

## ‘Comms-On-The-Move’ Satellite Modem Card

### 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™** has been designed for simple mechanical integration into OEM products, being small in physical size and with very low power consumption. It is compatible with our **Q-Flex™** and Quantum IP modems.

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™** can also be provided in a half-width chassis.

### Advanced Bandwidth-Efficient Features

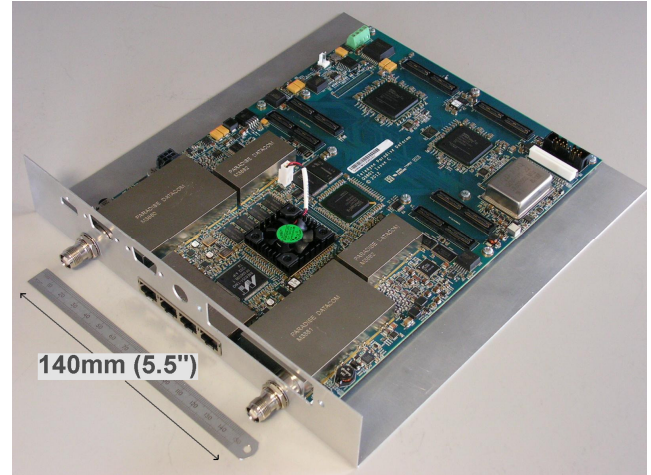
The **Q-Lite™** is small in size but big on features!

**Paired Carrier™** overlays transmit and receive carriers reducing satellite bandwidth by 50%.

**DVB-S2X**, the successor to the highly robust and bandwidth-efficient DVB-S2, includes spectral roll-offs as low as 5%. Our proprietary **low-latency extension** to DVB-S2x reduces link latency by nearly 80%!

### Markets and Applications

- ▶ Comms-on-the-move including vehicles, aircraft and UAVs
- ▶ Portable communication systems
- ▶ Compact, low-power satellite terminals
- ▶ Man-packs
- ▶ Disaster relief
- ▶ SNG and other broadcast applications



### FEATURES

- ▶ Small form factor (255mm x 184mm)
- ▶ L-band operation (950MHz to 2050MHz)
- ▶ Data rates to 200Mbps
- ▶ Optimized spectral roll-offs, including 5%
- ▶ **XStream IP™** advanced IP optimization suite including TCP acceleration, header & payload compression, dynamic routing, traffic shaping, encryption & ACM
- ▶ DVB-S2/S2X, **FastLink™** LDPC & TPC
- ▶ 24 Volt input power supply
- ▶ 25 to 33 Watt power consumption
- ▶ Optional keypad/LCD display & fans
- ▶ Optional L-band services (10MHz output, BUC/LNB PSU)
- ▶ Optional 1U half-rack enclosure (half the width of standard 19" rack)
- ▶ **LinkGuard™** signal-under-carrier interference detection
- ▶ Built-in spectrum & constellation monitors
- ▶ DVB Carrier ID. Fully compliant with DVB-CID standard
- ▶ **New! Q-NET™ Navigator** network M&C application included as standard

Request A Quote

**Satellite Modem Card**

Main Specifications	
Frequency	950 to 2050MHz (resolution 100Hz) (TNC connector)
Data Rate	<b>Standard:</b> 2,048kbps <b>Options:</b> 5Mbps, 10Mbps, 25Mbps, 60Mbps, 100Mbps, 160Mbps and 200Mbps
Data Rate Limits	<b>DVB-S2X (including DVB-S2):</b> 100kbps to 200Mbps <b>'Low-cost DVB-S2' option:</b> 350kbps to 132Mbps <b>FastLink™ LDPC:</b> 18kbps to 100Mbps <b>TPC:</b> 4.8kbps to 60Mbps 1bps resolution <b>DVB-S/DSNG:</b> 100kbps to 50Mbps 1bps resolution
Symbol Rate Limits	<b>DVB-S2X (including DVB-S2):</b> 100ksps to 200Msps <b>'Low-cost DVB-S2' option:</b> 350ksps to 37.5Msps <b>FastLink™ LDPC:</b> 18ksps to 40Msps <b>TPC:</b> 9ksps to 40Msps <b>DVB-S/DSNG:</b> 100ksps to 40Msps
Operating Modes	<b>DVB-S2/S2X (EN 302 307-1 &amp; EN 302 307-2)</b> <b>Closed Network (+ ESC) (IESS-315)</b> <b>DVB-S/DSNG (EN 300 421 &amp; EN 301 210)</b>
Impedance	50Ω
Return Loss	>15dB
Redundancy	1:1 through 1:16 redundancy ( <i>requires Utilities Card</i> )

