

# E6000<sup>®</sup> Converged Edge Router

Release 4.0



## PRODUCT OVERVIEW

The E6000<sup>®</sup> Converged Edge Router (CER) is a next-generation Converged Cable Access Platform (CCAP<sup>™</sup>) that provides cable operators unprecedented advances in channel density, power efficiency, and cost savings in a redundant, integrated architecture designed from the ground up for high availability. This powerful design enables operators to converge all services (video, high speed data, and voice) on a single physical connector, enabling additional savings in capital and operational expenditures along with increased operational efficiency. Operators that converge services with the E6000 CER economize rack space, power, and cooling in their facilities. The E6000 CER software benefits from over ten years of refinements in stability, hitless redundancy, and performance at high scale via its predecessor, the C4<sup>®</sup> CMTS. This software re-use also provides the E6000 CER with a proven set of features for IPv6. No other CCAP platform today enjoys a proven software code base for these critical functional areas.

Release 4.0 delivers a major set of value-added capabilities for E6000 CER customers. Software support (in DOCSIS® 3.0 mode) for the Upstream Cable Access Module 2 (UCAM-2) is provided by Rel. 4.0. The UCAM-2 hardware supports DOCSIS® 3.1 OFDMA while also providing a major increase in DOCSIS® 3.0 SC-QAM density per physical port. With Rel. 4.0 software, operators can employ 12 upstream SC-QAMs per UCAM-2 physical port (for 288 total SC-QAMs per UCAM-2 slot). In addition, Rel. 4.0 enables downstream OFDM on the Gen 1 DCAM with Annex A SC-QAMs for EuroDOCSIS™ operators. Another significant operational advantage for EuroDOCSIS operators is support for Annex A VOD with DVB Simulcrypt. For MPLS L2VPN applications, Rel. 4.0 supports Pseudo-wire Redundancy, CLI-based assignment of a modem to a VPN, and an option for a 1504-byte MTU. Many other important new features are also in Rel. 4.0.

Operators should note that beginning with Rel. 4.0, the E6000 CER no longer supports Payload Header Suppression (PHS).



## SUMMARY OF NEW & EXISTING FEATURES (PARTIAL LIST)

DOCSIS 3.1 Downstream Support (with Annex A)  
 No hardware upgrade required  
 Per F connector 96 MHz OFDM + up  
 to 36 SC-QAMs (max 32 for EuroDOCSIS)

DOCSIS 3.1 Downstream Support (with Annex B)  
 No hardware upgrade required  
 Per F connector 96 MHz OFDM + up  
 to 48 SC-QAMs (max 32 for DOCSIS)

Integrated Edge QAM (IEQ) Feature Set (Annex A):  
 Table-based VOD  
 SDV  
 DVB Simulcrypt Encryption  
 36 Annex A QAMs per connector  
 Max 32 EuroDOCSIS QAMs, max 16 TBVOD, max 8 SDV or SBVOD

Integrated Edge QAM (IEQ) Feature Set (Annex B):  
 Table-based VOD  
 SDV + Session-based VOD (ISA spec)  
 VPME Encryption  
 48 Annex B QAMs per connector  
 Max 32 DOCSIS QAMs, max 32 VOD

MPLS L2VPNs:  
 Point-to-point architecture (VPWS)  
 Remote LDP Signaling  
 PE router operation  
 16,000 VPNs per chassis  
 Pseudo-wire Redundancy  
 CLI-based Assignment of a Modem to a VPN

DOCSIS 3.1 Downstream Enhancements:  
 OFDM Block Size Flexibility (as low as 24 MHz)  
 2.5 usec Cyclic Prefix  
 LDPC Shortened Codeword

MPLS L3VPNs:  
 63 non-default VRFs  
 RIPv2 Passive Mode, static, or  
 local routing  
 Route leaking via static routes  
 Dot1q encapsulation  
 MPLS Ping and Traceroute

IPv6 Support:  
 IS-IS MT and OSPFv3  
 Prefix Delegation with Prefix Stability  
 IPv6 CM Management  
 Dual-Stack CPE  
 IPv6 Distribute Lists  
 ND and DHCPv6 Throttling  
 IPv6 TFTP Enforce  
 IPv6 Lease Query with Bulk Lease Query  
 Cable Source Verify  
 Extended ACLs

IPv6 Multi-VRF Support  
 IPv6 in up to four non-default VRFs  
 OSPFv3 or IS-IS MT

Hitless Bonded Modem Load Balancing via  
 Dynamic Bonding Change (DBC)  
 Hitless Bonded Modem Movement via DBC initiated by CLI

IS-IS Route Tags

Link-Layer Discover Protocol (LLDP) Northbound Updates

Bonding of 32 Downstream Channels

32A + 1B Mixed Annex

IPv4 /31 Subnet Support on NSI  
 IPv6 /127 Prefix Support on NSI

Lawful Intercept with Replication  
 up to 3 Mediation Devices (MDs)

Upstream Channel Bonding (up to 8 Channels)

5 to 85 MHz Upstream Support (UCAM and UCAM-2)

Managing the E6000 CER is typically done via SNMP and/or CLI. The E6000 CER has multiple options available for IPDR, a useful tool for measuring bandwidth usage. Physical maintenance of the E6000 CER is very simple. Air filters—one in the front and another in the rear of the chassis—should be inspected and/or replaced per recommendations in the E6000 CER User Documentation.

