



# USM

## RGB Universal Scalable Modulator

RGB's Universal Scalable Modulator (USM) delivers the industry's highest density, multi-service solution for digital QAM modulation and upconversion. Based on RGB's advanced Video Intelligence Architecture™ (VIA), the single rack unit USM is scalable, programmable and field-upgradeable, offering a cost-effective, next-generation digital video delivery platform that supports video-on-demand (VOD), switched digital video, broadcast and M-CMTS architectures. The highly flexible USM expedites deployment of advanced digital video services while reducing operation and management costs.

### Scalable, Multi-Service QAM Modulation and Upconversion

- One rack unit chassis supports up to 128 QAM channels in a 6 MHz channel system saving nearly ten times the rack space and power consumed by low density solutions.
- Supports the ability to multiplex up to 1280 programs in one rack unit, enabling operators to efficiently deploy scalable, personalized digital video services in switched and on-demand environments.
- Truly scalable design enables operators to introduce new services with lower capital expenditure and enjoy a flexible "pay-as-you-grow" model based on the number of QAM channels needed for current digital video service deployments.
- Offers RGB's pioneering full redundancy options, including automatic failover, hot-swappable 1:1 chassis redundancy, and service level and Gigabit Ethernet port redundancy.
- Programmable and field-upgradeable platform eliminates product obsolescence.

The RGB Universal Scalable Modulator (USM) is the industry's highest density product for digital QAM modulation and upconversion, supporting up to 8 QAM channels per RF port, for a total of 128 x 6 MHz QAM channels (6 QAM channels per RF port, for a total of 96 x 8 MHz QAM channels) in a one rack unit chassis. With the unique ability to perform high density QAM modulation, the USM allows cable operators to deliver more digital video services today and to make a smooth migration to next generation architectures, enabling the delivery of advanced personalized and on-demand services.

Based on RGB's Video Intelligence Architecture™ (VIA) and its flexible video processing capabilities, the USM receives MPEG-2 transport streams over IP through a 10Gigabit Ethernet interface or multiple Gigabit Ethernet interfaces, performs multiplexing, digital QAM modulation and RF upconversion, and delivers a superior RF signal to the hybrid fiber/coax (HFC) digital cable network.

The USM's multi-service, programmable architecture allows for the delivery of advanced services in video-on-demand (VOD), switched digital video (SDV) and broadcast environments, as well as DOCSIS 3.0 M-CMTS next-generation IP services.

### Expedites Service Deployments and Enables Pay-as-You-Grow Model

Offering many unique features and a high degree of flexibility, the USM expedites the deployment of advanced digital video services, while laying the groundwork for easy service additions in the future.

The USM supports four digital RF modules per chassis. Each digital RF module, RGB's STP2 module, has four RF interfaces, and supports up to 32 QAM channels per module when configured with up to eight block-upconverted adjacent QAM channels per RF interface. The USM is fully configurable and field-upgradeable through software licenses, allowing operators to increase processing capacity as their stream densities and network needs grow.

The scalable and modular design of the USM enables operators to minimize the cost of introducing new services, allowing them to benefit from a "pay-as-you-grow" model by giving them the ability to license QAM channels on an as needed basis.

With its flexible and programmable architecture, the USM can simplify and expedite future deployments of MPEG-4 H.264/AVC applications, or other advanced digital video services delivered over IP, without a need to replace or upgrade hardware.

### Unsurpassed Density Improves Manageability and Reduces OPEX

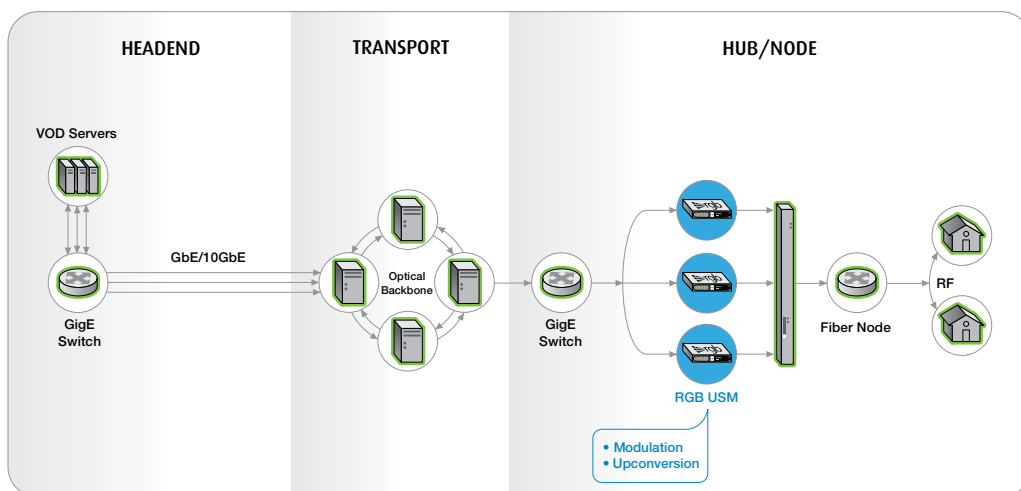
The high density USM can support up to 128 QAM channels in a 6 MHz channel system or 96 QAM channels in an 8 MHz channel system in a single rack unit chassis. Compared to conventional QAM modulators, the USM can save nearly 10 times the rack space and power consumption at the edge of the network. The USM requires less than 5 Watts of power per QAM channel, as compared to 10 times more for lower density solutions, and the single rack unit USM can replace the equivalent of a full rack of lower density QAM modulation products.