Traffic Interfaces	
<b>Standard:</b>	<b>4-port Gigabit Ethernet switch</b> (RJ45 connectors; for IP traffic and M&C)
<b>Options (one additional interface can be selected):</b>	<b>EIA-530</b> (RS422, X.21, V.35 and RS232 on 25-pin D-type female) <b>Quad ASI</b> (75Ω BNC female) <i>Please contact us regarding support for other interfaces</i>

Modulator	
Output Power	0 to -30dBm (0.1dB steps)
Output Power Stability/Accuracy	<b>Stability:</b> ±1.0dB, 0°C to 50°C <b>Accuracy:</b> ±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
Harmonics & Spurious	Better than -60dBc/ 4kHz in band
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; 3dBm ± 3dB
FSK Control	Allows monitor & control of a compatible L-band BUC from the modem via the Tx IFL cable ( <i>requires Utilities Card</i> )

Demodulator	
Input Range	<b>Minimum:</b> -130 + 10 log (symbol rate) <b>Maximum:</b> -80 + 10 log (symbol rate)
Maximum Composite	+10dBm
Wanted-to-composite	-102 + 10 log (symbol rate)
Frequency Sweep Width	±1kHz to ±250kHz (1kHz steps)
Acquisition Time	Dependent on FEC, data rate and sweep width
Clock Tracking Range	±100ppm minimum
Receive Filter Roll-off	5%, 10%, 15%, 20%, 25%, 35%
AGC Output	Buffered direct AGC output of the Rx signal level for antenna peaking ( <i>requires Utilities Card</i> )
LNB 10MHz Reference	Via IFL cable; 10MHz ± 0.01 ppm; 0dBm ± 3dB
LNB Voltage	Selectable 13V, 15V, 18V or 24V DC to LNB via IFL cable; maximum 0.5A

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-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. The CID waveform contains a unique Carrier ID and other identity information. A carrier monitoring system is required to decode CID waveforms	

Utilities Card	
Add-on card size: 168mm x 104mm 9-way D type for 1:1 and 1:N redundancy (compatible with PDQS Standalone Redundancy Switch) 15-way D type for alarms and AGC USB connector for software upgrades, etc. BNC connector for Station Clock Connectors for alarm relays, transmit inhibit function, support for second fan, Async ESC channel, AGC output for antenna pointing, FSK signalling	

Paired Carrier™ Option	
Paired Carrier™ (30kHz to 54MHz occupied bandwidth)	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
Paired Carrier™ data rate options	256kbps, 512kbps, 1024kbps, 2.5Mbps, 5Mbps, 10Mbps, 15Mbps, 20Mbps, 25Mbps, 30Mbps, 40Mbps, 50Mbps, 60Mbps, 80Mbps, 100Mbps and 200Mbps target rate
Power Asymmetry	-10dB to +10dB
Symbol Rate Asymmetry	Up to 12:1
Eb/No Degradation	Typically 0.1dB to 0.5dB; up to 0.7dB for 16QAM/16APSK; up to 1dB for 32APSK
Mobile Operation	Uses GPS data to continually recalculate position relative to satellite, allowing uninterrupted operation in mobile environments anywhere in satellite footprint

Test Facilities and Alarm Outputs	
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

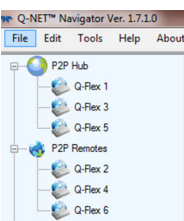
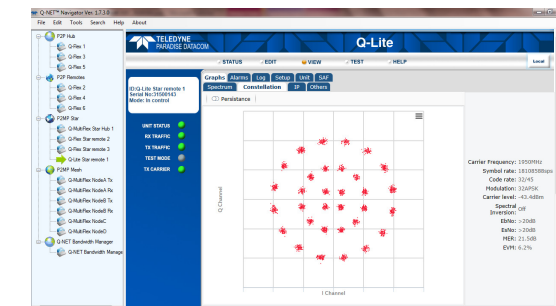
Mechanical/Environmental	
Size	255mm x 184mm
Weight	0.35kg
Power Supply	24 Volt DC input (not provided) Consumes 25 to 33 Watts
Compliances	FCC, CE and RoHS compliant
Safety Standards	EN60950-1:2006
Emissions & Immunity	<b>Emissions:</b> EN55022:2010 Class B <b>Immunity:</b> EN55024:2010 -40°C to 85°C ( <i>applies to Q-Lite card and all options other than: front panel, 'Low-cost DVB-S2' card &amp; BUC PSU options, which operate 0 to 50°C only</i> )
Operating & Storage Temperature	
Humidity	95% relative humidity, non-condensing
Conformal Coating	Available as an option; uses HumiSeal® 1B31 coating
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)

