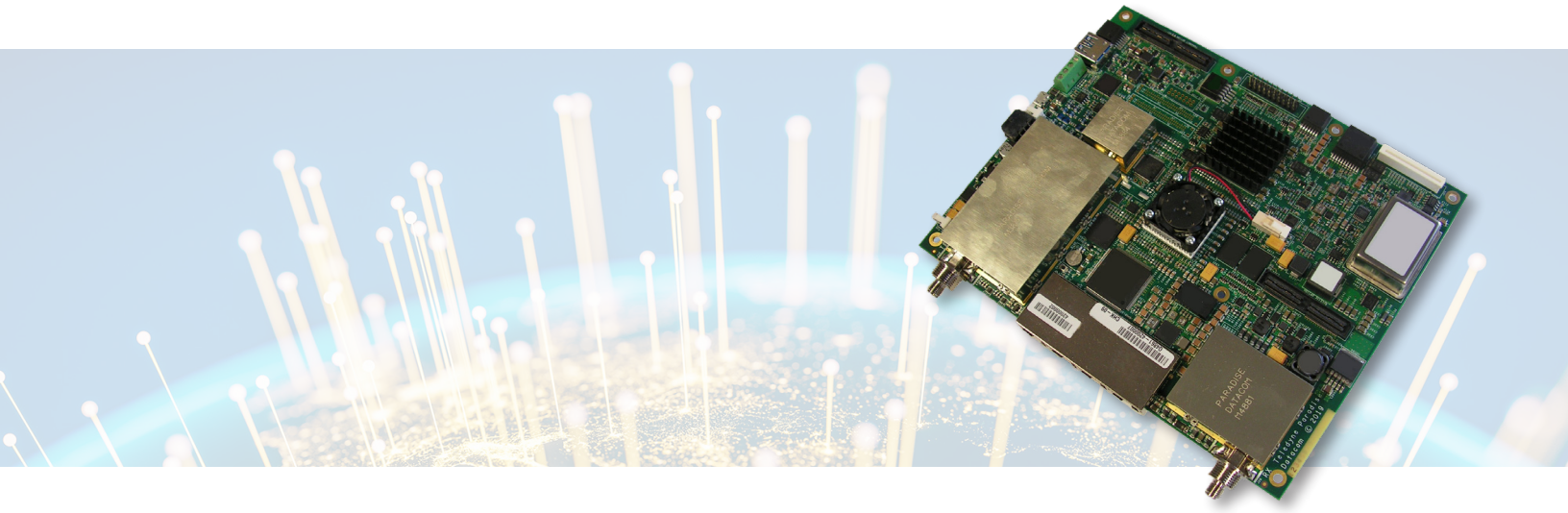
# AXIOM-X **Encryption**

## Small Form Factor Satellite Modem Card



## A Smaller, Compatible Member of the Paradise Modem Family **with AES-256 Encryption**

TELEDYNE
PARADISE DATACOM
Everywhereyoulook™

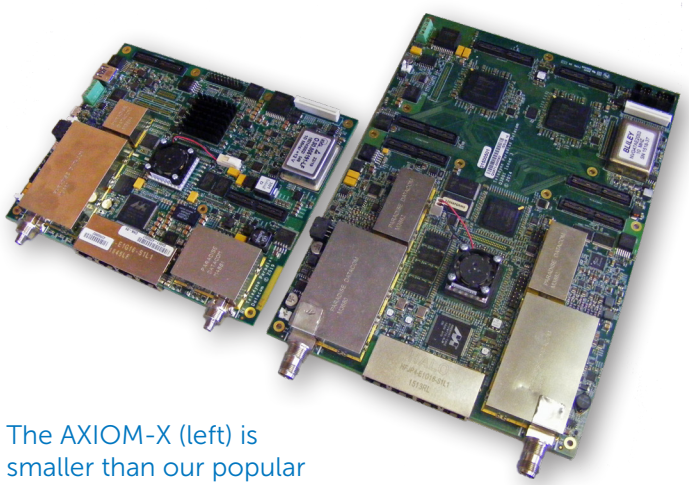
## Overview

If you have mission critical data, require continuous availability and the utmost security, then you're in our world. The AXIOM-X is our smallest, most powerful SCPC satellite modem.

