

**BSR 64000 DECOUPLED UPSTREAM MODULE**



The RX48 introduces advances in RF technology that will allow full DOCSIS 3.0 capability and much greater upstream spectrum utilization. It enables flexible scaling of upstream capacity to achieve subscriber speeds of 100Mbps or beyond for Ultra-Broadband services. The Motorola RX48, combined with the TX32 Decoupled Downstream Module, provides industry leading density in a fully protected Integrated CMTS.

The Motorola BSR 64000 RX48 Decoupled Upstream Module provides industry leading upstream channel density, advanced S-CDMA and A-TDMA capabilities, and high performance packet processing to allow reliable delivery of Ultra-Broadband services at significantly reduced cost per channel.

It is an evolutionary product offering 48 upstream burst receivers packed into a single energy efficient module that allows major flexibility for operators to cost-effectively scale upstream bandwidth to deliver carrier-class high-speed data, voice, and IP-based video services.

With the RX48, cable operators can deliver increased upstream peak bandwidth exceeding 100Mbps for DOCSIS 3.0 cable modems with upstream channel bonding, as well as increased average bandwidth available to legacy DOCSIS 1.x/2.0 cable modems. The significant increase in upstream capacity offered by the RX48 is critical for cable operators to be competitive with FTTx services.

**Upstream Channel Density**

The RX48 Decoupled Upstream Module combined with the TX32 Decoupled Downstream Module allows flexible upstream and downstream channel capacity ratios for the BSR 64000 I-CMTS solution to support a wide variety of deployment scenarios. The RX48 provides significant



channel density with 48 upstream RF receivers across eight physical RF ports. Each port may have up to 6 upstream RF receivers that can be easily enabled for increased channel capacity to support the steadily growing upstream bandwidth consumption associated with peer-to-peer, gaming, video conferencing, and high speed commercial and residential services.

**DOCSIS 3.0**

The RX48 incorporates next generation DOCSIS 3.0 Upstream MAC controllers,

**Features**

I-CMTS Decoupled Upstream Module for Flexible Upstream Capacity Expansion

DOCSIS 3.0 Upstream Channel Bonding to support Ultra-Broadband services of 100Mbps or more

Integrated RF Switch design enables High-Availability Services with Hitless RF Redundancy.

Increased Upstream Channel Density with a 60% energy savings over prior generation RF modules

Advanced S-CDMA design enables usage of low frequency Upstream Channels for greater upstream bandwidth

Deployable in all BSR 64000 HD Chassis with existing 2:8, SRM, and Ether-Flex modules for maximum investment protection

DOCSIS 3.0 Upstream S-CDMA/A-TDMA Burst Receivers, high-performance multi-core processor and packet processing components to support the advanced DOCSIS 3.0 feature set, including Upstream Channel Bonding, enhanced security (AES, Security Provisioning), IPv6, Multicast, IPDR Extensions, and enhanced Upstream RF support.

### **Upstream Channel Bonding**

Cable operators can deploy DOCSIS 3.0 upstream channel bonding to achieve peak upstream bandwidths of 100Mbps and beyond to offer services with faster download speeds for high-tiered subscribers. The RX48 provides significant investment protection for cable operators with the ability to grow the number of upstream channels per bonding group to support these higher peak upstream services as new DOCSIS 3.0 cable modems become available.

### **Spectrum Optimization with S-CDMA**

With S-CDMA, cable operators may increase upstream channel capacity as much as 50 percent by unlocking additional upstream channels that were previously unusable due to noise in the lower upstream frequency spectrum or high in-home attenuation. The RX48 decoupled upstream module facilitates the use of S-CDMA, so cable operators can use this new capacity to increase average data rates through higher order modulation or implement DOCSIS 3.0 upstream channel bonding to achieve bandwidths in excess of 100 Mbps.

### **Advanced RF Front End**

The RX48 offers an advanced RF front-end design comprised of RF filtering and gain adjusting circuits to optimize the DOCSIS 3.0, 2.0, and 1.x upstream RF signal linearity, modulation error ratio (MER), and input RF signal level to the upstream RF burst receivers for all supported modulation profiles.

### **Advanced Spectrum Management**

The RX48 implements advanced spectrum management and ingress noise cancellation techniques to maximize the available upstream channel throughput for DOCSIS

3.0 and legacy DOCSIS 2.0/1.x cable modems. Spectrum management is essential so that operators can identify impairments and make the necessary adjustments to improve upstream channel performance. The RX48 leverages noise measurement techniques such as Fast Fourier Transform (FFT) measurements to assess the type of upstream RF noise and overall condition of an upstream channel prior to applying upstream spectrum management rules to optimize available upstream channel bandwidth for cable modem operation.