Ethernet: Standard Features	
Bridging and Static Routing	<b>Trunking mode:</b> Hardware Layer 2 bridge supporting 200Mbps bi-directional traffic at up to 500,000 packets per second; zero jitter <b>Layer 2 bridge &amp; Layer 3 router:</b> 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
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
IEEE 1588 V2 Precision Time Protocol (PTP)	PTP hardware implementation with nanosecond-resolution timestamping provides sub-microsecond accurate clock synchronisation; modem implements a PTP boundary clock, operating in both master & slave modes
Web Server	Modem web server M&C interface; built-in test tools include: Rx constellation monitor; Rx spectrum analyser; <b>LinkGuard™</b> Signal-Under-Carrier interference detection; time graphs for key performance indicators (IP throughput, Eb/No, etc.)
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
Packet Generator/Analyser	Generates & analyses TCP & UDP packet streams, allowing modem-to-modem IP testing without any PCs
Ethernet MTU Size	<b>Standard:</b> 10k bytes <b>Optical Ethernet:</b> 16k bytes

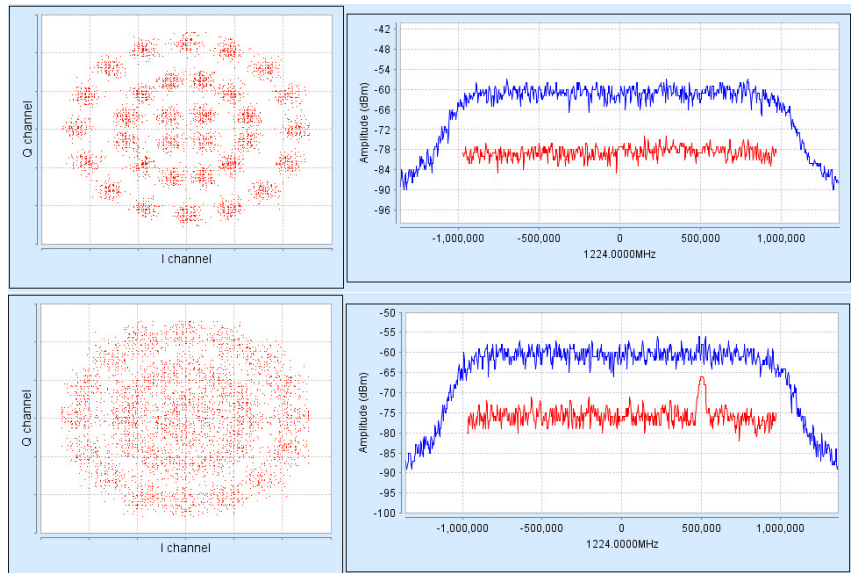
Ethernet: XStream IP™ Option	
<i>XStream IP™ is an integrated set of IP optimization and traffic management features designed for maximum reliability and bandwidth efficiency. The maximum throughput depends on features enabled &amp; traffic format</i>	
Traffic Shaping	Provides guaranteed throughput for 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 10,000 concurrent accelerated TCP connections (plus at least 40,000 unaccelerated TCP connections) up to 100Mbps
HTTP Acceleration	Speeds up download of web pages to web browsers; includes DNS caching
AES-256 Encryption	<i>Supported on Q-LiteE™ model only. The Q-LiteE™ is identical to the Q-Lite™ in every other respect</i>

Ethernet: XStream IP™ DVB-S2	
<i>Features that are provided as standard as part of DVB-S2 &amp; DVB-S2X are: ACM, VCM and IP-over-DVB Encapsulation. Note that GSE is a separate option</i>	
ACM	Dynamically varies modcod with varying link conditions, maximises throughput at all times by converting unused link margin into additional throughput; 100% link availability
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 MPE (EN 301 192), LULE (RFC 4326) or Paradise XStream Encapsulation (PXE)
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

Network Control	
<i>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</i>	
Q-NET™ Navigator	Allows all modems and third-party network devices to be fully controlled through a single application. It provides an easy-to-navigate site map, summary status reporting, etc. Provided as standard, free of charge
Q-NET™ Bandwidth Manager	Provides multi-satellite/transponder carrier planning and high-level system control, monitoring, recording and quality-of-service reporting



