Q-Lite™ WGS

ARSTRAT WGS Certified
Comms-On-The-Move Satellite Modem Card

A Portable Member of the Paradise Modem Family

CERTIFIED WGS CERTIFIED

TELEDYNE PARADISE DATACOM
Everywhereyoulook™

Overview

The Q-Lite WGS is a compact, single-board Satellite Modem card, which is certified for use with the high capacity Wideband Global SATCOM (WGS) system used by the United States and other allied militaries worldwide. The small form factor card is ideally focused for military and government applications providing broadcast services, data transfer, images and videos to troops in theater.

The Q-Lite WGS Modem card has been designed for simple mechanical integration into OEM products, being small in size and with very low power consumption, the Modem is suitable for integration into custom enclosures for portable communications and comms-on-the-move.

The unit is compatible with our ARSTRAT QFlex-400 WGS rack mount satellite Modem and our standard QMultiFlex-400 Hub and QFlex-400 series satellite Modems.

The Q-Lite WGS ARSTRAT certified Modem supports DVB-S2 and DVB-S2X, the most powerful and robust modulation and coding available for the space segment, supporting modulations from QPSK to 16APSK and data rates to 249Mbps. The Modem has an extended L-band frequency range, better RF performance, higher processing capability therefore allowing for future upgrades. In addition, the Modem is IP centric, supporting Ethernet / IP data in the highly efficient Trunking mode, where maximum performance is achieved in terms of bit rate and packets per second, with zero jitter.

It is ideal as a versatile point-to-point network modem or a remote modem in a point-to-multipoint network.

Monitoring and control of the modem is via Ethernet, with an option to fit a keypad and LCD display for local control. The Q-Lite WGS can also be provided in a half-width and ruggedised chassis.

Advanced Bandwidth-Efficient Features

DVB-S2X, is between 20% and 60% more band width efficient than its predecessor, DVB-S2.

Markets and Applications

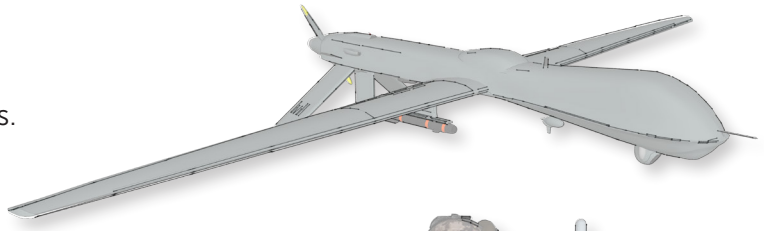
- Comms-on-the-move including vehicles, aircraft, UAVs and man-packs
- Government and Military secure networks
- Portable communication systems
- Compact, low-power VSAT terminals
- Secure commercial networks operating on the WGS Constellations
- Highly efficient IP Trunking

Features

- Small form factor (255mm x 184mm)
- Extended L-band operation to 2,450MHz
- Data rates to 249Mbps
- DVB-S2/S2X
- Optimized 20% spectral roll-off
- 24 Volt input power supply
- 25 to 33 Watt power consumption
- Satellite beacon receiver mode as standard
- Optional keypad/LCD display & fans
- Optional L-band services (10MHz output, LNB power, external BUC PSU)
- LinkGuard™ signal-under-carrier interference detection
- Built-in spectrum & constellation monitors
- Q-NET™ Navigator network control application included as standard

WGS Certification

ARSTRAT WGS certification number 20-003



Why Q-Lite WGS?

Our Flagship Software Defined Modem is Paradise Datacom's most innovative and flexible Satellite Modem to date

STATE OF THE ART

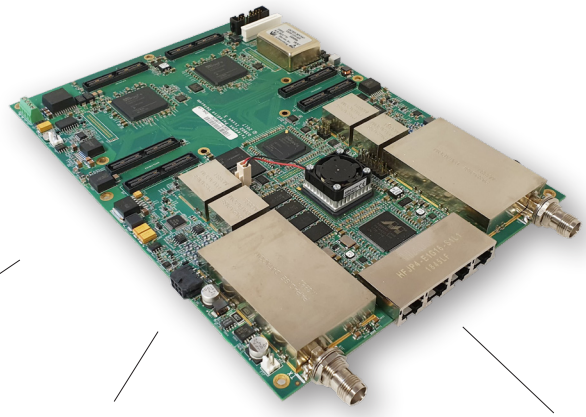
- DVB-S2X up to 16APSK provides the highest bandwidth efficiency
- Highly efficient Trunking mode, which provides the highest bit rate and packet per second performance with zero jitter

SECURE

- SCPC is both secure, and with Paradise Modems, easy to provision
- For enhanced security, AES-256 encryption is optionally built in
- AAA Radius support and access control lists.

