBS and unmodulated carrier test signals:

- "Configuring Unmodulated Test Signals" section on page 5-45
- "Configuring PRBS Test Signals" section on page 5-45
- "Verifying Test Signal Output" section on page 5-45

Configuring Unmodulated Test Signals

Table 5-11   Instructions to Configure Unmodulated Test Signals

	Command	Purpose
Step 1	Router(config-if)# **cable downstream if-output continuous-wave**	Generates an unmodulated continuous wave signal on the downstream channel. The interface is shut down.
Step 2	Router(config-if)# **no cable downstream if-output**	Stops sending test signals. Note Remember to re-enable the interface to resume normal operations.

Configuring PRBS Test Signals

Table 5-12

	Command	Purpose
Step 1	Router(config-if)# **cable downstream if-output prbs**	Generates a PRBS test signal on the downstream channel. The interface is shut down.
Step 2	Router(config-if)# **no cable downstream if-output**	Stops sending test signals. Note Remember to re-enable the interface to resume normal operations.

Verifying Test Signal Output

To verify the output of a continuous wave test signal or the output of a PRBS test signal, use a spectrum analyzer on the downstream channel. The downstream carrier is enabled as a default.

The standard mode of operation is modulated signal output and the interface is active. For PRBS and continuous wave output, the selected interface is shut down.

The functioning of the **no cable downstream if-output** command has not changed. The interface is shut down.

Pinging Unresponsive Cable Modems

Pinging a Cable Modem

Ping DOCSIS is a Cisco patent-pending feature that allows a cable system administrator to quickly diagnose the health of a channel between the Cisco uBR7100 series and the cable interface. The technology uses 1/64—the bandwidth of IP ping—and works with cable modems that do not have an IP address. This allows cable operators to ping cable modems that are unable to complete registration, have internal bugs, or that are unresponsive due to a crash.

The Ping DOCSIS feature includes a real time view and plot of requested power adjustments, and a measure of optimal headend reception power. This gives the cable operator the ability to solicit a configurable number of periodic ranging requests from a cable interface.

To ping a specific cable interface to determine if it is online, use the following command in EXEC mode.

Table 5-13   Instructions to Ping a Cable Modem

Command	Purpose
CMTS01# **ping docsis** addr	Pings the cable modem with a specific MAC address or IP address to see if it is online.

Verifying the Ping

The **ping docsis** command returns a verification from a cable modem that is pinged:

```
Queuing 5 MAC-layer station maintenance intervals, timeout is 25 msec:
!!!!!
Success rate is 100 percent (5/5)
```

Tip   If you are having trouble, make sure you are using a valid MAC or IP address for the cable interface you want to ping.

Using the Cable Monitor Feature

The Cable Monitor feature configures the cable interface so that it forwards copies of certain packets to a specified interface (typically one of the fixed Fast Ethernet ports on the Cisco uBR7100 series router). By attaching a network analyzer on that interface, you can monitor inbound or outbound packets for specific types of traffic. This can provide invaluable information about the type of traffic being sent or received, and whether that traffic contains any errors or unusual characteristics.

Note   Do not confuse the Cable Monitor feature that is available on the Cisco uBR7100 series router with the Cable Monitor feature available on Cisco cable CPE devices, such as the Cisco uBR924 cable access router. The CMTS feature allows the analysis of traffic over the cable interface, while the cable CPE version of this command provides a way for customers to obtain current configuration information when the CPE cable interface goes down.

The **cable monitor** cable interface command has the following syntax:

```
Router(config-if)# cable monitor [outbound | incoming] [timestamp] interface interface
{access-list <name | number> | sid <n> | mac-addr <address> | upstream <n>}[packet-type
{mac [type {map-req | map-grant | dsa | dsc | dsd ... }] | data packet-header {ethernet |
docsis}}]
```

Enter configuration commands, one per line. Then press **ctrl+z**.

```
Router# conf t

Router(config)# int c1/0
Router(config-if)# cable monitor ?

incoming Monitor incoming packets
outbound       Monitor outbound packets
timestamp Enable packet timestamping
interface Interface to forward monitored packets

Router(config-if)# cable monitor incoming ?

timestamp Enable packet timestamping
interface Interface to forward monitored packets

Router(config-if)# cable monitor incoming timestamp ?

interface Interface to forward monitored packets

Router(config-if)# cable monitor incoming timestamp interface e1/0 ?

access-list IP access list name
mac-addrMAC address of the device monitored
sid Service ID to be monitored
upstreamUpstream port to monitor

Router(config-if)# cable monitor incoming timestamp interface e1/0 sid 2 packet-type ?

mac Monitor mac packets
dataMonitor data packets
<cr>
Router(config-if)# cable monitor incoming timestamp interface e1/0 sid 2 packet-type mac ?

typeMonitor selected mac packets
<cr>
Router(config-if)# cable monitor incoming timestamp interface e1/0 sid 2 packet-type mac
type ?

map-req Monitor Requests
map-grantMonitor Grants
dsa Monitor dynamic service addition
dsc Monitor dynamic service change
dsd Monitor dynamic service deletion
Router(config-if)# cable monitor incoming timestamp interface e1/0 sid 2 packet-type mac
type map-req

Show CLI :
Router# show interface cable 1/0 monitor
```