**Q-NET™ Navigator supports the M&C of all Paradise modems (old and new) and third-party network devices 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. Q-NET™ Navigator is included as standard, free of charge.**



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

Forward Error Correction	
DVB-S2X (EN 302 307-2)  <i>Includes support for DVB-S2</i>	<b>Normal Frame:</b> 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 <b>Short Frame:</b> 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-S2X Advanced Modulation	<b>Normal Frame:</b> 128APSK 3/4, 7/9 256APSK 32/45, 3/4 256APSK-L 29/45, 2/3, 31/45, 11/15
DVB-S2X Low-latency Mode  <i>Paradise proprietary extension to DVB-S2X</i>	<b>Very Short Frame:</b> (Frame size of 5,400 bits, reducing latency to 33% of standard DVB-S2 Short frame) QPSK 1/5, 4/15, 1/3, 2/5, 7/15, 8/15, 3/5, 2/3, 11/15, 12/15 8PSK 11/15, 12/15 16APSK 12/15 <b>Ultra Short Frame:</b> (Frame size of 3,240 bits, reducing latency to 20% of standard DVB-S2 Short frame) QPSK 2/9, 1/3, 4/9, 5/9, 2/3, 7/9 8PSK 2/3, 7/9 16APSK 2/3, 7/9 32APSK 7/9 64APSK 7/9
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	<b>DVB-S:</b> QPSK 1/2, 2/3, 3/4, 5/6, 7/8 <b>DVB-DSNG:</b> 8PSK 2/3, 5/6, 8/9; 16QAM 3/4, 7/8 (ETSI EN 300421/ 301210 compliant)

TPC Performance Eb/No (dB) at BER 5E-8					
	Rate 1/2	Rate 3/4	Rate 7/8	Rate 0.93	
BPSK, (O)QPSK	3.0	4.2	4.2	6.5	
8PSK		6.3	6.8	9.6	
8QAM		6.7	6.8	10.1	
16QAM		7.6	7.9	10.4	

DVB-S/DSNG Performance Eb/No (dB) at QEF						
	Rate 1/2	Rate 2/3	Rate 3/4	Rate 5/6	Rate 7/8	Rate 8/9
QPSK	3.9	4.6	4.0	4.6	5.3	
8PSK		6.9		8.9		9.4
16QAM			9.0		10.7	

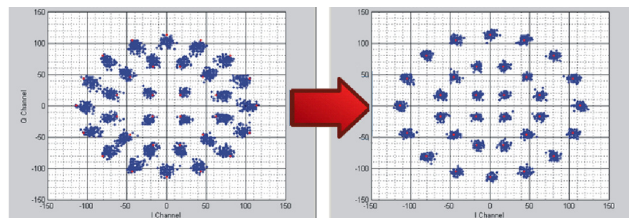
DVB-S2 Performance QEF (PER 10e-7) Normal frames, Pilots off		
	Spectral Efficiency	Eb/No (dB) & Es/No (dB)
QPSK 1/4	0.490243	1.1 (-2.0)
QPSK 1/3	0.656448	0.7 (-1.1)
QPSK 2/5	0.789412	0.7 (-0.3)
QPSK 1/2	0.988858	1.1 (1.1)
QPSK 3/5	1.188304	1.7 (2.4)
QPSK 2/3	1.322253	2.0 (3.2)
QPSK 3/4	1.487473	2.4 (4.1)
QPSK 4/5	1.587196	2.6 (4.6)
QPSK 5/6	1.654663	3.0 (5.2)
QPSK 8/9	1.766451	3.7 (6.2)
QPSK 9/10	1.788612	3.9 (6.4)
8PSK 3/5	1.779991	3.5 (6.0)
8PSK 2/3	1.980636	4.0 (7.0)
8PSK 3/4	2.228124	4.6 (8.1)
8PSK 5/6	2.478562	5.6 (9.5)
8PSK 8/9	2.646012	6.6 (10.8)
8PSK 9/10	2.679207	6.9 (11.2)
16APSK 2/3	2.637201	5.2 (9.4)
16APSK 3/4	2.966728	5.8 (10.5)
16APSK 4/5	3.165623	6.2 (11.2)
16APSK 5/6	3.300184	6.6 (11.8)
16APSK 8/9	3.523143	7.5 (13.0)
16APSK 9/10	3.567342	7.8 (13.3)
32APSK 3/4	3.703295	7.3 (13.0)
32APSK 4/5	3.951571	7.8 (13.8)
32APSK 5/6	4.119540	8.4 (14.5)
32APSK 8/9	4.397854	9.4 (15.8)
32APSK 9/10	4.453027	9.6 (16.1)

