

OVERVIEW

The **QFlex-400™** software-defined satellite modem, a variant of our flagship **Q-Flex™**, is our highest data rate IP modem. Compared to the standard **Q-Flex™**, it supports much higher data rates, an extended frequency range, better RF performance, improved carrier cancellation, more headroom for future upgrades and lower power consumption.

It is ideal as a versatile point-to-point network modem or a remote modem in a point-to-multipoint network. It is fully compatible with our **Q-NET™** satellite network solution and is a drop-in replacement for the **Q-Flex™** and **Q-Lite™**.

Advanced Bandwidth-Efficient Features

The **QFlex-400™** 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 recently enhanced carrier overlap technology (where transmit and receive carriers occupy the same space segment) with significantly increased suppression of the unwanted signal (reducing self-interference).

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

FEATURES

- ▶ IF/L-band (suitable for C/Ku/Ka-band etc.)
- ▶ Direct S-band operation to 2450MHz
- ▶ Data rates to 345Mbps bidirectional
- ▶ Low power consumption, typically 30W
- ▶ **XStream IP™** advanced IP optimization suite, including TCP & HTTP acceleration, header & payload compression, traffic shaping, encryption & ACM
- ▶ DVB-S2/S2X & **FastLink™** LDPC
- ▶ Optimized spectral roll-offs, including 5%
- ▶ **Paired Carrier+™** enhanced carrier overlay
- ▶ **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
- ▶ Interoperates fully with **Q-Flex™** & **Q-Lite™**

Markets and Applications

- ▶ IP trunking & IP/cellular backhaul
- ▶ Fiber backup restoral services
- ▶ Corporate & government networks
- ▶ Maritime, oil & gas communications
- ▶ Broadcast (H.264/H.265, HD, Ultra HD, etc.)
- ▶ Universal service obligation networks
- ▶ Disaster recovery
- ▶ Hub modem for Q-Lite VSAT terminals

<http://www.SatelliteDish.com> 954-941-8883

Main Specifications	
Frequency	L-band: 950 to 2450MHz (covering lower S-band also) (resolution 1Hz) IF: 50 to 180MHz (resolution 100Hz) N-type connectors for Tx & Rx
Data Rate	Standard: 2,048kbps Options: 5Mbps, 10Mbps, 25Mbps, 60Mbps, 100Mbps, 200Mbps and 345Mbps
Data Rate Limits	DVB-S2/S2X: 50kbps to 345Mbps FastLink™ LDPC: 18kbps to 100Mbps 1bps resolution
Symbol Rate Limits	DVB-S2/S2X: 100ksps to 70Msps FastLink™ LDPC: 18ksps to 40Msps
Operating Modes	DVB-S2/S2X (EN 302 307-1 & EN 302 307-2) Closed Network (+ ESC) (IESS-315)
Impedance	50Ω
Return Loss	L-band: >15dB; IF: >18dB
Redundancy	1:1 through 1:16 redundancy

Traffic Interfaces	
Standard: 4-port Gigabit Ethernet switch (RJ45 connectors; used for IP traffic and M&C)	
Options: Optical Gigabit Ethernet/OC-3 (Small Form-Factor pluggable module supporting all common optical standards)	

Modulator	
Output Power	IF: 0 to -25dBm (0.1dB steps) L-band: +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, 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 ± 2dBm
FSK Control	Allows monitor & control of a compatible L-band BUC from the modem via the Tx IFL cable (requires Utilities Card)

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 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 Spectral Roll-off	5%, 10%, 15%, 20%, 25%, 35%
LNB 10MHz Reference	Via IFL cable; 10MHz ± 0.01ppm; 2dBm ± 2dBm
LNB Voltage	Programmable 13V, 15V, 18V, 20V or 24V DC to LNB via IFL cable; maximum 0.75A

ClearInQ™ 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	

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

Paired Carrier+™ Option	
Paired Carrier+™ (30kHz 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 and 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
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	
Built-in Test Tools	As part of built-in web server: Rx constellation monitor; Rx spectrum analyser; LinkGuard™ Signal-Under-Carrier interference detection; 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 (requires Utilities Card)

