QMultiFlex-400™ Encryption

Encrypted IP Modulator/Multi-Demodulator Satellite Modem

A Powerful, Versatile and Secure Modem/Hub for Star and Mesh Networks

TELEDYNE
PARADISE DATACOM
Everywhereyoulook™

Overview

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

In addition, the **QMultiFlex-400E** unit 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%.

The **QMultiFlex-400E** hub system may be expanded to support a maximum of 128 remote sites. This is achieved by cascading Multi-demodulators at the hub, where each Multi-demod supports an additional 16 SCPC receive carriers into the hub.

All network modems can be monitored and controlled via **Q-NET™** Navigator (included as standard).

Markets and Applications

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

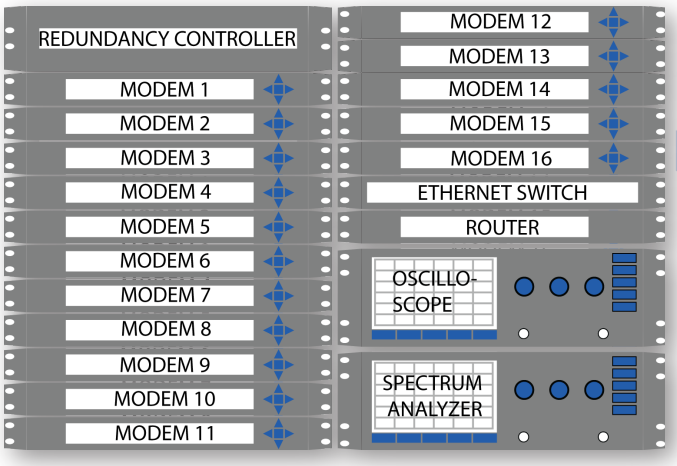
Features

- Encrypts all IP traffic using AES 256 Encryption as standard
- Star, Mesh & hybrid point-to-multipoint IP
- Modulator with up to 16 demodulators
- Embedded Hub Canceller
- DVB-S2/X Outbound **and 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 standard commands (supports OpenFlow)

Why QMultiFlex-400E?

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

The **QMultiFlex-400E** replaces all of these, at a significant cost savings even before considering the cost of spares, training and maintenance for all those individual boxes. And these savings can be multiplied as you scale your network.



The functionality of many separate units are contained in a single **QMultiFlex-400E**

STATE OF THE ART

- DVB-S2/X up to 64APSK provides the highest bandwidth efficiency

SECURE

- SCPC is both secure, and with Paradise Modems, easy to provision
- For enhanced security, AES-256 encryption is standard
- AAA Radius support and access control lists.

COMPATIBLE

- Reuse your existing code
- No need for extensive retraining of Maintenance staff
- Supports IF and L-band in one unit.

CONVENIENT

- Optional BUC power Supply reduces need for external equipment
- Built in Spectrum Analyser and Constellation monitor

PRACTICAL

- 1U rack mount chassis
- Simple front panel control with backlit LCD
- Intuitive web browser and Q-NET compatible
- Built in test tools, no need for expensive test equipment

EFFICIENT

- 5% spectral roll off saving 15% bandwidth over the standard 20%
- Advanced optimisation features, including TCP acceleration, traffic shaping and ACM/VCM.

WELL EQUIPPED

Transmitter

Fast:

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

Interface Ports

Convenient:

- Layer 2 switch and Layer 3 router.
- 4 Port GB Ethernet Switch (RJ45 connectors; used for IP traffic and M&C)
- Fast IP packet processor card fitted as standard

RF Stages

Future Proof:

- Transmit and Receive speeds field upgradeable, only pay for the capacity you need now
- Extended L-Band coverage from 950 to 2,450 MHz
- Wideband IF 50 - 180MHz

Receiver

Fast:

- Up to 338Mbps/ 68Msps

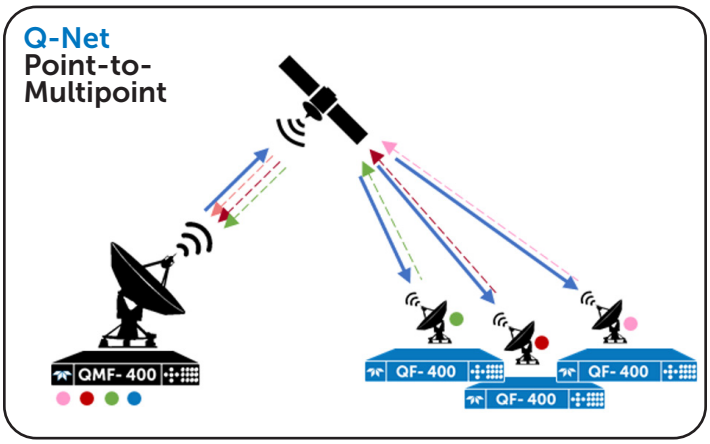
Support for Multiple Network Configurations

Point-to-multipoint networks allow a central hub to broadcast to many remote nodes. Each remote node receives the full bandwidth carrier, then the SCPC protocol and security allows only the traffic destined for that particular node to pass through.