DVB-S2X Performance QEF (PER 10e-7) Normal frames, Pilots off		
	Spectral Efficiency	Eb/No (dB) & Es/No (dB)
QPSK 13/45	0.567805	0.5 (-2.0)
QPSK 9/20	0.889135	0.9 (0.4)
QPSK 11/20	1.088581	1.1 (1.5)
8APSK-L 5/9	1.647211	3.1 (5.3)
8APSK-L 26/45	1.713601	3.2 (5.5)
8PSK 23/36	1.896173	3.6 (6.4)
8PSK 25/36	2.062148	4.1 (7.2)
8PSK 13/18	2.145136	4.3 (7.6)
16APSK-L 1/2	1.972253	3.4 (6.3)
16APSK-L 8/15	2.104850	3.5 (6.7)
16APSK-L 5/9	2.193247	3.6 (7.0)
16APSK-L 3/5	2.370043	3.9 (7.6)
16APSK-L 2/3	2.635236	4.4 (8.6)
16APSK 26/45	2.281645	4.2 (7.8)
16APSK 3/5	2.370043	4.4 (8.1)
16APSK 28/45	2.458441	4.2 (8.1)
16APSK 23/36	2.524739	4.6 (8.6)
16APSK 25/36	2.745734	5.2 (9.6)
16APSK 13/18	2.856231	5.4 (10.0)
16APSK 7/9	3.077225	6.0 (10.9)
16APSK 77/90	3.386618	7.0 (12.3)
32APSK-L 2/3	3.289502	6.5 (11.7)
32APSK 32/45	3.510192	6.5 (12.0)
32APSK 11/15	3.620536	6.7 (12.3)
32APSK 7/9	3.841226	7.5 (13.3)
64APSK-L 32/45	4.206428	8.4 (14.6)
64APSK 11/15	4.338659	8.9 (15.3)
64APSK 7/9	4.603122	9.3 (15.9)
64APSK 4/5	4.735354	9.5 (16.3)
64APSK 5/6	4.933701	10.3 (17.2)

DVB-S2 Performance QEF (PER 10e-7) Short frames, Pilots off		
	Spectral Efficiency	Eb/No (dB) & Es/No (dB)
QPSK 1/4	0.365324	2.2 (-2.2)
QPSK 1/3	0.629600	1.3 (-0.7)
QPSK 2/5	0.760928	1.1 (-0.1)
QPSK 1/2	0.848840	1.6 (0.9)
QPSK 3/5	1.156532	2.1 (2.7)
QPSK 2/3	1.288400	2.3 (3.4)
QPSK 3/4	1.420269	2.9 (4.4)
QPSK 4/5	1.508181	3.1 (4.9)
QPSK 5/6	1.596093	3.5 (5.5)
QPSK 8/9	1.727961	4.0 (6.4)
8PSK 3/5	1.725319	4.0 (6.4)
8PSK 2/3	1.922040	4.5 (7.3)
8PSK 3/4	2.118761	5.1 (8.4)
8PSK 5/6	2.381056	6.0 (9.8)
8PSK 8/9	2.577777	7.0 (11.1)
16APSK 2/3	2.548792	5.6 (9.7)
16APSK 3/4	2.809662	6.2 (10.7)
16APSK 4/5	2.983575	6.7 (11.4)
16APSK 5/6	3.157488	7.1 (12.1)
16APSK 8/9	3.418357	8.1 (13.4)
32APSK 3/4	3.493093	8.1 (13.5)
32APSK 4/5	3.709309	8.7 (14.4)
32APSK 5/6	3.925526	9.0 (14.9)
32APSK 8/9	4.249850	10.2 (16.5)

DVB-S2X Performance QEF (PER 10e-7) Short frames, Pilots off		
	Spectral Efficiency	Eb/No (dB) & Es/No (dB)
QPSK 11/45	0.453236	1.4 (-2.0)
QPSK 4/15	0.497192	1.3 (-1.7)
QPSK 14/45	0.585104	1.1 (-1.2)
QPSK 7/15	0.892796	1.4 (0.9)
QPSK 8/15	1.024664	1.7 (1.8)
QPSK 32/45	1.376313	2.6 (4.0)
8PSK 7/15	1.331876	3.1 (4.3)
8PSK 8/15	1.528597	3.4 (5.2)
8PSK 26/45	1.659745	3.8 (6.0)
8PSK 32/45	2.053188	4.8 (7.9)
16APSK 7/15	1.766184	4.0 (6.5)
16APSK 8/15	2.027053	4.4 (7.5)
16APSK 26/45	2.200966	4.8 (8.2)
16APSK 3/5	2.287923	5.0 (8.6)
16APSK 32/45	2.722705	5.8 (10.2)
32APSK 2/3	3.168769	6.8 (11.8)
32APSK 32/45	3.384985	7.3 (12.6)