### Multi-Level Redundancy Increases Reliability and Service Availability

With multiple levels of redundancy, the USM offers a high-availability solution for digital video network designs. Redundancy features, which vary by application, include:

- **Automatic Failover:** The USM switches to a standby unit upon fault detection on the active USM unit.
- **Chassis Redundancy:** The RGB Redundancy Docking Station (RDS) facilitates redundancy switching and offers hot-swappable 1:1 chassis redundancy.
- **Network Redundancy:** The chassis supports multiple Gigabit Ethernet input interfaces that can support redundant network connections.
- **Gigabit Ethernet Port Redundancy:** Each Gigabit Ethernet interface can be configured as a redundant port for any other Gigabit Ethernet port.

### RGB USM in the Video-On-Demand Environment



In addition, the flash card retains the configuration and licensing information for the unit, enabling rapid replacement and increasing operational efficiency.

### Standards-Based Monitoring and Management System

The USM can be provisioned and configured by RGB's VIA Element Manager using an intuitive, web-based graphical user interface (GUI). The USM can also be remotely configured and managed through any SNMP standards-compliant management application.

RGB's VIA Element Manager allows operators to remotely configure RF, Gigabit Ethernet and IP parameters. Operators can also configure or enable chassis redundancy when using RGB's Redundancy Docking Station (RDS).

### Compatibility and Standards Compliance

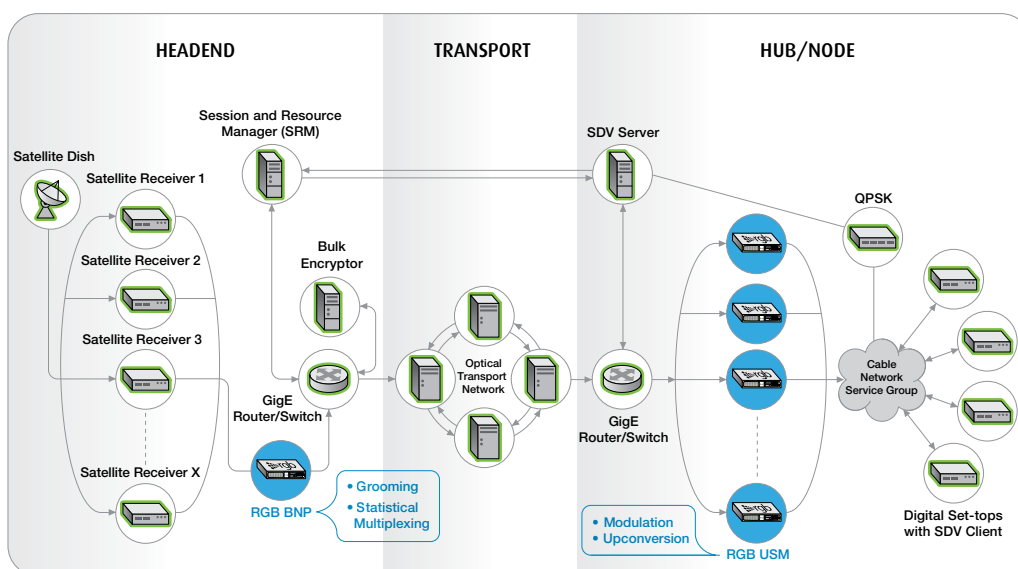
The USM supports both single program transport stream (SPTS) and multi-program transport stream (MPTS) video input over UDP/IP through its Gigabit Ethernet interfaces or 10Gigabit Ethernet interface. It also supports both multicast and unicast MPEG transport over IP. In an IP multicast environment the USM supports IGMPv3 and IGMPv2 for optimal compatibility with different configurations and environments.

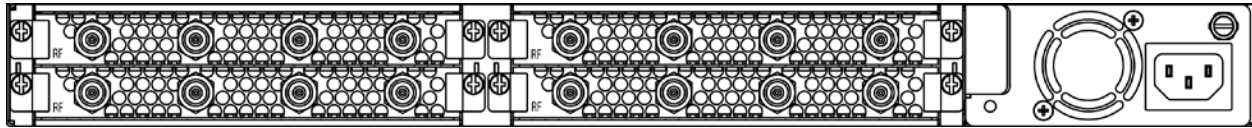
The USM is also interoperable with major VOD servers, switched digital video resource management and control servers, digital set-top boxes, edge/session resource managers and pre-encryption systems.