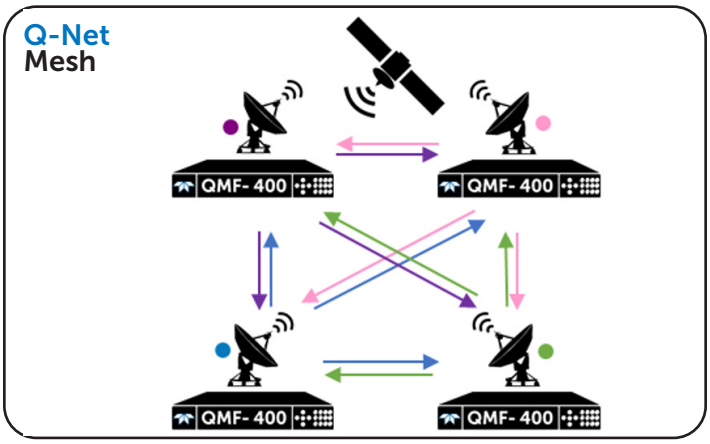
Managing all of this is the Q-Net software architecture, which performs configuration and network management functions.

Advantages

- QMultiFlex-400 is a hub within a 1U 19" rack mount chassis - no expensive additional hub required
- Supports 1 Outbound and up to 16 Inbound carriers
- DVB-S2/X, Tx up to 345Mb/s, 64APSK
- Speed upgradable in the field
- Unified platforms allow flexible redeployment
- The security of SCPC, with no contention or overbooking, and guaranteed CIR and BIR



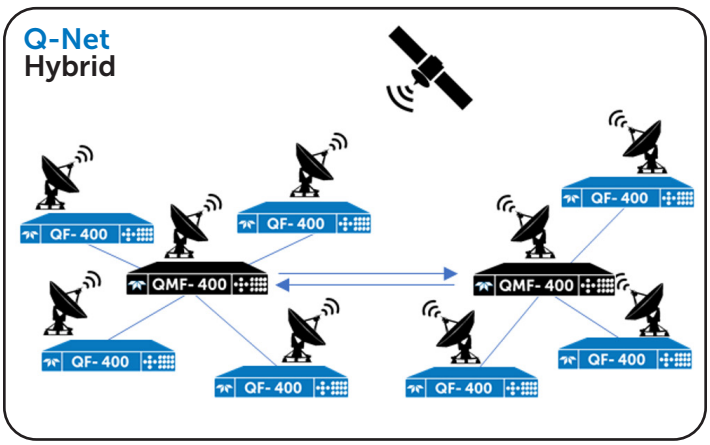
Q-Net Star Network: For a point-to-multipoint star network, the remote site transmits back to the hub, and the hub modem (**QMultiFlex-400**) is equipped with a separate demodulator for each site, up to a maximum of 16. However, a star system may be extended to support up to 128 sites with further QMultiFlex-400 demod only units connected at the hub. Each remote site communicates back to the hub or through the hub to other nodes. Remote sites can be populated with lower cost QFlex-400 P2MP modems.



Full Mesh Network: A full hubless mesh network allows each remote site to communicate with all other remote sites, providing:

- Robustness – does not rely on a single vulnerable hub site
- Lowest latency network as it does not require a satellite hop to a hub, then a second back out to the receiving node
- Saves bandwidth costs due to direct connection to other remote nodes.

In this case, each remote site is equipped with a **QMultiFlex-400** hub with demodulators for up to 16 other sites in a single chassis.



Q-Net Hybrid Network: In a Paradise Datacom point-to-multipoint network, the equipment is flexible enough to support hybrid topologies, allowing some nodes to have full access to other nodes, and some to communicate back to a hub. This can evolve as real-world networks evolve.