FastLink™ Performance at BER 5E-8 (Note: * denotes BER of 5E-12)				
	FEC Rate	Low BER Eb/No & Es/No	Balanced Eb/No & Es/No	Low Latency Eb/No & Es/No
BPSK	0.499	2.1 (-0.9)	2.9 (-0.1)	3.4 (0.4)
(O)QPSK	0.532	2.1 (2.4)	2.6 (2.9)	2.9 (3.2)
(O)QPSK	0.639	2.4 (3.5)	2.8 (3.8)	3.2 (4.3)
(O)QPSK	0.710	2.7 (4.2)	3.2 (4.7)	3.7 (5.2)
(O)QPSK	0.798	3.1 (5.1)	3.9 (6.0)	4.2 (6.2)
8PSK	0.639	5.4* (8.2)	5.9* (8.7)	6.3* (9.1)
8PSK	0.710	5.6* (8.9)	5.5 (8.8)	5.8 (9.1)
8PSK	0.778	5.6 (9.3)	6.1 (9.7)	6.4 (10.1)
8QAM	0.639	4.4 (7.2)	4.8 (7.6)	5.0 (7.8)
8QAM	0.710	5.0 (8.3)	5.3 (8.6)	5.5 (8.8)
8QAM	0.778	5.5 (9.2)	5.9 (9.6)	6.1 (9.8)
16APSK	0.726	7.6* (12.2)	7.5* (12.1)	7.5 (12.1)
16APSK	0.778	7.8* (12.7)	7.1 (12.0)	7.5 (12.4)
16APSK	0.828	7.4 (12.6)	8.1 (13.3)	8.4 (13.6)
16APSK	0.851	7.9 (13.2)	8.3 (13.6)	8.8 (14.1)
16QAM	0.726	7.2* (11.8)	6.6 (11.2)	6.8 (11.4)
16QAM	0.778	6.7 (11.6)	7.1 (12.0)	7.4 (12.3)
16QAM	0.828	7.2 (12.4)	7.7 (12.9)	8.0 (13.2)
16QAM	0.851	7.5 (12.8)	8.0 (13.3)	8.4 (13.7)
32APSK	0.778	9.8* (15.7)	9.6 (15.5)	10.0 (15.9)
32APSK	0.828	9.8 (16.0)	10.6 (16.8)	10.9 (17.1)
32APSK	0.886	10.8 (17.3)	11.4 (17.9)	11.9 (18.4)
32APSK	0.938	12.6 (19.3)	13.2 (19.9)	13.9 (20.6)