Designed to be rugged and energy efficient the AXIOM-X is ideal for portable and comms-on-the move applications.

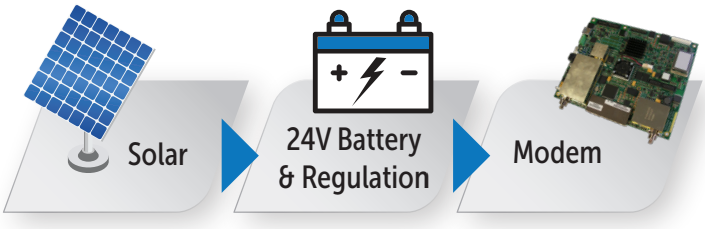
Features include:

- **Small:** 184mm (7.25") x 152 (6") x 18mm (3/4")
- **Lightweight:** 288g (0.6lb)
- **Extended temperature range:** -40 to +85°C
- **High capacity:** IP-centric, DVB-S2X, options up to 345Mb/s Tx, 230Mb/s Rx
- **Secure:** SCPC is more secure than TDMA, and provides guaranteed bandwidth for critical applications. Adding to this, the AXIOM-X Encrypted offers TCP/IP packet payload encryption using symmetric AES with 256-bit keys
- **Compatible with Q-Lite:** Mounting and RF connector centers are similar, uses the same control commands
- **Enhanced Doppler:** Superior performance for LEO and MEO communications with an allowable frequency shift of up to ±700kHz and rate of change up to ±100kHz/s



The AXIOM-X (left) is smaller than our popular Q-Lite modem (right)

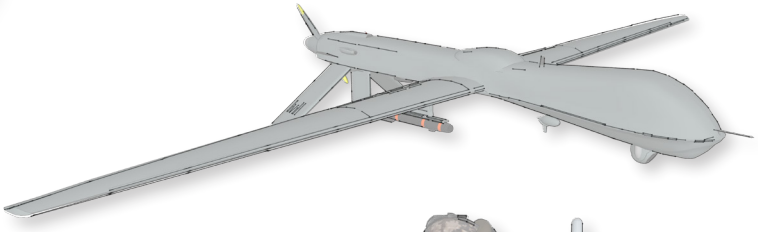
## Optimized for Low Power




AXIOM-X is ideal for low power applications like solar-powered systems.

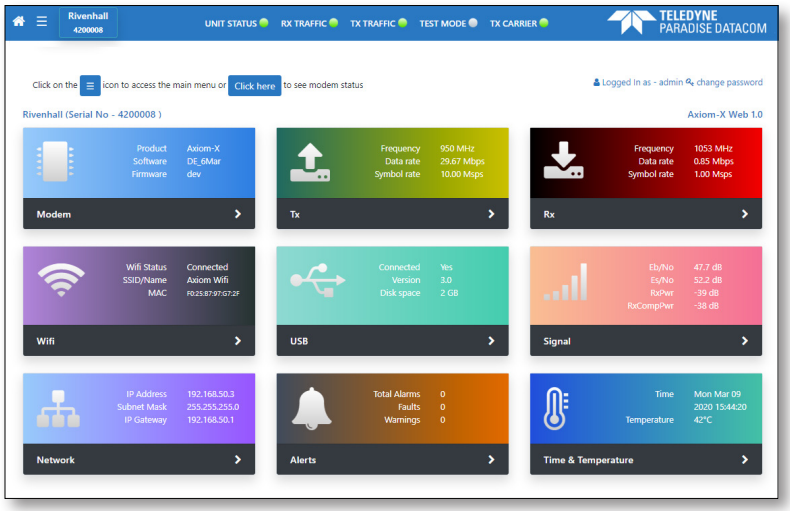
## Markets & Applications

- Comms-on-the-move including vehicles, aircraft and UAVs
- Man-packs
- Portable communication systems
- Compact, low-power VSAT terminals
- Satellite news gathering
- Disaster recovery

