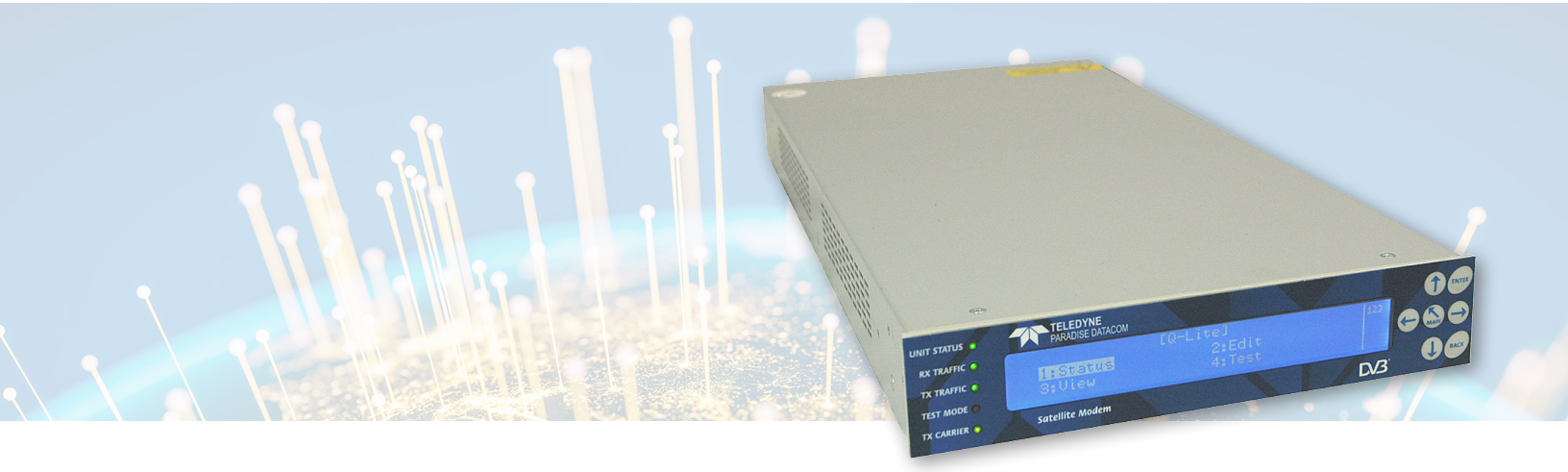
Q-Lite™ Half-Width

Satellite Modem



Full-featured modem in one-half 1U rack space

TELEDYNE
PARADISE DATACOM
Everywhereyoulook™

Overview

The **Q-Lite™** is a compact, single-board satellite modem suitable for integration into custom enclosures for portable communications and comms-on-the-move.

The Q-Lite™ half-width compact satellite modem is provided in 9.5-inch & 10.5-inch chassis. Two 9.5-inch chassis can be fitted side-by-side in a standard 19-inch rack, saving on air-conditioned hub space. Its small size and low power consumption also make it ideal for portable communications and comms-on-the-move.

The Q-Lite Half-Width modem supports Paradise Datacom's low latency Fastlink LDPC for latency sensitive applications and DVB-S2 / DVB-S2X, the most powerful and robust modulation and coding available for the space segment, supporting modulations from QPSK to 64APSK and data rates to 345Mbps. The Modem has an extended L-band frequency range, better RF performance, higher processing capability therefore allowing for future upgrades. Multiple serial interfaces are available or the unit may be used for L2 Bridging or L3 routing of IP traffic. In addition, the unit may be used 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.

Remote monitoring and control of the modem is via Ethernet.

Advanced Bandwidth-Efficient Features

Paired Carrier+™ is our enhanced carrier overlap technology that allows transmit and receive carriers to occupy the same space segment.

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

Bandwidth-saving IP features include ACM, acceleration and header and payload compression.

Markets and Applications

- Comms-on-the-move including vehicles, aircraft and UAVs
- Oil & gas
- Broadcast
- Disaster relief
- Maritime
- Satellite news gathering
- Compact, low-power satellite terminals

Features

- Data rates to 345Mbps
- Extended L-band operation to 2,450MHz
- Paired Carrier+™ enhanced carrier overlay
- **XStream IP™** advanced IP optimization suite including TCP Acceleration, header & payload compression, traffic shaping & ACM
- Optimized spectral roll-offs, including 5%
- DVB-S2/S2X, **FastLink™** LDPC & TPC
- 9.5-inch & 10.5-inch chassis options (convertible using just different L-brackets)
- Software Defined Network support: vendor-independent network device control using standard control (supports OpenFlow)
- 25 to 33 Watt power consumption
- AC & 48V DC input power supply options
- **LinkGuard™** signal-under-carrier interference detection
- Built-in spectrum & constellation monitors
- DVB Carrier ID. Fully compliant with DVB- CID standard
- **Q-NET™ Navigator** network control application included as standard
- Available in WGS-certified model

Why Q-Lite?

