# QMultiFlex-400™

## Point to Multipoint Hub
## IP Modulator / Multi-demodulator

**TELEDYNE PARADISE DATACOM**
Everywhere**you**look™

**DVBS2X**

**STEP ELECTRONICS**
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UNIT STATUS
RX TRAFFIC
TX TRAFFIC
TEST MODE
TX CARRIER

QMultiFlex-400

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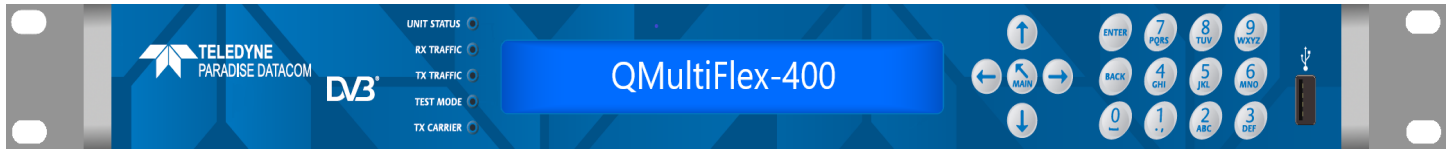
## OVERVIEW

The **QMultiFlex-400™** offers an affordable solution for point-to-multipoint satellite IP. The Hub supports a highly-efficient **DVB-S2/X** shared outbound along with up to 16 **DVB-S2/X** returns.

In addition, the **QMultiFlex-400™** supports an embedded Hub Canceller utilising the powerful DVB-S2 and DVB-S2X waveforms, allowing satellite carriers in a point-to-multipoint system to operate in the same satellite bandwidth, providing satellite BW savings of up to 50%.

Receive-only **QMultiFlex-400™** units can be cascaded to a transmit **QMultiFlex-400™** in order to share an outbound carrier between up to 128 remote sites.

*The **QMultiFlex-400™** is unique in the industry in allowing a rack of hub equipment, including all standard test and network equipment, to be replaced at a fraction of the price by a single box.*

## Advanced Bandwidth-Efficient Features

The **QMultiFlex-400™** supports the most powerful bandwidth-saving technology available, including an embedded **Hub canceller**.

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

IP features including VCM, ACM matched to a full suite of traffic shaping options.

## FEATURES

- ▶ Star, Mesh & hybrid point-to-multipoint IP
- ▶ Modulator with up to 16 demodulators
- ▶ **Embedded Hub Canceller**
- ▶ DVB-S2X outbound/inbounds
- ▶ Data rates to 345Mbps outbound & 338Mbps composite inbound across all enabled demodulators.
- ▶ **XStream IP™** advanced IP optimization suite including, TCP acceleration, traffic shaping & VCM/ACM
- ▶ **Q-NET™ Navigator** network control app
- ▶ Virtual Network Operator (VNO) support
- ▶ Layer 2 (including VLAN) & Layer 3 support
- ▶ Optimized spectral roll-offs, down to 5%
- ▶ Built-in spectrum and constellation monitors
- ▶ Supports low-cost **Q-Lite, QFlex, QFlex-400 & QFlex-400 P2MP** remote modems
- ▶ Optional redundancy protection
- ▶ Software Defined Network support: vendor-independent network device control using

## Markets and Applications

- ▶ IP trunking/backhaul & cellular backhaul
- ▶ Corporate/enterprise networking
- ▶ Government universal service obligation networks
- ▶ Broadcast
- ▶ Maritime, oil & gas communications
- ▶ Comms-on-the-move (COTM) networks

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## Common Specifications

| | |
|---|---|
| Frequency | **L-band:** 950 to 2450MHz (resolution 100Hz) **IF:** 50 to 180MHz (resolution 100Hz) N-type connectors for Tx & Rx |
| Traffic Interface | **4-port Gigabit Ethernet switch** (RJ45 connectors; used for IP traffic and M&C) |
| Network Topologies | Supports star, mesh and hybrid networks |
| Impedance | 50Ω |
| Return Loss | **L-band:** >15dB; **IF:** >18dB |
| Redundancy | 1:1 through 1:16 redundancy |