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

Option	Description
Provided as standard	<p><b>4.8kbps to 2.048Mbps Closed Network (+ ESC) modem with 4-port Ethernet 10/100/1000 BaseT switch for M&amp;C and traffic;</b> Ethernet bridge, static routing and all features described under Ethernet Standard Features</p> <p><b>L-band operation 950 to 2050MHz;</b> high-stability 10MHz reference</p> <p><b>TPC:</b> BPSK, QPSK, OQPSK, 8PSK, 8QAM and 16QAM; to 60Mbps subject to prevailing modem data rate</p> <p><b>LinkGuard™:</b> Signal-under-carrier interference detection web spectrum graph showing received spectrum and any interference underneath the received carrier while on traffic; automated alarm when interference rises above user-set threshold; supported for all FECs except for 'Low-cost DVB-S2' option</p> <p><b>AUPC:</b> Automatic Uplink Power Control</p> <p><b>Web browser monitoring tools:</b> Spectrum display, constellation monitor, TCP/IP throughput</p> <p><b>Internal Bit Error Rate Tester (BERT):</b> For non-DVB-S2/DVB-S2X operation only</p> <p><b>TCP/IP Packet Generator/Analyser:</b> Generates and analyses TCP &amp; UDP packet streams, allowing modem-to-modem IP testing without any other equipment</p> <p><b>IEEE 1588 V2 Precision Time Protocol and Network Time Protocol</b></p> <p><i>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</i></p>
Tx-only	Transmit functions only
Rx-only	Receive functions only
Data Rate	<p><b>5Mbps data rate:</b> Extends base operation to 5Mbps</p> <p><b>10Mbps data rate:</b> Extends 5Mbps operation to 10Mbps</p> <p><b>25Mbps data rate:</b> Extends 10Mbps operation to 25Mbps</p> <p><b>60Mbps data rate:</b> Extends 25Mbps operation to 60Mbps</p> <p><b>100Mbps data rate:</b> Extends 60Mbps operation to 100Mbps (FastLink™, DVB-S2 &amp; DVB-S2X only)</p> <p><b>200Mbps data rate:</b> Extends 100Mbps operation to 200Mbps (DVB-S2 &amp; DVB-S2X only)</p>
XStream IP™	<p><b>Traffic Shaping:</b> Supports CIR/BIR/priority settings for IP streams classified by IP address, Diffserv class, IEEE 802.1p priority tag, MPLS EXP field, VLAN ID and MPEG2 transport stream PID</p> <p><b>Header Compression:</b> IP/UDP/TCP/RTP packet header compression (RFC 3095) plus Ethernet header compression</p> <p><b>Payload Compression:</b> TCP/UDP packet payload compression using the Deflate algorithm (RFC 1951)</p> <p><b>Dynamic Routing:</b> RIP, OSPF and BGP</p> <p><b>TCP Acceleration:</b> Up to 10,000 concurrent accelerated TCP connections to 100Mbps subject to prevailing data rate</p> <p><b>HTTP Acceleration:</b> Speeds up download of web pages to web browsers; includes DNS caching; <i>requires TCP acceleration to be on and the modem to be in routing mode</i></p> <p><b>AES-256 Encryption:</b> <i>Please note that AES-256 Encryption (TCP/IP packet payload encryption using AES with 256-bit keys) is supported on the Q-LiteE™ model only. The Q-LiteE™ is identical to the standard Q-Lite™ in every other respect</i></p>
XStream IP™ DVB-S2 <i>Provided as standard as part of DVB-S2 &amp; DVB-S2X options</i>	<p><b>IP-over-DVB Encapsulation:</b> Encapsulation of IP packets and Ethernet frames over DVB-S2/S2X using Paradise XStream™ Protocol (PXE), MPE or ULE</p> <p><b>ACM:</b> DVB-S2/DVB-S2X ACM (dynamic adjustment of outbound modcod to maximize data rate)</p> <p><b>VCM:</b> Allows either two ASI streams, or one ASI stream and one IP stream, to be multiplexed onto a single carrier; requires Quad ASI hardware option</p>
XStream IP™ DVB-S2 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
DVB-S2X <i>To 200Mbps subject to prevailing modem data rate limits</i>	<p><b>DVB-S2/S2X CCM Tx:</b> DVB-S2 QPSK, 8PSK, 16APSK &amp; 32APSK Tx operation per EN 302 307-1. DVB-S2X QPSK, 8PSK, 8APSK, 16APSK, 32APSK &amp; 64APSK Tx operation per EN 302 307-2. Includes 5%, 10%, 15%, 20%, 25% &amp; 35% spectral roll-offs. Includes XStream IP™ DVB-S2, which comprises ACM, VCM and IP-over-DVB encapsulation</p> <p><b>DVB-S2/S2X CCM Rx:</b> Add-on card (P3609) supporting DVB-S2 QPSK, 8PSK, 16APSK &amp; 32APSK Rx operation per EN 302 307-1. DVB-S2X QPSK, 8PSK, 8APSK, 16APSK, 32APSK &amp; 64APSK Rx operation per EN 302 307-2. Includes 5%, 10%, 15%, 20%, 25% &amp; 35% spectral roll-offs. Includes XStream IP™ DVB-S2, which comprises ACM, VCM and IP-over-DVB decapsulation</p>
Low-cost DVB-S2 Option <i>DVB-S2 to 132Mbps subject to modem data rate limits</i>	<p><b>DVB-S2 CCM Tx:</b> DVB-S2 QPSK, 8PSK &amp; 16APSK Tx operation per EN 302 307-1. Includes 15%, 20%, 25% &amp; 35% spectral roll-offs. Includes XStream IP™ DVB-S2, which comprises ACM, VCM and IP-over-DVB encapsulation</p> <p><b>DVB-S2 CCM Rx:</b> Add-on card (P3604) supporting DVB-S2 QPSK, 8PSK &amp; 16APSK Rx operation per EN 302 307-1. Includes 15%, 20%, 25% &amp; 35% spectral roll-offs. Includes XStream IP™ DVB-S2, which comprises ACM, VCM and IP-over-DVB decapsulation. <i>Please note that this add-on card is physically different to the DVB-S2X add-on card!</i></p>
DVB-S2X Low-latency Mode <i>Proprietary extension to DVB-S2X</i>	<p><b>Very Short Frame:</b> Frame size of 5,400 bits, reducing latency to 33% of standard DVB-S2 Short frame; supports QPSK/8PSK/16APSK</p> <p><b>Ultra Short Frame:</b> Frame size of 3,240 bits, reducing latency to 20% of standard DVB-S2 Short frame; supports QPSK/8PSK/16APSK/32APSK/64APSK</p>