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 64APSK provides the highest bandwidth efficiency
- FastLink Low latency LDPC provides advanced optimisation modes for latency sensitive applications.

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
- Functional replacement for Q-Flex and older series Modems.
- No need for extensive retraining of Maintenance staff.
- Supports legacy interfaces and FEC schemes
- 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

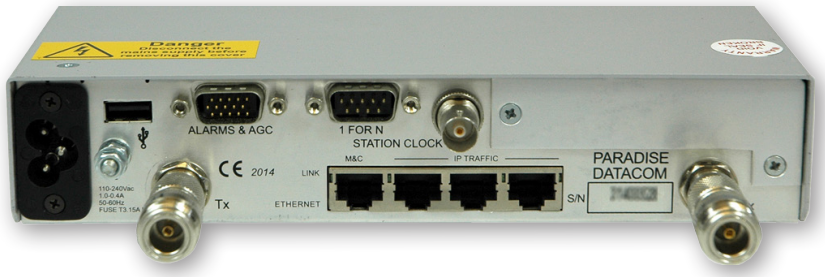
PRACTICAL

- 1U, half-width rack mount chassis
- Simple front panel control with back-lit LCD
- Intuitive web browser and Q-NET compatible
- Built in test tools, no need for expensive test equipment

EFFICIENT

- Paired Carrier+ saving up to 50% Bandwidth
- 5% spectral roll off saving 15% bandwidth over the standard 20%
- Advanced optimisation features, including TCP acceleration, Header and Payload compression.

WELL EQUIPPED



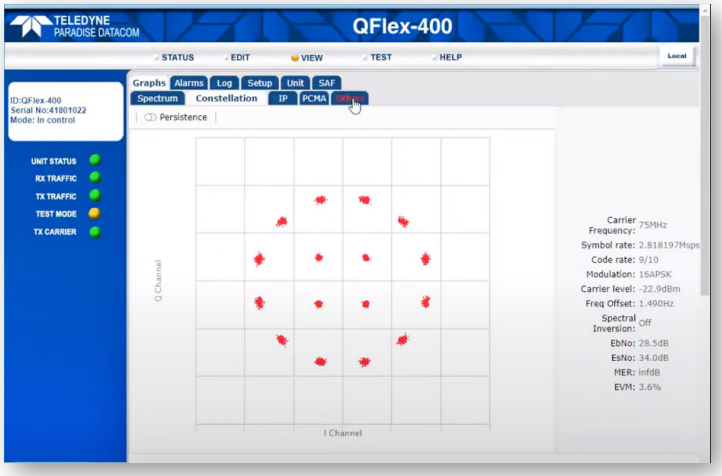
Transmitter
Fast:
- Up to 345Mbps / 70Msps
- Output power: IF 0 to -25dBm; Standard L-Band +5 to -40dBm

Interface Ports
Convenient:
- For IP traffic and legacy interfaces
- Allowing seamless migration from serial to IP
- 4 GB Ethernet ports, Layer 2 Bridge, Layer 3 router.

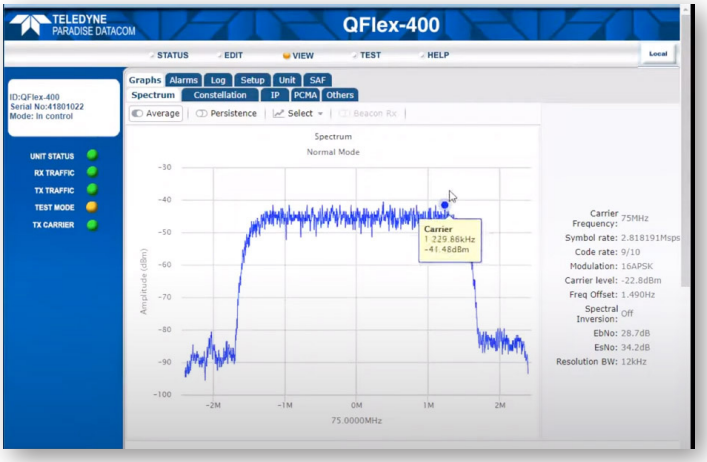
RF Stages
Future Proof:
- Transmit and Receive speeds field upgradeable, only pay for the capacity you need now
- Extended L-Band coverage from 950 to 2,450 MHz
- Wideband IF 50 - 180MHz

Receiver
Fast:
- Up to 345Mbps/ 70Msps

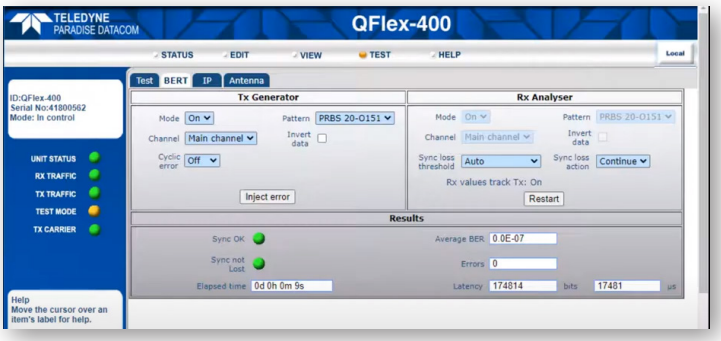
Powerful Onboard Test Equipment



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.



