TELEDYNE PARADISE DATACOM
Everywhereyoulook™

DVB S2X

Q-Lite™ Rugged
Outdoor Satellite Modem

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).

Advanced Bandwidth-Efficient Features

Paired Carrier+™ overlays transmit and receive carriers, reducing the required satellite bandwidth by 50%.

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 including TCP & HTTP acceleration, header & payload compression, traffic shaping, encryption & ACM
- DVB-S2/S2X, **FastLink™** LDPC & TPC
- VLAN/MPLS/Layer 2/Layer 3 support
- -40ºC to +85ºC operation
- AC, 12V & 24V DC input 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™** & **Q-MultiFlex™**
- Standard and custom mounting options

Teledyne Paradise Datacom
328 Innovation Blvd., Suite 100
State College, PA 16803 USA
Tel: +1 814 238 3450

Teledyne Paradise Datacom
2&3 The Matchyns, Rivenhall End, Witham
Essex, CM8 3HA United Kingdom
Tel: +44 1376 51563

www.paradisedata.com

215828 Issued 1 August 2018

Q-Lite™ Rugged

Outdoor Satellite Modem

TELEDYNE PARADISE DATACOM
Everywhereyoulook™

Main Specifications

Frequency	950 to 2450MHz (resolution 100Hz) (TNC connector)
Data Rate	**Standard:** 2,048kbps **Options:** 5Mbps, 10Mbps, 25Mbps, 60Mbps, 100Mbps, 200Mbps & 345Mbps
Data Rate Limits	**DVB-S2/S2X:** 50kbps to 345Mbps **DVB-S/DSNG:** 100kbps to 50Mbps **FastLink™ LDPC:** 18kbps to 100Mbps **TPC:** 2.4kbps to 60Mbps **DVB-S/DSNG:** 100kbps to 50Mbps 1bps resolution
Symbol Rate Limits	**DVB-S2/S2X:** 100ksps to 70Msps **FastDVB-S/DSNG:** 100ksps to 40Msps **Link™ 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) **DVB-S/DSNG** (EN 300 421 & EN 301 210) **Closed Network (+ ESC)** (IESS-315) **DVB-S/DSNG** (EN 300 421 & EN 301 210)
Impedance	50Ω
Return Loss	>15dB

Traffic Interfaces

Four Gigabit Ethernet ports (RJ45 connectors; used for IP traffic and M&C)

Modulator

Output Power	+5 to –40dBm (950 to 1950MHz) 0 to –40dBm (1950 to 2150MHz) 0 to –30dBm (2150 to 2450MHz) (0.1dB steps)
Output Power Stability/Accuracy	**Stability:** ±1.0dB, 0ºC to 50ºC **Accuracy:** ±0.375dBm
Transmit Filter Roll-off	5%, 10%, 15%, 20%, 25%, 35%
Phase Accuracy	±2º 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	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 ± 2dBm

Demodulator

Input Range (dBm)	**Minimum:** -140 + 10 log (symbol rate) **Maximum:** -68 + 10 log (symbol rate)
Maximum Composite	+10dBm
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 Filter Roll-off	5%, 10%, 15%, 20%, 25%, 35%
LNB 10MHz Reference	Via IFL cable; 10MHz ± 0.01 ppm; 2dBm ± 2dBm
LNB Voltage	Selectable 13V, 15V, 18V, 20V 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-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

Paired Carrier+™ Option

Paired Carrier+™ *(25kHz to 72MHz 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, 200Mbps & 345Mbps traffic rate
Carrier Asymmetry	**Power:** -10dB to +10dB **Symbol rate:** Up to 10:1
Eb/No Degradation	Typically less than 0.1dB
Delay Range	0 to 330ms

Test Facilities and 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	400mm x 214mm x 90mm
Weight	2.5kg (excluding external power unit)
Power Supply	**Options:** Outdoor PSU (mains to 24V DC) 12V DC input option (Modem consumes ~30 Watts)
Compliances	FCC, CE and RoHS compliant
Safety Standards	EN60950-1:2006
Emissions & Immunity	**Emissions:** EN55022:2010 Class B **Immunity:** EN55024:2010
Operating & Storage Temperature	**Storage:** -40ºC to 85ºC **Operation:** -40ºC to 85ºC
Weather-proofing	Sealed enclosure rated to IP65
Conformal Coating	Available as an option for Q-Lite modem card; uses HumiSeal® 1B31 coating

Rear of outdoor modem showing weatherproof connectors (4 x Ethernet, Tx, Rx and DC input). A mounting bracket allows the modem to be secured in place. Several mounting options are available and can be customised to suit individual requirements.

