



## Radiant Communications Corporation

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# QRF5000M MDU ENCODER



## Installation & Operational Manual

Rev.A2

# 1. Introduction

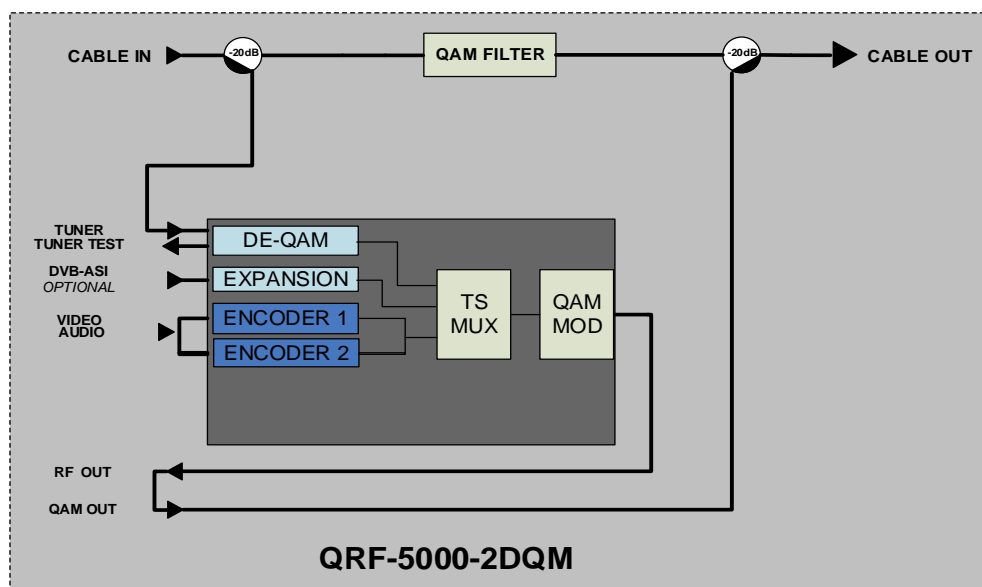
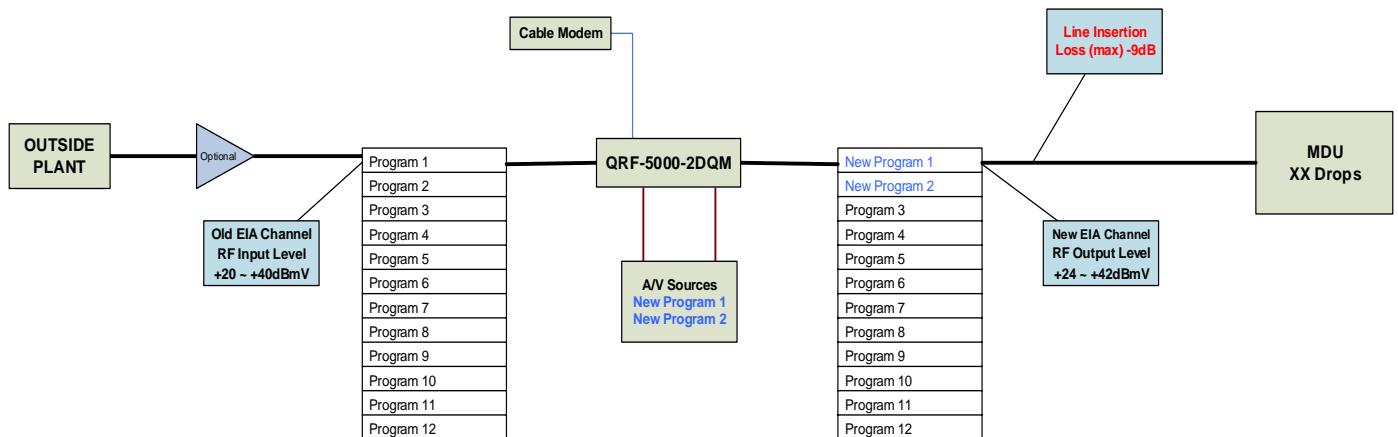
The Radiant Communications Corp. QRF5000M series is a highly integrated, technologically advanced family of products used to insert one or more local video feeds into a digital cable system. The QRF5000M series consists of several products which work seamlessly together, or completely independent, to fulfill specific individual requirements in a cost effective, efficient and flexible manner.

## QRF5000M

Video is encoded with a high quality, real time, hardware based, MPEG-2 encoder and audio is encoded using Dolby Digital 2.0 AC3 encoding. The units will encode, and packetize incoming signals and then multiplex them together so that they can be digitally QAM modulated in preparation for final RF agile up-conversion.

## QRF5000MDQ

The QRF5000MDQ contains a digital QAM tuner module, which can be configured to tune to any channel within a standard cable lineup. Once tuned, the user is shown a list of services which are within the digital channel. The users can then select which services to keep, and which services to remove. In conjunction with the up to four installed encoders and RF Notch Filter, the user can add local video to an existing digital QAM. This allows for maximum bandwidth allocation and provides a path for head end communications to reach a digital QAM tuner in the case where set top boxes are not used. This is important for applications where such signals as E.A.S are required.