US/	Time	Outbound	Flow	Flow Type	Flow	Packet	MAC	MAC	Encap
DS	Stmp	Interface	Type	Identifier	Extn.	Type	Extn.	Type	Type
all	yes	Et1/0	mac-addr	0050.5462.008c	yes	data	no	-	Ethernet
us	yes	Et1/0	acc-list	300	no	-	no	-	-
us	no	Et1/0	sid	2	yes	mac	yes	map-grant	-
all	no	Et1/0	acc-list	rrr	no	-	no	-	-
all	no	Et1/0	mac-addr	0042.b013.008c	yes	data	no	-	Ethernet
all	no	Et1/0	upstream	0	yes	data	no	-	docsis

Note See the *Broadband Command Consolidation* manual, available on Cisco.com and the documentation CD-ROM, for more information on this feature and its commands.

Using Cable Interface debug Commands

To troubleshoot cable interfaces, use the following **debug** commands in enable (privileged EXEC) mode.

Table 5-14   Instructions to Use Debug Command

Command	Purpose
CMTS01# **debug cable ?**	View all debug cable commands that are available.
CMTS01# **undebug all**	Turn off all debugging information to the console and choose a more selective **debug** command. **Note** Refer to the **debug** commands that follow.

Caution The following commands can generate large amounts of output as the number of cable modems grows. On heavily loaded systems with thousands of cable modems, these commands can dramatically affect router performance.

debug cable arp Command

This command activates debugging of arp requests on the cable interfaces. When this command is activated, all cable arp request messages are displayed on the Cisco uBR7100 series router console. The format for the command follows:

```
CMTS01# debug cable arp
```

To deactivate debugging of arp requests, use the following command:

```
CMTS01# no debug cable arp
```

debug cable envm Command (Environmental Monitor Messages)

This command activates debugging of the Cisco uBR7100 series environmental monitor. When this command is activated, all environmental monitor messages are displayed on the Cisco uBR7100 series router console. The format for the command follows:

```
CMTS01# debug cable envm
```

To deactivate debugging of the environmental monitor, use the following command:

```
CMTS01# no debug cable envm
```

debug cable err Command (MAC Protocol Errors)

This command activates debugging of cable MAC protocol errors. When this command is activated, any errors that occur in the cable MAC protocol are displayed on the Cisco uBR7100 series router console. The format for the command follows:

```
CMTS01# debug cable err
```

To deactivate debugging of MAC protocol errors, use the following command:

```
CMTS01# no debug cable err
```

debug cable privacy Command (Baseline Privacy)

This command activates debugging of baseline privacy. The format for the command follows:

```
CMTS01# debug cable privacy
```

To deactivate debugging of baseline privacy, use the following command:

```
CMTS01# no debug cable privacy
```

debug cable keyman Command (Baseline Privacy Activity)

This command activates debugging of the TEK and KEK baseline privacy key activity. When this command is activated, all activity related to KEK and TEK keys displays on the Cisco uBR7100 series router console. The format for the command follows:

```
CMTS01# debug cable keyman
```

To deactivate debugging of the keys, use the following command:

```
CMTS01# no debug cable keyman
```

debug cable mac-messages Command

This command activates debugging of messages generated in the cable MAC that frames and encrypts downstream RF signals. When this command is activated, messages generated by the cable MAC are displayed on the Cisco uBR7100 series router console. The format for the command follows:

```
CMTS01# debug cable mac-messages
```

To deactivate debugging of cable MAC messages, use the following command:

```
CMTS01# no debug cable mac-messages
```

debug cable map Command

This command activates debugging of cable maps that identify data on cable interfaces. When this command is activated, messages related to cable maps are displayed on the Cisco uBR7100 series router console. The format for the command follows:

```
CMTS01# debug cable map
```

To deactivate debugging of cable maps, use the following command:

```
CMTS01# no debug cable map
```

debug cable modems Command

This command activates debugging of cable modems. When this command is activated, messages from cable modems on the HFC network are displayed on the Cisco uBR7100 series router console. The format for the command follows:

```
CMTS01# debug cable modems
```

To deactivate debugging of cable MAC messages, use the following command:

```
CMTS01# no debug cable modems
```

debug cable phy Command (Messages)

