

Cisco – Cable Radio Frequency (RF) FAQs

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Cable Radio Frequency (RF) FAQs

Questions

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Q. How do I measure the upstream RF signal?

A. Use the "Zero Span Method"

For additional information on this method please see [Connecting and Configuring the Cable Headend](#).

1. Connect the spectrum analyzer to the upstream signal from your cable network at the combiner where all the cable modems connect.
2. Set the analyzer to view the upstream with a center frequency to match the configuration on the CMTS.
3. Set the span to 0 MHz.
4. Set the bandwidth and video channel bandwidth to 3 MHz. Do extended pings.
5. Set the sweep value to 80 micro sec. Push the sweep button, manual, 80, then usec.
6. Activate the trigger line between the highest and lowest portions of the signal. Do this by pushing the trig button, video button, and turn dial down appropriately.
7. Adjust the amplitude so the upper portion of the RF signal is on the top graticule of the display grid and reset the trigger line accordingly.

Q. How do I measure the downstream power signal from the MC-xx card?

A. When measuring the downstream power signal that comes from the cable line card to the upconverter the power measured in dBmV is different depending on which series of line cards you have.

For a MCxx "B" card the output is at 32 dBmV +/-2 dB.

For a MCxx "C" card the output is at 42 dBmV +/-2dB.

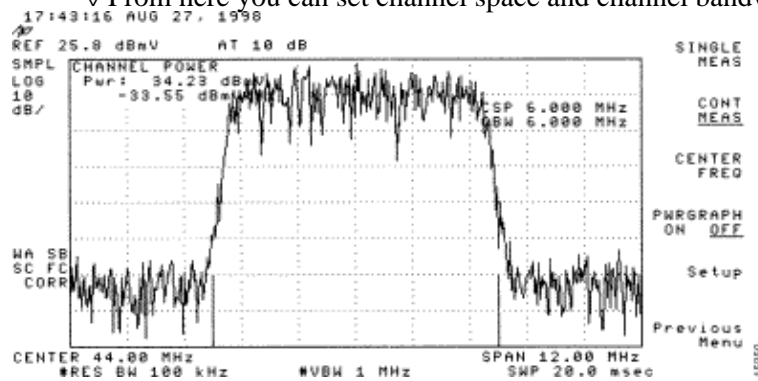
For a complete table of all the MC cards powers, please click [here](#)

This is important because not all upconverters have the "autogain" feature that can automatically adjust to the given power and therefore require padding.

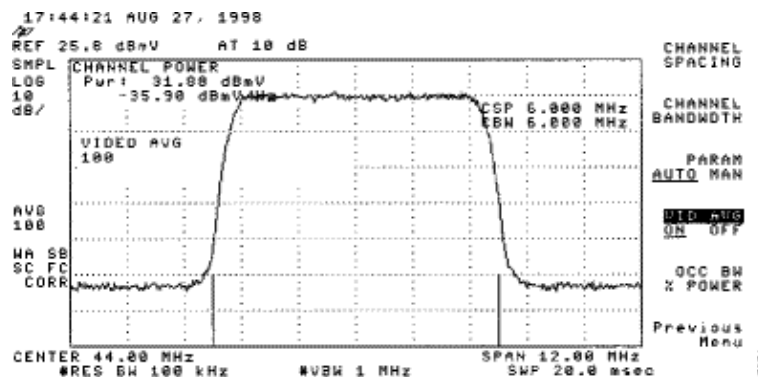
1. When measuring the power output from the line card be sure to set the center frequency to 44MHz and a span of 10 MHz.
2. Turn the Amplitude dial almost to the top so the dBmV setting will read about -10dBmV.
3. Measure the IF signal using the channel power option.
4. Set the channel spacing and channel bandwidth to 6MHz.

◇ Press meas/user, power menu, setup.

◇ From here you can set channel space and channel bandwidth.



1. Set the video average feature by going to, previous menu, setup, video ave
Note: The values doing video averaging are 2.5dB below the actual channel power.