## Storage and Operating Environment

Operating Temperature:	0°C to 50°C
Storage Temperature:	-40° to 70° C
Relative Humidity:	5% to 95%
Altitude:	-200' to 10,000 Feet

### General Features

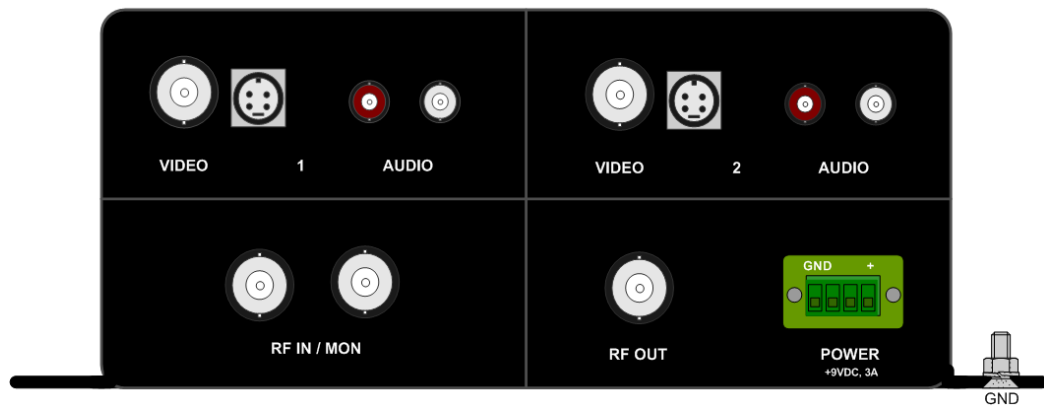
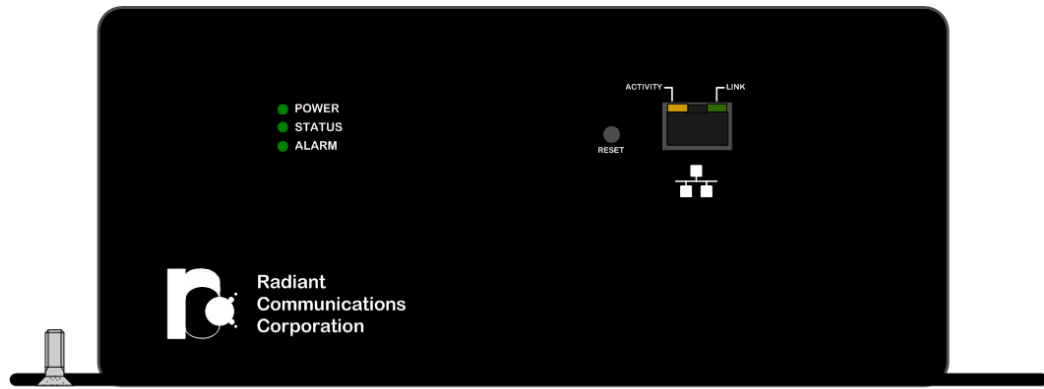
- MPEG-2 Encoding Schemes
- Dolby Digital 2.0 (AC-3) Audio Encoding
- 64/256 QAM Mode Support
- LCD Management and Configuration Display
- Remote upgrade capabilities
- Network monitoring and management capability
- Low power consumption

### Video Encoding Features

- MPEG-2 MP@ML
- Adaptive field/frame motion estimation and DCT type
- Hardware Time Base Correction
- Motion estimation search range +/- 127 pels horizontal and +/- 63 pels vertical, with half-pel accuracy
- 8-tap horiz. filter and 4-tap vert. filter
- Adjustable controls
- Fixed frame rates of 29.97 (NTSC)
- Constant or variable bit-rate from 1.5Mb/s to 15 Mb/s
- Resolution of 352x480, 480x480, 528x480, 544x480, 640x480, 704x480 and 720x480
- Programmable GOP structure and length: I, IP, IBP and IBBP

### Audio Encoding Features

- MPEG-1 Layer I, and II
- 2-channel consumer grade AC-3
- Sampling frequencies: 32, 44.1 and 48 KHz.
- Bit-rate from 256,224, 192, 160 and 128kb/s



## LEDs

- Power – Indicates that the unit is powered and that the self diagnostic tests regarding power are passing when green.
- Status – Indicates that there are valid video signals being sensed on all video inputs when green.
- Alarm – Indicates any errors in the unit when red which will be flagged on the LCD via a message as well as error coding available in the Status | Error Codes menu in the System menu.
- Link / Act: Indicate link and activity on Ethernet management port.

## Ethernet Management Port

The Ethernet Management Port is used for monitoring, upgrading, and for a command line interface to configure the unit.

Network parameters including the unit's IP address, Default Gateway, and Subnet Mask can be viewed by going to the System | Network menu or by going to the System | Status menu.

## DC Power

The unit is powered by 9V DC @ 3A power supply. Four port I/O connector is not used at the moment.

## Audio Inputs

Each encoder supports two channels of audio. A dual vertical stacked RCA connector is available.

**Video Inputs**

Each encoder supports one video input and can be either an S-Video or Composite video input. A BNC connector is available for the composite video and an S-Video DIN connector is available for the S-Video input.

**RF Input**

The QRF5000M receives its input via a  $75\Omega$  F-Connector. This should be connected to the RF cable feed for tuning and decoding of digital QAM signals.

**RF Output**

The QRF5000M transmits an RF output which is the QAM modulated MPTS ASI stream up-converted to the user's desired frequency.

## 2. Installation

### Preparation

The QRF5000M series can be connected to and configured without the use of any tools or external software. Although not necessary, connections such as the RF output may be tightened by hand with a wrench, being sure not to cross thread or over tighten the connections.

### Unpacking

QRF5000M series Package Contents:

- QRF Unit
- Installation and User Manual
- AC Power Cord

### Cabling the Unit

*Note: All connections are described above.*

#### QRF5000M Connections

The connections include video and audio connections as well as any necessary MPTS ASI expansion and serial data connections required.

The remaining connection is the RF input and output.