## GENERAL SPECIFICATIONS

### RF Downstream

Frequency Range (MHz)	57 to 999 (DOCSIS 3.0) 90 to 1002 (EuroDOCSIS 3.0)
Modulation (QAM)	64, 256
Data Rate (Mbps) (Max.)	30.34 to 55.62 per channel
RF Output Level (dBmV)	25 to 60
Typical Modulation Error Ratio (MER) (dB)	47
Symbol Rate (Msym/sec)	5.361 (DOCSIS); 6.952 (EuroDOCSIS)
Bandwidth (MHz)	6 (DOCSIS), 8 (EuroDOCSIS)
Output (load) impedance (ohms)	75

### Physical

Power	-48 VDC (-40 to -72 VDC)
Power Consumption (full-fill Gen 1 system)	3,800 W nominal at -48 VDC, 77°F (25°C)
Operating Temperature:	
Short Term °F (°C)	+23 to +131 (-5 to +55)
Long Term °F (°C)	+41 to +104 (+5 to +40)
Storage Temperature °F (°C)	-40 to +158 (-40 to +70)
Operating Humidity (Min.- Max.)	5 to 85% (Non condensing)
Dimensions (H x W x D) in. (cm)	28 x 17.4 x 32.5 (72.0 x 44.2 x 82.6)
Weight lbs. (kg) (full-fill system)	Approx. 235 (107)

## GENERAL SPECIFICATIONS (CONT'D)

### RF Upstream

Frequency Range (MHz)	5 to 85 MHz
Modulation	QPSK, 16 QAM, 32 QAM, 64 QAM
Channel Type	TDMA, ATDMA, TDMA/ATDMA
Data Rate (Mbps) (Max.)	30.72 per channel
RF Input Level (dBmV)	-16 to +29
Frequency Resolution (KHz)	< 1
Symbol Rate (Ksym/sec)	1280, 2560, 5120
Bandwidth per Channel (MHz)	1.6, 3.2, 6.4

### Installation Environment

Management Interfaces	10/100/1000 Mbps Ethernet (RJ-45) plus Console (serial port, RJ45)
Network-side Interfaces	10 Gigabit Ethernet (SFP+) auto-baud, eight per card
Connector Access	NSI Ethernet ports via front of chassis, management ports via rear (RSM PIC)

### Management Access

In-band Management with Access Control Lists via any NSI port
Out-of-Band Management via dedicated Ethernet port on RSM PIC
Console (serial) port on RSM PIC

## ORDERING CODES

Part Number	Description	Part Number	Description
801023	Duplex Chassis Kit - Two RSMs, No CAMs	1000445	UCAM-2 (License Bundle purchase required)
801022	Simplex Chassis Kit - One RSM, No CAMs	1000443	48 UCAM-2 DOCSIS 3.0 Upstream Licenses (for Channels 1 – 48)
801025	128 DS DCAM Kit (Active) - 1 DCAM, Active DCAM PIC, and 128 DOCSIS DS Licenses	1000458	96 UCAM-2 DOCSIS 3.0 Upstream Licenses (for Channels 1 – 96)
801021	128 DS DCAM Kit (Spare) - 1 DCAM, Spare CAM PIC, and 128 DOCSIS DS Licenses	1000456	144 UCAM-2 DOCSIS 3.0 Upstream Licenses (for Channels 1 – 144)
782208	256 DS DCAM Kit (Active) - 1 DCAM, Active DCAM PIC, and 256 DOCSIS DS Licenses	1000457	192 UCAM-2 DOCSIS 3.0 Upstream Licenses (for Channels 1 – 192)
782209	256 DS DCAM Kit (Spare) - 1 DCAM, Spare CAM PIC, and 256 DOCSIS DS Licenses	799012	Router System Module Kit - 1 RSM and RSM PIC
782210	192 DS DCAM Kit (Active) - 1 DCAM, Active DCAM PIC, and 192 EuroDOCSIS DS Licenses	796836	Router System Module
782211	192 DS DCAM Kit (Spare) - 1 DCAM, Spare DCAM PIC, and 192 EuroDOCSIS DS Licenses	796847	RPIC - Physical Interface Card for RSM
782205	192 DS DCAM Kit (Active) - 1 DCAM, Active DCAM PIC, and 192 DOCSIS DS Licenses	801146	SFP+ Optical Interface, 10GBASE-LR/LW, 1310nm
782206	192 DS DCAM Kit (Spare) - 1 DCAM, Spare DCAM PIC, and 192 DOCSIS DS Licenses	801147	SFP+ Optical Interface, 10GBASE-SR, 850nm
1000226	DOCSIS 3.1 Downstream Licenses - 1 MHz DS License Bundle.	781346	SFP+ Optical Interface, 10GBASE-ER, 1550nm
781304	Annex B 32 DOCSIS DS License Bundle	781347	SFP+ Optical Interface, 10GBASE-ZR, 1550nm
781296	Annex A 32 EuroDOCSIS DS License Bundle	801169	E6000 Software Maintenance – Phone Plus Gold
1000010	Annex B Narrowcast Video License (Single VOD/SDV License)	1000012	Annex B Narrowcast Video Replication License
804061	Annex B Narrowcast Video 8-License Bundle		Full Price List available from ARRIS

## CUSTOMER CARE

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