COMPATIBLE

- Reuse your existing code
- Compatible with QFlex-400 WGS Modems.
- No need for extensive retraining of Maintenance staff
- Supports IF and L-band in one unit.



CONVENIENT

- Optional BUC power Supply reduces need for external equipment
- Built in Spectrum Analyser and Constellation monitor

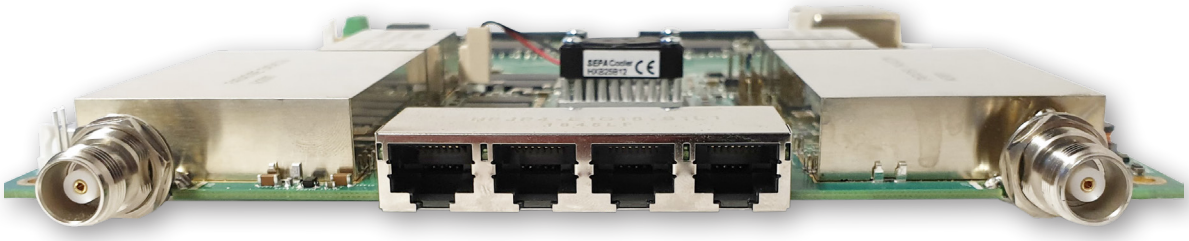
PRACTICAL

- Small size, lightweight and low power consumption
- Optional keypad/LCD & fans
- Built in test tools, no need for expensive test equipment

EFFICIENT

- DVB-S2X is the most robust and efficient Modulation and coding for the space segment
- 5% spectral roll off saving 15% bandwidth over the standard 20%
- Support for Paradise Datacom's highly efficient IP Centric, Trunking mode

WELL EQUIPPED



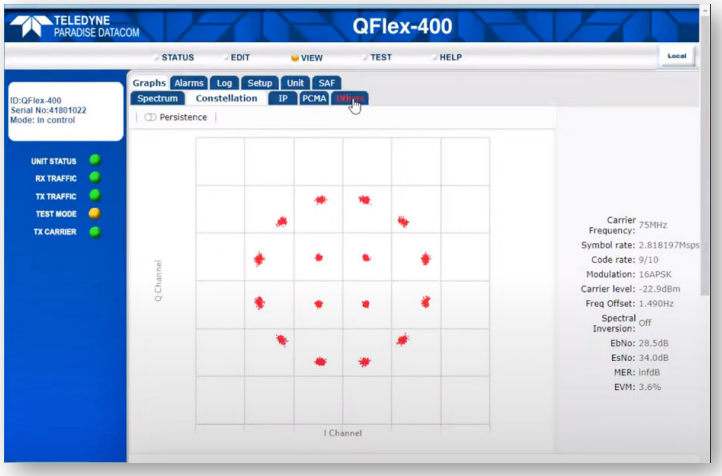
Transmitter
Fast:
- Up to 249Mbps / 69.9Msps
- Output power: IF 0 to -25dBm; Standard L-Band +5 to -40dBm

Interface Ports
Convenient:
- 4 GB Ethernet ports, Layer 2 Bridge, Layer 3 router
- Support for VLAN M&C

RF Stages
Future Proof:
- Transmit and Receive speeds field upgradeable, only pay for the capacity you need now
- Extended L-Band coverage from 950 to 2,450 MHz
- Wideband IF 50 - 180MHz