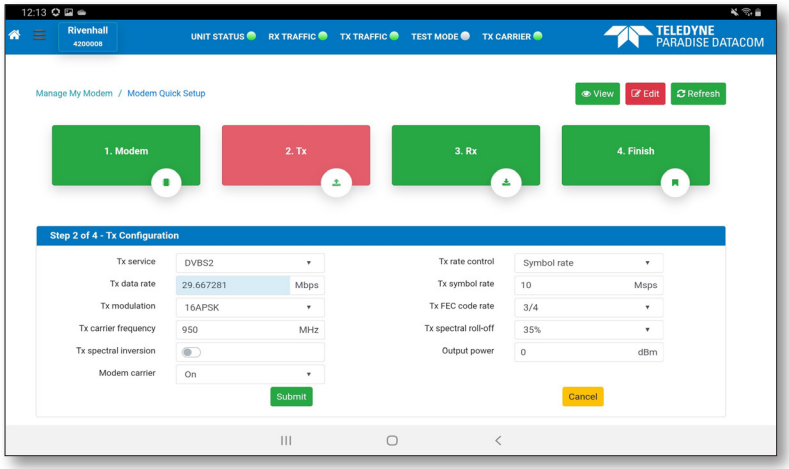


## New Web User Interface

The AXIOM-X M&C is via an intuitive Ethernet based web browser ideally suited to use on a tablet, Mobile or laptop PC and allows the user to install, configure and monitor the Modem with ease. In addition, WiFi capability provided by a Paradise supplied pluggable USB Dongle further enhances the ease of use and provides greater flexibility for remote control and installation using portable devices.



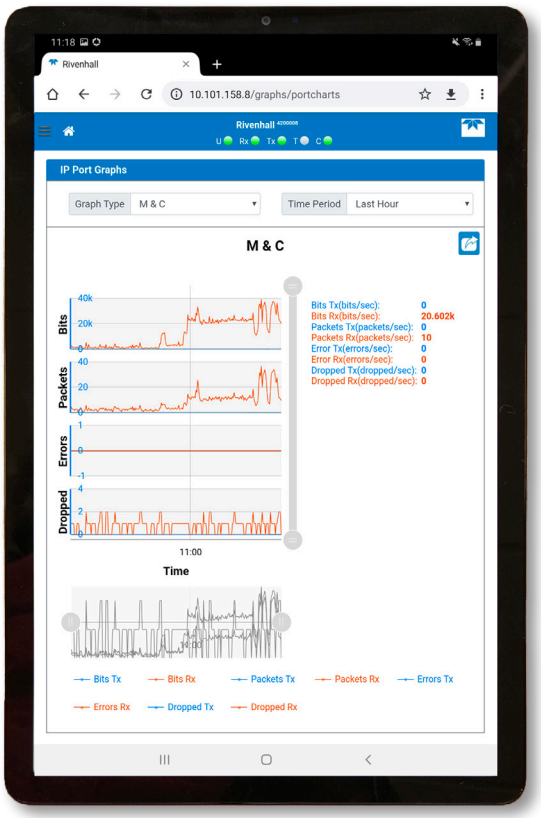

Clear, Intuitive Home views allows easy, one click navigation direct to the required fields




Easy flow configuration allowing quick set-up of key parameters (upper)

Network tree overview (lower)


Tablet view allowing easy on the move Browsing



# Built for the Most Stringent Portable Applications

## SECURE

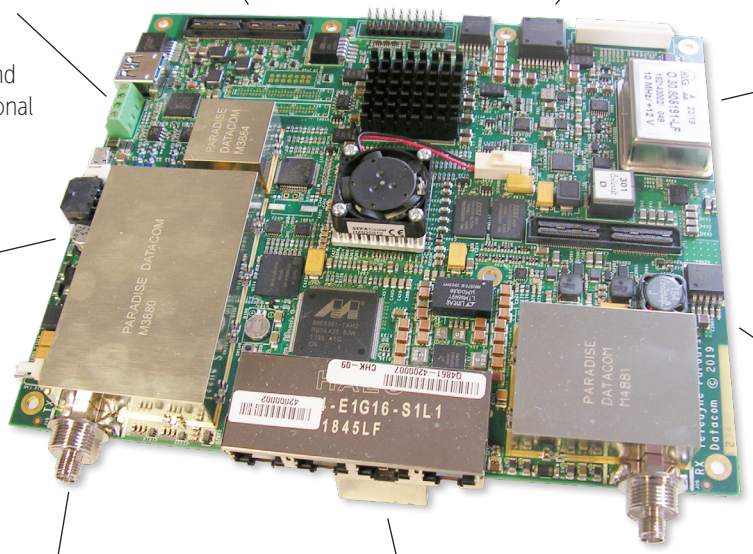
- SCPC is both secure, and with Paradise Modems, easy to provision
- For enhanced security, AES-256 encryption is built in

