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QRF5000 MDU ENCODER

Data Sheet

Version 1.1



Caution

- Verify proper grounding prior to applying power to the QRF5000
- Allow for proper ventilation by not covering vents on sides of chassis. A minimum of 1RU separation between adjoining chassis is recommended.

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I. Introduction

The QRF5000 from Radiant Communications Corp is an MPEG-2 encoder with one video input and two audio inputs. It will encode, and packetize incoming signals and then QAM modulate the MPEG transport stream where it is finally up-converted to RF for insertion into a local cable network. The unique algorithm of compression and buffer control enables the QRF5000 to compress video and audio signals at user selectable bit-rates from 1.5 Mbps to 15 Mbps with excellent picture and sound quality. The QRF5000 is ideal for adding local video and audio feeds into a digital network.

I.1 Main features

-Video Encoder

- MPEG-2 MP@ML
- H.263 baseline
- Adaptive field/frame motion estimation and DCT type
- Constant or variable bit rates from 1.5Mbps to 15Mbps
- Horizontal sizes of 352, 480, 528, and 704 pixels
- Vertical sizes of 240, 480 lines (NTSC) or 288, 576 lines (PAL)
- Studio-grade picture and sound quality
- PCR re-stamping to minimize PCR jitter
- Alterable PID numbers

-Audio

- 2- channel consumer grade AC-3
- Sampling frequencies: 32, 44.1, and 48 KHz.
- Two analog Audio input channels

-QAM / RF

- Supports 64 QAM and 256 QAM per ITU-J.83 Annex A, B, and C downstream standards
- Low phase noise for demanding 256 QAM transmission
- High dynamic range with low noise and spurious levels
- Supports world wide channel frequency plans (177-873 MHz)
- RF output power > +60 dBmV RMS

-System

- Front panel controls or system adjustment and monitoring with 122x32 graphical display
- Network monitoring and management capability
- Compact 1RU standard 19" rack mountable
- Low power consumption

2. QRF5000 I/O Identification



Fig. 1 QRF5000 Front Panel

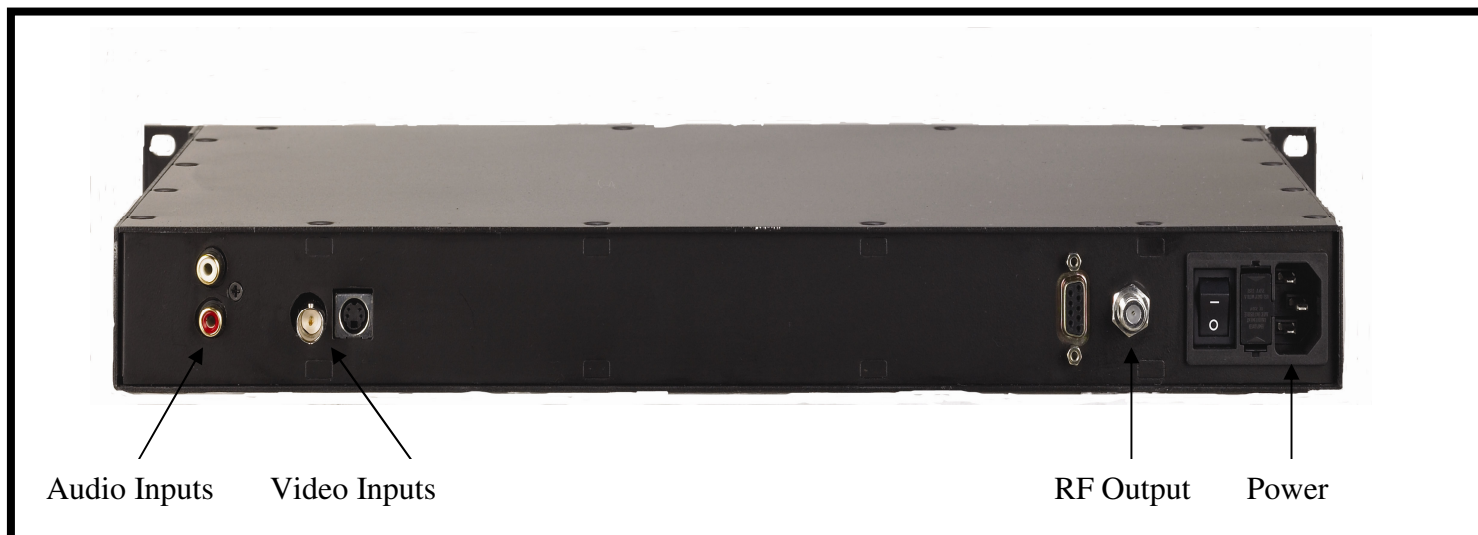


Fig. 2 QRF5000 Rear Panel

2.1 Front Panel Controls, Indicators and Connections

Controls

The buttons on the front panel perform the following functions:

1. ENTER:
 - a. Press to enter menu mode
 - b. Press to select a menu item
2. UP/DOWN:
 - a. Use to select a menu item
 - b. Use to scroll through data values
3. LEFT/RIGHT:
 - a. Use to move the cursor Left or Right when entering data values
4. PLUS / MINUS
 - a. Used to increment and decrement through menu item values

Indicators

The indicators serve the following purpose:

1. LCD:

The LCD is used to display menu items and choices as well as information regarding the status of the unit.
2. LED indicators

The front panel has three LED indications.

 - a. Power: Indicates that all internal power supplies are within voltage tolerance limits.
 - b. Status: Indicates valid video is being inserted into the unit
 - c. Alarm: Indicates all internal built in diagnostics are within design limits
 - d. Link / Act: Indicate link and activity on Ethernet management port.

Connections

The sole connection on the front panel is an RJ45 for Ethernet management and remote status monitoring.

2.2 Rear Panel Connections

All Input and Output connections are made from the rear of the QRF5000.

Video:

Connect your video source to either the CVBS input or the S-video connector as shown in figure 2.

Audio

Connect the audio source to the analog input connectors using RCA connectors.

RF

Connect the RF output into a combiner for adding the signal into your local cable network. The signal being combined with the QRF5000 output (usually the remote cable feed) needs to be filtered to make room for the QRF5000's RF output. The filter requirements depend on the channel selected for the QRF5000 output.

3. Configuring the QRF5000

3.1 Initialization

After applying power to the encoder, the QRF5000 undergoes a built-in diagnostic routine which also loads the previously stored configuration parameters. After a few seconds, the QRF5000 will be initialized, and display the main screen which shows the model number and an asterisk to indicate that the unit is ready.

3.2 Configuration parameters

The QRF5000 has several configurable parameters which can be changed by the front panel controls or by the network management system (if available).

Encoder Menu Options

Parameter	Range	Default	Menu Path
Video Source Select	CVBS, S-video	CVBS	ENCODER → VIDEO → SOURCE
Video Resolution	DI, 3/4 DI, 2/3 DI, 1/2 DI	DI	ENCODER → VIDEO → RESOLUTION
Video Bit Rate	1.5 – 15.0 Mbps	4.0 Mbps	ENCODER → VIDEO → BIT RATE
Audio Sample Rate	32, 44.1, 48 kHz	48 kHz	ENCODER → AUDIO →SAMPLE RATE
Audio Bit Rate ^{1,2}	128, 160, 192, 224, 256, 284, 320, 448 kbps	448 kbps	ENCODER → AUDIO →BIT RATE
Audio Channel ^{1,2}	Stereo, Dual, Joint, Single	Stereo	ENCODER → AUDIO →CHANNEL
Video PID ³	0021 – 8190 ⁴	0033	ENCODER → PID →VIDEO
Audio PID ³	0021 – 8190 ⁴	0034	ENCODER → PID →AUDIO
PCR PID ³	0021 – 8190 ⁴	0033	ENCODER → PID →PCR
PMT PID ³	0021 – 8190 ⁴	0032	ENCODER → PID →PMT

QAM Menu Options

Parameter	Range	Default	Menu Path
Output Channel	7 – 137	18	QAM → CHANNEL
Output Power	44 – 62 dBmV Mute	46 dBmV OFF	QAM → POWER
QAM Mode	Annex A – 64 QAM Annex A – 256 QAM Annex B – 64 QAM Annex B – 256 QAM Annex C – 64 QAM Annex C – 256 QAM	Annex B – 64 QAM	QAM → MODE
Interleaver Depth	128,1 128,2 64,2 128,3 32,4 128,4 16,8 128,5 8,16 128,6 128,7 128,8	128,1	QAM → INTERLEAVER
QAM Format	Normal CW, PRBS 23, PRBS 23 no MPEG PRBS 60 PRBS 63 Null Packets	Normal	QAM → Format

System Menu Options

Parameter	Range	Default	Menu Path
About Info			SYSTEM → ABOUT
Load Default Values			SYSTEM → LOAD DEFAULTS

Notes:

1. 32Kbps sample rate available in Single Channel mode only.
2. Single Channel mode does not support 256kbps or 384kbps.
3. PID values should be unique to ensure proper operation.
4. PID Values 0000 – 0032, 8191, and 8192 are Reserved by MPEG2, DVB, ATSC standards