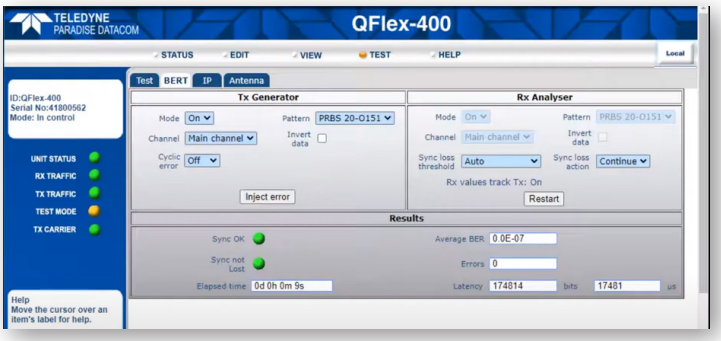
Receiver
Fast:
- Up to 249Mbps/ 69.9Msps

Powerful Onboard Test Equipment



Constellation view: The Rx Constellation Monitor can be used to check for correct modem operation including checking for signal distortion and phase noise. The persistence mode is useful for showing any long-term effects due to phase noise and interference.

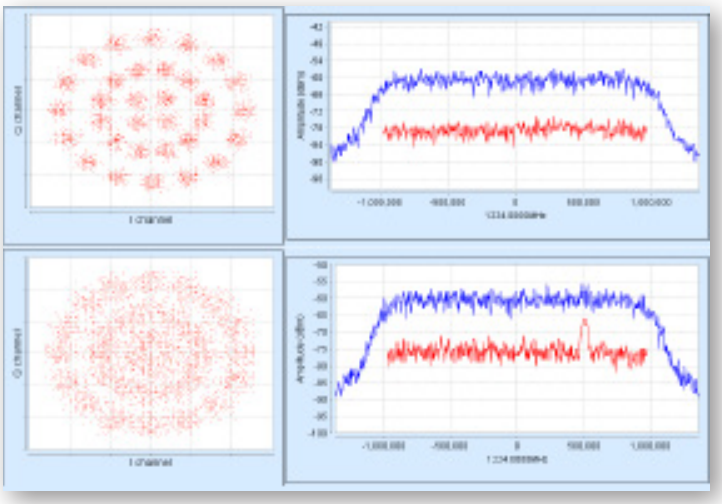
Spectral view: The Rx Spectrum Monitor is a powerful real-time spectrum analyser within the modem that is used to view the received signal spectrum. The monitor can not only display the wanted carrier but a Super Wide view allows checking for adjacent interfering carriers.



Inbuilt Bit Error Rate Test Set (BERT): The internal PRBS BER Tester allows pseudo-random bit patterns to be injected into the main traffic or overhead channel and the BER results to be monitored. Use of the ESC and AUX channels allows continuous real time traffic performance monitoring whilst the modem carries traffic. As well as average BER, number of bit errors and sync status, latency can also be measured.

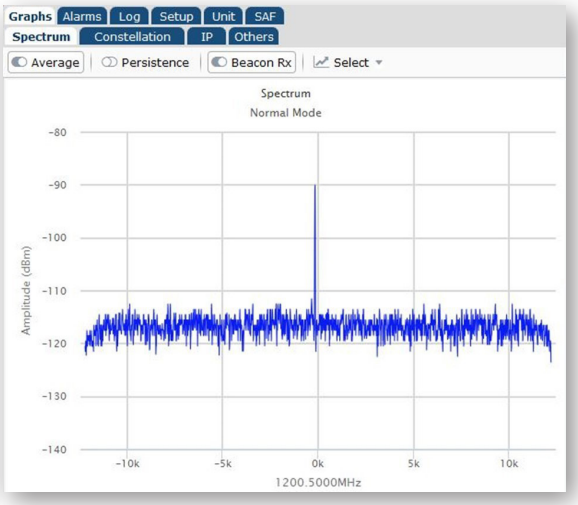
LinkGuard™ Interference Detection

Built-in Spectrum Analyser showing LinkGuard™ Signal-Under-Carrier interference detection without/with interferer present.



Beacon Receiver Function

Q-Lite™ detects satellite beacon transmissions down to very low signal levels. This helps with automatic antenna pointing and removes the need for a separate beacon receiver.