## COMPATIBLE

- Reuse your existing code
- No need for extensive retraining of maintenance staff
- Inclusion of SMA connectors with the same spacing as Q-Lite aids compatibility

## STATE OF THE ART

- DVB-S2X up to 256APSK provides the highest bandwidth efficiency
- Advanced compression and acceleration features optional
- Ideal for use with constellations




## RUGGED

Single card, wide operating temperature range of -40 to +85°C with typical start-up temperature of -20°C to +60°C

## CONVENIENT

Optional BUC Power Supply reduces need for external equipment

## COMPACT & EFFICIENT

Small size and weight

## WELL EQUIPPED

### Transmitter

**Fast:** Up to 345 Mbps, 100Msps
Output power 0 to -40dBm

### 4 Gigabit Ethernet Ports

**Convenient** – no need for an external switch, saving space, power, wiring; Layer 2 Bridging, Layer 3 Routing

### Receiver

**Fast:** Up to 230Mbps, 98Msps

### RF Stages

- **Future Proof:** Transmit and receive speeds upgradeable in the field – only pay for the capacity you need now
- L-band coverage from 950 to 2,150 MHz

## Main Specifications

| | |
|---|---|
| Topology | Point to Point or Star Modem within a Point to Multipoint Network |
| Standard | **DVB-S2:** (EN 302 307-1) **DVB-S2X:** (EN 302 307-2) (Supports all DVB-S2 & DVB-S2X MODCODs including Linear MODCODs) |
| Frequency | **L-band:** 950 to 2150MHz (resolution 1Hz) |
| Data Rates | **Standard:** 2,048kbps (Tx); up to 230Mbps (Rx) **Tx Options:** 5Mbps, 10Mbps, 25Mbps, 100Mbps, & 345Mbps |
| Data Rate Limits | **DVB-S2/S2X:** Up to 345Mbps Tx & 230Mbps Rx |
| Tx Symbol Rate Limits | **DVB-S2/S2X:** 90ksps to 100Msps |
| RX Symbol Rate Limits | **DVB-S2/S2X:** 90ksps to 98Msps (98Msps@QPSK, 85Msps@8PSK/8APSK, 64MSps@16APSK, 51Msps@32APSK,43Msps@64APSK, 36Msps@128APSK, 32Msps@256APSK) |
| DVB Features | ACM/VCM, DVB Encapsulation, GSE Encapsulation |

## Modulator Specifications

| | |
|---|---|
| Modulator | **DVB-S2:** QPSK, 8PSK & 16APSK **DVB-S2X:** QPSK, 8PSK, 8APSK-L 16APSK, 16APSK-L, 32APSK, 32APSK-L, 64APSK & 64APSK-L **Options for Advanced Modulation:** 128APSK, 256APSK and 256APSK-L |
| Output Power | 0 to –40dBm (950 to 2,150MHz) |
| Transmit Filter Roll-off | **DVB-S2:** 20%, 25%, 35% **DVB-S2X:** 5%, 10%, 15%, 20%, 25%, 35% |
| Harmonics & Spurious | Better than –55dBc/ 4kHz in-band (at 0dBm to –30dBm output) |
| BUC PSU SAF Option | Allows either 24V DC, or separate 48V input to be used to power a BUC via the IFL (6A Max) |
| BUC 10MHz Reference | Via IFL cable; 10MHz ± 0.01 ppm; 2dBm ± 2dBm |
| QoS | Provides guaranteed throughput for priority traffic; supports Committed and Burst Information Rates. Stream classification by VLAN ID, IP address, IEEE 802.1p priority, Diffserv DSCP, & MPLS EXP |