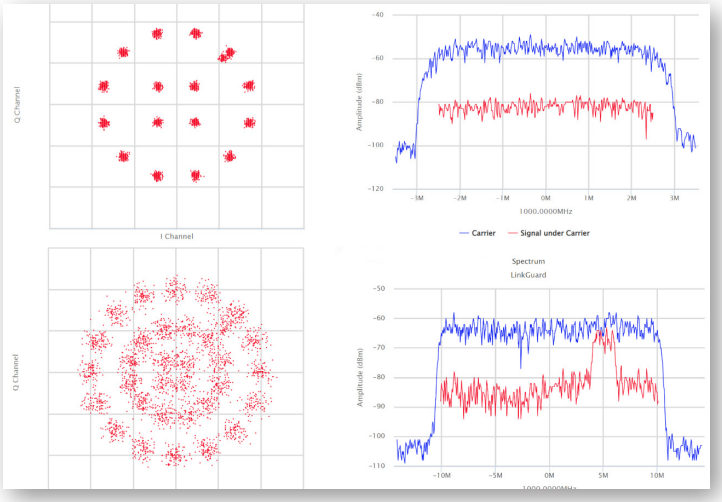
Spectral view: The Rx Spectrum Monitor is a powerful real-time spectrum analyser within the modem that is used to view the received signal spectrum. The monitor can not only display the wanted carrier but a Super Wide view allows checking for adjacent interfering carriers.



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.

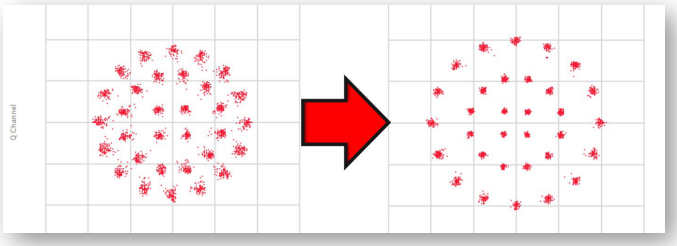
LinkGuard™ Interference Detection

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



ClearLinQ™

'Before and after' constellations showing ClearLinQ™ Adaptive Tx Pre-distorter compensating for severe non-linear signal distortion to a 32APSK carrier.



Advanced Bandwidth-Efficient Features

The Q-Lite™ modem supports the most powerful bandwidth-saving technology available.

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

Paired Carrier+™ is our enhanced carrier overlap technology that allows transmit and receive carriers to occupy the same space segment.

XStream IP™ bandwidth-saving IP features include ACM, TCP acceleration and header and payload compression.

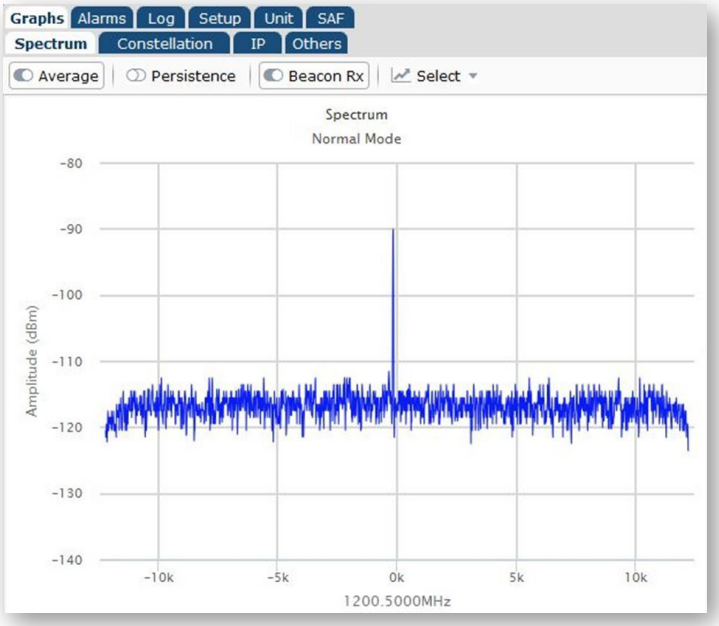
Included Network Management

Q-NET Navigator supports monitor and control of all Paradise modems from a single application. Includes easy-to-use navigation, support for multiple operator roles / access levels, continuous status / alarm polling and full access to all modem features. The web based Q-NET Navigator is included as standard, free of charge.

Paired Carrier+: used to reduce the occupied satellite bandwidth by up to 50% by overlaying the transmit and receive carriers in the same space segment. Adaptive self-interference cancellation is used to remove the unit's transmitted signal from the composite received signal, leaving just the desired signal.

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.