## Demodulator Specification

| | |
|---|---|
| Demodulators | **Options:** 4, 8, 12 or 16 (total) (14 Demods with Hub canceller enabled) |
| Operating Bandwidth | All inbound carriers must be within a bandwidth of 72MHz |
| Waveform | **Options:** DVB-S2/S2X (EN 302 307-1 & 2) |
| Data Rate | **Each DVB-S2X inbound:** 50kbps to 197Mbps **Total for all inbounds combined:** Up to 338Mbps 1bps resolution |
| Symbol Rate | **Each DVB-S2X inbound:** 100ksps to 40Msps **Total for all inbounds combined:** Up to 68Msps 1sps resolution |
| Input Range (dBm) | **L-band minimum:** -140 + 10 log (symbol rate) **IF minimum:** -130 + 10 log (symbol rate) **IF/L-band maximum:** -68 + 10 log (symbol rate) |
| Maximum Composite | +10dBm |
| Wanted-to-Composite | -102 + 10 log (symbol rate) |
| Receive Spectral Roll-off | **DVB-S2/S2X** 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 0.75A |

## Modulator Specification

| | |
|---|---|
| Operating Modes | **DVB-S2** (EN 302 307-1) & **DVB-S2X** (EN 302 307-2) |
| Data Rate (1bps resolution) | **DVB-S2/S2X:** 50kbps to 345Mbps |
| Symbol Rate (1sps resolution) | **DVB-S2/S2X:** 100ksps to 70Msps |
| Output Power (0.1dB resolution) | **L-band:** +5 to –40dBm (950 to 1950MHz) 0 to –40dBm (1950 to 2150MHz) 0 to –30dBm (2150 to 2450MHz) **IF:** 0 to –25dBm (0.1dB steps) (0.1dB steps) |
| Output Power Stability/Accuracy | **Stability:** ±1.0dB, 0ºC to 50ºC **Accuracy:** ±0.375dBm |
| Transmit Spectral Roll-off | **DVB-S2/S2X** 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, IESS-308 & IESS-316 |
| Harmonics & Spurious | Better than –55dBc/ 4kHz in-band (at 0dBm to –30dBm output) |
| Transmit On/Off Ratio | -65dBc 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 |

## Embedded Hub Canceller

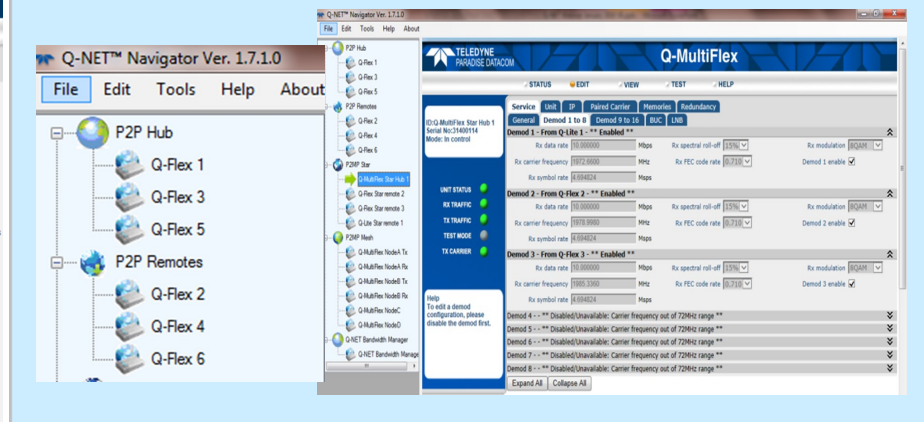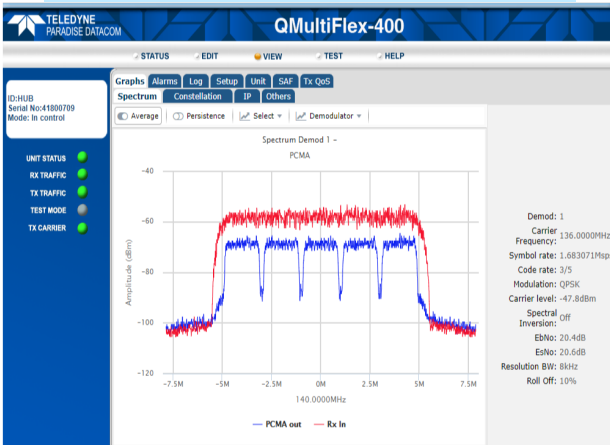| | |
|---|---|
| Hub Canceller BW *(100kHz to 72MHz)* | Hub Transmit and IB Multiple receive carriers are overlaid in the same space segment. Cancellation allows unwanted Hub transmit to be removed leaving the wanted receive carriers. **NOTE:** 14 demods supported when Hub Canceller is enabled. |
| Hub Canceller data rate options | 256kbps, 512kbps, 1024kbps, 2.5Mbps, 5Mbps, 10Mbps, 15Mbps, 20Mbps, 25Mbps, 30Mbps, 40Mbps, 50Mbps, 60Mbps, 80Mbps, 100Mbps and 200Mbps traffic rate |
| Carrier Asymmetry | **Power:** -10dB to +10dB **Symbol rate:** Up to 10:1 |
| Eb/No Degradation | Typically less than 0.2dB |
| Delay Range | 0 to 330ms |