## Router Specifications

| | |
|---|---|
| Network Support | Layer 2 Bridging, Layer 3 Routing, Jumbo Frames to 10k bytes, 160k pps Trunking Mode: Supporting 230Mbps bi-directional traffic at up to 350k pps, each way |
| Management | HTTP/S Web Server, SNMP v1, v2c & v3, AAA RADIUS Secure User Login & Access Control Lists, SSH |
| Protocols | IPv4/IPv6, IEEE 802.1q /p VLAN support, NAT, DHCP, Network Time Protocol (NTP), Active Queue Management (AQM), MPEG over IP, OpenAMIP Protocol Support |
| Advanced IP Features | Robust Header Compression (RFC 3095), Payload Compression, Dynamic Routing (RIP V1, V2; OSPF V2, V3; BGP V4), TCP Acceleration, **AES-256 Encryption** |

## Demodulator Specifications

| | |
|---|---|
| Demodulator | **DVB-S2:** QPSK, 8PSK & 16APSK **DVB-S2X:** QPSK, 8PSK, 8APSK-L 16APSK, 16APSK-L, 32APSK, 32APSK-L, 64APSK & 64APSK-L **Options for Advanced Modulation:** 128APSK, 256APSK and 256APSK-L |
| Enhanced Doppler | **Frequency shift:** up to ±700kHz; r**ate of change** up to ±100kHz/s (symbol rate dependent) |
| Receive Filter Roll-off | **DVB-S2:** 20%, 25%, 35% **DVB-S2X:** 5%, 10%, 15%, 20%, 25%, 35% |
| Input Range | **Minimum:** -140 + 10 log (symbol rate) **Maximum:** -78 + 10 log (symbol rate) |
| LNB Voltage | Selectable 13V, 15V, 18V or 20V DC to LNB via IFL cable; maximum 0.5A |

## Interface, Mechanical and Environmental Specifications:

| | |
|---|---|
| Traffic | 4-port Gigabit Ethernet switch (RJ45 connectors; Interface used for IP traffic and M&C) |
| IF Tx and Rx | L-band: 950 to 2,150MHz (resolution 1Hz) SMA connectors |
| Power Supply | Regulated 24 Volt DC input ± 0.5V (not provided) Power consumption 30W max |
| Mechanical | Size: 184 x 152 x 18mm[1]; Weight: 288g |
| Environmental | -40°C to 85°C Operating Temperature; 95% relative humidity, non-condensing; FCC, CE and RoHS compliant; Safety: EN62368-1:2014 Edition 2; Emissions: EN55032:2015 Class B, Immunity: EN55035:2017 |

| | |
|---|---|
| Random [2] Vibration | DEF STAN 00-035 Part 3 [3] Materiel Transported by Wheeled Vehicles as Restrained Cargo, On-Road (A1), r.m.s. (g)=1.42. Materiel Transported in Fixed Wing Jet Aircraft (A5), r.m.s. (g)=1.77 (vertical axis), r.m.s. (g)=1.30 (longitudinal and lateral axes). Materiel Installed or Deployed in Wheeled Vehicles, Off-road and Degraded Roads (A17), r.m.s. (g)=2.63. RTCA DO-160G [4] Section 8 Category R Curve B1, r.m.s. (g)=2.10. |
| Operating [2] Shock | DEF STAN 00-035 Part 3 [3] Materiel Transported or Installed in Military Vehicles Whether Road, Rail or Air (A2), Half-sine, 20g, 11ms. RTCA DO-160G [4] Section 7 Category B, Sawtooth, 6g, 11ms. |

[1] 18mm tall with heatsink fan. Customers may use their own cooling, in which case height is 13mm without fan
[2] Unit under test operational during exposure
[3] DEF STAN 00-0035 Part 3 tests conducted using AXIOM-R
[4] RTCA DO-160G tests conducted using AXIOM AIR