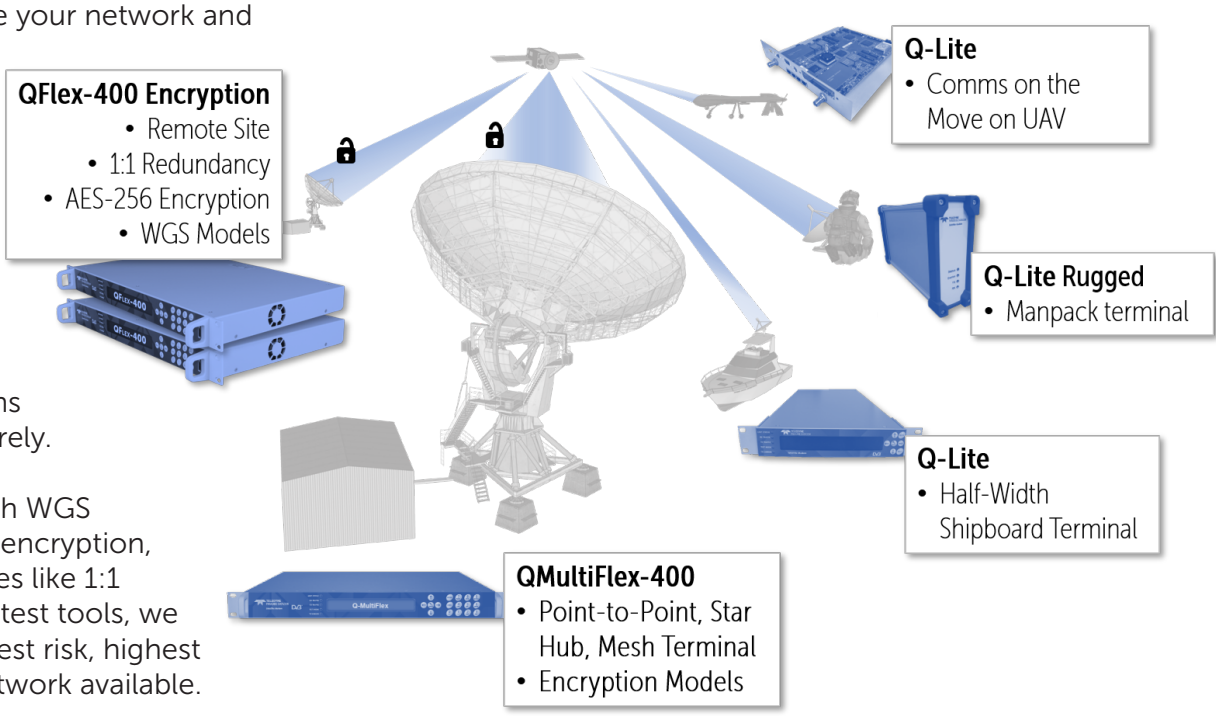


The Q-Net Family

Q-Net is a fabric that allows each of the Q-Series modems to seamlessly interoperate 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 180MHz (resolution 100Hz) TNC connectors for Tx & Rx
Data Rates	**Standard:** 2,048kbps **Options:** 5, 10, 25, 60, 100, 200 & 345Mbps
Data Rate Limits	**DVB-S2/S2X:** 55kbps to 345Mbps **FastLink™ LDPC:** 18kbps to 100Mbps (1bps resolution) **TPC:** 2.4kbps to 60Mbps **DVB-S/DSNG:** 100kbps to 50Mbps (1bps resolution)
Symbol Rate Limits	**DVB-S2/S2X:** 150ksps to 70Msps **FastLink™ LDPC:** 18ksps to 40Msps **TPC:** 2.4ksps to 40Msps **DVB-S/DSNG:** 100ksps to 40Msps
Operating Modes	**DVB-S2/S2X** (EN 302 307-1 & EN 302 307-2) **Closed Network** (+ ESC) (IESS-315) **DVB-S/DSNG** (EN 300 421 & EN 301 210)
Impedance	50Ω
Return Loss	**L-Band:** 950MHz to 2GHz >16dB 2GHz to 2.45GHz >12dB **IF:** > 18dB
Redundancy	1:1 through 1:16 redundancy (requires Utilities Card)

Mechanical/Environmental

Size	440mm x 215mm (480mm x 250mm when fitted with TNC to N type converters and L-mounting brackets)
Weight	1.5kg
Power Supply	90 to 264VAC, 1A @ 100V, 0.5 A @ 240V, 47 to 63 Hz Fused IEC connector (live and neutral fused); 48V DC option
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	0°C to +50°C
Storage Temperature	-20°C to +70°C (limits must not be exceeded)
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)

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.)
BER Tester	Bit error rate tester operates over main traffic or ESC channel, allowing BER monitoring while on traffic. Not available in DVB-S2/S2X modes. Supports various test patterns compatible with common BER testers
Other Test Modes	Transmit CW Transmit alternate 1-0 pattern Simulated satellite delay for TCP/IP packets
Alarm Relays	4 independent Form C relays for unit, Tx, Rx and deferred alarms