#### Connecting to the Ethernet Management

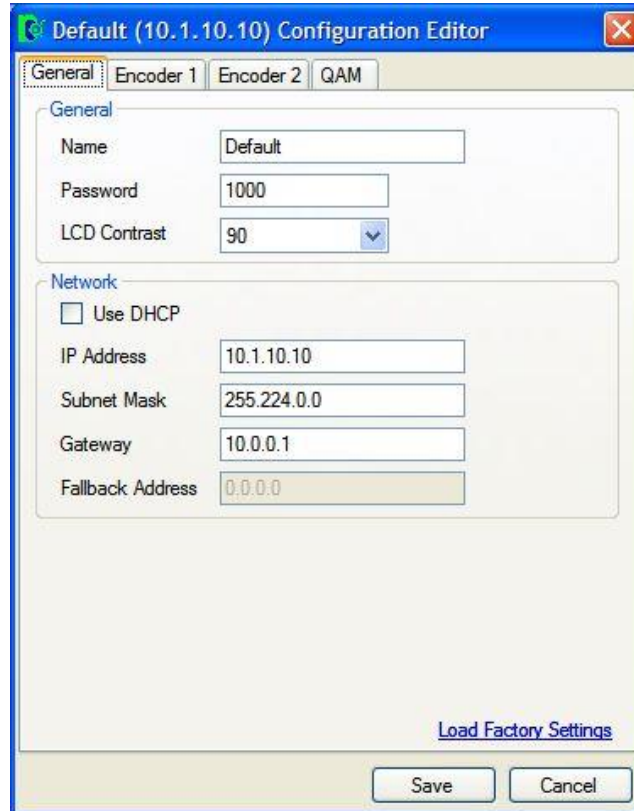
The management connection consist of one Ethernet port which is a RJ-45 connection running at 10/100Mbps. This connection does not need to be made in order for the unit to operate It is used for management.

#### Connecting Power

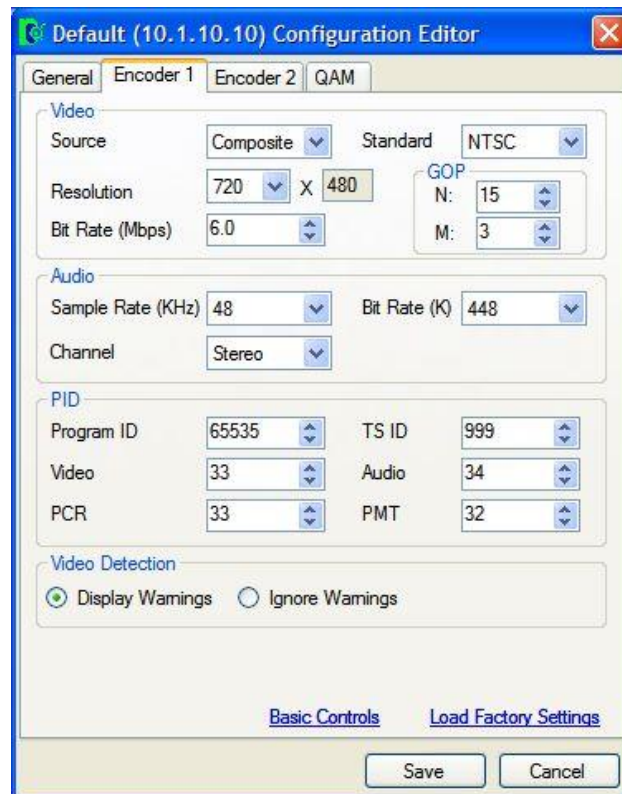
The QRF5000M support DC power of 9V @ 3A.



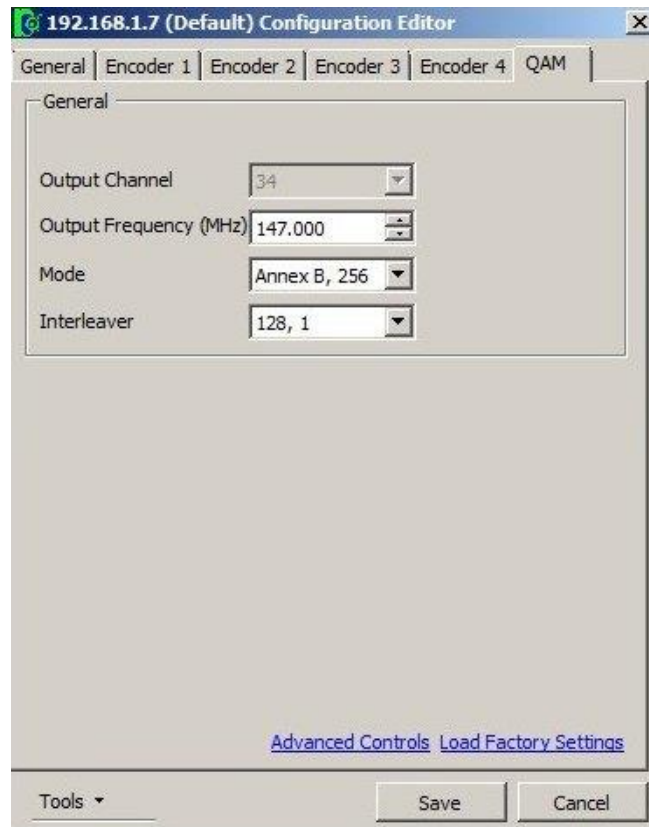
After entering the proper password, you will see the following dialog box.



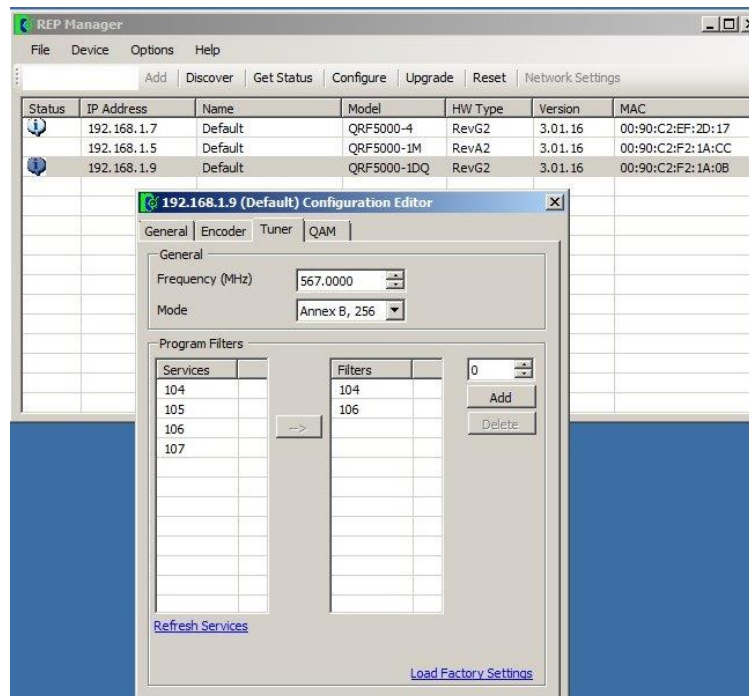
From here, it is easy to configure the units settings. The following pictures show examples of the configuration dialog boxes.







