

# AQX Series DOCSIS® 3.0

## Mobile Backhaul & Business Services



### AQX Highlights

The AQX series Rugged Cable Modem is DOCSIS® 3.0 and EuroDOCSIS™ 3.0 compliant and is weatherproof and specially designed for installations where temperatures can be extreme, uncontrolled, and typical of the outside plant in an HFC cable network. This cable modem is designed to withstand electrical over-voltages and surges commonly experienced in HFC network outside plant. It is also designed to withstand high powered LTE cells at close proximity. It eliminates LTE frequencies getting into the HFC network.



### Cable Modem Features

- Designed for DOCSIS® & EURODOCSIS™ specifications
- Network Monitoring - Embedded Spectrum Analyzer
- For D3.0, 8x4 or 16x4 bonded channels with data rates in excess of 300 or 600 and 100 Mbps for DS and US respectively
- Support for BSOD and L2VPN
- Dual PAD (US & DS) system
- Adjustable DS slope with Cable Simulator module
- Specialized Ethernet Receptacle that reduces RF interference
- Watchdog module that monitors Cable Modem health and resets unit when problem is detected. This reduces truck rolls.
- Strand, pedestal, mast, pole and wall mounting
- HFC cable powered, 40 to 100 VAC
- 10/100/1000 BASE-T auto sensing / auto-MDIX Ethernet port
- Power over Ethernet (PoE and PoE+) Gigabit interface for attached Ethernet devices with remote power recycle option
- Temperature Hardened and weather proof IP68 rated housing.
- Optional wall outlet power supply
- Optional Optical Interface with SFP

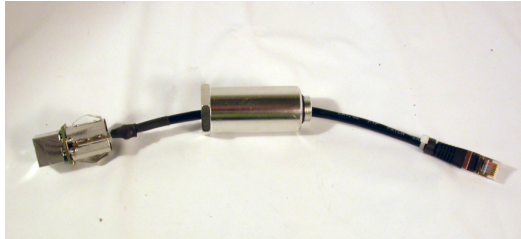
**Specifications are subject to change without prior notification.**

For more information on our products, please visit: [www.electroline.com](http://www.electroline.com) or call: 800-461-3344

## Electroline Specific and Unique Features

### 1. Superior Radio Frequency Interference (RFI) Isolation: over 130dB

- 1.1. Ethernet RFI Enhanced Port: A special patented design that filters noise coming from Small Cells and getting inside the AQ housing, and thus into the HFC network.
- 1.2. Ethernet termination: a shielded Ethernet cable is terminated inside the Ethernet receptacle and the proper grounding of the Ethernet cable shield.
- 1.3. Specific design to isolate the different sections of the outdoor housing from each other in order to reduce or eliminate the interference between each other. These sections are the Power Supply, HFC plant RF and the Ethernet.

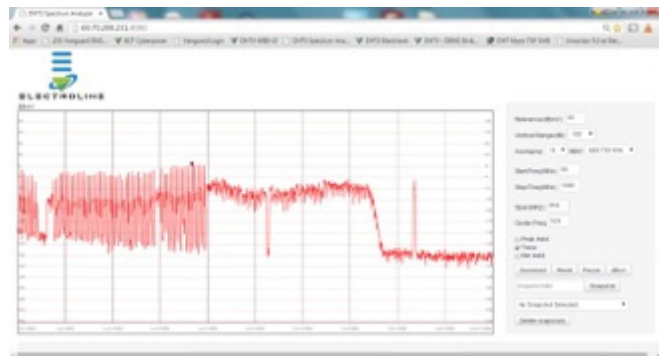
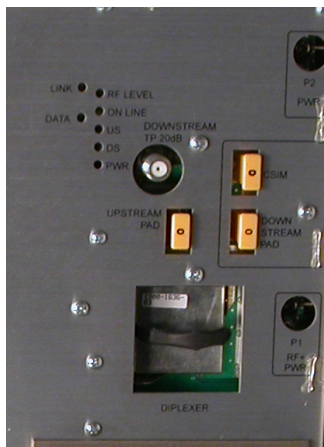


### 2. Proprietary Intelligence (PI) for our Cable Modem: Reduce truck rolls. Electroline has implemented many levels of protection to ensure that the Cable Modem remains functional in case of a failure. These PI system will reduce maintenance and truck rolls. There are 5-tiers PI:

- 2.1. A Firmware Watchdog system designed to reboot the CM engine if an internal error is detected.
- 2.2. A Hardware Watchdog system that will reset the complete CM. With the help of a special Chipset added to the CM, the Electroline PI code running in the CM will monitor the health of the CM and reset the CM if it finds any malfunctions.
- 2.3. An SNMP watchdog. The PI in the CM is set to reset the CM if there are no SNMP activity detected during a certain period of configured time.
- 2.4. An RF watchdog: The AI code in the CM will reset the CM if it becomes offline after a certain configured time.
- 2.5. An RF scanning watchdog: The PI code in the CM will reset the CM if after 5 DS scanning cycles no DOCSIS carrier is found

