



Radiant Communications Corporation

5001 Hadley Road
South Plainfield
NJ 07080
Tel (908) 757-7444
Fax (908) 757-8666
WWW.RCCFIBER.COM

QRF500MFX PON ENCODER



Installation & Operational Manual

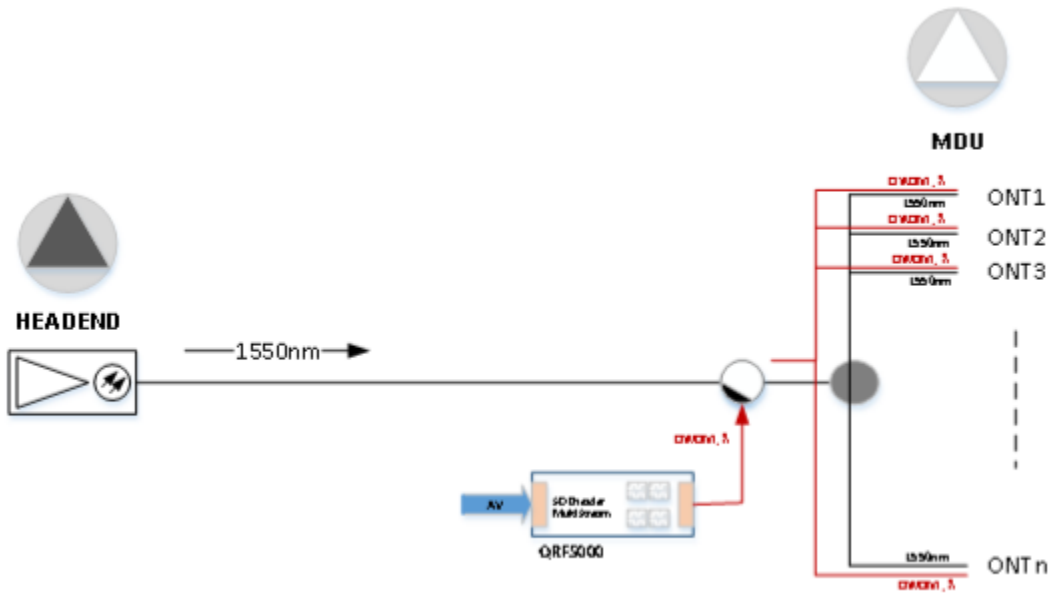
Rev.A7

1. Introduction

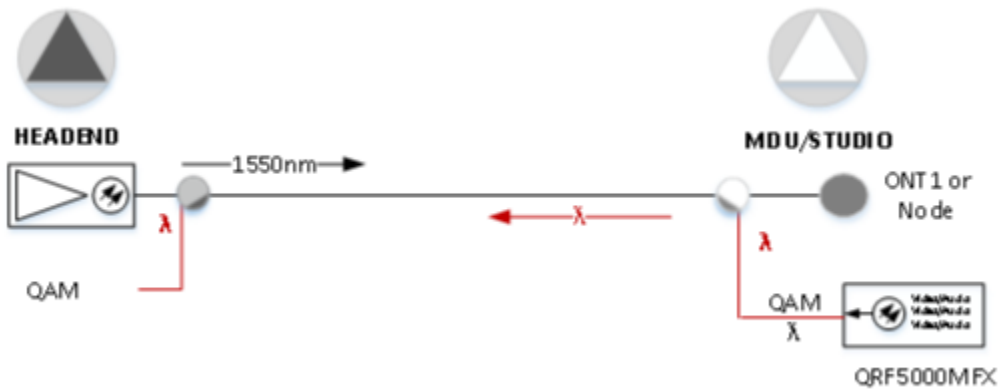
The Radiant Communications Corp. QRF5000MFX series is a highly integrated, technologically advanced family of products used to insert one or more local video feeds into a digital cable RfO/PON system. The QRF5000MFX series consists of several products which work seamlessly together, or completely independent, to fulfill specific individual requirements in a cost effective, efficient and flexible manner.

QRF5000MFX

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 and fed to a broadband ITU laser output module.



