QAM and VSB MPEG RF Signal Generator

▶ RTX130A

RTX130A

Both Set Top Box manufacturers, broadcasters and cable operators are providing new, advanced services to customers. These services require new consumer devices that have embedded DVRs, HD tuners, advanced video decoders, data broadcast capability and telephony/ internet connection to support advanced service offerings. The tasks of software engineering and the timescale for design verification and conformance testing are increasing significantly with this advanced functionality. RTX130A is designed to meet these needs for:

- MPEG digital TV Set Top Box, Integrated Digital TV and MPEG consumer device software development
- Equipment manufacturers and broadcast operators who need a solution for design evaluation and testing in their MPEG transmission environment

In the digital terrestrial broadcasting and cable environment, powerful RF modulated signal generation functionality is required in a portable form factor for design, test and maintenance.

The RTX130A QAM and VSB RF Signal Generator offers a flexible, affordable solution for design evaluation and conformance testing of digital video products conforming to the DVB-C/ITU-T J.83 standards, annex A, B, C and ATSC (8VSB) standards for digital terrestrial and cable TV systems.
The RTX130A RF MPEG Signal Generator provides this functionality:

- Supports ITU-T J.83 standards, annex A (DVB-C), B, C and ATSC VSB, for modulation of streams played from disk
- QAM modulation mode[*1] of 16, 64, 256 and 8 VSB
- Frequency: 50 to 860 MHz in 12.5 KHz steps
- 36/44 MHz IF output
- RF Output Level, 45-58 dBmV in 1 dB Steps
- DVB-ASI/SMPTE310M and SPI transport stream input/output for recording and playout from hard disk
- With the RTX130A, you can select the combination of RF modulation options required when ordering, and can add further modulation options when needed, protecting your original investment.

[*1] Not all constellations are available in all QAM modes.

▶ Features & Benefits

Provides a Complete Solution for DVB-C/QAM ITU-T J.83 standards, Annex A (DVB-C), B, C and VSB Signal Generation by Integrating a QAM and VSB Modulator, Up Converter and MPEG Generator in a Portable Form Factor

Real-time Updating of Timestamps and Time Tables for Error-free Looping From Disk

USB, DVD Drive and GbE Interface for loading of Transport Streams for Optimum Flexibility in Storing and Managing Transport Stream Libraries

Integration with Automated Systems Enabled by Ethernet Remote Control Using SCPI (Standard Command for Programmable Instruments) Command Set

Quick and Easy Interpretation of Complex Structures by Utilizing a Color Hierarchical Display of Transport Stream Components

Easy Integration with Tektronix MPEG Analysis Tools for Transport Stream Creation to Support Compliance and Stress Testing of Video Products Using MPEG-2 Technology

Integrates with Tektronix Monitoring Tools for Powerful and Cost-effective Transport Stream Monitoring and Error Recording

▶ Applications

QAM and VSB Consumer Receiver Design and Manufacturing Test

Evaluation of Professional QAM and VSB Equipment

Performance Verification of QAM and VSB Systems

Simulation of Digital Terrestrial and Cable Broadcasting Transmission

Scheduling of Stream Play Out and Recording for Production Line Applications

Tektronix
Enabling Innovation

The RTX130A is the optimum tool for design and evaluation of consumer QAM and VSB equipment such as set-top boxes and integrated televisions; devices requiring a directly modulated RF input. The RTX130A can also be used as a signal source for end to end broadcast system evaluation and maintenance.

As an integrated solution, RTX130A removes the need to purchase a separate transport stream generator, QAM and VSB modulator, and an up-converter to generate QAM and VSB modulated RF test signal. DVB-SPI and ASI/SMPTE310M interfaces are also provided as standard, allowing recording and play out of MPEG-2 Transport Streams.

The RTX130A offers continuous, error-free transport stream looping for long duration play out, and PCR jitter insertion for stressing MPEG product designs. Users can continuously loop test streams, including updating of all timestamps, continuity counters and time tables.

Ethernet network control functionality enables remote control of functions like Play, Record, Clock Rate and PCR Jitter Insertion using the SCPI (Standard Control for Programmable Instruments) command set, allowing easy integration into ATE automated environments.