### 3. Ruggedized Architecture: Our ruggedized product is among the leaders in the industry

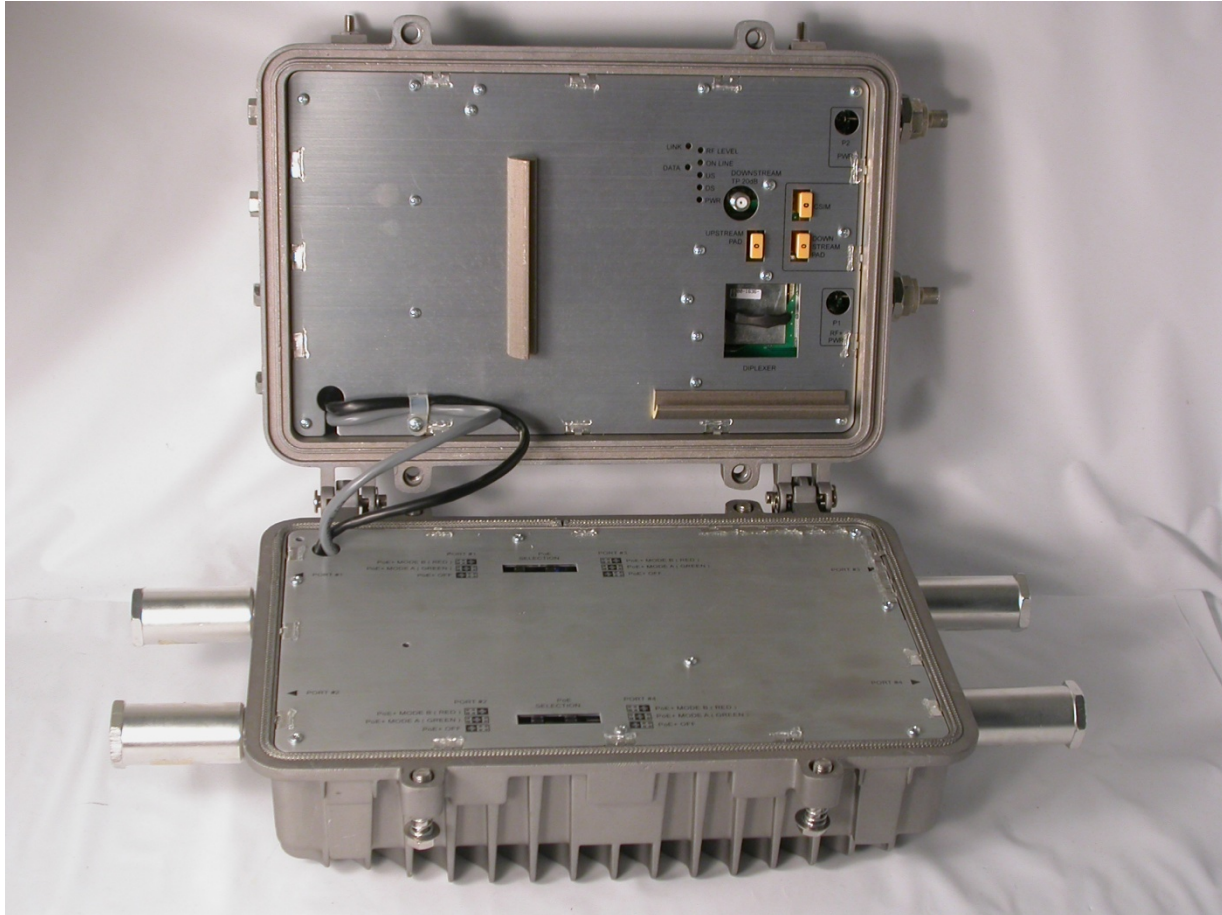
- 3.1. Industrial Components used: Most critical parts used on the CM are rated for Industrial specifications
- 3.2. Specialized RF Front End: Modularized Diplexer for future band-split changes; Separate PADs to adjust power levels (attenuation) on downstream and upstream direction; Adjustable downstream slope (Cable Simulator); Downstream Test Point (TP 20 dB).
- 3.3. Troubleshooting Tool: A special Electroline developed integrated spectrum analyzer with a precision of 1 dB at typical temperatures; temperature sensor integrated in CM to compensate the values reported by different temperature readings .
- 3.4. Individually calibrated with specific calibration points for improved accuracy .
- 3.5. Temperature hardened: Tested SCTE40 at -40 to 60 degrees Celsius.
- 3.6. Water/Dust Ingress Protection Rating: IP-68 rated.
- 3.7. MSO OPEX optimized: Through the PI implemented in the CM and its ability not only to self reset, but also remotely control the power on any attached CPE device on its PoE ports.