Local Insertion



Backhaul to headend/hub site

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
- 11% OMI
- 40km SBS suppression
- 64/256 QAM Mode Support
- 7dBm ITU Laser Output
- 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

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



QRF5000MFX Front Panel



QRF5000MFX Rear Panel

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 12V DC @ 3A Comcast EPS-3 power supply.

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.

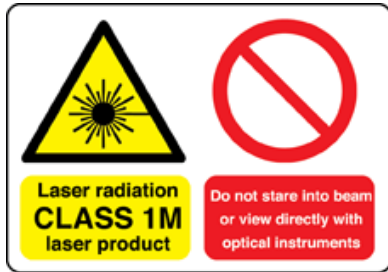
QAM Output

The QRF5000MFX transmits an RF output which is the QAM modulated SPTS or MPTS stream up-converted to the user's desired frequency over ITU Laser.

2. Installation

Preparation

The QRF5000MFX series can be connected to and configured without the use of any tools or external software.



The Laser Output is 7dBm, proceed with precaution.

Unpacking

QRF5000MFX series Package Contents:

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

Cabling the Unit

Note: All connections are described above.

QRF5000MFX Connections

The connections include video and audio connections as well as SC/APC fiber output. The remaining connection is 4 pin DC power connector, prewired at the factory.



To preserve end-of-line MER performance and achieve desired RF channel levels, the locally inserted ITU optical CH 19 level MUST be -10 dB relative to the incoming broadcast optical level. This is achieved by optically padding the transmitter output of the QRF5000MFX

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

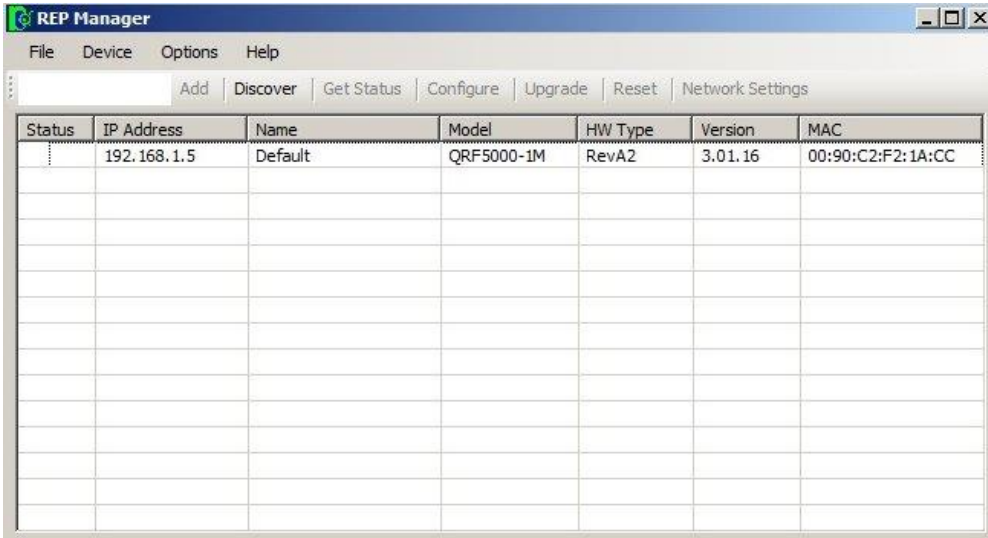
The QRF5000MFX support DC power of 12V @ 3A.

3. Operation

Controlling the unit via Ethernet

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

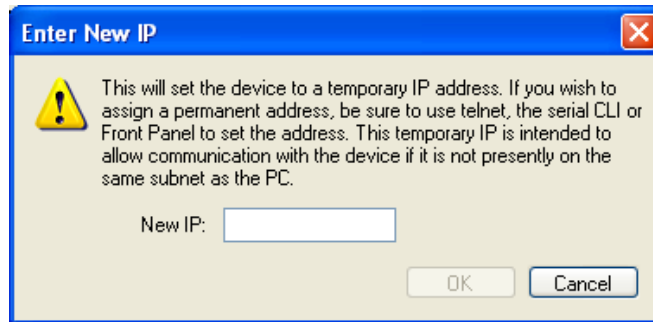
The first task is to discover the unit(s).