An optional scheduler application enables the RTX130A to be used as a simple MPEG stream server for manufacturing test signal transmission.

► Characteristics

System Characteristics

MPEG Stream Source Characteristics – Supports MPEG-2, DVB and ATSC Transport Stream protocols. Records and plays out MPEG Transport Streams in multiple formats. Error-free looping. PCR jitter insertion.

Packet Length – 188, 204 or 208 bytes and Non-TS.

Maximum Data Rate –
Memory: 200 Mbps.
Disk: 120 Mbps.

Minimum Data Rate – 256 Kbps. (ASI)

Number of Input/Output Interfaces –
One DVB SPI I/O, one ASI/SMPTE310M In, one ASI/SMPTE310M Out, one IF Out and one RF Out.

DVB Synchronous Parallel Interface –
Connector: 25-Pin D-sub, maximum data rate: 200 Mbps.

Asynchronous Serial Interface –
Connector: BNC, Maximum Data Rate: 200 Mbps, user-selectable burst and non-burst transmission format.

SMPTE310M –
Connector. BNC, data rate: 19.392658 Mbps.

Internal Storage Capacity – 150 GB usable.

Internal Reference Clock – 27 MHz ±1 ppm.

External Reference Input –
10/27 MHz ±1 ppm (recommended).

RF Signal Characteristics

Broadcasting System –
DVB-C/ITU-T J.83 Annex A, ITU-T J.83 Annex B, ITU-T J.83 Annex C, ATSC.

Internal Reference Clock – 27 MHz ±1 ppm.

Output Connector – BNC, 75 Ω.

RF Frequency Range –
50 MHz to 860 MHz, 12.5 KHz step.

RF Output Amplitude –
45 dBmV to 58 dBmV, 1 dB step.

IF Frequency Range – 36/44 MHz.

IF Output Amplitude – 35 ±3 dBmV.

Modulation Characteristics –

Mode – DVB-C/ITU-T J.83 Annex A (Option M1).
- Symbol Rate – 5 to 6.9565 Msps (IF), 5 to 6.9565 Msps (RF).
- Carrier Modulation – 16/64/256 QAM.
- Outer Coding – RS (204,188).
- Roll Off – 0.15.

Mode – ITU-T J.83 Annex B (Option M2).
- Symbol Rate – 5.056941/5.360537 Msps.
- Carrier Modulation – 64/256 QAM.
- Outer Coding – RS (128,122).
- Roll Off – 0.18/0.12.

Mode – ITU-T J.83 Annex C (Option M3).
- Symbol Rate – 5.274 Msps 1 to 5.3097 Msps (IF), 5 to 5.3097 Msps (RF), 5.274 Msps (JCTEA).
- Carrier Modulation – 64 QAM.
- Outer Coding – RS (204, 188).
- Roll Off – 0.13.

Mode – ATSC (Option M4).
- Symbol Rate – 10.762237 Msps.
- Carrier Modulation – 8 VSB.
- Outer Coding – RS (207, 187).
- Roll Off – 0.1152.
- 8VSB adjacent channel spectral emissions comply with FCC emission mask for low-power DTV transmitters[*1] within 4 MHz of either side of the band-edge.

Platform Characteristics

Operating System – Windows XP.

Disk Space – System: 10 GB, MPEG storage: 150 GB.

RAM – 512 MB.

DVD+/–RW Drive

Display – LCD, 640x480.

Character Input – Keypad.

Keyboard and Mouse – Standard.

Interfaces –
VGA output, Printer port, Serial port, USB2.0, 1000Base-T Ethernet, IEEE 1394b.

Environmental Characteristics

Temperature –
Operating: +5 ºC to +40 ºC.
Non-operating: -20 ºC to +60 ºC.

Humidity –
Operating: 20% to 80% (noncondensing).
Non-operating: 5% to 90% (noncondensing).

Altitude –
Operating: Up to 3 km.
Non-operating: Up to 12 km.

[*1] FCC's emission regulations for low-power DTV transmitters are given in 47CFR part 74.794(a).