Features

ClearLinQ™ Adaptive Tx Predistorter	Corrects for linear & non-linear distortion in the RF chain (i.e. amplifier and transponder). Applicable to all FECs and modulations. Maximises amplifier linear output power; minimises required back-off. Up to 2dB performance gain
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
DVB Carrier ID Option (ETSI TS 103 129)	Supports the identification of interfering carriers. Allows identification of individual modem carriers by superimposing a low-power CID waveform onto the carrier with negligible degradation. **Supported for all carriers.** The CID waveform contains a unique Carrier ID and other identity information. A carrier monitoring system is required to decode CID waveforms
Traffic Interfaces	**Standard: 4-port Gigabit Ethernet switch** (RJ45 connectors; used for IP traffic and M&C) **Options** (maximum of one additional interface may be selected)**:** • **EIA-530** (RS422, X.21, V.35 and RS232 on 25-pin D-type female) • **Quad ASI** (75Ω BNC female) *Please contact us regarding support for other interfaces*

Optional Functionality

Modulator

Output Power (0.1dB steps)	**IF:** 0 to –25dBm (0.1 dB steps) **L-Band** (0.1 dB steps)**:** • +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	5%, 10%, 15%, 20%, 25%, 35%
Phase Accuracy	±2° maximum
Amplitude Accuracy	±0.2dB maximum
Carrier Suppression	-30dBc minimum
Output Phase Noise	As EN 302 307, EN 300 421, IESS-308 & EN 301 210; minimum 16dB better than IESS-308/309
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 ± 2dB
FSK Control	Allows monitor & control of a compatible L-band BUC via the Tx IFL cable

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
RX Spectral Roll-off	5%, 10%, 15%, 20%, 25%, 35%
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

Ethernet: Standard Features

Bridging and Static Routing	**Trunking mode:** Hardware Layer 2 switch supporting 345Mbps bi-directional traffic at up to 200,000 packets per second; zero jitter **Layer 2 bridge & Layer 3 router:** Software processing capability of up to 150,000 packets per second
IPv4/IPv6	Dual IPv4/IPv6 TCP/IP supporting IPv4/ IPv6 bridging and routing
VLAN Support	IEEE 802.1q VLAN support
	IEEE 802.1p packet prioritisation using strict priority or fair weighting queuing
Software Defined Network Support	OpenFlow and other SD-WAN protocols provide support for network virtualisation; see Q-NET Satellite Network Solution white paper for more details
DHCP	DHCP client for automatic allocation of M&C IP address; DHCP server allocates IP addresses to network devices
NAT	NAT firewall; allows all network devices to share a single IP address when viewed from other end of satellite link
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
sFlow Performance Metrics	sFlow is the industry standard for network monitoring, giving full modem performance visibility to sFlow compatible network management devices
Active Queue Management (AQM)	Implements CoDel (controlled delay) which overcomes buffer bloat by maintaining a constant delay through the modem for all IP packets
MPEG over IP	Supports the efficient transfer of SMPTE 2002-2 MPEG2 transport streams over satellite
OpenAMIP Protocol Support	Controls modem interaction with compliant antenna control units to support antenna deployment/pointing/ tracking
Virtual Routing & Forwarding	VRF supports multiple modem routing tables, allowing inter-VLAN routing
Packet Generator/ Analyser	Generates & analyses TCP & UDP packet streams, allowing modem-to-modem IP testing without any PCs
Ethernet MTU Size	10k bytes

Ethernet: XStream IP™ DVB-S2X

Provided as standard as part of DVB-S2/S2X

ACM	Dynamically varies Modcod with varying link conditions, maximises throughput at all times by converting unused link margin into additional throughput; 100% link availability
DVB-S2/X VCM mode	Supports MultiStream mode where the outbound carrier consists of multiple Modcods. Up to 6 Modcod's are supported, which allows stations to be configured to receive any one of these Modcod's, depending on signal strength at the remote site.
VCM	Supports transmission/reception of two ASI streams or, one ASI stream with one IP stream, each with its own Modcod for optimal throughput
IP-over-DVB Encapsulation	Supports the transmission of IP packets with/without Ethernet frames over DVB-S2/S2X; encapsulates & decapsulates using GSE (see below), MPE (EN 301 192), ULE (RFC 4326) or Paradise XStream Encapsulation
GSE Encapsulation	Highly efficient encapsulation of IP packets or Ethernet frames; compatible with EN 302 307-2 standard, for use with DVB-S2 and DVB-S2X

Ethernet: XStream IP™ Option

XStream IP™ is an integrated set of IP optimization and traffic management features designed for maximum reliability and bandwidth efficiency. The maximum throughput depends on features enabled & traffic format