The tuner page allows you to easily add and remove program filters.



## Updating Client Software

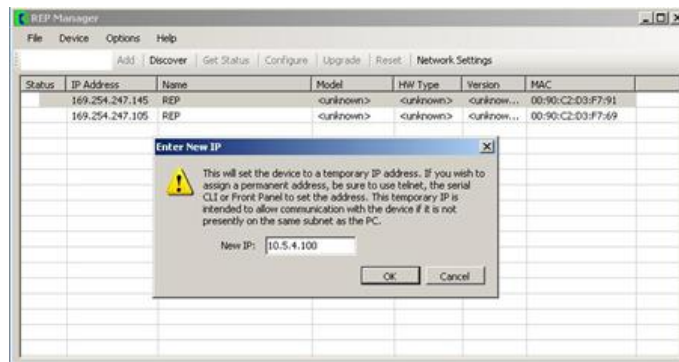
To update a QRF5000 series product, simply highlight the unit you wish to update, and select the Upgrade option. You will be prompted for an upgrade file. (Contact Radiant Communications Technical support for questions regarding unit upgrades)

## Auto Match PIDs Procedure

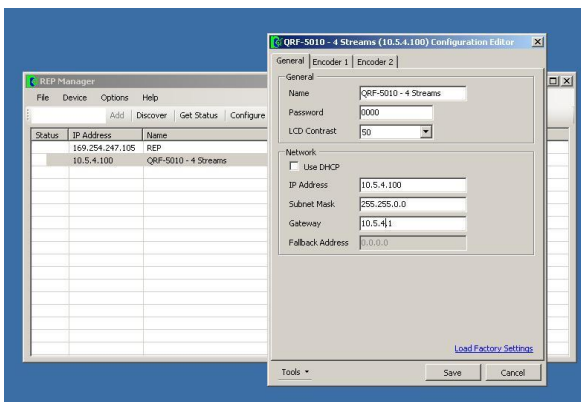
The “Auto Matching PID’s“function from Radiant Communications is an easy way for the QRF product family to add local video insertion without having to worry about potential PID conflicts. The QRF can automatically assign PID values that match values from services in the incoming QAM. These are normally services that are to be dropped and replaced with the local services.

- **Discover the QRF5000**

- The units are shipped from the factory with a DHCP enabled. When discovered with the GUI, the units will have 169.x.x.x IPs.
- Highlight the unit and click **Network Settings**. This will set the device to a temporary IP address. This temporary IP is intended to allow communication with the device if it is not presently on the same subnet as the PC.

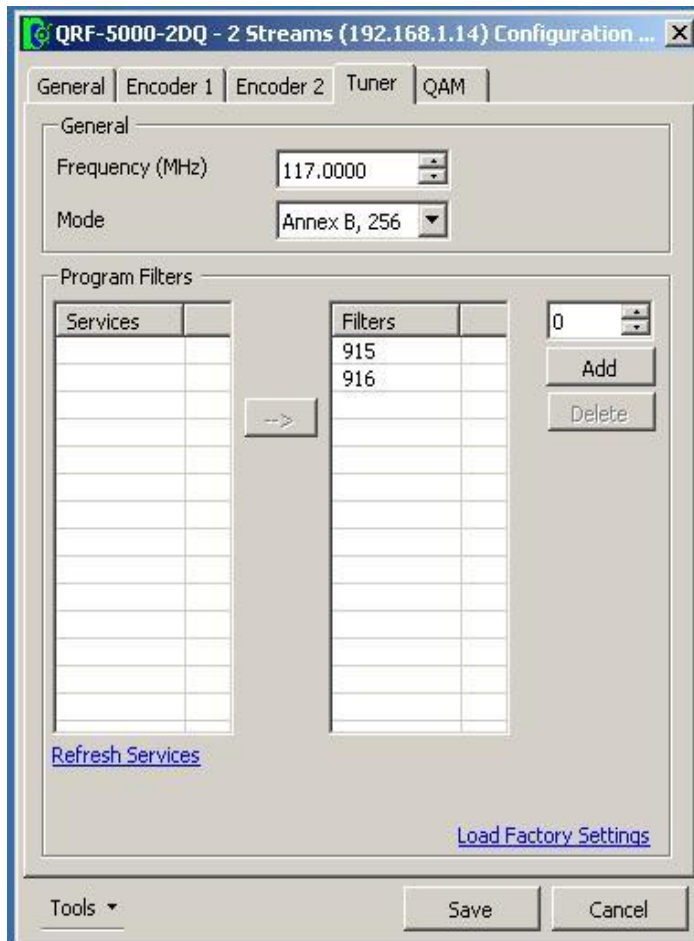


- Click 'Discover' then highlight the unit with the temporary IP and click **Configure**.
- Under the 'General' tab, change the network settings. Uncheck DHCP and enter the new static IP, Subnet and Gateway. Click **Save** and **Yes** on the new window to confirm the changes, and reset of the unit.