3.3 Menu Tree

Main Menu	Sub-Menu 1	Sub-Menu 2	Options	Description
ENCODER				Configures the Video and Audio Encoder
	VIDEO			Sets the Video Parameters
		SOURCE	CVBS, S-VIDEO	Selects the video input source
		RESOLUTION	DI ¾ DI 2/3 DI 1/2DI	Sets Video Resolution for the Encoder
		BIT RATE	1.5 – 15.0 Mbps	Sets the Video Bit Rate
		SOURCE	CVBS, S-VIDEO	Selects the video input source
	AUDIO			Sets Audio Parameters
		SAMPLE	32, 44.1, 48 kbps	Select Audio Sample Rate
		BITRATE	128, 160, 192, 224, 256, 284, 320, 448 Kbps	Select Audio Bit Rate
		CHANNEL	STEREO, DUAL, JOINT, SINGLE	Selects Audio Mode
	PID			Sets the PID for the Primary Encoder
		VIDEO PID		Sets the PID for the Video in the Primary Encoder
		AUDIO PID		Sets the PID for the Audio in the Primary Encoder
		PCR PID		Sets the PID for the Clock Reference
		PMT PID		Set the PID for the Program Map Table
QAM				Configures the QAM and RF modules
	CHANNEL		7-137	Selects output channel for RF modulator
	Output Power		44 - 62dBmV MUTE	Selects the RF output power Mutes the output
	QAM		Annex A, 64 QAM Annex A, 256 QAM Annex B, 64 QAM Annex B, 256 QAM Annex C, 64 QAM Annex C, 256 QAM	Sets the QAM encoding mode

Main Menu	Sub-Menu 1	Sub-Menu 2	Options	Description
	INTERLEAVER		128,1 128,2 64,2 128,3 32,4 128,4 16,8 128,5 8,16 128,6 128,7 128,8	Sets the Interleaver Depth (Annex B only)
	FORMAT		Normal CW PRBS23 MPEG Null Packets PRBS60 PRBS63	Sets QAM Output mode. Select NORMAL for normal operation, all other modes are for test.
SYSTEM				Used to find out product information and load factory default values
	ABOUT			Display Model and Version information
	LOAD DEFAULTS			Load Factory Default Values as defined in section 3.2

4. Specifications

Inputs:

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 Ohm		
Video Input Connectors				BNC – for CVBS input 5 pin mini DIN for S-Video input
Audio Input Levels			1V RMS	
Audio Frequency response	20 Hz		20 kHz	@48 kHz sampling
Audio Input impedance	25 KOhm			
Audio Input Connectors				Stacked RCA Red/White

Encoding:

Specification	Min	Typ	Max.	Notes
Video Compression		MPEG2		MP@ML
Video Resolution		DI 3/4DI 2/3DI 1/2DI		Front panel controlled
Video Bit Rate	1.5 Mbps		15 Mbps	Front panel controlled
Audio Compression		AC3		
Audio Sample Rate		32, 44.1, 48 kbps		Front panel controlled
Audio Bit Rate	128 kbps		448 kbps	Front panel controlled

RF OUTPUT:

Specification	Min	Typ	Max.	Notes
RF Frequency Range	177 MHz CATV – Ch7		873 MHz CATV – Ch 137	center frequency Front panel controlled
Frequency Step Size		6 MHz		
Frequency Accuracy and Stability	-25ppm		+25ppm	
RF Output Level	44 dBmV		62dBmV	Front panel controlled
RF Output adjustment Step Size		0.5dBmV		
RF Output Accuracy	-1dB -2dB	0dB	+1dB +2dB	55-60 dBmV output 50-55 dBmV output
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 ¹ 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 ² 9.0 – 15.0 MHz offset ² All other out-of-band channels ³
Double-Sideband integrated phase noise			<-50dBc <-52dBc <-54dBc	1 kHz – 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.

Environmental:

Specification	Min	Typ	Max.	Notes
Operating Temp	0 degrees		50 degrees	Celsius
Storage Temp	-40 degrees		70 degrees	Celsius
Humidity	5%		95%	Relative, non-condensing

Mechanical:

Specification	Min	Typ	Max.	Notes
Dimensions		17"x12"x1.75"		Does not include mounting ears Overall 18.98" with mounting ears for mounting in standard 19" rack
Weight		5.5 lbs		
Material				Aluminum alloy 5052-H32 0.062 " thick minimum
Finish				Black matte powder coated over clear irridite

Power Consumption:

Specification	Min	Typ	Max.	Notes
Operating Voltage	85 VAC		264 VAC	47-440 Hz
Operating Current		160mA	250mA	@ 110VAC
Power		17.6 W		