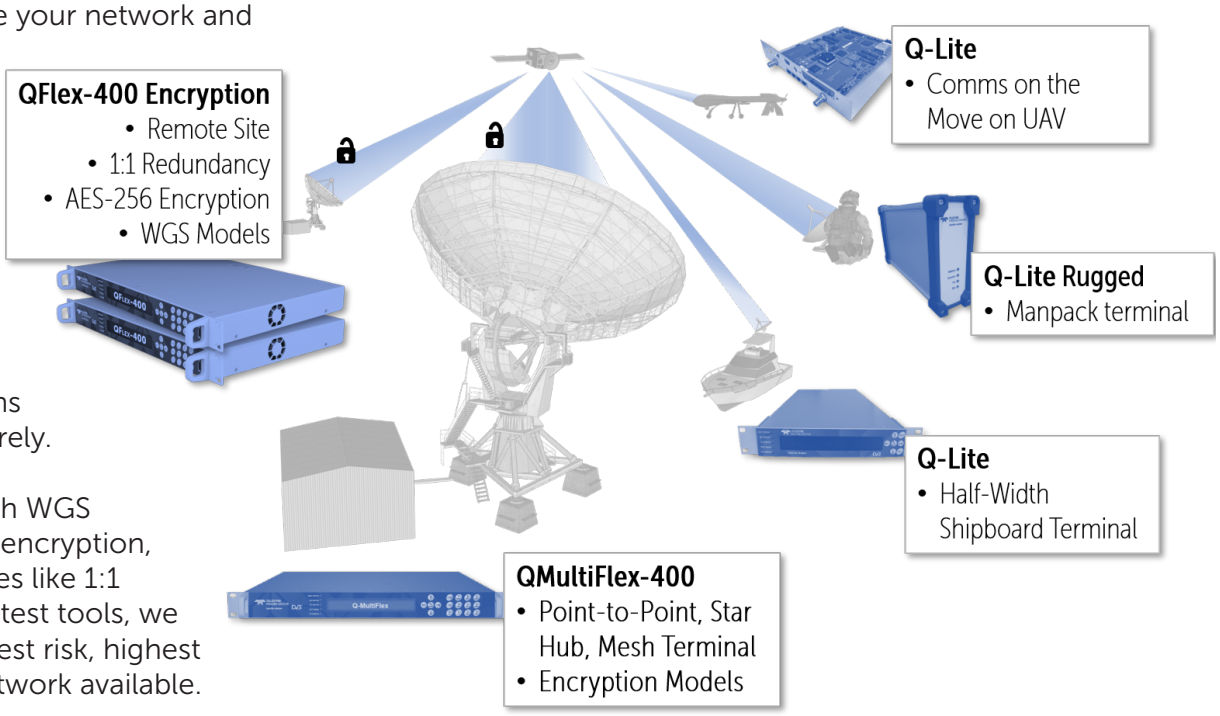


The Q-Net Family

Q-Net is a fabric that allows each of the Q-Series modems to seamlessly inter-operate giving you the ability to upgrade your network and re-use assets at will.

The different models have been thoughtfully designed to cover a wide variety of network situations flexibly and securely.

From models with WGS certification and encryption, to built-in features like 1:1 redundancy and test tools, we give you the lowest risk, highest return secure network available.



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.
The QFlex-400, Q-Lite, Q-Lite Half Width and Q-Lite Rugged models are also available as **WGS-certified** models.

Main Specifications

Topology	Point to Point or Star Modem within a Point to Multipoint Network
Frequency	**L-band:** 950 to 2,450MHz (resolution 1Hz) **IF:** 50 to 90, 100 to 180MHz (resolution 1Hz) TNC connectors for Tx & Rx
Data Rates	**Standard:** 2,048kbps **Options:** 5, 10, 25, 60, 100, 200 & 249Mbps
Data Rate Limits	**DVB-S2/S2X:** 68kbps to 249Mbps
Symbol Rate Limits	**DVB-S2/S2X:** 150ksps to 69.9Msps
Operating Modes	**DVB-S2/S2X** (EN 302 307-1 & EN 302 307-2)
Impedance	50Ω
Return Loss	Typically >18dB for **IF** and >16dB for **L-band** to 2GHz, >12dB above 2GHz.
Redundancy	1:1 through 1:16 redundancy (requires Utilities Card)