## Comparing AXIOM-X to Q-Lite

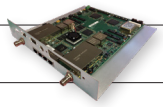
| Specification | AXIOM-X Family | Q-Lite |
|---|---|---|
| Data Rate | Tx: 345 Mbps Rx: 230 Mbps | 345 Mbps |
| Symbol Rate | Tx: 100 Msps Rx: 98 Msps [5] | 70 Msps |
| Modulation | DVB-S2X up to 256APSK | DVB-S2X up to 256APSK |
| RF Frequency Range | L: 950 to 2,150 MHz | IF: 50 to 180 MHz<br>L: 950 to 2,450 MHz |
| RF Tx Power Range | L: 0 to -40 dBm | IF: 0 to -25 dBm<br>L: +5 to -40 dBm (950 to 1,950 MHz)<br>0 to -40 dBm (1,950 to 2,150 MHz)<br>0 to -30 dBm (2,150 to 2,450 MHz) |
| RF Connector | SMA Connectors | TNC IF & L |
| PCMA Bandwidth | N/A | 72 MHz |
| Terrestrial Interface Slots | N/A | Choice of Two |
| Ethernet M&C/ Traffic Ports | 1 M&C, 3 Traffic | IP: 1 M&C, 3 Traffic |
| Size, Weight | 184 x 152 x 18mm, 0.29kg | 255mm x 184mm, 0.35kg |
| Cooling | OEM Terminal Dependent | Terminal Dependent or<br>2 Fans: 1 Side, 1 Rear Mounted |

[5] 98Msps@QPSK, 85Msps@8PSK/8APSK, 64MSps@16APSK, 51Msps@32APSK,43Msps@64APSK, 36Msps@128APSK, 32Msps@256APSK

## The Paradise Family of Secure SCPC Modems

| Paradise SCPC Modems | | | Point-to-Point | Mesh | Point-to-MultiPoint, Star, Hybrid | | Features of Note |
|---|---|---|---|---|---|---|---|
| | | | | | Hub | Remote Site | |
| Standard | 1U 19" Rack | QFlex-400 | ✓ | | | ✓ | PCMA+ enhanced carrier overlay available |
| | | QMultiFlex-400 | ✓ | ✓ | ✓ | ✓ | Optional Embedded Hub Canceller |
| | | QFlex-400 P2MP | ✓ | | | ✓ | Configured remote |
| | | QubeFlex | ✓ | | | | Small Sat/LEO - support for CCSDS |
| | | AXIOM-N | ✓ | | | ✓ | IP-centric modem |
| Small Form Factor | Rack Mount Half Width | Q-Lite Half Width | ✓ | | | ✓ | Mountable side-by-side in 1U rack space |
| | | AXIOM-C | ✓ | | | ✓ | Compact IP-centric modem |
| | Rugged | Q-Lite Rugged | ✓ | | | ✓ | IP65 weatherproof outdoor modem |
| | | AXIOM-R | ✓ | | | ✓ | IP67 IP-centric modem |
| | OEM Card | Q-Lite Card | ✓ | | | ✓ | For OEM integration |
| | | AXIOM-X | ✓ | | | ✓ | Our smallest modem |





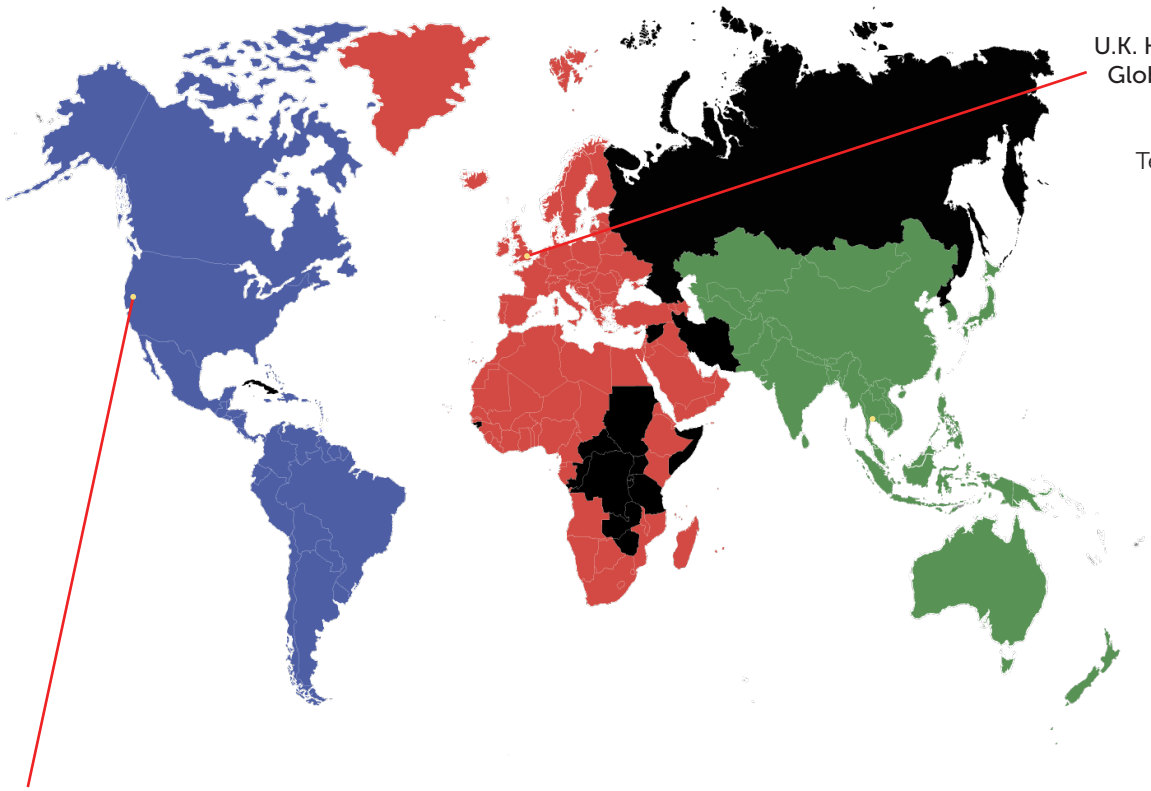
All modem models except QubeFlex are also available as **encrypted models**, capable of TCP/IP packet payload encryption using symmetric AES with 256-bit keys. Note that these models are export controlled.