#### 4. Customer Service Level Agreement (SLA) requirements and Business Services support:

Business Services over DOCSIS® (BSoD) support. Capability to map different SLAs on specified Layer 2 DOCSIS® Tunnels (L2VPN) based on packet differentiating factors. These factors are:

- 4.1. VLAN Tags (IEEE802.1q)
- 4.2. IP addresses
- 4.3. IP Differentiated Services Code Points (DSCP)
- 4.4. UDP/TCP port numbers



#### 5. Modular and Scalable architecture: A customer focused product

5.1. Scalable design with options for 1-port, 2-ports and 4-ports PoE+ interfaces.

5.2. Additional features include:

- 5.2.1. Strand, wall, pedestal, pole mounting options.
- 5.2.2. 100% Electroline designed and Cablelabs® certified Cable Modem.
- 5.2.3. Power Output on Ethernet capable of doing 12VDC (non-standard), 24VDC (non-standard) and 48VDC (actual 50-57 VDC at PSE as PoE+ standard).

# Embedded DOCSIS® & EURODOCSIS™ 3.0 Cable-Modem Specifications

	DOCSIS® 3.0	EURODOCSIS™ 3.0
<b>RF DOWNSTREAM</b>		
Operating Frequency Range (center)	111 to 999 MHz	112 to 1002MHz
Frequency Range (edge-to-edge)	54 to 1002, 85 to 1002, 108 to 1002 MHz	85 to 1006, 108 to 1006MHz
Tuner	Full band capture frontend with 8 or 16 fully independent digital tuners	
Demodulation	8 (BCM3383) or 16 (BCB33843) demodulators, 64 QAM or 256 QAM	
Maximum Raw Data Rate	8 or 16 downstream channels, each 6 MHz channel: 42.88 Mbps for 256 QAM and 30.34 Mbps for 64 QAM	8 or 16 downstream channels, each 8 MHz channel: 55.62 Mbps for 256 QAM and 41.71 Mbps for 64 QAM
Bandwidth per Channel	6MHz	8MHz
Operating Level Range (at modem's input)	-15 to +15dBmV	+43 to +73 dBµV for 64 QAM +47 to +77 dBµV for 256 QAM
Input Impedance	75 ohms	
<b>RF UPSTREAM</b>		
Operating Frequency Range (edge-edge)	5 to 42 MHz, 5 to 65 MHz, or 5 to 85 MHz	5 to 65 MHz, or 5 to 85 MHz
Upstream Transmission	4 upstream channels	
Modulation	QPSK, 8 QAM, 16 QAM, 32 QAM, 64 QAM at ATDMA Mode  QPSK, 8 QAM, 16 QAM, 32 QAM, 64 QAM, 128 QAM at SCDMA mode	QPSK, 8 QAM, 16 QAM, 32 QAM, 64 QAM at ATDMA Mode  QPSK, 8 QAM, 16 QAM, 32 QAM, 64 QAM, 128 QAM at SCDMA mode
Maximum Data Rate per channel	<b>Channel Width (MHz) Raw Data Rate (Mb/s)</b>	<b>Channel Width (MHz) Raw Data Rate (Mb/s)</b>
Modulation		
QPSK	1.6    2.56	1.6    2.56
16 QAM	1.6    5.12	1.6    5.12
QPSK	3.2    5.12	3.2    5.12
16 QAM	3.2    10.24	3.2    10.24
32 QAM	3.2    12.8	3.2    12.8
8 QAM	6.4    15.4	6.4    15.4
16 QAM	6.4    20.5	6.4    20.5
32 QAM	6.4    25.6	6.4    25.6
64 QAM	6.4    30.72	6.4    30.72
<b>ELECTRICAL</b>		
Input Voltage	Cable powered 40 to 120 AC 50 / 60 Hz sin or Quasi square wave;	
Power Consumption (modem module)	<10 Watts D3.0 Cable Modem	
Surge Protection (F connector) Ring Wave Combination wave	IEEE C62.41-1991, cat A3 6KV 200A IEEE C62.41-1991, cat B3 6KV 3KA	IEC 61000-4-12, Level 4 (4KV/133A) IEC 61000-4-5, Level 4 (4KV/2KA)
Surge Protection for Ethernet Port	Combo Wave 6Kv 12 Ohms (500A)	
Data Ports	Ethernet 10/100/1000BASE-T (Auto-sensing with Auto-MDIX) RJ-45 Ethernet	
Optical (optional)	SFP cage	
RF	Female "F" type	
Power Over Ethernet (PoE+); choose from 1-port, 2-ports, and 4-ports options	For IEEE 802.3at configuration: 48Vdc at 600mA; Optional factory configurations: 24Vdc; or 12Vdc	
<b>MECHANICAL</b>		
Dimension (W x D x H)	Not including "F" connector: 12.6"x9.5"x5.5" (32cmx24cmx14cm)	
Weight	15.4 lbs (7 Kgs)	
Operating Temperature	-40° to 140°F (-40° to 60°C)	
Operating Humidity	0 to 90% RH non-condensing	
Designed to Comply with the Following Standards	DOCSIS® / EuroDOCSIS™ 3.0, 2.0, 1.1, 1.0	
Regulatory and Safety Approvals	As required per country	