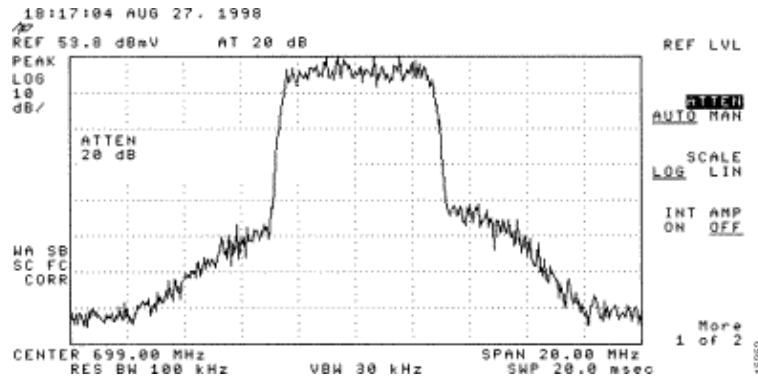


For additional information please see the Measuring the Downstream RF Signal Using the Channel Power Option on a Spectrum Analyzer chapter of Connecting and Configuring the Cable Headend

Q. How do I measure the downstream power signal from the upconverter output?

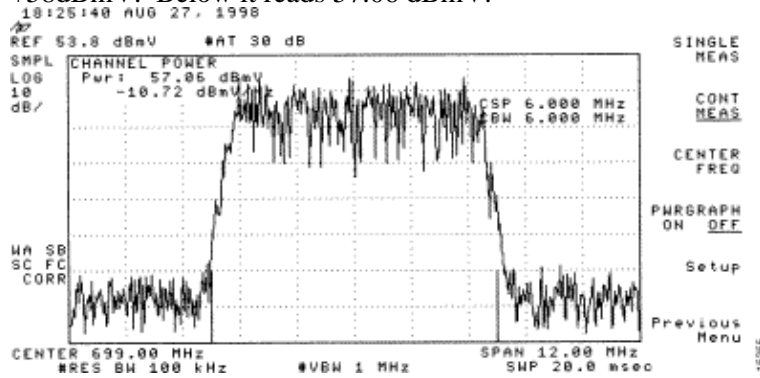
A. The objective of this exercise is to make sure that the power from the upconverter of a modulated digital QAM signal is between the range of +50 to +58 dBmV.

1. Connect the downstream output of the cable card to the upconverter input connector.
2. Connect the spectrum analyzer to the RF output of the upconverter.
3. Set the output of the upconverter between +50 and +58 dBmV.
4. Set the center frequency on the spectrum analyzer to match your configuration on the CMTS with a span of 20 MHz.
5. Set the channel spacing and channel bandwidth to 6 MHz. If the RF signal causes an overload or "laser clipping" you need to add attenuation. You will see a sloping of the lines at the sides of the RF signal as seen below.



6. To add attenuation, push the "amplitude" button then the "manual" button, then a value like 10 and then MHz button.
7. Change the spectrum analyzer settings to view the digital channel power. Push "previous menu," then "setup" then "channel power." Here you will be able to see if there is too much power from the upconverter if the value falls outside the range of +50 to 58 dBmV.
8. If the value is outside the required range, adjust the power setting on the upconverter.
 1. On a GI upconverter you do this by pushing the down arrow key which selects the mode. Go to the mode with the vertical bars.
 2. Then push the right arrow to activate the the bars to blink
 3. Now to add dB push and hold the up arrow key for 3 seconds.
 4. To subtract dB push and hold the down arrow key for 3 seconds.

After adjusting the upconverter the spectrum analyzer should read between +50 and +58dBmV. Below it reads 57.06 dBmV.