## Ordering: AXIOM-X Encryption

| Standard Features | | Description |
|---|---|---|
| | ☑ | **100kbps to 2.048Mbps DVB-S2 CCM/ACM** (EN 302 307-1) **Modem**, Supporting QPSK, 8PSK & 16APSK, 20%, 25% & 35% Roll off, with **4-port Gigabit Ethernet switch for M&C and traffic**; **L-band** operation 950 to 2,150MHz; high-G 10MHz reference (with G sensitivity rating of 1 x$10^{-9}$/g)<br>**AUPC:** Automatic Uplink Power Control<br>**Traffic Shaping:** Supports CIR/BIR/priority settings for IP streams classified by IP address, Diffserv class, IEEE 802.1p priority tag, MPLS EXP field, and VLAN ID<br>**Dynamic Routing:** RIP, OSPF and BGP |
| | ☑ | **AES-256 Encryption:** TCP/IP packet payload encryption using symmetric AES with 256-bit keys |

| Optional Features | | |
|---|---|---|
| Extend Tx Data Rate | ○ | **5Mbps:** Extends base operation to 5Mbps |
| | ○ | **10Mbps:** Extends 5Mbps operation to 10Mbps |
| | ○ | **25Mbps:** Extends 10Mbps operation to 25Mbps |
| | ○ | **100Mbps:** Extends 25Mbps operation to 100Mbps |
| | ○ | **345Mbps:** Extends 100Mbps operation to 345Mbps |
| Add Advanced IP Features | ○ | **Compression:** IP/UDP/TCP/RTP packet header compression (RFC 3095) plus Ethernet header compression; TCP/UDP packet payload compression using the Deflate algorithm (RFC 1951) |
| | ○ | **Acceleration:** Up to 10,000 concurrent accelerated TCP connections to 100Mbps subject to prevailing data rate limits |
| DVB-S2X | ○ | **DVB-S2X** CCM, ACM, VCM: QPSK, 8PSK, 8APSK, 16APSK, 32APSK & 64APSK Tx/Rx operation per EN 302 307-2. Includes 5%, 10%, 15%, 20%, 25% & 35% spectral roll-offs. Includes DVB features; ACM, VCM and DVB encapsulation. To 345/230Mbps subject to prevailing modem data rate limits. |
| | ○ | **Advanced Modulation:** 128APSK, 256APSK, 256APSK-L |
| BUC | ○ | Enable **BUC** PSU software feature to provide DC via the IFL to power a BUC. 6A Max at 24V supplied via the Modem PSU or 48V can be separately connected to the IFL via the AXIOM-X |

# Global Sales Offices



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