- **Program the tuner**

- If not already open, launch the configuration editor for the QRF in question, by highlighting the unit in the REP Manager and hitting 'Configure'.
- Under the Tuner tab, enter the frequency and QAM mode of the incoming QAM channel that you wish to drop and replace.
- Highlight the program(s) that you wish to filter and press the arrow button.
- The left table shows ALL services found at this frequency. The right table shows services that are being filtered.



The following pictures show examples of the configuration web pages.

http://192.168.1.54/

**Radiant**  
Communications Corp.

QRF5000-2DQM RevA  
3.01.03

**General** Encoder1 Encoder2 Tuner Qam

**General**

Name: Default  
Passcode: 0000  
LCD Contrast: 50

**Network**

DHCP:  Enable

IP Address: 10 . 0 . 0 . 10  
Subnet Mask: 255 . 224 . 0 . 0  
Gateway: 10 . 0 . 0 . 1  
Fall Back Address: 0 . 0 . 0 . 0

Save Load Defaults Cancel

http://192.168.1.54/

**Radiant**  
Communications Corp.

QRF5000-2DQM RevA  
3.01.03

**General** Encoder1 Encoder2 Tuner Qam

**Video**  Encoder Enabled

Source: Composite Standard: NTSC  
Resolution: 720 X 480  
Bit Rate(Mbps): 6

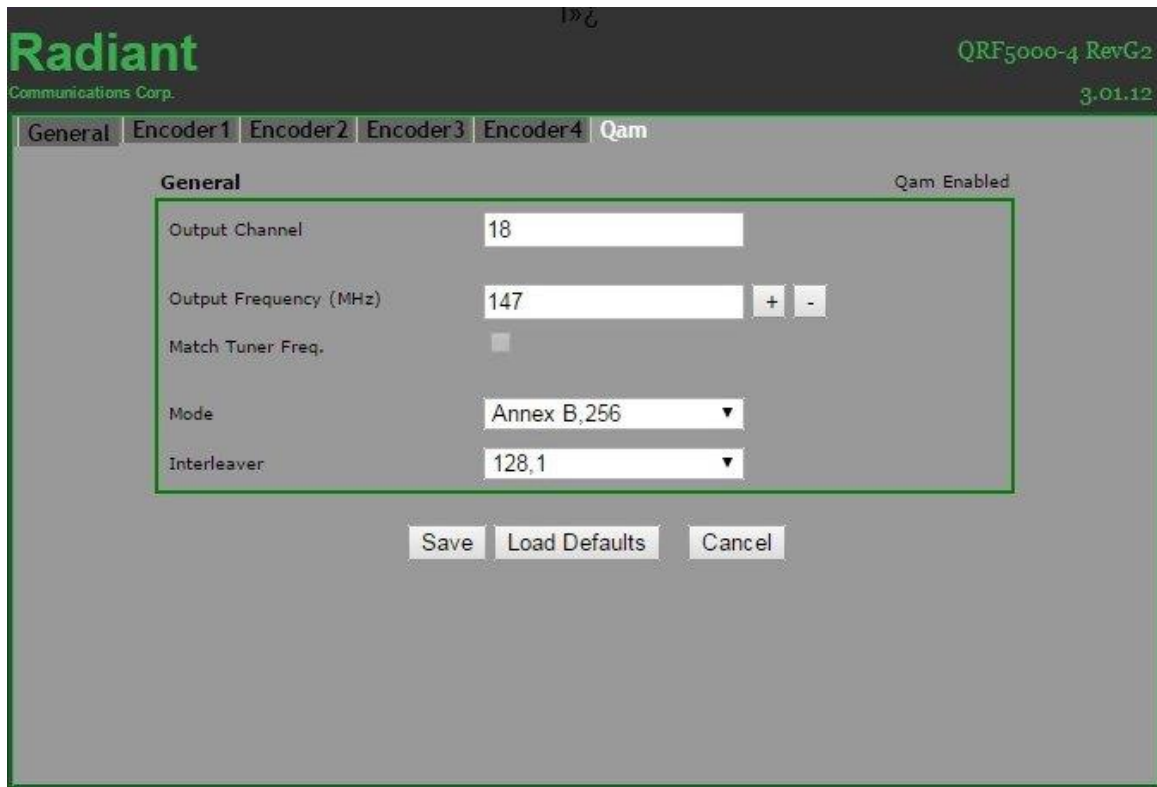
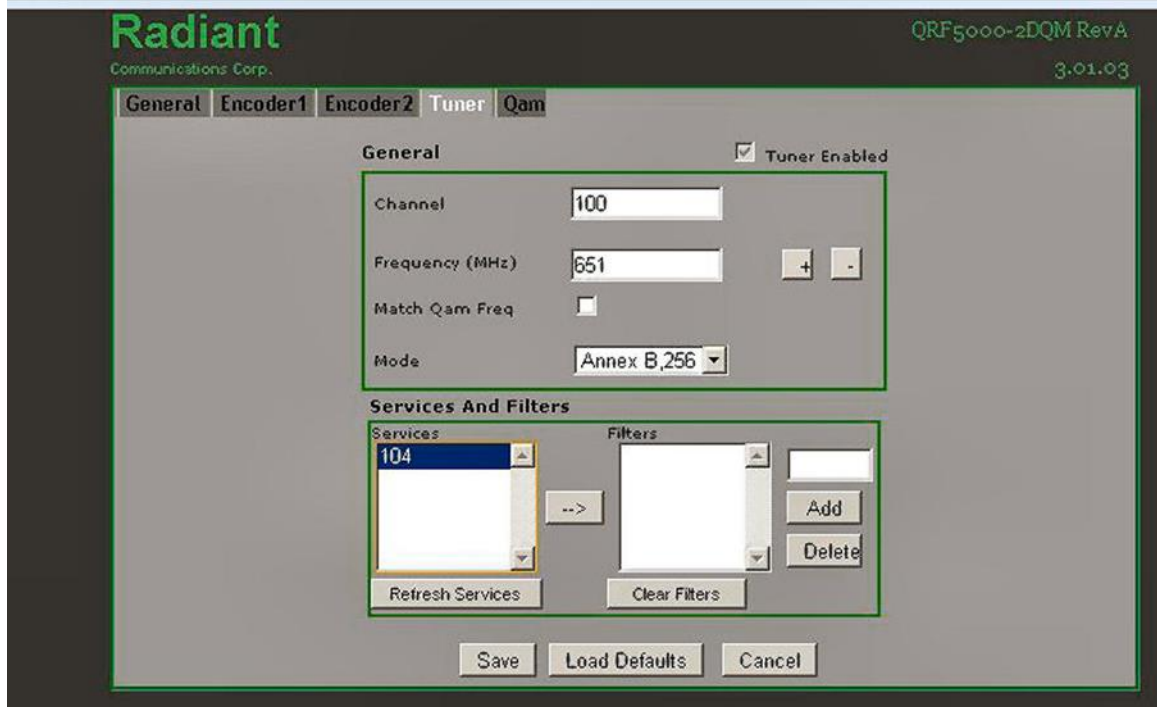
**Audio**  Encoder Audio Enabled

