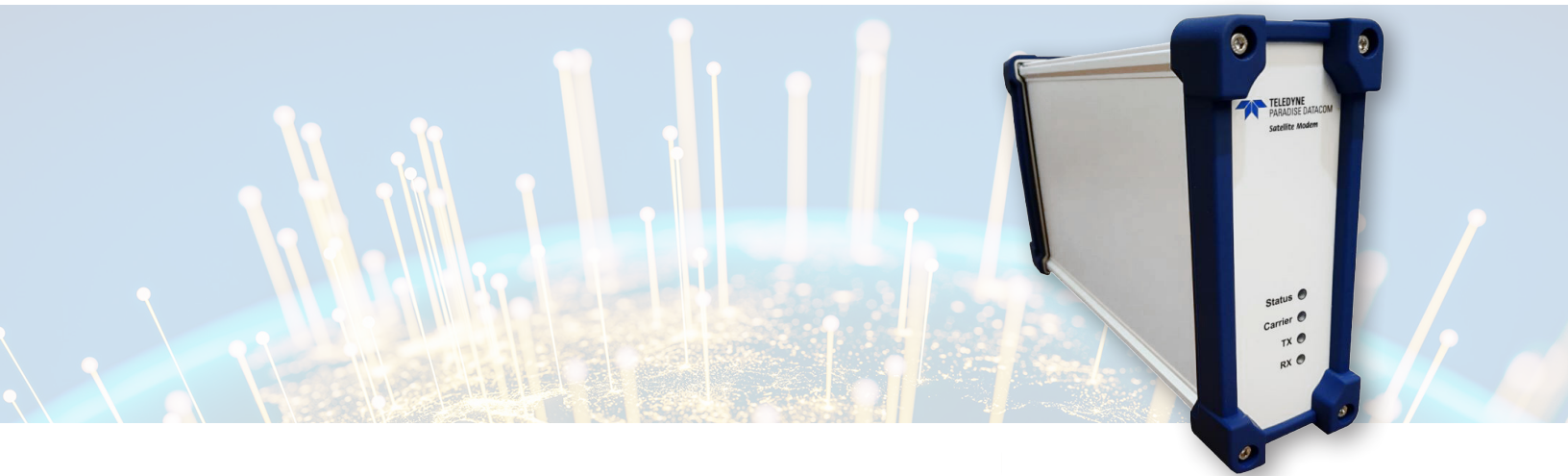


Q-Lite™ Rugged

Satellite Modem



IP65 Weatherproof
Modem for Outdoor Use

Overview

The compact **Q-Lite™** Rugged is an IP65 weatherproof outdoor satellite modem that is ideal for portable communications and comms-on-the-move. Incorporating our industrial temperature grade **Q-Lite™** modem card, it is suitable for all types of IP services including broadcast video, trunking, backhaul and internet.

The **Q-Lite™** Rugged is fully compatible with our **Q-Flex™** and **Q-MultiFlex™** modems (for point-to-point and point-to-multipoint respectively).

The **Q-Lite** Rugged 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.

The Q-Lite can also be provided in a half-width and full-width chassis.

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

- Portable/mobile communication systems
- Compact, low-power VSAT terminals
- Man-packs
- IP trunking & IP/cellular backhaul
- Corporate & government networks
- Maritime, oil & gas communications
- Broadcast (H.264/H.265, HD, Ultra HD, etc.)

Features

- IP65 weatherproofing for outdoor use
- Data rates to 345Mbps
- Four IP65 Ethernet ports
- Optimized spectral roll-offs, including 5%
- **XStream IP™** advanced IP optimization suite including TCP Acceleration, header & payload compression, traffic shaping & ACM
- DVB-S2/S2X, **FastLink™** LDPC & TPC
- VLAN/MPLS/Layer 2/Layer 3 support
- -20 °C to +55 °C operation
- AC, 12V & 24V DC input power supply options
- Optional L-band services (10MHz output, LNB power, 24V to external BUC)
- **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
- Compatible with **Q-Flex™** and **Q-MultiFlex™**
- Standard and custom mounting options
- 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