This command activates debugging of messages generated in the cable PHY—the physical layer where upstream and downstream activity between the Cisco uBR7100 series router and the HFC network is controlled. When this command is activated, messages generated in the cable PHY are displayed on the Cisco uBR7100 series router console. The format for the command follows:

```
CMTS01# debug cable phy
```

To deactivate debugging of the cable PHY, use the following command:

```
CMTS01# no debug cable phy
```

debug cable qos Command

This command activates debugging of QoS. When this command is activated, messages related to QoS parameters are displayed on the Cisco uBR7100 series router console. The format for the command follows:

```
CMTS01# debug cable qos
```

To deactivate debugging of QoS, use the following command:

```
CMTS01# no debug cable qos
```

debug cable range Command (Ranging Messages)

This command activates debugging of ranging messages from cable interfaces on the HFC network. When this command is activated, ranging messages generated when cable interfaces request or change their upstream frequencies are displayed on the Cisco uBR7100 series router console. The format for the command follows:

```
CMTS01# debug cable range
```

To deactivate debugging of cable interface ranging, use the following command:

```
CMTS01# no debug cable range
```

debug cable receive Command (Upstream Messages)

This command activates debugging of upstream messages from cable interfaces. When this command is activated, any messages generated by cable interfaces and sent to the Cisco uBR7100 series router will be displayed on the Cisco uBR7100 series router console. The format for the command follows:

```
CMTS01# debug cable receive
```

To deactivate debugging of upstream messages, use the following command:

```
CMTS01# no debug cable receive
```

debug cable reg Command (Modem Registration Requests)

This command activates debugging of registration requests from cable interfaces on the HFC network. When this command is activated, messages generated by cable interfaces as they make requests to connect to the network are displayed on the Cisco uBR7100 series router console. The format for the command follows:

```
CMTS01# debug cable reg
```

To deactivate debugging of cable registration, use the following command:

```
CMTS01# no debug cable reg
```

debug cable reset Command (Messages)

This command activates debugging of reset messages from cable interfaces on the HFC network. When this command is activated, reset messages generated by cable interfaces are displayed on the Cisco uBR7100 series router console. The format for the command follows:

```
CMTS01# debug cable reset
```

To deactivate debugging of cable reset messages, use the following command:

```
CMTS01# no debug cable reset
```

debug cable specmgmt Command (Spectrum Management)

This command activates debugging of spectrum management (frequency agility) on the HFC network. When this command is activated, messages generated because of spectrum group activity are displayed on the Cisco uBR7100 series router console. Spectrum group activity can be additions or changes to spectrum groups, or frequency and power level changes controlled by spectrum groups. The format for the command follows:

```
CMTS01# debug cable specmgmt
```

To deactivate debugging of cable spectrum management, use the following command:

```
CMTS01# no debug cable specmgmt
```

debug cable startalloc Command (Channel Allocations)

This command activates debugging of channel allocations on the HFC network. When this command is activated, messages generated when channels are allocated to cable interfaces on the HFC network are displayed on the Cisco uBR7100 series router console. The format for the command follows:

```
CMTS01# debug cable startalloc
```

To deactivate debugging of cable channel allocations, use the following command:

```
CMTS01# no debug cable startalloc
```

debug cable transmit Command (CMTS Transmissions)

This command activates debugging of transmissions from the Cisco uBR7100 series router across the HFC network. When this command is activated, messages generated at the headend are displayed on the Cisco uBR7100 series router console. The format for the command follows:

```
CMTS01# debug cable transmit
```

To deactivate debugging of cable transmissions, use the following command:

```
CMTS01# no debug cable transmit
```

debug cable ucc Command (Upstream Channel Change Messages)

This command activates debugging of upstream channel change (UCC) messages generated when cable interfaces request or are assigned a new channel. When this command is activated, messages related to upstream channel changes are displayed on the Cisco uBR7100 series router console. The format for the command follows:

```
CMTS01# debug cable ucc
```

To deactivate debugging of cable upstream channel changes, use the following command:

```
CMTS01# no debug cable ucc
```

debug cable ucd Command (Upstream Channel Description Messages)

This command activates debugging of upstream channel descriptor (UCD) messages. UCD messages contain information about upstream channel characteristics and are sent to the cable modems on the HFC network. Cable modems that are configured to use enhanced upstream channels use these UCD messages to identify and select an enhanced upstream channel to use. When this command is activated, messages related to upstream channel descriptors are displayed on the Cisco uBR7100 series router console. The format for the command is as follows:

```
CMTS01# debug cable ucd
```

To deactivate debugging of cable upstream channel descriptor, use the following command:

```
CMTS01# no debug cable ucd
```