### RGB VIA Product Family

The USM is a member of RGB's groundbreaking VIA product family of intelligent video processors. Based on RGB's flexible Video Intelligence Architecture (VIA), the VIA product family leverages standard-based Gigabit Ethernet and IP data networking technologies to easily integrate with existing infrastructure and dramatically lower the cost of delivering advanced digital video services. This multi-function platform is scalable, programmable and upgradeable, making the future-proof VIA product family an intelligent choice for implementing the next generation of all-digital, personalized, on-demand architectures.

### RGB USM in the Switched Digital Video Environment





RGB USM Rear View

## RGB USM Specifications

<b>INPUT INTERFACES</b> Gigabit Ethernet 10Gigabit Ethernet Fast Ethernet DOCSIS Timing Interface (DTI)	8 SFP interfaces with support for copper or optical 1 XFP interface with support for optical 1 10/100BaseT control and management interface with RJ45 connector 1 DOCSIS timing interface with RJ45 connector
<b>OUTPUT INTERFACES</b> RF Interfaces Number of RF Interfaces	F-type 75 $\Omega$ (female) connector 16 RF interfaces per chassis, 4 RF interfaces per STP2 module
<b>MPEG PROCESSING</b> STP2 QAM Modulation Module MPEG Multiplexing  Video Processing   Jitter Tolerance	Maximum of 4 STP2 modules in each chassis for integrated QAM modulation and RF upconversion Up to 128 MPEG-2 transport streams for 6 MHz channel system and up to 96 MPEG-2 transport streams for 8 MHz channel system SD or HD, VBR and CBR MPTS and SPTS IP unicast and multicast with IGMPv2 and IGMPv3 PID filtering, PID re-mapping PCR correction within +/- 500 nsec Extraction, generation and insertion of PSI tables: PAT, PMT +/- 100ms
<b>VIDEO FORMATS</b> MPEG Profile and Level	MPEG-2, MP@ML (SD) and MP@HL (HD)
<b>QAM RF</b> Frequency Range Channel Bandwidth Options Frequency Accuracy Modulation  MER Power Adjust Output Return Loss   In-Band Power Difference  Power per Channel Absolute Accuracy RF Block Muting Channel Muting Output Power per Channel	54-870 MHz 6 MHz or 8 MHz $\leq 30$ kHz ITU-T J.83 Annex A (DVB-C) 64-QAM, 128-QAM and 256-QAM ITU-T J.83 Annex B 64-QAM, 256-QAM > 35 dB (unequalized), > 43 dB (equalized) 8 dB in 0.1 dB steps > 14 dB within an active channel from 54 MHz to 750 MHz > 13 dB within an active channel from 750 MHz to 870 MHz > 12 dB in every inactive channel from 54 MHz to 870 MHz > 10 dB in every inactive channel from 870 MHz to 1002 MHz < 0.5 dB between any two adjacent channels in a block < 1dB between any two non-adjacent channels in a block +/- 2 dB > 73 dB > 50 dB +60 dBmV for 1 channel, +56 dBmV for 2 channels +52 dBmV for 4 channels, +50 dBmV for 6 channels +49 dBmV for 8 channels
<b>REDUNDANCY</b>	Hot-swappable 1:1 chassis redundancy with RDS, automatic failover to hot standby USM unit
<b>ENCRYPTION (OPTIONAL)</b>	Privacy Mode Encryption
<b>MANAGEMENT AND CONFIGURATION</b>	SNMPv2 Alarm and event SNMP traps Static and DHCP automatic management interface IP configuration RGB USM VIA Element Manager with graphical user interface RGB USM MIB
<b>REGULATION COMPLIANCE</b> Safety Electromagnetic	CE UL, TUV FCC Part 15, Class A, EN55022, EN55024
<b>ELECTRICAL/MECHANICAL</b> Input Power  Line Frequency Power Consumption Dimensions Weight	AC: 100-127 VAC @ 7.6 A to 200-240 VAC @ 3.8 A DC: 48 VDC @ 14 A (range 36-75 VDC) 50-60 Hz Approximately 5 W per channel (675 W per chassis with 128 QAMs) 1 rack unit – 1.75" H x 19" W x 23" L (43.6 H x 433 W x 583 L mm) 30 lbs. (11.34 kg) at full capacity
<b>ENVIRONMENTAL</b> Storage Temperature Operating Temperature Humidity	-40° to 70° C 0° to 40° C 5% to 95% (non-condensing)



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