Sample Rate (KHz): 48 Bit Rate (K): 192  
Channel: Stereo

**PID**

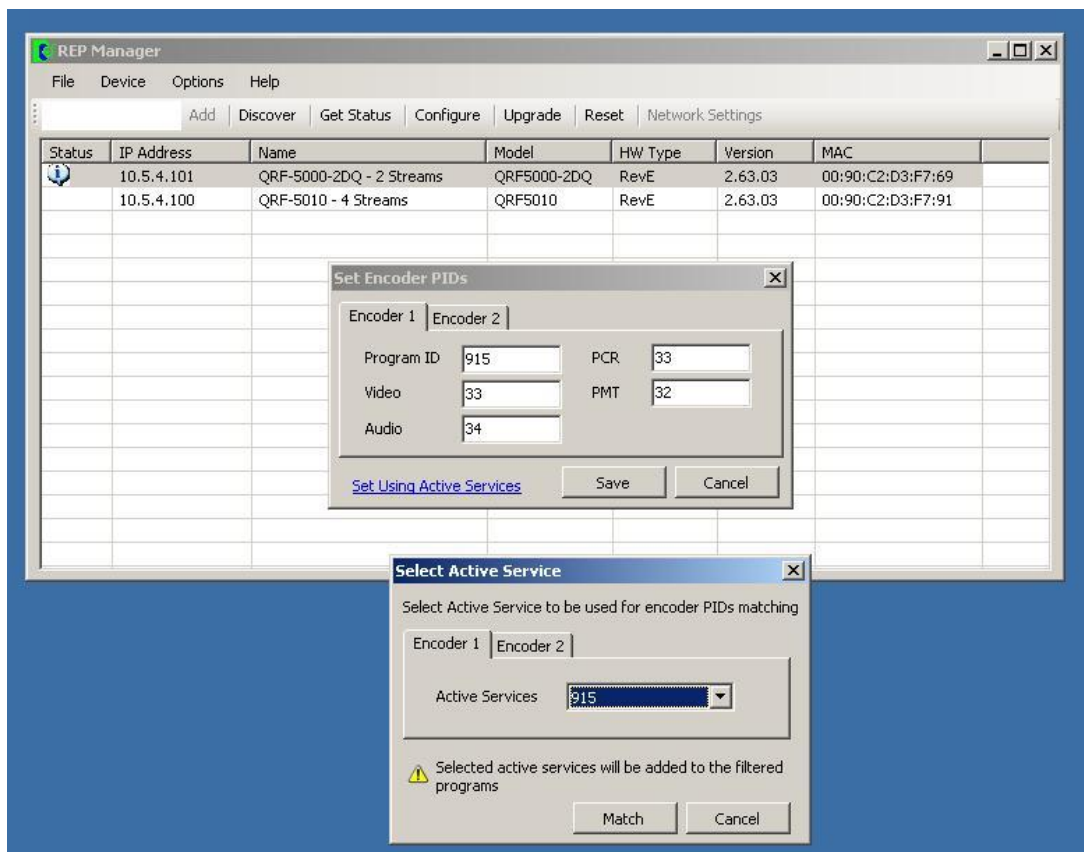
Program ID: 1 TS ID: 999  
Video: 33 Audio: 34  
PCR: 33 PMT: 32  
Video Detection:  Display Warnings

Save Load Defaults Cancel



- **Auto match PID's.**

- Go back to the REP MANAGER main screen, and highlight the unit that was just configured.
- From the 'Device' Menu, click **Auto Match PIDs**.
- Click the '**Set Using Active Services**' link. This will open another dialog box which will contain a drop down list of all the services found on the tuner. Select the Encoder1 tab, and also the service which you wish to drop. Click 'Match' and all PID's for this service will be set to that of the incoming stream.
- Repeat for **Encoder 2**, make sure to select Encoder2 tabs when doing so.
- Click 'Save' to Save and apply all settings.