**Configuration options continue on next page.**

	Option	Description	Fully configurable - pay only for what you need!
<b>DVB-S2X Advanced Modulation</b>		128APSK, 256APSK, 256APSK-L <i>Note: available as a modulator option only</i>	
<b>FastLink™</b> Low-latency LDPC		Add-on card (P3605); includes BPSK, QPSK, OQPSK, 8PSK, 8QAM, 16APSK, 16QAM, 32APSK & 64QAM; to 100Mbps subject to prevailing modem data rate limits; includes 20%, 25% & 35% spectral roll-offs as standard	
<b>Paired Carrier™</b>  <i>Subject to prevailing modem data rate limits.</i>  <i>Occupied bandwidth: minimum 30kHz; maximum 54MHz</i>  <i>Note that Paired Carrier™ is also available as a low-cost 90-day per annum license for redundancy system standby modems - please contact Sales for details</i>		<b>Paired Carrier™ add-on card</b> P3607 (requires one or more options below)	
		Paired Carrier™ up to <b>256kbps</b> (requires Paired Carrier™ add-on card)	
		Extends Paired Carrier™ up to <b>512kbps</b>	
		Extends Paired Carrier™ up to <b>1.024Mbps</b>	
		Extends Paired Carrier™ up to <b>2.5Mbps</b>	
		Extends Paired Carrier™ up to <b>5Mbps</b>	
		Extends Paired Carrier™ up to <b>10Mbps</b>	
		Extends Paired Carrier™ up to <b>15Mbps</b>	
		Extends Paired Carrier™ up to <b>20Mbps</b>	
		Extends Paired Carrier™ up to <b>25Mbps</b>	
		Extends Paired Carrier™ up to <b>30Mbps</b>	
		Extends Paired Carrier™ up to <b>40Mbps</b>	
		Extends Paired Carrier™ up to <b>50Mbps</b>	
		Extends Paired Carrier™ up to <b>60Mbps</b>	
		Extends Paired Carrier™ up to <b>80Mbps</b>	
	Extends Paired Carrier™ up to <b>100Mbps</b>		
	Extends Paired Carrier™ up to <b>200Mbps</b>		
<b>Terrestrial Interfaces</b> <i>(Please choose one option)</i>		<b>EIA-530:</b> D25 DCE supporting RS422/X.21/V.35/RS232	
		<b>Quad ASI:</b> 4xBNC 75Ω sockets; includes DVB-S/DSNG FEC (which can also be used with the IP terrestrial interface)	
<b>Utilities Card</b>		Add-on card size: 168mm x 104mm 9-way D type for 1:1 and 1:N, compatible with PDQS Standalone Redundancy Switch 15-way D type for alarms and AGC USB connector for software upgrades, etc. BNC connector for Station Clock Also connectors for alarm relays, transmit inhibit function, additional fan, Async ESC channel, AGC output for antenna pointing, FSK signalling	
<b>Optimised Spectral Roll-off</b>		Extends the standard FastLink™, TPC & DVB-S/DSNG 35%, 25% and 20% roll-off factors to include 5%, 10% and 15% roll-offs	
<b>ClearLinQ™</b>		<b>Adaptive Tx Predistorter:</b> Corrects for linear & non-linear distortion in the RF chain (amplifier & transponder). Applicable to all FECs and modulations including DVB-S2/S2X, FastLink™ & TPC	
<b>DVB-CID</b>		<b>DVB Carrier ID:</b> Tx carrier identification per ETSI 103 129	
<b>Keypad/LCD Display</b>		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 and support the membrane when it is fitted	
<b>Fan</b>		Paradise standard modem fan: 20mm; 12V; 2.5W; 12.0 CFM; 65000 hour lifetime; connects to Q-Lite™ card; a second fan requires the Utilities card to be fitted	
<b>Conformal Coating</b>		Seals the PCB using a protective polymer coating that shields the electronics from moisture, salt and chemicals when operated in harsh environments	

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