- Outdoor Power Supply Unit or Battery Power (charger available)
- Built in Spectrum Analyser and Constellation monitor

PRACTICAL

- IP65 Weatherproofing for outdoor use
- 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:

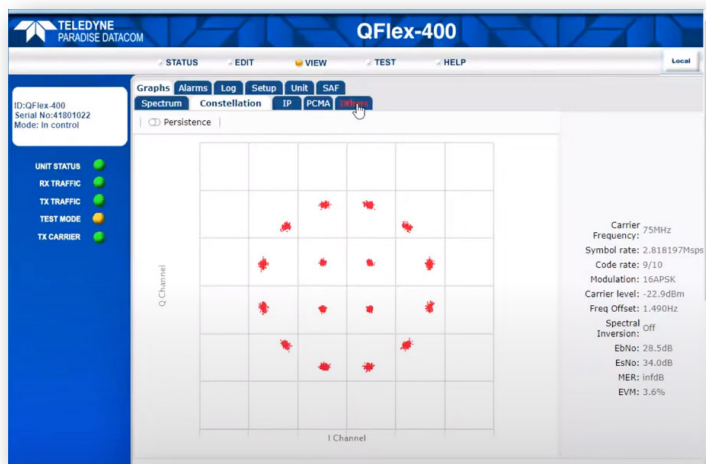
- Up to 345Mbps / 70Msps
- Output power: IF 0 to -25dBm; Standard L-Band +5 to -40dBm

Interface Ports

Convenient:

- For IP traffic and legacy interfaces
- Allowing seamless migration from serial to IP
- 4 GB Ethernet ports

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.



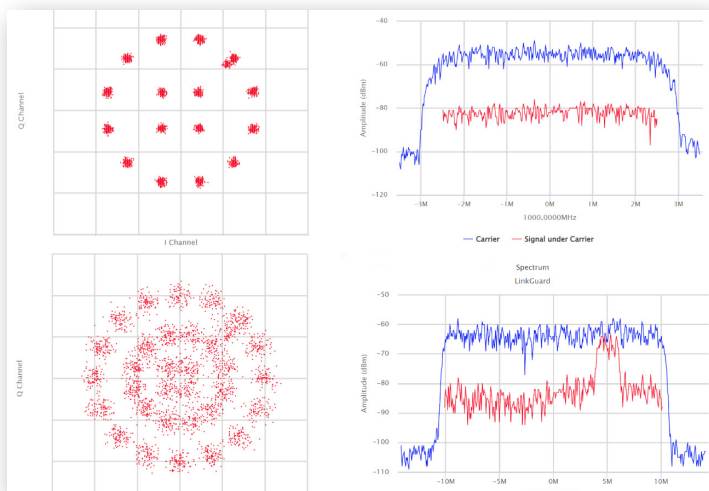
Spectral view: The Rx Spectrum Monitor is a powerful real-time spectrum analyser within the modem that is used to view the received signal spectrum. The monitor can not only display the wanted carrier but a Super Wide view allows checking for adjacent interfering carriers.



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.