215828 Issued 1 August 2018

Q-Lite™ Rugged

Outdoor Satellite Modem

TELEDYNE PARADISE DATACOM
Everywhereyoulook™

Ethernet: Standard Features

Bridging and Static Routing	**Trunking mode:** Hardware Layer 2 switch supporting 345Mbps bi-directional traffic at up to 700,000 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 whitepaper 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
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 (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™ 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 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	*Supported on **Q-LiteE™** model only. The Q-LiteE™ is identical to the Q-Lite™ in every other respect*

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
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

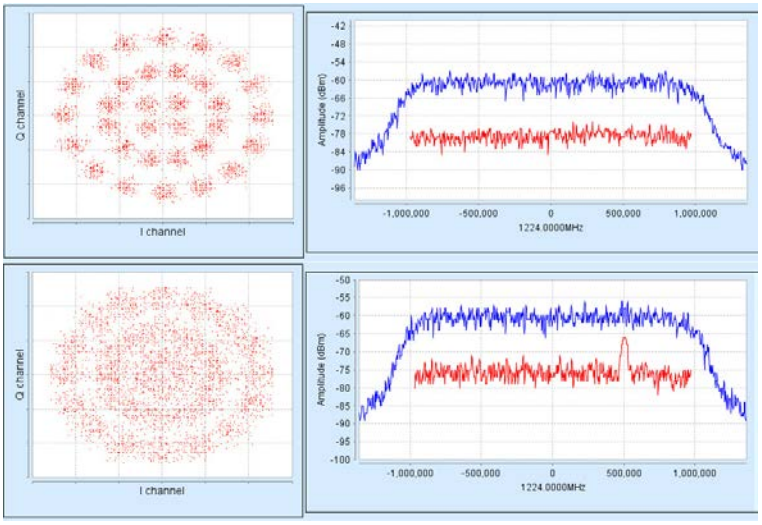
Network Control

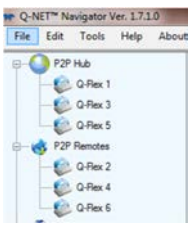
Web browser user interface support is provided as standard. SNMP and command line interfaces support the development of third-party user interfaces. In addition, the following network control application options are available

Q-NET™ Navigator	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

LINKGUARD

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





Network Control: Q-NET™ Navigator

Q-NET™ Navigator *supports monitor and control of all Paradise modems 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.*

215828 Issued 1 August 2018

Q-Lite™ Rugged
Outdoor Satellite Modem

TELEDYNE PARADISE DATACOM
Everywhereyoulook™

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-S2X Advanced Modulation	**Normal Frame:** **128APSK** 3/4, 7/9 **256APSK** 32/45, 3/4 **256APSK-L** 29/45, 2/3, 31/45, 11/15
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)

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	0.629060	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)