Modulator

Output Power (0.1dB steps)	**IF:** 0 to –25dBm **L-Band:** • +5 to -40dBm (950 to 1,950MHz) • 0 to –40dBm (1,950 to 2,150MHz) • 0 to –30dBm (2,150 to 2,450MHz)
Output Power Stability/ Accuracy	Stability: ±1.0dB, 0°C to 50°C Accuracy: ±0.375dBm
Transmit Filter Roll-off	20% (other spectral roll off's are available including 5% roll off, which is 15% more bandwidth efficient than 20% roll off. (Not WGS certified))
Phase Accuracy	±2° maximum
Amplitude Accuracy	±0.2dB maximum
Carrier Suppression	-30dBc minimum
Output Phase Noise	As EN 302 307, EN 300 421
Harmonics & Spurious	Better than –55dBc/ 4kHz in-band (at 0dBm to –30dBm output)
Transmit On/ Off Ratio	-65dB minimum
BUC PSU Option	24V or 48V DC via IFL cable, 200W
BUC 10MHz Reference	Via IFL cable; 10MHz ± 0.01 ppm; 2dBm ± 2dBm
FSK Control	Allows monitor & control of a compatible L-band BUC from the modem via the Tx IFL cable (requires Utilities Card)

Mechanical/Environmental

Size	255mm x 184mm
Weight	493g
Power Supply, Tolerance	24 V DC input (not provided) Consumes 25 to 33W 24 V +/- 5% max. Paradise Recommends: +/- 0.5V
Compliance	FCC, CE and RoHS compliant
Safety Standards	EN 62368-1:2014
Emissions & Immunity	Emissions: EN 55032:2015 class A Immunity: EN 55032:2017
Operating Temperature	Component temperature: -40°C to +85°C Typical start-up temperature: -20°C to +60°C (Applies to Q-Lite and mezzanine cards. The front panel and all interface cards are rated 0 to +50°C.)
Storage Temperature	-40°C to +85°C (limits must not be exceeded) (Applies to Q-Lite and mezzanine cards. The front panel and all interface cards storage -20°C to +70°C)
Humidity	95% relative humidity, non-condensing
Shock & Vibration	Certification to relevant part of MIL-810G currently in progress
Design & Production Facility Certification	Both the design and production facilities are ISO9001 certified; the production facility is additionally AS9100 certified (giving parts traceability)

Option Card Weights

All weights include the necessary fixing kits.

P3732 Antenna pointing card	add 21g
P3719 Utilities card	add 114g

Demodulator

Input Range (dBm)	**IF minimum:** -130 + 10 log (symbol rate) **L-band minimum:** -140 + 10 log (symbol rate) **IF/L-band maximum:** -68 + 10 log (symbol rate)
Maximum Input Power	**L-band:** +10dBm **IF:** 0dBm
Wanted-to-Composite	-102 + 10 log (symbol rate)
Frequency Sweep Width	±1kHz to ±255kHz (1kHz steps)
Acquisition Time	Dependent on FEC, data rate and sweep width
Receive Spectral Roll-off	20% (other spectral roll off's are available including 5% roll off, which is 15% more bandwidth efficient than 20% roll off. (Not WGS certified))
LNB 10MHz Reference	Via IFL cable; 10MHz ± 0.01ppm; 2dBm ± 2dB
Antenna Pointing Output	Scalable 0 to 10V DC output signal of the wanted Rx power level, composite Rx signal level, demodulator AGC level or Eb/No level for antenna peaking/pointing (requires Utilities Card or Antenna Pointing Card)
LNB Voltage	Programmable 13V, 15V, 18V, 20V or 24V DC to LNB via IFL cable; maximum 0.5A

Features

DVB-S2/S2X Rx Adaptive Equaliser	Corrects for slope on the carrier and group delay (typically found at transponder edges, causing inter-symbol interference). The 9-tap Rx equaliser is provided as standard; automatically switched on above 10Msps
Traffic Interfaces	**Standard:** **4-port Gigabit Ethernet switch** (RJ45 connectors; used for IP traffic and M&C)