Mechanical/Environmental	
Size	1U chassis, 285mm deep excluding front panel handles and rear panel connectors and fans
Weight	3kg
Power Supply	90 to 264VAC, 1A @100V, 0.5A @ 240V, 47 to 63Hz Fused IEC connector (live and neutral fused); 24V and 48V DC options
Compliances	FCC, CE and RoHS compliant
Safety Standards	EN60950-1:2006
Emissions & Immunity	Emissions: EN55022:2010 Class B Immunity: EN55024:2010
Operating Temperature	Standard: 0 to 50°C (storage: -40°C to 70°C)
Humidity	95% relative humidity, non-condensing



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
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	Support for the Open Antenna Modem Interface Protocol (OpenAMIP) protocol, facilitating the exchange of data with compliant antenna control units (ACUs). Supports antenna deployment/pointing/tracking
Packet Generator/Analyser	Generates & analyses TCP & UDP packet streams, allowing modem-to-modem IP testing without any PCs
Ethernet MTU Size	Standard: 10k bytes Optical Ethernet: 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 & 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	Supported on Q-FlexE™ model only. See separate Q-FlexE™ datasheet

Ethernet: XStream IP™ DVB-S2X

<i>Provided as standard as part of DVB-S2/S2X</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
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 (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

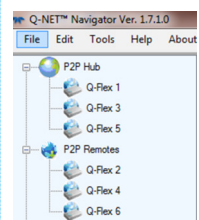
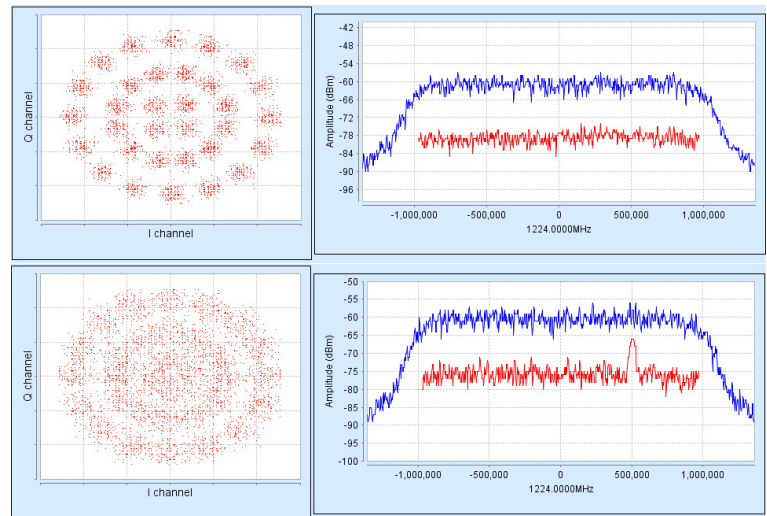
Network Control

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
Q-NET™ Bandwidth Manager	Provides multi-satellite/transponder carrier planning and high-level system control, monitoring, recording and quality-of-service reporting

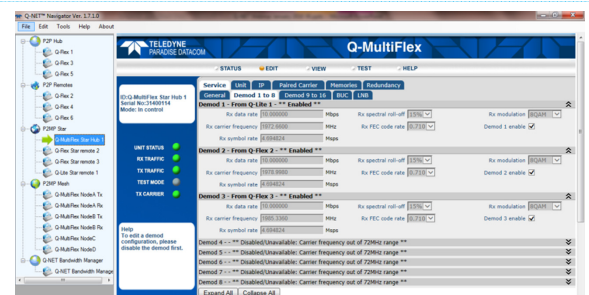


*Built-in Spectrum Analyser showing **LinkGuard™** Signal-Under-Carrier interference detection without/with interferer present.*



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.



Forward Error Correction

DVB-S2X (EN 302 307-2)	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

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 3/18	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	0.929796	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)

