NSG™ 9000-6G

SCALABLE UNIVERSAL EDGEQAM

The NSG™ 9000-6G is the latest generation of the Harmonic high density Universal EdgeQAM system, capable of reaching up to 144 QAM RF outputs per unit. The device is designed as a highly integrated digital video gateway which multiplexes on-demand content streamed over an IP network.

The NSG 9000-6G was engineered for scalability; it is capable of growing in QAM density from 1 to 144 QAMs per unit. In addition to providing unparalleled output density, the NSG 9000-6G is designed to support a variety of applications including Video on Demand (VOD), Switched Digital Video (SDV), Broadcast, Modular Cable Modem Termination System™ (M-CMTS) and Direct to Edge (D2E) concurrently.

Stream Processing

The NSG 9000-6G is housed in a modular, 2-RU chassis, and performs PID filtering, multiplexing, scrambling, QAM modulation, and RF upconversion for up to 144 MPEG transport streams simultaneously. The NSG accepts digital MPEG input through its gigabit Ethernet (GbE) ports, then directs the multimedia to different QAMs to create the outgoing transport streams as QAM-RF output signals. The NSG 9000-6G is also designed to meet the DOCSIS 3.0 M-CMTS requirements for downstream data transmission.

Modularity

In order to maximize scalability and flexibility, the NSG 9000-6G is designed as a completely modular system. The chassis is fitted with a passive backplane, while all the processing and modulation functions are performed on retrievable modules. The chassis has nine QAM RF module slots; each module has two QAM RF ports. Each port is capable of supporting up to 8 adjacent and/ or non-adjacent QAM channels on Annex B and C, or up to 6 QAM channels on Annex A. The system can host two AC or DC power supplies, which are redundant to each other.

The processing module features 8 SFP cages supporting both optical fiber and copper interfaces. The processing module also includes two 10/100Base-T ports for management and conditional access networks. In addition, this module supports two DOCSIS Timing Interface ports (DTI), which are redundant to each other, for synchronizing the clocks in an M-CMTS application. An on-board ASI monitoring port is used to monitor the transport streams within the system with an MPEG analyzer.

Designed for ease of operation, the NSG 9000-6G QAM RF modules and power supplies are hotswappable, allowing for flexible enhancement of the system density without service down-time. The device cooling fans are contained in a detachable front bezel which snaps on the chassis, allowing field replacement.

HIGHLIGHTS

- True universal EdgeQAM, able to support VOD, SDV, BCST and M-CMTS services concurrently
- High density, modular 2-RU system capable of hosting up to nine QAM RF output modules
- Dual redundant, load sharing power supplies
- Hot swappable QAM RF modules containing 2 RF ports capable of outputting up to 8 QAM channels each in semi-flexible QAM locations
- Processing module with 8 GbE SFP cages supports up to 6 Gbps in total using both copper and/or FO links
- DOCSIS 3.0 ready
- Controlled via the Mass Configuration Tool (MCT), an HTTP web GUI or Command Line Interface (CLI)
- Motorola Privacy Mode support
- GbE port redundancy supporting multiple redundancy schemes
- Supporting 1:1 device redundancy using EdgeCluster technology

Management

The NSG 9000-6G offers several methods of configuration and monitoring. Each device comes with an on-board server for web-based control. The GUI supports all of the NSG 9000-6G's configuration and monitoring functionality, and can be accessed with an Internet browser. The NSG 9000-6G also supports a local control panel, which consists of an LCD display area and a keypad.

In order to facilitate the simple and simultaneous configuration of a large number of NSG devices, Harmonic offers a spreadsheet-based Mass Configuration Tool (MCT). This tool also allows users to perform firmware upgrades and remote configuration as well as backup and restoration for multiple devices.

For operators who prefer working with Command Line Interface (CLI), the NSG 9000-6G device supports a full suite of CLI commands that enables monitoring and configuring the device using custom scripts. In addition, the NSG 9000-6G supports in-depth monitoring, utilization statistics and alarm aggregation via Harmonic's NMX Digital Services Manager.

The NSG 9000-6G supports various standard as well as proprietary SNMP MIBs, and thus its status, alarms, statistics and utilization can be monitored using any SNMP-compliant management platform.

The NSG 9000-6G incorporates an audit trail mechanism that keeps a record of which users accessed the device, as well as which operations they performed and at what time frames. Using the audit mechanism, operators gain greater transparency regarding access and configuration changes performed on deployed NSG 9000-6Gs.

The NSG 9000-6G supports a connection to an external Syslog server, which stores logs originating from multiple devices. This enables operators to integrate the NSG 9000-6G into their centralized logging systems, simplifying system operation and maintenance.