Test Facilities & Alarm Outputs

Built-in Test Tools	As part of built-in web server: Rx constellation monitor; Rx spectrum analyser; **LinkGuard™** Signal-Under-Carrier interference detection; beacon receiver function that provides automatic detection of satellite beacon transmissions; time graphs for key performance indicators (IP throughput, Eb/No, etc.)
Other Test Modes	Transmit CW Transmit alternate 1-0 pattern
Alarm Relays	4 independent Form C relays for unit, Tx, Rx and deferred alarms (requires Utilities Card)

Ethernet: Standard Features

Trunking Mode	Hardware Layer 2 switch supporting 249Mbps bi-directional traffic at up to 200,000 packets per second; zero jitter
IPv4/IPv6	Dual IPv4/IPv6 TCP/IP supporting IPv4/IPv6 bridging and routing
VLAN Support	Passes VLAN tagged traffic transparently in Trunking mode
DHCP	DHCP client for automatic allocation of M&C IP address.
SNMP	SNMP v1, v2c & v3
Access Control Lists	Separate IP and MAC address black/ white user access control lists
Network Time Protocol (NTP)	NTP client synchronises modem time & date to NTP server; provides millisecond accuracy
Web Server	Modem web server M&C interface (including built-in tools listed under Test Facilities)
AAA RADIUS Secure User Login	Authentication, Authorisation & Accounting. Greater access control & accountability. Replaces standard modem login with user's personal network login credentials
IP Metrics	Tx, Rx throughput (bps, pps) graphs; dropped, errored packet counts
OpenAMIP Protocol Support	Controls modem interaction with compliant antenna control units to support antenna deployment/pointing/tracking
Ethernet MTU Size	10k bytes

Included Network Management

Web browser user interface support is provided as standard. SNMP and command line interfaces support the development of third-party user interfaces. In addition, the following network control application options are available

Q-NET™ Navigator	A simple interface to allow all Q-series modems in a network to be monitored and controlled from a single desktop application. Provided as standard, free of charge.

Utilities Card

Option	Add-on card size: 168mm x 104mm • 9-way D type for 1:1 and 1:N redundancy (compatible with Q-NET PDQS Redundancy Switch) • 15-way D type for alarms (4 independent Form C relays for unit, Tx, Rx and deferred alarms), Tx Inhibit signal and scalable DC voltage output for antenna pointing USB connector for software upgrades, etc. • Second fan for environments where extra cooling is required • FSK signalling