## DVB Carrier ID Option (ETSI TS 103 129)

Supports the identification of interfering carriers by superimposing a low-power CID waveform onto the carrier with negligible degradation. **Supported for all carriers.** A carrier monitoring system is required to decode CID waveforms

## Mechanical/Environmental

| | |
|---|---|
| Size | 1U chassis, 285mm deep excluding handles, connectors and fans |
| Weight | 3kg |
| Power Supply | 90 to 264VAC, 50/60Hz 1.9A Fused IEC connector (live and neutral fused); 48V DC option |
| Compliances | FCC, CE and RoHS compliant |
| Safety Standards | EN62368-1:2014,Edition 2 |
| Emissions & Immunity | **Emissions:** EN55022:2010 Class B **Immunity:** EN55024:2010 |
| Operating Temperature | 0 to 50ºC (storage: -20ºC to 70ºC) |
| Humidity | 95% relative humidity, non-condensing |

## Hub Canceller Spectral View:



## Network Control: Q-NET™ Navigator

**Q-NET™ Navigator** *supports the control of all network modems and third-party network devices from a single application. Includes easy-to-use navigation, multiple operator roles/access levels (including Virtual Network Operator support), continuous status/ alarm polling and automatic synchronisation of all network configuration changes.* **Q-NET™ Navigator** *is included as standard.*





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## 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 switch & 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 access/trunking |
| 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 |
| Web Server | Modem web server M&C interface (inc. 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 |
| Virtual Routing & Forwarding | VRF supports multiple modem routing tables, allowing inter-VLAN routing |
| Ethernet MTU Size | 10k bytes |

## XStream IP™ Tier 1 (Tx only)

*XStream IP™ is an IP optimization suite designed for maximum reliability and bandwidth efficiency. The following features are provided as a standard part of the Modulator Option.*

| | |
|---|---|
| Traffic Shaping | Provides guaranteed throughput for priority traffic; supports Committed and Burst Information Rates. Stream classification uses one or more of: VLAN ID, IP address, IEEE 802.1p priority & Diffserv DSCP |
| IP-over-DVB Encapsulation | Supports the transmission of IP packets with/without Ethernet frames over DVB-S2/DVB-S2X; encapsulates & decapsulates using highly-efficient Ethernet Multi-Stream (EMS) encapsulation |

## XStream IP™ Tier 2 (Tx only) Option

*The Tier 2 option extends the transmit capabilities provided by the XStream IP™ Tier 1 option.*

| | |
|---|---|
| DVB-S2/S2X ACM | Dynamically varies modcod with varying link conditions in order to maximise throughput for each remote site at all times by converting unused link margin into additional throughput; 100% link availability |
| DVB-S2/S2X VCM | Supports the transmission of up to 6 IP streams. Each stream has its own associated modcod for optimal per-site throughput |