Traffic Shaping	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, PID & MPLS EXP
Header Compression	Robust Header Compression (RFC 3095). Reduces Ethernet/IP/UDP/TCP/RTP header sizes typically by 90%. 1-way packet processing limit: 60,000 pps; 2-way limit: 45,000 pps. Includes Ethernet header compression (compresses 14-byte Ethernet frame to typically one byte)
Payload Compression	Uses Deflate algorithm (RFC 1951) to compress TCP & UDP packets; typical payload compression of 50%
Dynamic Routing	RIP V1, V2; OSPF V2, V3; BGP V4
TCP Acceleration	Typical throughput level of 90% of link capacity. Supports 4,400 concurrent accelerated TCP connections (plus at least 40,000 unaccelerated TCP connections) up to 100Mbps
AES-256 Encryption	Supported on Q-LiteE™ model only. The Q-LiteE™ is identical to the Q-Lite™ in every other respect

Paired Carrier+™ Option

Paired Carrier+™	Transmit and receive carriers are overlaid in the same space segment. Echo cancellation techniques are used to cancel the unwanted transmit carrier, leaving the wanted receive carrier. Supports an occupied bandwidth between 25kHz and 70MHz depending on license
Data Rate Options	256kbps, 512kbps, 1024kbps, 2.5Mbps, 5Mbps, 10Mbps, 15Mbps, 20Mbps, 25Mbps, 30Mbps, 40Mbps, 50Mbps, 60Mbps, 80Mbps, 100Mbps, 200Mbps and 345Mbps traffic rate
Carrier Asymmetry	**Symbol rate:** Up to 10:1
Max Sym Rate	70MBaud (carrier roll-off 10% max)
Min Sym Rate	25kBaud
Delay Range	0 to 350ms
Cancellation Range	-10 to +10dB local to remote carrier
Cancellation ratio	28dB typical
Es/No degradation (symmetric carriers)	<0.1dB for Es/No ≤ 7dB. <0.2dB for 7dB < Es/No ≤ 11dB. <0.4dB for 11dB < Es/No ≤ 14dB. <0.5dB for 14dB < Es/No ≤ 16dB. <1.0dB for 16dB < Es/No ≤ 18dB. <1.5dB for 18dB < Es/No ≤ 20dB. <2.0dB for 20dB < Es/No ≤ 22dB.
Monitoring	Delay, frequency offset, power offset, lock status, channel amplitude slope and group delay (consult sales)
Mobile Operation	Uses GPS data to continually recalculate position relative to satellite, allowing uninterrupted operation in mobile environments anywhere in satellite footprint

Forward Error Correction

DVB-S2X EN 302 307-2 Includes support for DVB-S2	**Normal Frame:** **QPSK** 13/45, 9/20, 11/20 **8PSK** 23/36, 25/36, 13/18 **8APSK-L** 5/9, 26/45 **16APSK** 26/45, 3/5, 28/45,23/36, 25/36, 13/18, 7/9, 77/90 **16APSK-L** 5/9, 8/15, 1/2, 3/5, 2/3 **32APSK** 32/45, 11/15, 7/9 **32APSK-L** 2/3 **64APSK** 11/15, 7/9, 4/5, 5/6 **64APSK-L** 32/45 **Short Frame:** **QPSK** 11/45, 4/15, 14/45, 7/15, 8/15, 32/45 **8PSK** 7/15, 8/15, 26/45, 32/45 **16APSK** 7/15, 8/15, 26/45, 3/5, 32/45 **32APSK** 2/3, 32/45
DVB-S2 EN 302 307-1	**QPSK** 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 **8PSK** 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 **16APSK** 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 **32APSK** 3/4, 4/5, 5/6, 8/9, 9/10
FastLink™ Low-Latency LDPC	**BPSK** 0.499 **(O)QPSK** 0.532, 0.639, 0.710, 0.798 **8PSK/8QAM** 0.639, 0.710, 0.778 **16APSK/16QAM** 0.726, 0.778, 0.828, 0.851 **32APSK** 0.778, 0.828, 0.886, 0.938 **64QAM** 0.828, 0.886, 0.938, 0.960
TPC	**BPSK** 5/16, 21/44, 3/4, 7/8 **(O)QPSK** 5/16, 21/44, 3/4, 7/8, 0.93 **8PSK** 3/4, 7/8, 0.93 **8QAM** 3/4, 7/8, 0.93 **16QAM** 3/4, 7/8, 0.93
DVB-S/DSNG	DVB-S: QPSK 1/2, 2/3, 3/4, 5/6, 7/8 DVB-DSNG: 8PSK 2/3, 5/6, 8/9; **16QAM** 3/4, 7/8 (ETSI EN 300421/ 301210 compliant)

Utilities Card

Standard	Includes the following features: • 9-way D type for 1:1 and 1:N redundancy (compatible with Q-NET PDQS Redundancy Sw) • 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

Included Network Management

Web browser user interface support provided standard. SNMP & command line interfaces support development of third-party user interfaces. The following network control application options is 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.

Ideal for comms-on-the-move:
Two 9.5-inch chassis can be fitted side-by-side in a standard 19-inch rack, saving on air-conditioned hub space.