Optional Functionality

WGS Supported Modulation and Code Rates

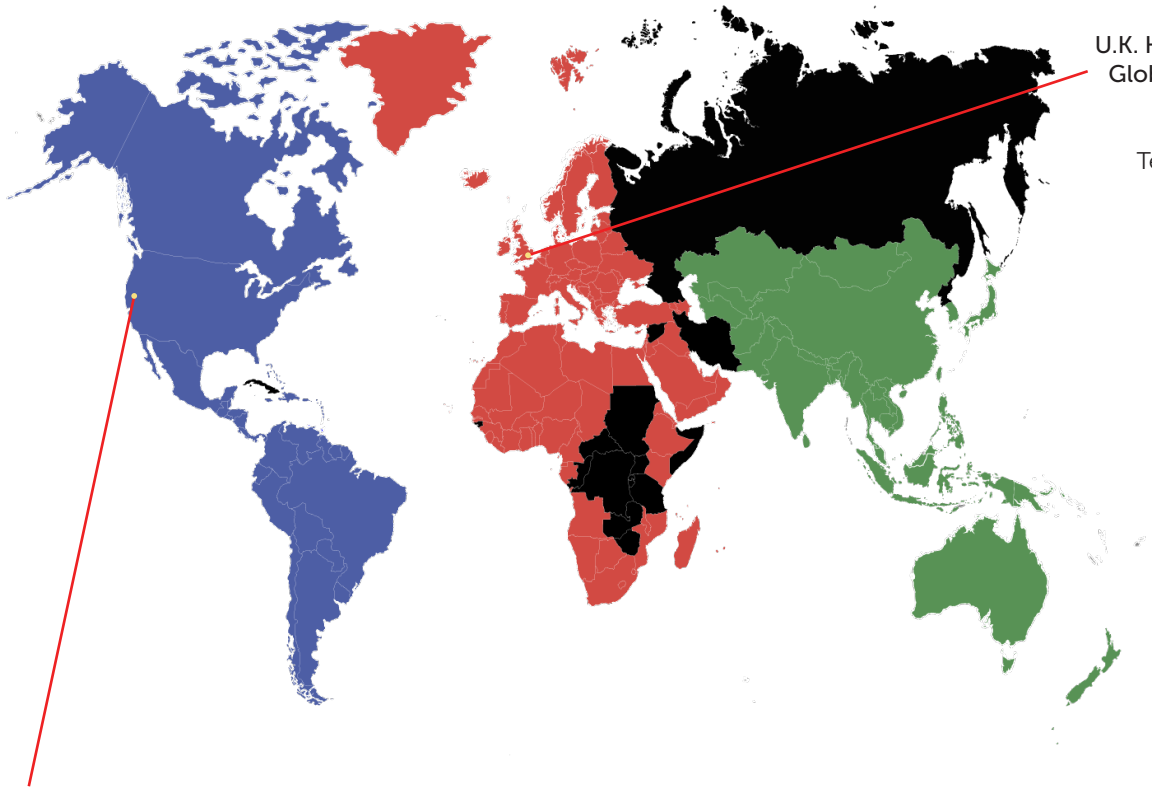
Waveform	Minimum Data Rate (kbps)	Maximum Data Rate (kbps)	Minimum Symbol Rate (ksps)	Maximum Symbol Rate (ksps)
QPSK DVB-S2 1/4 NF	73.536	34,268.00	150	69,900
QPSK DVB-S2 1/3 NF	98.467	45,885.73	150	69,900
QPSK DVB-S2 2/3 NF	198.338	92,425.49	150	69,900
QPSK DVB-S2 5/6 NF	248.199	115,660.94	150	69,900
QPSK DVB-S2 8/9 NF	264.968	123,474.94	150	69,900
QPSK DVB-S2 9/10 NF	268.292	125,023.97	150	69,900
QPSK DVB-S2X 13/45 NF	85.171	39,689.60	150	69,900
QPSK DVB-S2X 11/20 NF	163.287	76,091.82	150	69,900
QPSK DVB-S2 2/5 SF	114.139	53,188.86	150	69,900
QPSK DVB-S2 1/2 SF	127.326	59,333.92	150	69,900
QPSK DVB-S2 3/4 SF	213.040	99,276.78	150	69,900
QPSK DVB-S2X 11/45 SF	67.985	31,681.17	150	69,900
QPSK DVB-S2X 14/45 SF	87.766	40,898.76	150	69,900
QPSK DVB-S2X 7/15 SF	133.919	62,406.45	150	69,900
QPSK DVB-S2X 32/45 SF	206.447	96,204.25	150	69,900
8PSK DVB-S2 2/3 NF	297.095	138,446.47	150	69,900
8PSK DVB-S2 3/4 NF	334.219	155,745.84	150	69,900
8PSK DVB-S2 9/10 NF	401.881	187,276.57	150	69,900
8PSK DVB-S2X 23/36 NF	284.426	132,542.52	150	69,900
8PSK DVB-S2X 13/18 NF	321.770	149,945.01	150	69,900
8PSK DVB-S2 3/5 SF	258.798	120,599.78	150	69,900
8PSK DVB-S2 8/9 SF	386.667	180,186.67	150	69,900
8PSK DVB-S2X 7/15 SF	199.781	93,098.14	150	69,900
8PSK DVB-S2X 26/45 SF	248.962	116,016.18	150	69,900
8PSK DVB-S2X 32/45 SF	307.978	143,517.81	150	69,900
16APSK DVB-S2 2/3 NF	395.580	184,340.33	150	69,900
16APSK DVB-S2 5/6 NF	495.028	230,682.87	150	69,900
16APSK DVB-S2 8/9 NF	528.471	246,267.70	150	69,900
16APSK DVB-S2 9/10 NF	535.101	249,357.20	150	69,900
16APSK DVB-S2X 26/45 NF	342.247	159,487.00	150	69,900
16APSK DVB-S2X 3/5 NF	355.506	165,666.00	150	69,900
16APSK DVB-S2X 23/36 NF	378.711	176,479.26	150	69,900
16APSK DVB-S2X 25/36 NF	411.860	191,926.78	150	69,900
16APSK DVB-S2X 7/9 NF	461.584	215,098.05	150	69,900
16APSK DVB-S2X 77/90 NF	507.993	236,724.57	150	69,900
16APSK DVB-S2 3/4 SF	421.449	196,395.36	150	69,900
16APSK DVB-S2X 7/15 SF	264.928	123,456.23	150	69,900
16APSK DVB-S2X 8/15 SF	304.058	141,691.01	150	69,900
16APSK DVB-S2X 3/5 SF	343.188	159,925.80	150	69,900
16APSK DVB-S2X 32/45 SF	408.406	190,317.10	150	69,900