## XStream IP™ Tier 3 (Tx and Rx) Option

*The following features apply to both transmit and receive and can be used independently of XStream IP™ Tier 1 and XStream IP™ Tier 2 options. The Tier 3 option supports all demodulators for a single price.*

| | |
|---|---|
| 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 |

## 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 Paradise Modems 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 |
| Modem Compatibility | Compatible with the use of QFlex-400, QFlex-400 P2MP and Q-Lite™ satellite modems |

## Test Facilities and Alarm Outputs

| | |
|---|---|
| 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, deferred, Tx and aggregated Rx alarms |

## Utilities Card (fitted as standard)

9-way D type for 1:1 & 1:N redundancy (compatible with Q-NET PDQS Redundancy Switch)

15-way D type for alarms, Tx Inhibit signal

USB connector for software upgrades, etc. Second fan providing additional cooling FSK signalling

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## Forward Error Correction

| | |
|---|---|
| **DVB-S2X**<br>(EN 302 307-2)<br><br>*Includes support for DVB-S2* | **Normal Frame:**<br>**QPSK** 13/45, 9/20, 11/20<br>**8PSK** 23/36, 25/36, 13/18<br>**8APSK-L** 5/9, 26/45<br>**16APSK** 26/45, 3/5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90<br>**16APSK-L** 5/9, 8/15, 1/2, 3/5, 2/3<br>**32APSK** 32/45, 11/15, 7/9<br>**32APSK-L** 2/3<br>**64APSK** 11/15, 7/9, 4/5, 5/6<br>**64APSK-L** 32/45<br>**Short Frame:**<br>**QPSK** 11/45, 4/15, 14/45, 7/15, 8/15, 32/45<br>**8PSK** 7/15, 8/15, 26/45, 32/45<br>**16APSK** 7/15, 8/15, 26/45, 3/5, 32/45<br>**32APSK** 2/3, 32/45 |
| **DVB-S2**<br>(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<br>**8PSK** 3/5, 2/3, 3/4, 5/6, 8/9, 9/10<br>**16APSK** 2/3, 3/4, 4/5, 5/6, 8/9, 9/10<br>**32APSK** 3/4, 4/5, 5/6, 8/9, 9/10 |

## DVB-S2 Performance
### QEF (PER 10-7)
### 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 10-7)
### 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) |

## PER v BER

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

**Q-MultiFlex™:** *The industry's first 'Hub in a Box'.*

*Historically, networks required separate boxes for modulators, demods, IP optimisers, Ethernet switches, routers, packet encapsulators, spectrum analysers, oscilloscopes, redundancy controllers.*

*Now you can replace all of these with a single box! That's a lot of money you won't have to spend and that's leaving out the cost of spares, training and maintenance for all those individual boxes. And you can multiply the saving times over as you scale the network!*

*'Before'* **and** *'After'*

## DVB-S2 Performance
### QEF (PER 10-7)
### 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 10-7)
### 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) |