The screenshot shows the REP Manager application window. The title bar reads 'REP Manager'. The menu bar includes 'File', 'Device', 'Options', and 'Help'. Below the menu bar is a toolbar with buttons for 'Add', 'Discover', 'Get Status', 'Configure', 'Upgrade', 'Reset', and 'Network Settings'. The main area contains a table with the following columns: Status, IP Address, Name, Model, HW Type, Version, and MAC. One row is populated with the following data:

Status	IP Address	Name	Model	HW Type	Version	MAC
	192.168.1.5	Default	QRF5000-1M	RevA2	3.01.16	00:90:C2:F2:1A:CC

Once the units are discovered, they can be easily configured, upgraded or restarted. If the units are discoverable, but not on the same subnet, you will be prompted with the ability to temporarily change the units IP so that you can communicate with it.

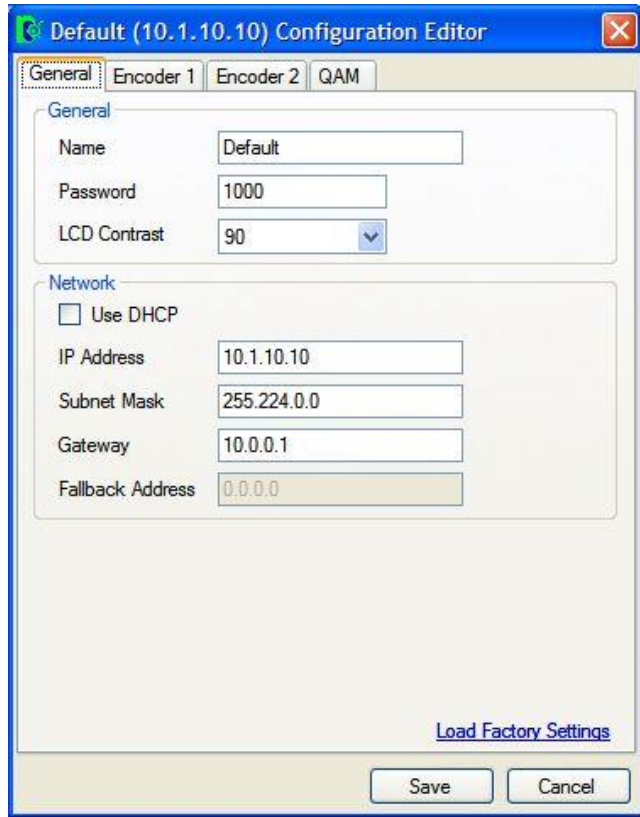


Configuring the unit

After selecting the unit you wish to configure by highlighting the units IP, select the configure button. If the password has been modified from the default '0000', the following dialog box will appear.

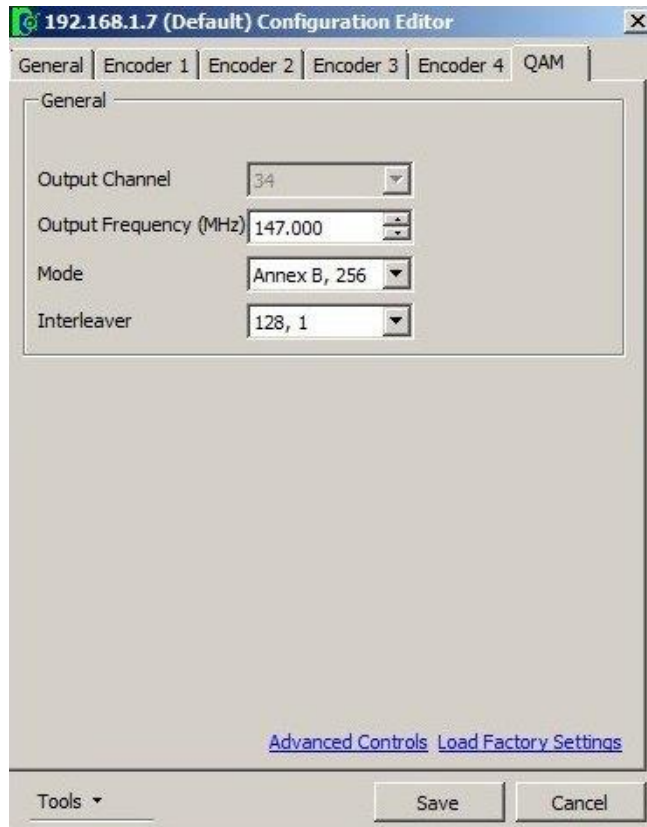


After entering the proper password, you will see the following dialog box.