Ordering: Q-Lite™ Half-Width Satellite Modem

Standard Features		Description
Base Modem	☑	**Q-Lite mounted in 9.5-inch chassis** (supplied with additional L-brackets to allow easy conversion to 10.5-inch chassis) **4.8kbps to 2.048Mbps Closed Network (+ ESC) modem with 4-port Gigabit Ethernet switch for M&C and traffic** **IF operation 50 to 180MHz; L-band operation 950 to 2450MHz**; high-stability 10MHz reference **TPC:** BPSK, QPSK, OQPSK, 8PSK, 8QAM and 16QAM; to 60Mbps subject to prevailing modem data rate **AUPC:** Automatic Uplink Power Control **All features described under Ethernet Standard Features** **All features described under Test Facilities** **Utilities card as described** **AC mains input**

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 (FastLink, DVB-S2 & DVB-S2X only)
	☐	**200Mbps data rate:** Extends 100Mbps operation to 200Mbps (DVB-S2 & DVB-S2X only)
	☐	**345Mbps data rate:** Extends 200Mbps operation to 345Mbps (DVB-S2 & DVB-S2X only)
XStream IP™	☐	**XStream IP Bundle,** includes all of the features listed below (or select any combination of individual features):
	☐	**Traffic Shaping:** Supports CIR/BIR/priority settings for IP streams classified by VLAN ID, IP address, Diffserv class, IEEE 802.1p priority, MPLS EXP field & MPEG2 transport stream PID
	☐	**Header Compression:** IP/UDP/TCP/RTP packet header compression (RFC 3095) plus Ethernet header compression
	☐	**Payload Compression:** TCP/UDP packet payload compression using the Deflate algorithm (RFC 1951)
	☐	**Dynamic Routing:** RIP, OSPF and BGP
	☐	**TCP Acceleration:** Up to 4,400 concurrent accelerated TCP connections to 100Mbps subject to prevailing data rate
DVB-S2X To 345Mbps subject to prevailing modem data rate limits	☐	**DVB-S2/S2X CCM Tx:** DVB-S2 QPSK, 8PSK, 16APSK & 32APSK Tx operation per EN 302 307-1. DVB-S2X QPSK, 8PSK, 8APSK, 16APSK, 32APSK & 64APSK Tx operation per EN 302 307-2. Includes 5%, 10%, 15%, 20%, 25% & 35% spectral roll-offs. Includes XStream IP™ DVB-S2X, which comprises ACM, VCM and IP-over-DVB encapsulation
	☐	**DVB-S2/S2X CCM Rx**: Add-on card supporting DVB-S2 QPSK, 8PSK, 16APSK & 32APSK Rx operation per EN 302 307-1. DVB-S2X QPSK, 8PSK, 8APSK, 16APSK, 32APSK & 64APSK Rx operation per EN 302 307-2. Includes 5%, 10%, 15%, 20%, 25% & 35% spectral roll-offs. Includes XStream IP™ DVB-S2X, which comprises ACM, VCM and IP-over-DVB decapsulation
ClearLinQ™	☐	**Adaptive Tx Predistorter:** Corrects for linear & non-linear distortion in the RF chain (amplifier & transponder). Applicable to all FECs and modulations
FastLink™ Low-latency LDPC	☐	Add-on card; includes BPSK, QPSK, OQPSK, 8PSK, 8QAM, 16APSK, 16QAM, 32APSK & 64QAM; to 100Mbps subject to prevailing modem data rate limits; includes 5%, 10%, 15%, 20%, 25% & 35% spectral roll-offs as standard