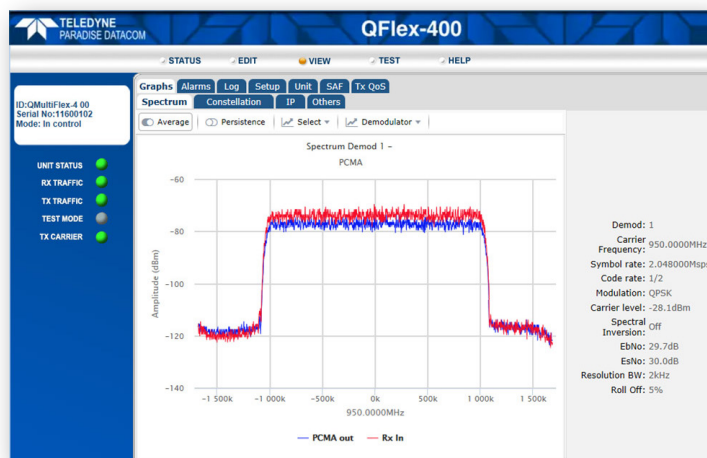
Advanced Bandwidth-Efficient Features

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



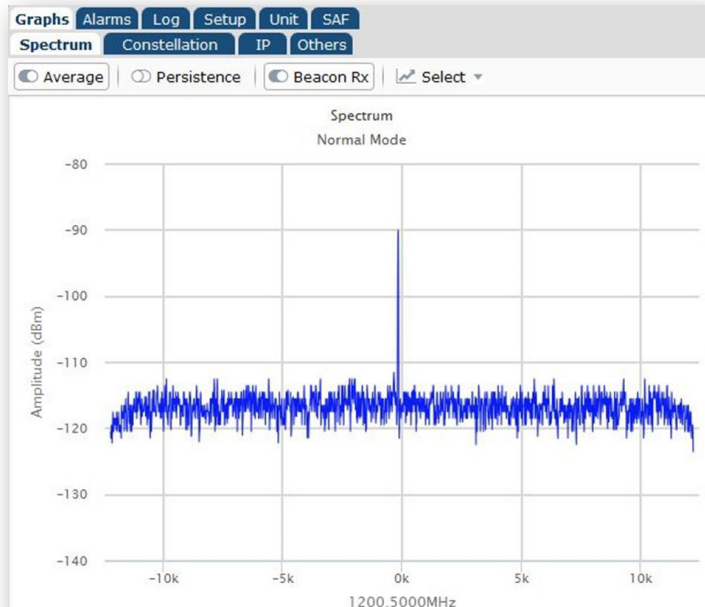
Included Network Management

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.