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





Updating Client Software

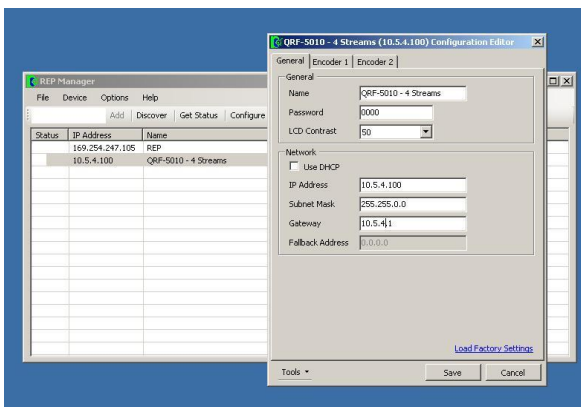
To update a QRF5000 series product, simply highlight the unit you wish to update, and select the Upgrade option. You will be prompted for an upgrade file. (Contact Radiant Communications Technical support for questions regarding unit upgrades)

- **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.



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



Cable Modem Setup Procedure

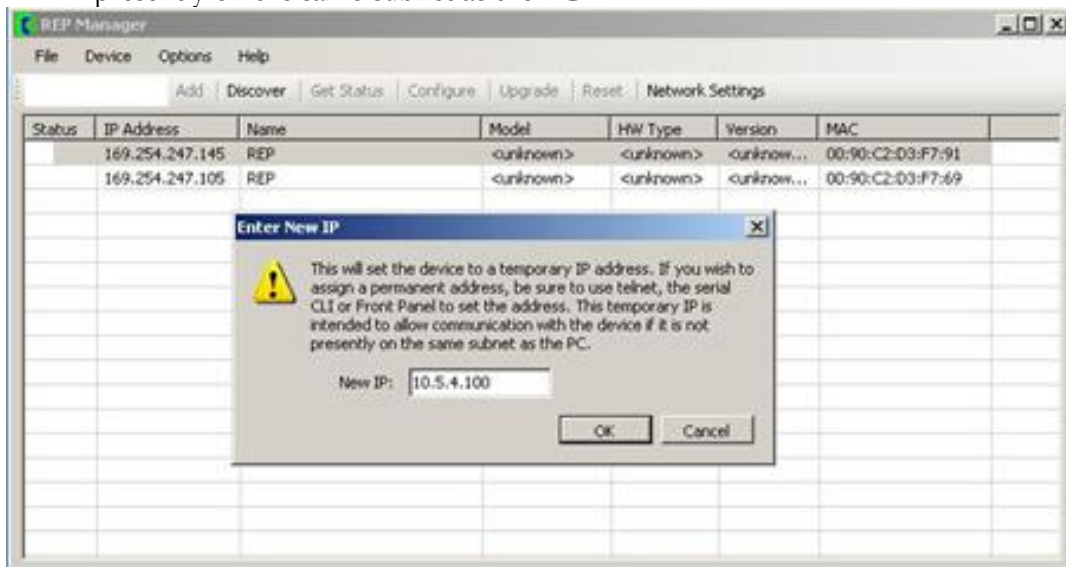
The QRF5000 series can easily be controlled remotely via an Ethernet connection using Radiant Communications RepManager software. Successful Ethernet connection could be established by following the steps below. This procedure can be done on all QRF5000 Series units.

- 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-5000 Series unit to the cable modem using Ethernet RJ-45 cable. The network port is located on the front panel of the QRF-5000 unit.
- Configuration:
- Configuration using the controls on the front panel of the unit.