Benefits of the NSG 9000

- **High Density** — Supporting up to 144 QAMs per 2-RU unit, the NSG 9000-6G is capable of supporting more than 2000 concurrent VOD streams, depending on the bit-rates.
- **Flexibility** — Each NSG 9000-6G can scale from one to 144 QAM RF outputs, and is ideal for a variety of applications, including VOD, switched digital video, broadcast and data.
- **Performance** — The NSG 9000-6G supports the same high performance standard of the existing NSG family, with superior RF specifications, stream processing functionality and management options.
- **Modular Design** — The NSG 9000-6G platform features hot swappable RF-QAM modules and power supplies, a retrievable processing module and detachable front panel.
- **Reliability** — The system supports dual redundant load-sharing power supplies, castaluminum covered QAM RF modules and a robust chassis design, all designed to provide high reliability and superior performance over time.
- **Network Management** — The NSG 9000-6G can be managed via a web-based GUI, Mass Configuration Tool (MCT), Command Line Interface (CLI), Harmonic's NMX Digital Services Manager, an SNMP compliant management platform, or a local control panel.
- **Security** — The NSG 9000-6G incorporates an integral configurable firewall to protect the device from unauthorized and offensive traffic. This mechanism increases the operator's ability to create and maintain secure systems using the NSG 9000-6G. It also supports HTTPS, enabling operators who strive for increased system security to communicate with the device over a secured connection.
- **Redundancy** — The NSG9000-6G supports multiple GbE port redundancy schemes as well as intra-port and inter-port socket redundancy schemes. High availability solutions can be supported by the NSG9000-6G through the use of EdgeCluster technology.

Applications

- Video on Demand (VOD)
- Switched Digital Video (SDV)
- Broadcast applications
- Modular CMTS
- Direct to Edge (D2E)

NSG™ 9000-6G SCALABLE UNIVERSAL EDGEQAM

GIGABIT ETHERNET INPUT

Type	Gigabit Ethernet 802.3z
Ports	8 Independent ports
Connector	8 x SFP cages
I/O Speed (1Gbe ports)	1 x 960 Mbps per port
IP Encapsulation	MPEG TS over UDP/IP/MA 1 to 7 TS/ IP
MPEG Format	188 Bytes per TS packet
I/O Processing	Up to 960 Mbps per port
Total Processing Capacity	Up to 6 Gbps
Addressing & Protocols	Unicast (UDP, L2TPv3), Multicast (IGMPv1,v2,v3)
Management	ARP, ICMP
Monitoring	GbE port forwarding
Redundancy	4 x (1 + 1), 2 x (3 + 1)

ASI MONITOR PORT

Type	ASI Output
Connector	BNC, 75Ω
Configuration	Configurable mirroring per QAM
MPEG Format	188 Bytes per TS packet

MANAGEMENT INTERFACES

Ethernet	2 x 10/100 Base-T
Connector	RJ-45 (1 Management, 1 CAS)
Serial Port	RS232

RE-MULTIPLEXING

PID	Re-mapping & remultiplexing
PSI/SI	PAT/PMT extraction and generation

SCRAMBLING

Motorola Privacy Mode	

MANAGEMENT

Standalone Control	NSG Web-client Command Line Interface (CLI) through SSH/Serial
Mass Configuration	Mass Configuration Tool (MCT)
NMS	Harmonic NMX Digital Service Manager (monitoring only)
Protocols	TCP/IP, RPC SNMP v1,v2c,v3 HTTP, HTTPS, SCP, RS-232

REDUNDANCY SCHEMES

Device Redundancy	EdgeCluster
GbE Port Redundancy	4 x (1 + 1), 2 x (3 + 1)
Socket Redundancy	Inter-port socket redundancy (BCST pass-through) Intra-port socket redundancy (ISA-SDV)

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ENVIRONMENTAL

Operating Temperature Range	32°F to 122°F 0°C to 50°C
Storage Temperature Range	-40°F to 158°F -40°C to 70°C
Relative Humidity	0 to 95% non-condensing
Operating Altitude	Up to 15,000 feet (4,572 meters)
Storage Altitude	Up to 12,192 meters (40,000 feet)

PHYSICAL

Input Voltage	85-264 VAC, 47-63 Hz 36- 72 VDC
Power Consumption	537W @ 220VAC 553W @ 110VAC 553W @ -48VDC
Power Modules	1+1 redundant AC/DC, load sharing power supplies
Rack Space	2-RU
Dimensions (W x H x D)	19 in x 3.47 in x 20.75 in 48.26 cm x 8.81 cm x 52.7 cm
Weight Chassis and processing board Power supplies RF Module	 34 lb / 15.4 Kg 3.9 lb / 1.8 Kg 2.2 lb / 1.0 Kg

QAM RF

RF Module Type	NSG-8R1G	
Connector	F-Type, 75 Ω	
Ports	2 RF ports per module	
RF Output Power per Channel N=1 N=2 N=3 N=4 N=6 N=8	Annex A 62 dBmV 59 dBmV 57.2 dBmV 56 dBmV 53 dBmV N/A	Annex A 62 dBmV 59 dBmV 57.2 dBmV 56 dBmV 54.2 dBmV 52 dBmV
RF Frequency Range (Annex B,C)	53 MHz to 999 MHz ±3 KHz, 62.5 KHz steps	
RF Frequency Range (Annex A)	54 MHz to 998 MHz ±3 KHz, 62.5 KHz steps	
QAM Constellations	Annex A,C Annex	16, 32, 64, 128, 256 B 64, 256
Bandwidth	Standard: 6 MHz or 8 MHz Non-standard: 5.65 MHz to 8 MHz	
QAM Density per Port (Annex B,C)	1-8 semi-flexibly located QAM channels	
QAM Density per Port (Annex A)	1-6 semi-flexibly located QAMchannels	
QAM Encoding	ITU-T J.83 Annex A (DVB), B, C (Japan)	
RF Output Power Adjustment Range	8 dB in 0.1 dB steps	
Output Return Loss	14 dB within any channel from 50 MHz to 1002 MHz (typical > 16 dB	