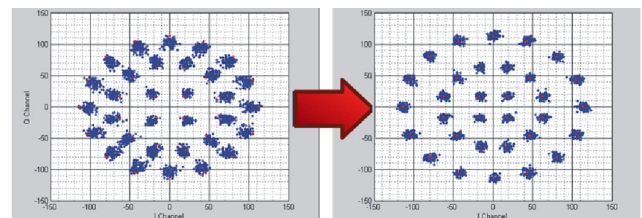
	FEC Rate	Low BER Eb/No & Es/No	Balanced Eb/No & Es/No	Low Latency Eb/No & Es/No
BPSK	0.499	2.1 (-0.9)	2.9 (-0.1)	3.4 (0.4)
(O)QPSK	0.532	2.1 (2.4)	2.6 (2.9)	2.9 (3.2)
(O)QPSK	0.639	2.4 (3.5)	2.8 (3.8)	3.2 (4.3)
(O)QPSK	0.710	2.7 (4.2)	3.2 (4.7)	3.7 (5.2)
(O)QPSK	0.798	3.1 (5.1)	3.9 (6.0)	4.2 (6.2)
8PSK	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)

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 Pre-distorter compensating for severe non-linear signal distortion to a 32APSK carrier.



	Option	Description
Fully configurable - pay only for what you need!		
Base Modem	✓	2.4kbps to 2.048Mbps Tx/Rx Closed Network (+ ESC) modem with 4-port Gigabit Ethernet switch for M&C and traffic; all features described under Ethernet Standard Features Front-panel keypad and display IF operation 50 to 180MHz L-band operation 950 to 2450MHz; high-stability 10MHz reference DVB Carrier ID: Tx carrier identification per ETSI 103 129 LinkGuard™: Signal-under-carrier interference detection web spectrum graph AUPC: Automatic Uplink Power Control Web browser monitoring tools: Spectrum display, constellation monitor, TCP/IP throughput Internal Bit Error Rate Tester (BERT): For non-DVB-S2/DVB-S2X operation only
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
		200Mbps data rate: Extends 100Mbps operation to 200Mbps
		345Mbps data rate: Extends 200Mbps operation to 345Mbps
XStream IP™		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 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; <i>requires TCP acceleration to be on and the modem to be in routing mode</i>
XStream IP™ DVB-S2X <i>Provided as standard as part of DVB-S2/S2X option</i>		IP-over-DVB Encapsulation: Encapsulation of IP packets and Ethernet frames over DVB-S2 using GSE, Paradise XStream Protocol (PXE), MPE or ULE
		ACM: DVB-S2/DVB-S2X ACM (dynamic adjustment of outbound modcod to maximize data rate)
DVB-S2X <i>To 345Mbps subject to prevailing modem data rate limits</i>		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
DVB-S2X Advanced Modulation		128APSK, 256APSK, 256APSK-L
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

QFlex-400™

IP Satellite Modem

	Option	Description	Fully configurable - pay only for what you need!
Paired Carrier+™ <i>Subject to prevailing modem data rate limits.</i> <i>Occupied bandwidth: minimum 30kHz; maximum 72MHz</i> Paired Carrier+™ is also available as a low-cost 90-day per annum license for redundancy system standby modems - 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	
Terrestrial Interfaces		Optical Gigabit Ethernet/OC-3: Small Form-factor Pluggable module; supports single-mode & multi-mode fibre & all wavelengths; supports all standard fibre connector types such as SC & LC (subject to provision of suitable mating socket for SFP cage)	
Utilities Card		Add-on card with: 9-way D type for 1:1 and 1:N redundancy (compatible with Q-NET PDQS Redundancy Switch) 15-way D type for alarms (4 independent Form C relays for unit, Tx, Rx and deferred alarms), Tx Inhibit signal and scalable DC voltage output for antenna pointing USB connector (alternative method for software upgrades, loading configurations, etc.) Second fan for environments where extra cooling is required FSK signalling	
ClearLinQ™		Adaptive Tx Predistorter: Corrects for linear & non-linear distortion in the RF chain (amplifier & transponder). Applicable to all FECs and modulations	
DC Input		24V DC: K3023 24V DC primary power input (in place of 100 to 240V AC input)	
		48V DC: K3018 48V DC primary power input (in place of 100 to 240V AC input)	
BUC PSU		AC In & 24V Out: P3543 AC input, 24V 200W DC to Tx BUC	
		AC In & 48V Out: P3544 AC input, 48V 200W DC to Tx BUC	
		48V In & 24V Out: P3545 Floating 48V DC input; +24V 200W DC to Tx BUC	
		48V In & 48V Out: P3546 Floating 48V DC input; +48V 200W DC to Tx BUC	
		+48V In & 48V Out: P3547 +48V DC input; +48V 200W DC to Tx BUC	