EMC/Safety

EMC – EN61326-1.
Safety –
UL61010-1, CAN/CSA C22.2 No.6 1010-1-04, EN61010-1.
Australia Declaration of Conformity –
AS/NZS 2064.

Power Requirements

Mains Voltage Range – 100 to 240 VAC.
Mains Frequency – 50/60 Hz.
Power Requirements – 80 VA Max.

Physical Characteristics

Dimensions	**mm**	**in.**
Height	132	5.2
Width	214	8.4
Depth	435	17
Weight	**kg**	**lbs.**
Net	6.2	13.7

PC System Requirement for Scheduler Software

The following PC configuration is required for installation.

- Intel or 100% compatible motherboard chipset
- Windows 2000 Operating System or Windows XP Operating System
- 256 Megabytes (MB) of RAM
- 2 to 3 MB of available hard disk space for the applications and documentation
- VGA (640x480) resolution video adapter and monitor (XGA (1024x768) or higher resolution recommended)
- CD-ROM or DVD drive
- Keyboard and Microsoft mouse or compatible pointing device

IMPORTANT NOTE – Apart from those specifically authorized by Tektronix, there should be no other application installed on the PC. If other applications are installed, it is possible they may interfere with the operation of the software supplied. Software operation under these circumstances cannot be guaranteed.

▶ Ordering Information

RTX130A

RF Signal Generator.

Includes: Stream capture and play out with error-free looping and PCR jitter insertion, QAM and VSB signal output, 512 MB RAM, 150 GB MPEG stream storage, sample streams, USB keyboard and mouse, front cover and user manual.

Please specify power plug when ordering.

Please note at least one modulation option must be ordered with an RTX130A, a maximum of four modulation options can be supported in total per RTX130A. Only one RF output is provided. MTX100A units can not be upgraded to RTX130A standard and do not support RTX130A RF options.

RTX130A Options

Opt. M1 – DVB-C/ITU-T J.83 Annex A Modulation Mode.

Opt. M2 – ITU-T J.83 Annex B Modulation Mode.

Opt. M3 – ITU-T J.83 Annex C Modulation Mode.

Opt. M4 – ATSC Modulation Mode.

Opt. SC – Scheduler.

Service

Opt. C3 – Calibration Service 3 years.

Opt. C5 – Calibration Service 5 years.

Opt. D1 – Calibration Data Report.

Opt. D3 – Calibration Data Report 3 years (with Opt. C3).

Opt. D5 – Calibration Data Report 5 years (with Opt. C5).

Opt. R3 – Repair Service 3 years.

Opt. R5 – Repair Service 5 years.

International Power Plugs

Opt. A0 – U.S. plug, 115 V, 60 Hz.

Opt. A1 – Euro plug, 220 V, 50 Hz.

Opt. A2 – U.K. plug, 240 V, 50 Hz.

Opt. A3 – Australia plug, 240 V, 50 Hz.

Opt. A4 – North America plug, 240 V, 50 Hz.

Opt. A5 – Switzerland plug, 220 V, 50 Hz.

Opt. A6 – Japan plug, 100 V, 110/120 Volt, 60 Hz.

Opt. A10 – China plug, 50 Hz.

Opt. A99 – No power cord.

Language Options

Opt. L0 – English manual.

Opt. L5 – Japanese manual.

Upgrade Kit

RTX13UP Opt. M1 – Add DVB-C/ITU-T J.83 Annex A Modulation Mode.

RTX13UP Opt. M2 – Add ITU-T J.83 Annex B Modulation Mode.

RTX13UP Opt. M3 – Add ITU-T J.83 Annex C Modulation Mode.

RTX13UP Opt. M4 – Add ATSC Modulation Mode.

RTX13UP Opt. SC – Add Scheduler.

Optional Accessories

WFM7F05 – Rackmount kit.

1700F06 – Blank panel.

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Our most up-to-date product information is available at:
www.tektronix.com

Product(s) are manufactured in ISO registered facilities.

Product(s) complies with IEEE Standard 488.1-1987, RS-232-C and with Tektronix Standard Codes and Formats.

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