## Cable Modem Setup Procedure

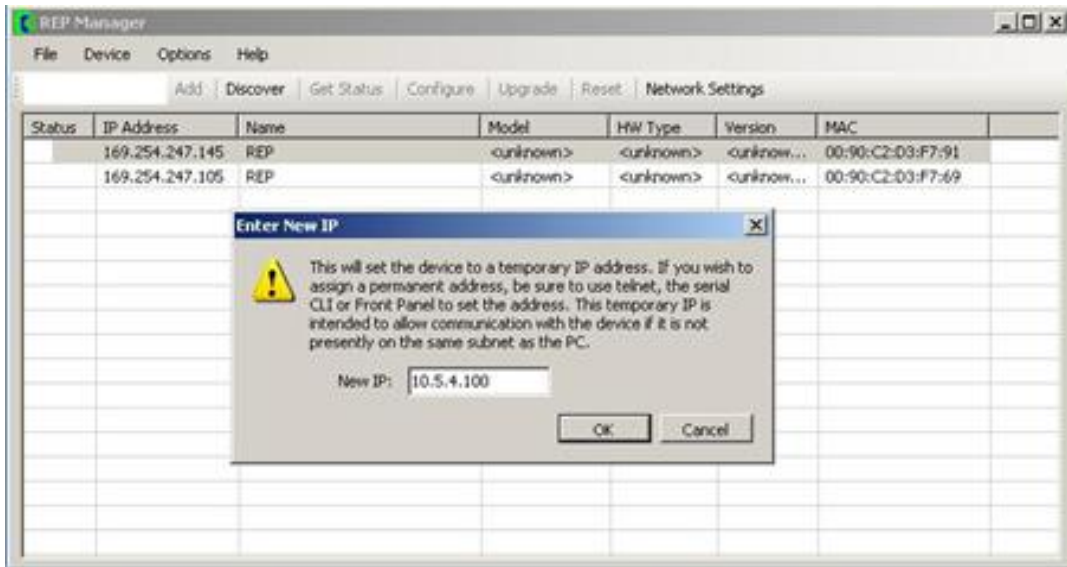
The QRF5000 series can easily be controlled remotely via an Ethernet connection using Radiant Communications RepManager software.

Successful Ethernet connection could be established by following the steps below. This procedure can be done on all QRF5000 Series units.

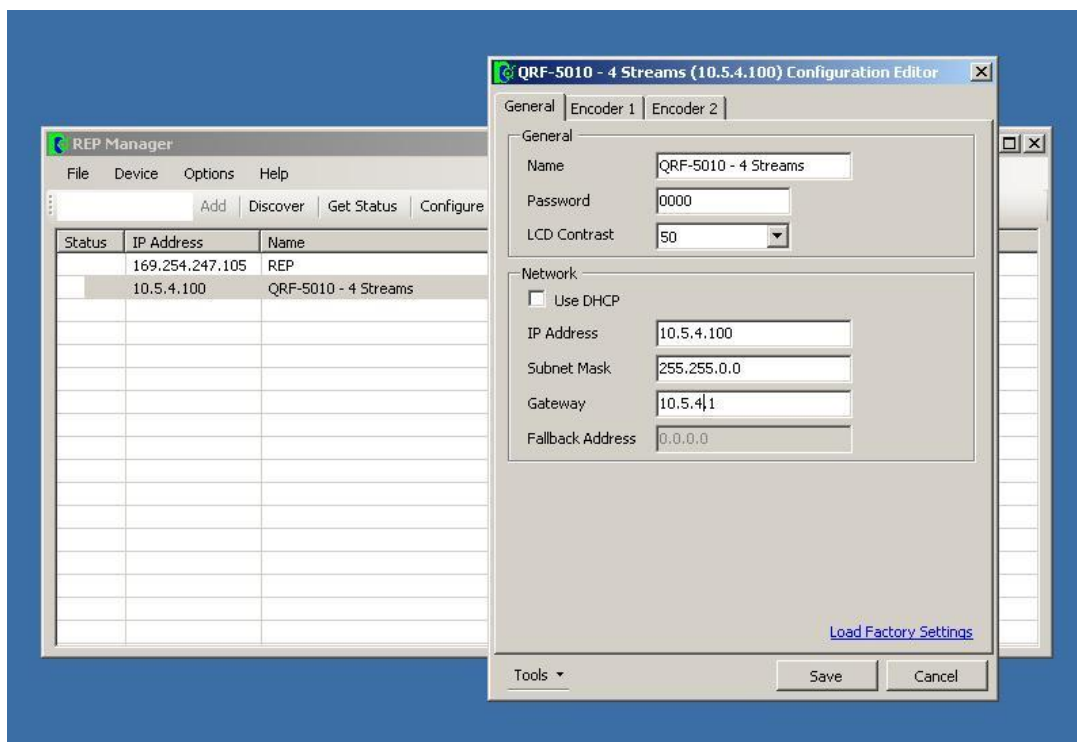
- Install the Radiant Communications RepManager software on the management PC. The latest version of the software could be obtained from the CD included with the unit or by downloading it from <http://support.rccny.com/qrf>.
- Connect the QRF-5000W Series unit to the cable modem using Ethernet RJ-45 cable. The network port is located on the front panel of the QRF-5000W unit.
- Configuration:
- Configuration using the controls on the front panel of the unit.

The units are shipped from the factory with a DHCP enabled. If your network doesn't contain a working DHCP server, a static IP within the subnet must be assigned to the unit. Below is the menu tree structure of the network parameters. All defaults are in bold or in parenthesis:

- System
  - Network
    - IP Mode
      - Static
      - **DHCP**
    - Static IP
      - Set Static IP using left, right, and +/- keys
    - Status
      - Displays the IP Configuration
    - Advanced
      - DHCP Fallback
        - Set the DHCP Fallback Address
- Configuration using the RepManager Software.
  - Discover the QRF
  - The units are shipped from the factory with a DHCP enabled. When discovered with the GUI, the units will have 169.x.x.x IPs.
  - Highlight the unit and click **Network Settings**. This will set the device to a temporary IP address. This temporary IP is intended to allow communication with the device if it is not presently on the same subnet as the PC.



- Click 'Discover' then highlight the unit with the temporary IP and click **Configure**.
- Under the 'General' tab, change the network settings. Uncheck DHCP and enter the new static IP, Subnet and Gateway. Click **Save** and **Yes** on the new window to confirm the changes, and reset of the unit.



- The communication port used by Radiant Communications RepManager Software is UDP - 2000. This port must open throughout your network.