Ordering: Q-Lite™

Standard Features		Description
Base Modem	☑	74kbps to 2.048Mbps Tx/Rx DVB modem with 4-port Gigabit Ethernet switch for M&C and traffic. Front-panel keypad and display . IF operation 50 to 180MHz. L-band operation 950 to 2450MHz; high-stability 10MHz reference All features described under Ethernet Standard Features. All features described under Test Facilities AUPC: Automatic Uplink Power Control When connected to the output of an external BUC PSU (not provided), the Q-Lite™ can provide up to 200W to the BUC at 24V or 48V, as determined by the BUC PSU **DVB-S2/S2X CCM Tx:** DVB-S2 QPSK, 8PSK & 16APSK Tx operation per EN 302 307-1. DVB-S2X QPSK, 8PSK, 8APSK, 16APSK, Tx operation per EN 302 307-2. Includes 20% spectral roll-off. **DVB-S2/S2X CCM Rx:** Add-on card supporting DVB-S2 QPSK, 8PSK & 16APSK Rx operation per EN 302 307-1. DVBS2X QPSK, 8PSK, 8APSK, 16APSK Rx operation per EN 302 307-2. Includes 20% spectral roll-off

Optional Features		
Tx Only	○	Transmit functions only
Rx Only	○	Receive functions only
Extend Tx Data Rate	○	**5Mbps data rate:** Extends base operation to 5Mbps
	○	**10Mbps data rate:** Extends 5Mbps operation to 10Mbps
	○	**25Mbps data rate:** Extends 10Mbps operation to 25Mbps
	○	**60Mbps data rate:** Extends 25Mbps operation to 60Mbps
	○	**100Mbps data rate:** Extends 60Mbps operation to 100Mbps
	○	**200Mbps data rate:** Extends 100Mbps operation to 200Mbps
	○	**249Mbps data rate:** Extends 200Mbps operation to 249Mbps
Utilities Card	○	**Add-on card** size: 168mm x 104mm • 9-way D type for 1:1 and 1:N redundancy (compatible with Q-NET PDQS Redundancy Switch) • 15-way D type for alarms (4 independent Form C relays for unit, Tx, Rx and deferred alarms), Tx Inhibit signal and scalable DC voltage output for antenna pointing • USB connector for software upgrades, etc. • Second fan for environments where extra cooling is required • FSK signalling
Antenna Pointing Card	○	Smaller, lighter, lower power alternative to Utilities Card that provides **AGC output for antenna pointing** (along with Tx Inhibit and Rx Lock status) and serial RS232/RS485 M&C bus (alternative to Ethernet control). Scalable 0 to 10V DC output signal represents any of the following: • Receive power level • Receive composite signal level • Demodulator AGC level • Eb/No
Keypad/LCD Display	○	Paradise **standard front-panel membrane** (local user interface) consisting of: LEDs that provide basic modem status; 3-line LCD display; keypad. The Q-Lite™ software will automatically detect & support the membrane when it is fitted
Fan	○	Paradise **standard modem fan**: 20mm; 12V; 2.5W; 12.0 CFM; 65,000 hour lifetime; connects to Q-Lite™ card; a second fan requires the Utilities card to be fitted

Global Sales Offices



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