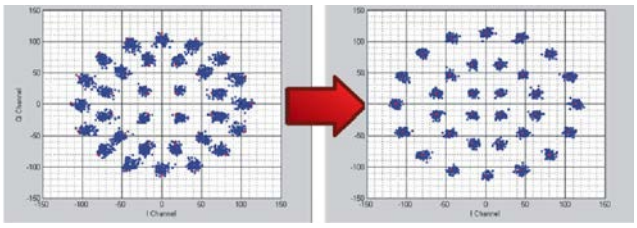
	FEC Rate	Spectral Efficiency	Low BER Eb/No & Es/No	Balanced Eb/No & Es/No	Low Latency Eb/No & Es/No
BPSK	0.499	0.499	2.1 (-0.9)	2.9 (-0.1)	3.4 (0.4)
(O)QPSK	0.532	1.064	2.1 (2.4)	2.6 (2.9)	2.9 (3.2)
(O)QPSK	0.639	1.278	2.4 (3.5)	2.8 (3.8)	3.2 (4.3)
(O)QPSK	0.710	1.42	2.7 (4.2)	3.2 (4.7)	3.7 (5.2)
(O)QPSK	0.798	1.596	3.1 (5.1)	3.9 (6.0)	4.2 (6.2)
8PSK	0.639	1.917	5.4* (8.2)	5.9* (8.7)	6.3* (9.1)
8PSK	0.710	2.13	5.6* (8.9)	5.5 (8.8)	5.8 (9.1)
8PSK	0.778	2.334	5.6 (9.3)	6.1 (9.7)	6.4 (10.1)
8QAM	0.639	1.917	4.4 (7.2)	4.8 (7.6)	5.0 (7.8)
8QAM	0.710	2.13	5.0 (8.3)	5.3 (8.6)	5.5 (8.8)
8QAM	0.778	2.334	5.5 (9.2)	5.9 (9.6)	6.1 (9.8)
16APSK	0.726	2.904	7.6* (12.2)	7.5* (12.1)	7.5 (12.1)
16APSK	0.778	3.112	7.8* (12.7)	7.1 (12.0)	7.5 (12.4)
16APSK	0.828	3.312	7.4 (12.6)	8.1 (13.3)	8.4 (13.6)
16APSK	0.851	3.404	7.9 (13.2)	8.3 (13.6)	8.8 (14.1)
16QAM	0.726	2.904	7.2* (11.8)	6.6 (11.2)	6.8 (11.4)
16QAM	0.778	3.112	6.7 (11.6)	7.1 (12.0)	7.4 (12.3)
16QAM	0.828	3.312	7.2 (12.4)	7.7 (12.9)	8.0 (13.2)
16QAM	0.851	3.404	7.5 (12.8)	8.0 (13.3)	8.4 (13.7)
32APSK	0.778	3.89	9.8* (15.7)	9.6 (15.5)	10.0 (15.9)
32APSK	0.828	4.14	9.8 (16.0)	10.6 (16.8)	10.9 (17.1)
32APSK	0.886	4.43	10.8 (17.3)	11.4 (17.9)	11.9 (18.4)
32APSK	0.938	4.69	12.6 (19.3)	13.2 (19.9)	13.9 (20.6)

PER v BER

Note: A PER of 10e-7 is equivalent to a BER of 6.6 x 10e-11.

Interference Mitigation: ClearLinQ™

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



215828 Issued 1 August 2018

	Option	Description **Fully configurable - pay only for what you need!**
Provided as standard	✓	**Q-Lite modem in sealed, weatherproof chassis rated to IP65** **2.4kbps to 2.048Mbps Closed Network Tx/Rx modem with 4 Gigabit Ethernet ports for M&C and traffic** **All features described under Ethernet Standard Features** **L-band operation 950 to 2450MHz**; 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***
Tx-only		Transmit functions only
Rx-only		Receive functions only
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™		**Traffic Shaping:** 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
		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 10,000 concurrent accelerated TCP connections to 100Mbps subject to prevailing data rate
		HTTP Acceleration: Speeds up download of web pages to web browsers; includes DNS caching; *requires TCP acceleration to be on and the modem to be in routing mode*
		***AES-256 Encryption:** 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*
XStream IP™ DVB-S2X *Provided as standard as part of DVB-S2/S2X option*		**IP-over-DVB Encapsulation:** Encapsulation of IP packets and Ethernet frames over DVB-S2/S2X using GSE, Paradise XStream™ Protocol (PXE), MPE or ULE
		ACM: DVB-S2/S2X ACM (dynamic adjustment of outbound modcod to maximize 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 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 and IP-over-DVB decapsulation

Configuration options continue on next page

Q-Lite™ Rugged

Outdoor Satellite Modem

TELEDYNE PARADISE DATACOM
Everywhereyoulook™

	Option	Description **Fully configurable - pay only for what you need!**
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 20%, 25% & 35% spectral roll-offs as standard
Paired Carrier+™ *Subject to prevailing modem data rate limits.* *Occupied bandwidth: minimum 25kHz; maximum 72MHz* Paired Carrier+™ *is also available as a low-cost 180-day license for light users (the license counts down only when* Paired Carrier+™ *is being actively used) - please contact Sales 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 FastLink™, TPC & DVB-S/DSNG 35%, 25% and 20% roll-off factors to include 5%, 10% and 15% roll-offs
ClearLinQ™		**Adaptive Tx Predistorter:** Corrects for linear & non-linear distortion in the RF chain (amplifier & transponder). Applicable to all FECs and modulations including DVB-S2/S2X, FastLink™ & TPC
DVB-CID		**DVB Carrier ID:** Tx carrier identification per ETSI 103 129
Conformal Coating		Seals the modem card using a protective polymer coating that shields the electronics from moisture, salt and chemicals when operated in harsh environments
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