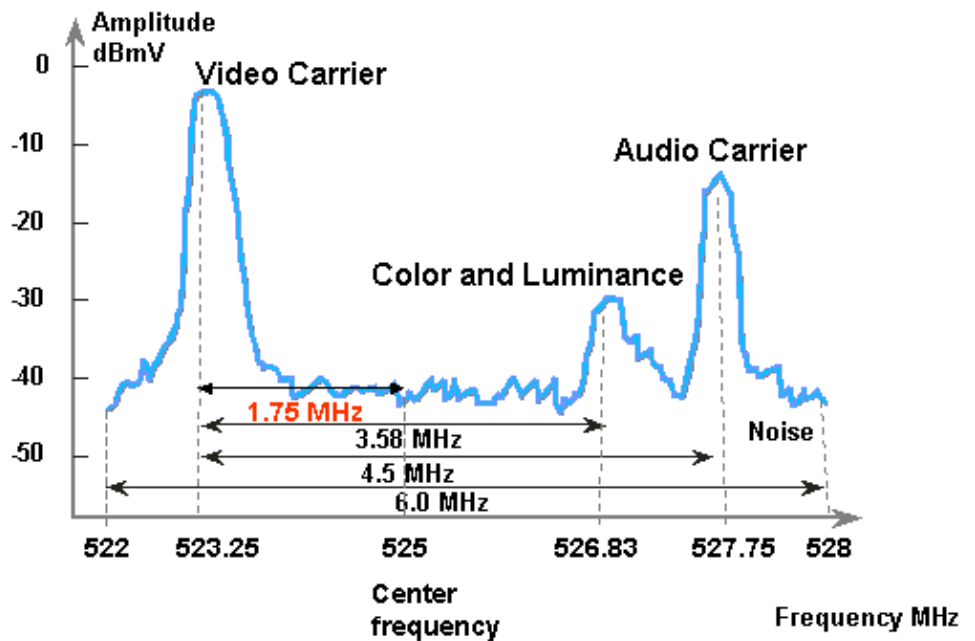
• See also Connecting and

Configuring the Cable Headend

Q. Why is it, on GI upconverters, that the frequency must be set at 1.75 MHz less than the center frequency for a particular NTSC channel?

A. The GI C6U has been set to work off the standard Video Carrier (blue signal) frequency for many years. The reason that they did that is because the video carrier had the higher amplitude in the channel. With data channels (represented by the purple signal), the standard is to use the center frequency to represent that channel. The reason is that the data signals are flatter through the 6MHz channel. The difference between the center frequency and the Video Carrier is 1.75MHz.

Look at both video and data signals from the spectrum analyzer represented in the pictures below.



Q. What is meant by "unity gain?"

A. Unity gain is a concept in which all the amplifiers in a cascade are in balance with their power (dBmV) inputs and outputs. To achieve "unity gain" the receiver output must be adjusted either by padding or attenuation in the node to the proper level determined by the RF input. The RF section or the node is then adjusted to the output levels that give optimal noise and distortion performance for the RF plant. Usually, the outputs of all subsequent amplifiers following the node will be set to the same levels. Thus, we can say that the plant is aligned where the gain factor between a common reference point at each amplifier equals one. For the forward plant, the unity gain point is the amplifier output.

Q. What is the correlation between the minislot size and channel widths?

A. The minislot size and the channel width are related to certain degree but not really tightly coupled. You may already know that minislot size is in units of ticks, and each tick is defined to be 6.25 us (us = microseconds) The channel width is just another way of saying symbol rate.

They are related in a sense that with modulation format (QPSK or 16-QAM) fixed, the higher the symbol rate, the more symbols can fit a chosen minislot size. For example, assuming Quadrature Phase-Shift Keying (QPSK), a minislot of 8 ticks can carry 64 symbols at 1280 ksym rate, or 128 symbols at 2560 ksym rate. Thus the minislot size can also be expressed in

terms of symbols or bytes. But changing of symbol rate does not always imply changing of minislot size, unless a certain minislot size is not valid after the symbol rate change. The minislot sizes are lower-bounded by the DOCSIS, that is to say 32 symbols, and upper-bounded by Broadcom CMTS PHY chip (BCM3137), that is to say 256 symbols. So all the possible minislot sizes are as follows:

		QPSK					16-QAM		
320	160 (ksym/s)	2560	1280	640	320	160	2560	1280	640
(us)	(ticks)	(bytes)					(bytes)		
---	-----	----	-----	----	----	----	-----	-----	----
12.5	2	8	-	-	-	-	16	-	-
25	4	16	8	-	-	-	32	16	-
50	8	32	16	8	-	-	64	32	16
100	16	64	32	16	8	-	128	64	32
16	-								
200	32	-	64	32	16	8	-	128	64
32	1								
400	64	-	-	64	32	16	-	-	128
64	32								
800	128	-	-	-	64	32	-	-	-
128	64								

So, if your CMTS is at QPSK, 1280 ksym rate and 8 ticks minislot size, and then you change the sym rate to 640 ksym, the minislot size is still valid. But if you change the sym rate to 320 ksym, the minislot size becomes invalid; if this occurs, the CMTS will change the minislot size accordingly.

Q. What do the "Show Cable Modem" States mean?

The following list provides all the possible states of a cable modem and what they mean.

offline – modem considered offline

init(r1) – modem sent initial ranging

init(r2) – modem is ranging

init(rc) – 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 – modem registered, enabled for data

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

online(pk) – modem registered, BPI enabled and KEK assigned

online(pt) – modem registered, BPI enabled and TEK assigned

reject(m) – modem attempted to register but was refused due to bad mic

reject(c) – modem 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

If cable modems are not online, you can read [Troubleshooting uBR Cable Modems Not Coming Online](#)

Q. What does the "*" and "!" mean for the power level reading on the "show cable modem" command?

A. The "show cable flap-list" and the "show cable modem" can indicate when the Cisco uBR7200 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 (!) indicates that a cable modem increased its power level to the maximum level. For Cisco cable modems that equals 61 dBmV.

Q. How do I decode the Cable Flap List?

A. Here is a simple explanation of how to decode the "show cable flap" output on Cisco's CMTS.

One thing to keep in mind is that the flap list is simply a "event detector" and there are three situations that can cause an event to be counted. They are:

- ◆ Reinsertions
- ◆ Hits/Misses
- ◆ Power Adjustments

1. Reinsertions

First, we might see flaps along with insertions if a modem has a registration problem and keeps trying to quickly reregister over and over. The P-Adj column may be low. When the time between two initial maintenance reregistrations by the cable modem is less than 180

seconds, you'll get "flaps" along with "insertions." Therefore, the flap detector will count it. This default value of 180 seconds can be changed if desired:

```
router(config)#cable flap-list insertion-time ?  
<60-86400> Insertion time interval in seconds
```

2. Hits/Misses

Secondly, the flap detector will count a flap when we see a "miss" followed by a "hit". Event detection is counted in the "Flap" column only. These polls are hello packets that are sent every 30 seconds. If we get a "miss" followed by a "miss" the polls will be sent every second for 16 seconds attempting vigorously to get a response. If we get a "hit" before the 16 seconds are up, you'll get a flap but if you don't get a "hit" for 16 polls, the modem will go off-line in order to begin initial maintenance all over again. If the modem finally comes back online, you'll get an "insertion" because the cable modem inserted itself back into an active state. The flap count is incremented if there are 6 consecutive misses. This default value can be changed if desired:

```
router(config)#cable flap miss-threshold ?  
<1-12> missing consecutive polling messages
```

3. Power Adjustments

Finally, the flap detector will show a "flap" in the list when we see power adjustment activity. Event detection is counted in the P-Adj columns and the "Flap" column. The station maintenance poll constantly adjusts the cable modem transmit power, frequency, and timing. Whenever the power adjustment exceeds 2 dB then the "Flap" and the P-Adj" counter is incremented. This suggests upstream plant problems. The threshold default value of 2 dB can be changed if desired as follows:

```
router(config)#cable flap power-adjust threshold ?  
<1-10> Power adjust threshold in dB
```

Related Information

- [Technical Support – Cisco Systems](#)
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