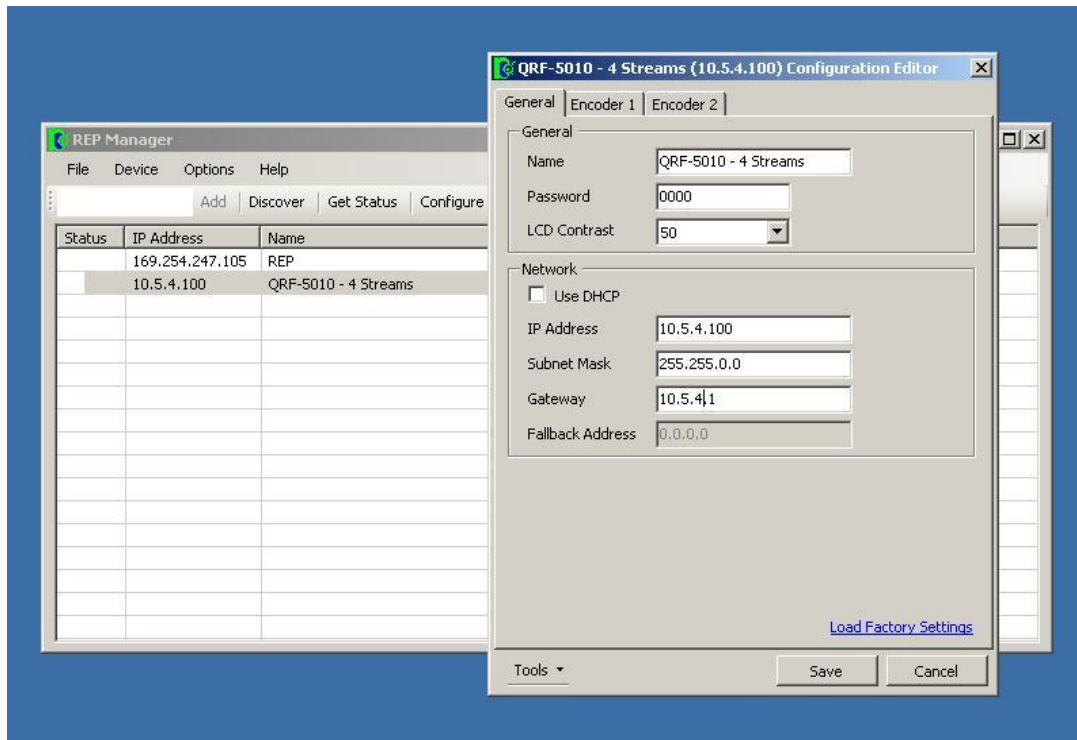
The units are shipped from the factory with a DHCP enabled. If your network doesn't contain a working DHCP server, a static IP within the subnet must be assigned to the unit. Below is the menu tree structure of the network parameters. All defaults are in bold or in parenthesis:

- 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' than 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 be 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	600Ω		25kΩ	
Audio Input Connectors				Stacked RCA Red/White ¹ Balanced 600Ω terminal Block ¹

Video Specifications

Specification	Min	Typ	Max.	Notes
Video Input Level	-6dB	1Vp-p	+3dB	Input AGC range
Video Frequency		6 MHz		Input anti-aliasing filter
Video Input Impedance		75 Ω		
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	54 MHz		873 MHz	center frequency Front panel controlled
Frequency Step Size		6 MHz		
Frequency Accuracy and Stability	-5KHz		+5KHz	
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 and Noise	>35dB >41dB			Unequalized ² MER 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 ³ 9.0 – 15.0 MHz offset ³ All other out-of-band channels ⁴
Double-Sideband integrated phase noise			<-50dBc <-52dBc <-54dBc	1kHz – 10 kHz 10 kHz – 50 kHz 50 kHz – 3 MHz

ITU Laser Specifications

Specification	Min	Typ	Max.	Notes
Output Power		7dBm		Optical attenuator required for local insertion ⁵
Frequency Range	47MHz		1GHz	
Wavelength	1310nm		1610nm	DWDM from ch18 to 54 CWDM from 1270nm to 1610nm
OMI		11%		

Notes:

1. Standard product has Stacked RCA Red/White audio input interface with 25k Ω input impedance. Unites can be ordered with 600 Ω balanced terminal block audio input interface as option.
2. 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.
3. Excluding up to three spurs, each is less than -60dBc measured in 10 kHz BW.
4. 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.
5. To preserve end-of-line MER performance and achieve desired RF channel levels, the locally inserted ITU optical CH 19 level MUST be -10 dB relative to the incoming broadcast optical level. This is achieved by optically padding the transmitter output of the QRF5000MFX.

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