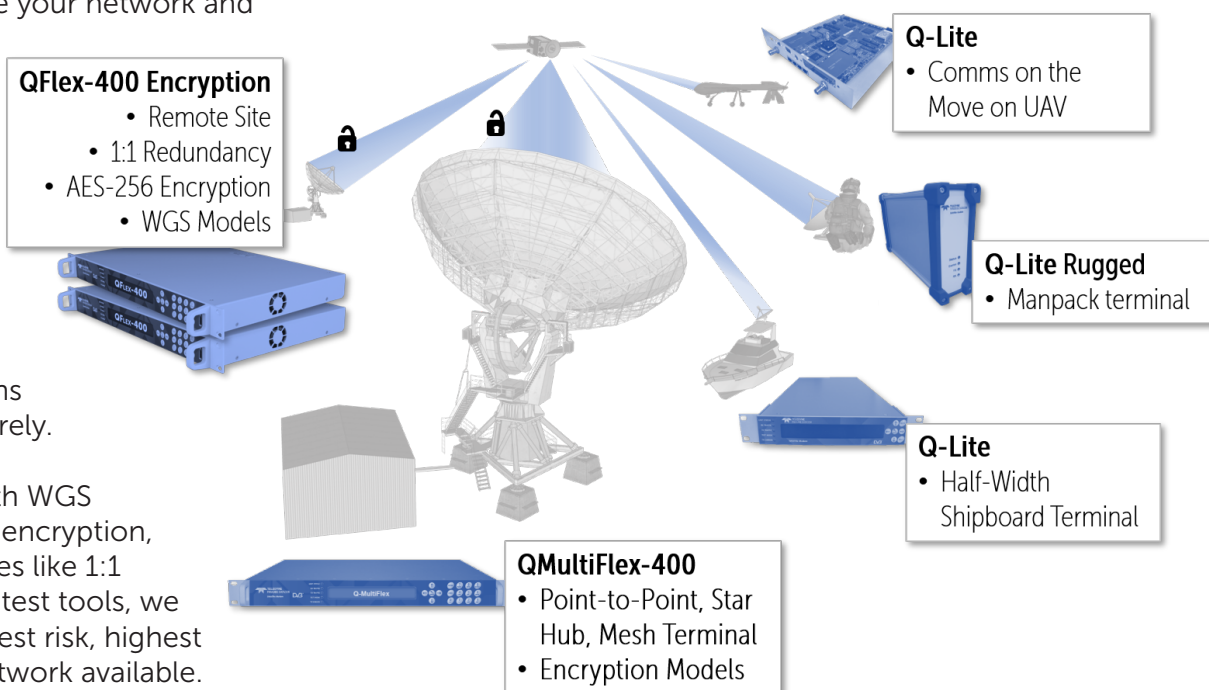


The Q-Net Family

Q-Net is a fabric that allows each of the Q-Series modems to seamlessly 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 Cancellor
		QFlex-400 P2MP	✓		✓	Configured remote
		QubeFlex	✓			Small Sat/LEO - support for CCSDS
		AXIOM-N	✓		✓	IP-centric modem 
Small Form Factor						

Main Specifications

Frequency	950 to 2,450MHz (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 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	950MHz to 2GHz >16dB 2GHz to 2.45GHz >12dB
Traffic Interfaces	Four Gigabit Ethernet ports (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.)
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

Mechanical/Environmental

Size	440mm x 214mm x 90mm
Weight	2.5kg (excluding external power unit)
Power Supply	Options: Outdoor PSU (mains to 24V DC) 24V ± 5%. Recommended ± 0.5V 12V DC input option (Modem consumes ~30 Watts)
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	-20°C to +55°C
Storage Temperature	-20°C to +70°C (limits must not be exceeded)
Weather-proofing	Sealed enclosure rated for IP65
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)

Modulator

Output Power (0.1dB 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: ± 1.0 dB, 0°C to 50°C Accuracy: ± 0.375 dBm
Transmit Filter Roll-off	5%, 10%, 15%, 20%, 25%, 35%
Phase Accuracy	$\pm 2^\circ$ maximum
Amplitude Accuracy	± 0.2 dB 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	External 24V DC input can also be used to power a BUC via IFL cable
BUC 10MHz Reference	Via IFL cable; 10MHz ± 0.01 ppm; 2dBm ± 2 dBm

Demodulator

Input Range (dBm)	Minimum: -140 + 10 log (symbol rate) Maximum: -68 + 10 log (symbol rate)
Maximum Input Power	+10dBm
Wanted-to-Composite	-102 + 10 log (symbol rate)
Frequency Sweep Width	± 1 kHz to ± 255 kHz (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 ± 0.01 ppm; 2dBm ± 2 dBm
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 WA-SDN protocols provide support for network virtualisation; see Q-NET Satellite Network Solution white paper for more details
D	

Ethernet: XStream IPT™ 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 IPT™ Option



XStream IPT™ 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, 30

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)

Ordering: Q-Lite™ Rugged Satellite Modem

Standard Features	Description
Base Modem	☒ Q-Lite modem in sealed, weatherproof chassis rated to IP65 2.4kbps to 2.048Mbps Closed Network (+ ESC) modem with 4-port Gigabit Ethernet ports for M&C and traffic All features described under Ethernet Standard Features L-band operation 950 to 2,450MHz; high-G 10MHz reference (with G sensitivity rating of 1 x10⁻⁹/g) 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 Test Facilities Note: A power source is not included as standard (see over the page for options); a user-supplied 24V DC regulated input can also be used

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% &

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
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
Outdoor PSU	☐ Weatherproof PSU that converts mains input to 24V DC for powering the modem
12V DC Battery	☐ 12V DC battery power source for powering the modem (comes with 12V to 24V DC to DC converter)
Battery Charger	☐ Battery charger for 12V DC battery

Global Sales Offices

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Teledyne Paradise Datacom reserves the right to change specifications of products described in this document at any time without notice and without obligation to notify any person of such changes.

Refer to the website or contact Sales or Customer Support for the latest product information. The modem is classified ECCN 5A991.b.4 and is subject to U.S. Department of Commerce export control. Export re-export or diversion contrary to U.S. law is prohibited.