

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

## Release 6.0



## 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 allows 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.

Release 6.0 includes a number of significant new features that deliver financial and operational benefits to cable operators. Among these new features is support for upstream DOCSIS<sup>®</sup> 3.1 functionality (OFDMA) with the Upstream Cable Access Module 2 (UCAM-2). Also included in Rel. 6.0 are a density increase for Annex B SC-QAMs (supported on both Gen 1 DCAM and DCAM-2), an expansion of SC-QAM support and OFDM channel width for Annex A (for the Gen 1 DCAM), additional DOCSIS 3.1 subcarrier modulation support, and other new features.

Roadmap for future capabilities is subject to change.

Release 6.0 delivers cost savings and increased operational efficiencies for E6000 operators. For those deploying DOCSIS 3.1 modems, Rel. 6.0 provides field-ready OFDMA support with the UCAM-2. Annex A operators can use 144 MHz of OFDM plus as many as 36 total SC-QAMs on the Gen 1 DCAM with Rel. 6.0. In addition, Annex B support of 36 DOCSIS SC-QAMs with 12 TBVOD SC-QAMs is provided on both Gen 1 DCAM and DCAM-2 (with 192 MHz OFDM). Rel. 6.0 also extends the maximum size of a Link Aggregation Group (LAG) to 16 total interfaces and adds the capability to shut down a single subinterface without affecting others on a given physical interface.

Roadmap for future capabilities is subject to change.



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

<ul style="list-style-type: none"> <li>OFDMA Support with UCAM-2</li> <li>1 x 96 MHz with up to 12 SC-QAMs per US-SG</li> <li>US Bonding of Eight (8) Channels</li> </ul>	<ul style="list-style-type: none"> <li>96 Downstream Service Groups and 96 Upstream Service Groups per Chassis (Gen 2)</li> </ul>
<ul style="list-style-type: none"> <li>DCAM-2 Annex A: 44 SC-QAMs (max 32 EuroDOCSIS) + 192 MHz OFDM</li> <li>DCAM-2 Annex B: 48 SC-QAMs (max 32 DOCSIS) + 192 MHz OFDM</li> </ul>	<ul style="list-style-type: none"> <li>5 to 85 MHz Upstream Support (UCAM)</li> <li>5 to 204 MHz Upstream Support (UCAM-2)</li> </ul>
<ul style="list-style-type: none"> <li>Gen 1 DCAM DOCSIS 3.1 Downstream Support (with Annex A)</li> <li>No hardware upgrade required</li> <li>Per F connector 144 MHz OFDM + up to 36 SC-QAMs (max 32 for EuroDOCSIS)</li> </ul>	<ul style="list-style-type: none"> <li>Gen 1 DCAM DOCSIS 3.1 Downstream Support (with Annex B)</li> <li>No hardware upgrade required</li> <li>Per F connector 96 MHz OFDM + up to 48 SC-QAMs (max 36 for DOCSIS)</li> </ul>
<ul style="list-style-type: none"> <li>Integrated Edge QAM (IEQ) Feature Set (Annex A):</li> <li>Table-based VOD</li> <li>SDV</li> <li>DVB Simulcrypt Encryption</li> <li>36 Annex A QAMs per connector</li> <li>Max 32 EuroDOCSIS QAMs, max 16 TBVOD, max 8 SDV or SBVOD</li> </ul>	<ul style="list-style-type: none"> <li>Integrated Edge QAM (IEQ) Feature Set (Annex B):</li> <li>Table-based VOD</li> <li>SDV + Session-based VOD (ISA spec)</li> <li>VPME Encryption</li> <li>48 Annex B QAMs per connector</li> <li>Max 32 DOCSIS QAMs, max 32 VOD</li> </ul>
<ul style="list-style-type: none"> <li>MPLS L2VPNs:</li> <li>Point-to-point architecture (VPWS)</li> <li>Remote LDP Signaling</li> <li>PE router operation</li> <li>16,000 VPNs per chassis</li> <li>Pseudo-wire Redundancy</li> <li>CLI-based Assignment of a Modem to a VPN</li> </ul>	<ul style="list-style-type: none"> <li>DOCSIS 3.1 Downstream Enhancements:</li> <li>OFDM Block Size Flexibility (as low as 24 MHz)</li> <li>2.5 usec Cyclic Prefix</li> <li>LDPC Shortened Codeword</li> <li>Exclusion Band Support (DCAM and DCAM-2)</li> </ul>
<ul style="list-style-type: none"> <li>MPLS L3VPNs:</li> <li>63 non-default VRFs</li> <li>RIPv2 Passive Mode, static, or local routing</li> <li>Route leaking via static routes</li> <li>Dot1q encapsulation</li> <li>MPLS Ping and Traceroute</li> </ul>	<ul style="list-style-type: none"> <li>IPv6 Support:</li> <li>IS-IS MT and OSPFv3</li> <li>Prefix Delegation with Prefix Stability</li> <li>IPv6 CM Management</li> <li>Dual-Stack CPE</li> <li>IPv6 Distribute Lists</li> <li>ND and DHCPv6 Throttling</li> <li>IPv6 TFTP Enforce</li> <li>IPv6 Lease Query with Bulk Lease Query</li> <li>Cable Source Verify</li> <li>Extended ACLs</li> </ul>
<ul style="list-style-type: none"> <li>IPv6 Multi-VRF Support</li> <li>IPv6 in up to four non-default VRFs</li> <li>OSPFv3 or IS-IS MT</li> </ul>	<ul style="list-style-type: none"> <li>Hitless Bonded Modem Load Balancing via Dynamic Bonding Change (DBC)</li> <li>Hitless Bonded Modem Movement via DBC initiated by CLI</li> </ul>
<ul style="list-style-type: none"> <li>Bonding of 32 Downstream Channels, 8 Upstream Channels</li> </ul>	<ul style="list-style-type: none"> <li>48 DOCSIS SC-QAMs per DS Port (no IEQ, no OFDM)</li> </ul>