Ordering: Q-Lite™ Continued

Paired Carrier+™ Subject to prevailing modem data rate limits. Occupied bandwidth: minimum 25kHz; maximum 72MHz Paired Carrier+™ is also available as a low-cost 90 -day license for light users (the license counts down only when Paired Carrier+™ is being actively used) - please contact us for details	○	**Paired Carrier+™ add-on card** (requires one or more options below)
	○	Paired Carrier+™ up to **256kbps** (requires Paired Carrier+™ add-on card)
	○	Extends Paired Carrier+™ up to **512kbps**
	○	Extends Paired Carrier+™ up to **1.024Mbps**
	○	Extends Paired Carrier+™ up to **2.5Mbps**
	○	Extends Paired Carrier+™ up to **5Mbps**
	○	Extends Paired Carrier+™ up to **10Mbps**
	○	Extends Paired Carrier+™ up to **15Mbps**
	○	Extends Paired Carrier+™ up to **20Mbps**
	○	Extends Paired Carrier+™ up to **25Mbps**
	○	Extends Paired Carrier+™ up to **30Mbps**
	○	Extends Paired Carrier+™ up to **40Mbps**
	○	Extends Paired Carrier+™ up to **50Mbps**
	○	Extends Paired Carrier+™ up to **60Mbps**
	○	Extends Paired Carrier+™ up to **80Mbps**
	○	Extends Paired Carrier+™ up to **100Mbps**
	○	Extends Paired Carrier+™ up to **200Mbps**
	○	Extends Paired Carrier+™ up to **345Mbps**
Terrestrial Interfaces (Please choose up to one hardware options)	○	**EIA-530:** D25 DCE supporting RS422/X.21/V.35/RS232
	○	**Quad ASI:** 4xBNC 75Ω sockets; includes DVB-S/DSNG FEC (for use with ASI, or MPEG over IP, or general IP)
Optimised Spectral Roll-Off	○	Extends the standard 35%, 25% and 20% roll-off factors to include 5%, 10% and 15% roll-offs for TPC and legacy FEC's
DVB-CID	○	**DVB Carrier ID:** Tx carrier identification per ETSI 103 129
IBS	○	Satellite framing to IESS 309 with low-rate Intelsat ESC (to IESS 403) and high-rate IBS ESC
Legacy FEC	○	**Sequential FEC** (limited to maximum of 2.048Mbps); TCM 8PSK 2/3 to IESS 310; Viterbi BPSK/QPSK/OQPSK FEC rates 1/2, 3/4 & 7/8; Intelsat Reed-Solomon outer codec
DC Input	○	48V DC: **K3027** 48V DC primary power input (in place of 100 to 240V AC input)
BUC PSU (Select up to one BUC PSU option)	○	**AC In & 24V Out:** P3563 AC input, 24V 200W DC to Tx BUC
	○	**AC In & 48V Out:** P3564 AC input, 48V 200W DC to Tx BUC
	○	**48V In & 24V Out:** P3565 Floating 48V DC input; +24V 200W DC to Tx BUC
	○	**48V In & 48V Out:** P3566 Floating 48V DC input; +48V 200W DC to Tx BUC

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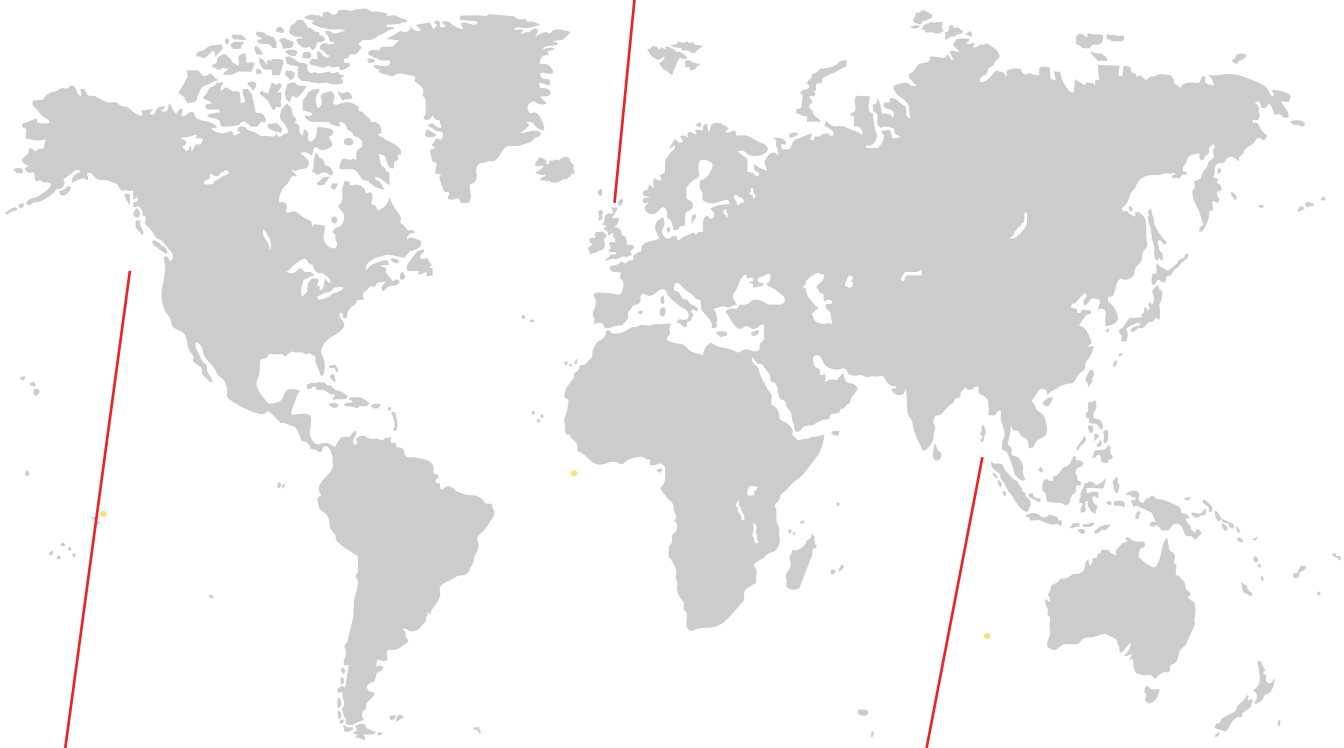

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