In addition, the RX48 supports the capability to configure one of the six upstream receivers per RF port to be used as a dedicated receiver for upstream RF spectrum analysis without interrupting services. The spectrum analysis is used to aid in the selection of the best upstream channel frequencies and modulation type to optimize upstream bandwidth with spectrum management.

### **RF Hitless Redundancy**

The BSR 64000 I-CMTS solution supports 1:N redundancy with the RX48 Decoupled Upstream Module to offer fully protected upstream operation avoiding any interruption of high-speed data, voice or video services. The Standby RX48 Module occupies slot 6 of the BSR 64000, and provides full redundant operation upon switch over with the BSR 64000 integrated RF switch.

## SPECIFICATIONS

<b>Flexible Configurations</b>	BSR 64000 I-CMTS Chassis Configuration with the TX32 and RX48 Decoupled DOCSIS 3.0 modules, SRM controller module, and Ether-Flex High-Speed Interface modules	
	Deployable with 2:8 DOCSIS/EuroDOCSIS modules operating with unique MAC Domains	
<b>Features</b>	High-performance Dual-Core PPC Processor and Packet Processing Engines	
	Advanced DOCSIS 3.0 Upstream MAC and Upstream Burst Receiver Chipset	
	4 GB High-speed DDR2 Memory	
	48 Upstream QAM receivers	
	8 Upstream RF Ports	
	Maximum of 6 upstream QAM receivers per RF port	
	Field-Upgradable Firmware	
<b>Standard- Based</b>	Compliant with DOCSIS 3.0, 2.0, and 1.x	
	Compatible with DOCSIS, J-DOCSIS, and EuroDOCSIS specifications	
<b>RF</b>	Upstream RF frequency range	5 to 85 MHz
	Upstream modulation	4 (QPSK), 8, 16, 32 and 64 QAM
	RF Receive Input Level Range	-7 to +23 dBmV per DOCSIS 3.0 PHY Specification
	Input load impedance:	75 $\Omega$
<b>Physical</b>	Occupies a single slot in the BSR 64000 chassis	
	Hot-swappable	
	RF Interfaces	Eight 'F' type connectors on rear I/O module
	Diagnostic Ports	DB-9 and RJ-45 (1000BASE-T Only)
	Module LEDs	Fail, Status, and Alarm
	Upstream Port LEDs	Link and Fault
	Dimensions (H x W x D)	15.0 x 15.0 x 1.0 inches (38.1 x 38.1 x 2.54 cm)
	Weight	4.1 lbs.
<b>Management</b>	Supports standards-based IP Detail Record/Streaming Protocol (IPDR/SP)	
	Supports standards-based and Motorola Proprietary DOCSIS 1.x, 2.0, and 3.0 MIBs	
<b>Environmental</b>	Operating temperature	0° C (32° F) to +40° C (104° F)
	Storage temperature	-20° C (-4° F) to +70° C (158° F)
	Operating humidity	10%-95% non condensing
	Non-Operating and Storage Humidity	5% - 95% non condensing
<b>Regulatory Compliance</b>	Safety	UL60950-1:2003, 1st Ed; CSA C22.2 No. 60950-1-03, 1st Ed. IEC 60950-1:2001, 1st Ed.; EN 60950-1:2002, 1st Ed.; 2006/95/EC
	Electromagnetic Emissions	EN 300386 V 1.4.1: 2008, Telecom Centers; 55022: 2006 +A1: 2007, Class A (specified by EN 300386); IEC CISPR 22: 2005 +A1: 2005, Class A; CFR 47 Part 15, Subpart B, Class A; VCCI V3: 2009, Class A; AS/ NZS CISPR 22: 2006, Class A 2004/108/EC

**SPECIFICATIONS CONTINUED**

	Electromagnetic Immunity	EN 300386 V 1.4.1: 2008, Telecom Centers; RRL Notice 2008-38
	Environmental	RoHS,WEEE; 2005/95/ EC
	Physical	Designed for NEBS GR-63-CORE Level 3 Requirements; ETS 300 019 Part 1-1 Class 1.1, Part 1-2 Class 2.2, Part 1-3 Class 3.1
<b>Power</b>	Unit Power	150 watts (typical)
<b>Software</b>	Minimum software revision	

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