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) Gen 1 DCAM	57 to 999 (DOCSIS 3.0) 90 to 1002 (EuroDOCSIS 3.0)
Frequency Range (MHz) DCAM-2	108 to 1218
RF Output Level (dBmV)	25 to 60 (SC-QAMs)
Typical Modulation Error Ratio (MER) (dB)	47
Modulation (QAM)	64, 256, DOCSIS 3.1
Data Rate (Mbps) (Max.)	30.34 to 55.62 per channel (SC-QAMs)

Output (load) impedance  
(ohms) 75

### Physical

Power (Gen 1)	-48 VDC (-40 to -72 VDC)
Power (Gen 2)	-48 VDC (-44 to -72 VDC)
Power Consumption (full-fill Gen 1 system)	3,800 W nominal at -48 VDC, 77°F (25°C)
Power Consumption (full-fill Gen 2 system)	5,800 W nominal at -48 VDC, 77°F (25°C)
Operating Temperature:	
Short Term °F (°C)	+23 to +131 (-5 to +50)
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 (UCAM) 5 to 204 (UCAM-2)
SC-QAM Modulation	QPSK, 16 QAM, 32 QAM, 64 QAM
Channel Type	OFDMA (UCAM-2), TDMA, ATDMA, TDMA/ATDMA
Data Rate (Mbps) (Max.)	30.72 per channel (ATDMA)
RF Input Level (dBmV)	-16 to +29
Frequency Resolution (KHz)	< 1
Symbol Rate (Ksym/sec)	1280, 2560, 5120
Bandwidth per SC-QAM (MHz)	1.6, 3.2, 6.4

### Management and NSI Interfaces

Management Interfaces (Gen 1)	10/100/1000 Mbps Ethernet (RJ-45) plus Console (serial port, RJ45)
Management Interfaces (Gen 2)	100/1000 Mbps Ethernet (RJ-45) plus Console (serial port, RJ45)
Network-side Interfaces (Gen 1)	10 Gigabit Ethernet (SFP+) auto-baud, eight per card
Network-side Interfaces (Gen 2)	100 Gigabit Ethernet (QSFP-28), three per slot; 10 Gigabit Ethernet (SFP+), ten per slot

### Management Access

In-band Management with Access Control Lists via any NSI port
Out-of-Band Management via dedicated Ethernet port on RPIC and RPIC-2Q
Console (serial) port on RPIC and RPIC-2Q

## ORDERING CODES

Part Number	Description	Part Number	Description
1000508	Router System Module 2 (RSM-2)	1000509	Physical Interface Card for RSM-2 (RPIC-2Q)
1000536	GEN-2 Duplex Chassis Kit - Two RSM-2s, No CAMs	1000445	UCAM-2 (Must purchase PN 1000443 – 48 Upstream DOCSIS 3.0 licenses with this item)
1000537	GEN-2 Simplex Chassis Kit - One RSM-2, No CAMs	1000443	48 INITIAL US D3.0 UCAM-2 License Bundle – For Channels 1-48
1000506	DCAM-2 (Must purchase PN 1000488 – 128 DS DOCSIS 3.0 licenses with this item)	1000483	72 INITIAL US D3.0 UCAM-2 License Bundle – For Channels 1-72
1000488	128 INITIAL DS D3.0 DCAM-2 Annex A License Bundle - For Channels 1-128	1000458	96 INITIAL US D3.0 UCAM-2 License Bundle – For Channels 1-96
1000600	160 INITIAL DS D3.0 DCAM-2 Annex A License Bundle - For Channels 1-160	1000456	144 INITIAL US D3.0 UCAM-2 License Bundle – For Channels 1-144
1000489	192 INITIAL DS D3.0 DCAM-2 Annex A License Bundle - For Channels 1-192	1000457	192 INITIAL US D3.0 UCAM-2 License Bundle – For Channels 1-192
1000490	256 INITIAL DS D3.0 DCAM-2 Annex A License Bundle - For Channels 1-256	1000561	138 INITIAL US D3.0 UCAM-2 License Bundle – For Channels 1-138
1000493	128 INITIAL DS D3.0 DCAM-2 Annex B License Bundle - For Channels 1-128	1000515	24 US DOCSIS 3.0 SC-QAM License Bundle (UCAM-2 Only)
1000601	160 INITIAL DS D3.0 DCAM-2 Annex B License Bundle - For Channels 1-160	1000516	32 US DOCSIS 3.0 SC-QAM License Bundle (UCAM-2 Only)
1000494	192 INITIAL DS D3.0 DCAM-2 Annex B License Bundle - For Channels 1-192	1000444	48 US DOCSIS 3.0 SC-QAM License Bundle (UCAM-2 Only)
1000226	DOCSIS 3.1 Downstream Licenses - 1 MHz DS License Bundle.	1000325	Router System Module 2 Kit - 1 RSM-2 and RPIC-2Q
1000526	48 DS DOCSIS 3.0 SC-QAM Annex B License Bundle (DCAM-2 Only)	801169	E6000 Software Maintenance – Phone Plus Gold
1000535	48 DS DOCSIS 3.0 SC-QAM Annex A License Bundle (DCAM-2 Only)		

Full Price List available from ARRIS

## CUSTOMER CARE

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