*For assistance please contact your system administrator.*



## Audio and Video Specifications

### Audio Specifications

Specification	Min	Typ	Max.	Notes
Audio Input Levels			1V RMS	
Audio Frequency response	20 Hz		20 kHz	@48 kHz sampling
Audio Input impedance	25 k $\Omega$			
Audio Input Connectors				Stacked RCA Red/White

### Video Specifications

Specification	Min	Typ	Max.	Notes
Video Input Level	-6dB	1V <sub>p-p</sub>	+3dB	Input AGC range
Video Frequency		6 MHz		Input anti-aliasing filter
Video Input Impedance		75 Ohm		
Video Input Connectors				BNC – for CVBS input 5 pin mini DIN for S-Video input

### 64/256 QAM Specifications

#### RF Specifications

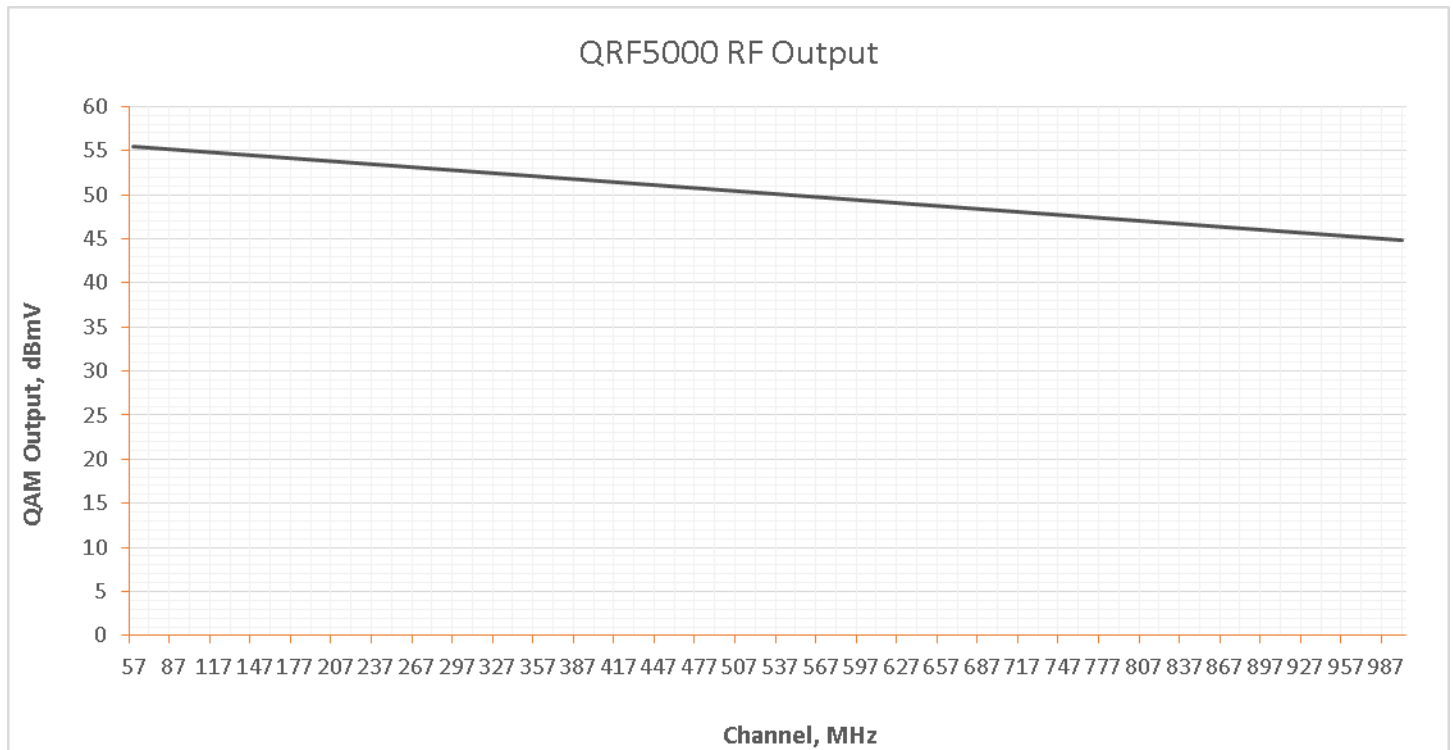
Specification	Min	Typ	Max.	Notes
RF Frequency Range	93 MHz		873 MHz	center frequency Front panel controlled
Frequency Step Size		6 MHz		
Frequency Accuracy and Stability	-5KHz		+5	
RF Output Level		+55dBmV		See RF output Chart
RF Output Stability	-1dB		+1dB	Relative to RF Output Level
RF Output Return Loss	>14dB >13dB			88-750 MHz 750-870 MHz
Channel Frequency Response				Per 2.1.6 of DOCSIS RF ATP 104 (Downstream Spectral Mask)
RF Muting Ratio	>65dB			
In-Channel Spurious	>35dB			Unequalized <sup>1</sup> MER

and Noise	>41dB			Equalized MER Terminated into 75 Ohm load
Other Channel Spurious and Noise			<-58dBc <-62dBc <-65dBc <-73dBc	3.0 – 3.75 MHz offset 3.75 – 9.0 MHz offset <sup>2</sup> 9.0 – 15.0 MHz offset <sup>2</sup> All other out-of-band channels <sup>3</sup>
Double-Sideband integrated phase noise			<-50dBc <-52dBc <-54dBc	1kHz – 10 kHz 10 kHz – 50 kHz 50 kHz – 3 MHz

Notes:

1. With MER instrument calibration process using a “golden” QAM reference source in a manner described in Section 2.1.26.3 of the DOCSIS ATP.
2. Excluding up to three spurs, each is less than -60dBc measured in 10 kHz BW.
3. From 47 MHz to 1000 MHz in 6 MHz BW, excluding spectrally non-aggregating spurs and/or second or third harmonics. The total power in such excluded spurs is less than -60dBc.

### RF Output Chart



### Customer Support Information

#### Contacting Radiant Communications for Technical Support

Radiant Communications can be contacted for technical support by calling the following number:

Phone: (800) 278-6940