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| | Option | Description     **Fully configurable - pay only for what you need!** |
|---|---|---|
| **Base Unit**<br>*(Note: Mod and/or Demod options must be selected to make the unit functional)* | ✓ | **Front-panel keypad and display**<br>**IF operation 50 to 180MHz; L-band operation 950 to 2450MHz; IF/L-band Tx/Rx N-type connectors**<br>**High-stability 10MHz reference (for BUC/LNB)**<br>**4-port Gigabit Ethernet switch for M&C and traffic**; all features described under Ethernet Standard Features<br>**All features described under Test Facilities**<br>**AC mains input** (unless DC input option selected)<br><br>**XStream IP™ Tier 1 (Tx only)**: provided as standard with any **Modulator Option**; includes:<br>• **Traffic Shaping:** CIR/BIR/priority settings for IP streams classified by VLAN ID, IP address, IEEE 802.1p priority & Diffserv DSCP<br>**IP-over-DVB Encapsulation:** transmission of IP packets and Ethernet frames over DVB-S2/S2X using Ethernet Multi-Stream (EMS) encapsulation |
| **Modulator Options** | | **DVB-S2/S2X CCM Tx:** Modulator transmit function to 100Mbps/70Msps (default); 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™ Tier 1 (Tx only)**, which comprises traffic shaping and IP-over-DVB encapsulation |
| **Modulator Data Rate Options** | | **200Mbps data rate:** Extends 100Mbps Tx operation to 200Mbps (*DVB-S2 & DVB-S2X only*) |
| | | **345Mbps data rate:** Extends 200Mbps Tx operation to 345Mbps (*DVB-S2 & DVB-S2X only*) |
| **Demodulator Options** | | *Note: DVB-S2/S2X multi-demodulators include, as standard, the same modulations and roll-offs as specified for the **DVB-S2/S2X** modulator; default maximum composite receive data rate total of 338Mbps/68Msps.*<br>*Note: When the **Hub Canceller** is enabled, a maximum of 14 demodulators are available.* |
| | | **4 demodulators:** enables demodulators 1 to 4 inclusive (includes hardware for 16 demodulators) |
| | | **8 demodulators:** enables demodulators 5 to 8 inclusive (requires 4 demodulator option) |
| | | **12 demodulators:** enables demodulators 9 to 12 inclusive (requires 8 demodulator option) |
| | | **16 demodulators:** enables demodulators 13 to 16 inclusive (requires 12 demodulator option) |
| **XStream IP™ Options** | | **XStream IP™ Tier 2 (Tx only)**: requires **Modulator Option**; includes:<br>• **DVB-S2/S2X point-to-multipoint VCM** (up to 6 streams in shared outbound, each with its own modcod)<br>**DVB-S2/S2X point-to-multipoint ACM** (dynamic adjustment of all outbound modcods to maximize data rate) |
| | | **XStream IP™ Tier 3 (Tx & Rx)**: applies to Tx and Rx; does not require XStream IP™ Tier 1 or Tier 2 options; supports all enabled demodulators; includes:<br>• **TCP Acceleration:** Supports up to 4,400 concurrent accelerated TCP connections at up to 100Mbps |
| **Hub Canceller**<br>*(Supporting DVB-S2 and DVB-S2X waveforms)*<br><br>*Subject to prevailing modem data rate limits.*<br><br>*Occupied bandwidth: minimum 100kHz—72MHz*<br><br>*A Hub Canceller is also available as a low-cost 90-day license for Redundant Hub units (the license counts down only when the canceller is active)* | | Hub Canceller+ up to **256kbps** |
| | | Extends Hub Canceller+ to **512kbps** |
| | | Extends Hub Canceller+ up to **1.024Mbps** |
| | | Extends Hub Canceller+ up to **2.5Mbps** |
| | | Extends Hub Canceller+ up to **5Mbps** |
| | | Extends Hub Canceller+ up to **10Mbps** |
| | | Extends Hub Canceller+ up to **15Mbps** |
| | | Extends Hub Canceller+ up to **20Mbps** |
| | | Extends Hub Canceller+ up to **25Mbps** |
| | | Extends Hub Canceller+ up to **30Mbps** |
| | | Extends Hub Canceller+ up to **40Mbps** |
| | | Extends Hub Canceller+ up to **50Mbps** |
| | | Extends Hub Canceller+ up to **60Mbps** |
| | | Extends Hub Canceller+ up to **80Mbps** |
| | | Extends Hub Canceller+ up to **100Mbps** |
| | | Extends Hub Canceller+ up to **200Mbps** |
| **DVB-CID** | | **DVB Carrier ID:** Tx carrier identification per ETSI 103 129 |
| **DC Input** | | **48V DC: K3025** 48V DC primary power input (in place of 100 to 240V AC input) |
| **BUC PSU** | | **AC In & 24V Out: P3553** 24V 200W DC to Tx BUC |
| | | **AC In & 48V Out: P3554** 48V 200W DC to Tx BUC |
| | | **24V & 48V In & 24V Out: P3555** +24V 200W DC to Tx BUC |
| | | **24V & 48V In & 48V Out: P3556** +48V 200W DC to Tx BUC |