Advantages for Users Needing High Security & Resiliency in Point-to-Multipoint Network

	Star Network	Mesh Network
Components required?	QMultiFlex-400-based system with QFlex-400 P2MP remotes. Q-Net network management software included. Can also be Q-Lite or AXIOM-X small form factor modems for comms-on-the-move applications.	QMultiFlex-400s at each node. One QMultiFlex-400 is required at each node within the Hubless Mesh network. Q-Net network management software included.
If a hub site is incapacitated?	Geographic redundancy feature available as a licensed option to allow a second remotely located hub to take over in case of hub failure	Mesh capability allows parts of the network to still function even if one or more nodes are down, providing the upmost resiliency.
If a local modem fails?	1:1 redundancy feature – add a second modem at each site to take over in case of local modem failure	
I need to know I have instant, secure communications under all conditions	• SCPC provides guaranteed CIR, BIR, no network contention. • Full mesh means each node can communicate with any other in a single satellite hop (lowest latency, also not using bandwidth twice needlessly)	
I need maximum data security	Encrypted models with AES-256 available for enhanced security. Modems share a single code-base.	
I want to minimize CapEx and OpEx	• No expensive Hub required. • Hub Canceller option allows outbound and inbound carriers in the same frequency band if in the same spot beam. • Modems can be flexibly redeployed as needs change – modems deployed in Point-to-point links can be redeployed as remotes in a point-to-multipoint networks – maximum compatibility. • Modems can be speed-upgraded in the field later. • No yearly maintenance fees.	

Product Features and Advanced Options

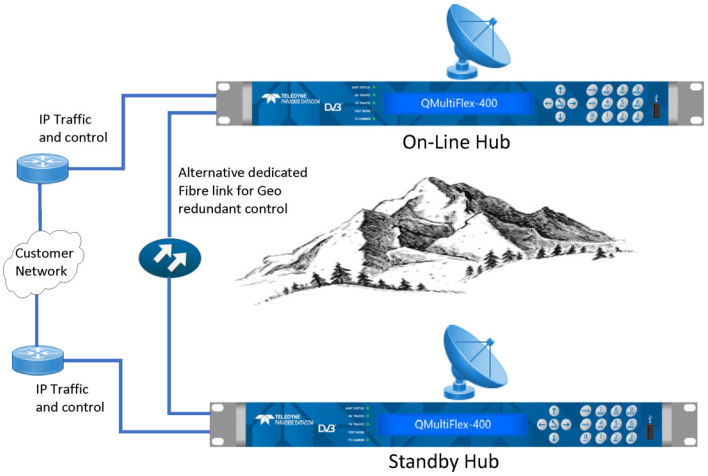
Included Network Management

Q-NET™ Navigator supports the control of all network modems 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.

Geographical Redundancy

A pair of QMultiFlex-400 hubs can be configured to provide resiliency against natural disasters, catastrophic events or inclement weather that can cause network outgages.

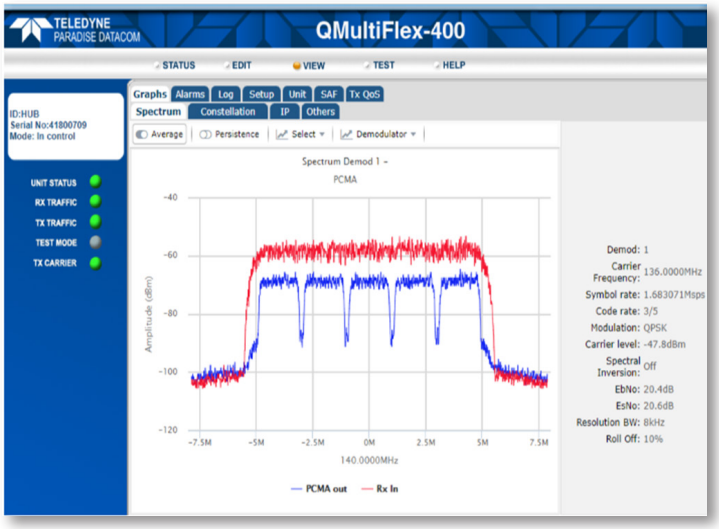
Geo-Redundant systems tackle the core issue by providing another diverse hub that simultaneously operates with the same functionality, albeit in standby mode. If a user's primary hub goes down, the service will connect to the secondary hub, thus preserving network traffic. Ideal for resilient military systems where preserving core network functionality is critical at all times.



Hub Canceller Option

This software option enables the embedded Hub Canceller software in the QMultiFlex-400 modem. With this option enabled, the output from the carrier and return can occupy the same bandwidth. Advantages include:

- Up to 50% bandwidth savings
- Smaller footprint with less required rack space
- Reduced power consumption
- Simpler and easier to deploy and operate



Advanced Bandwidth-Efficient Features

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

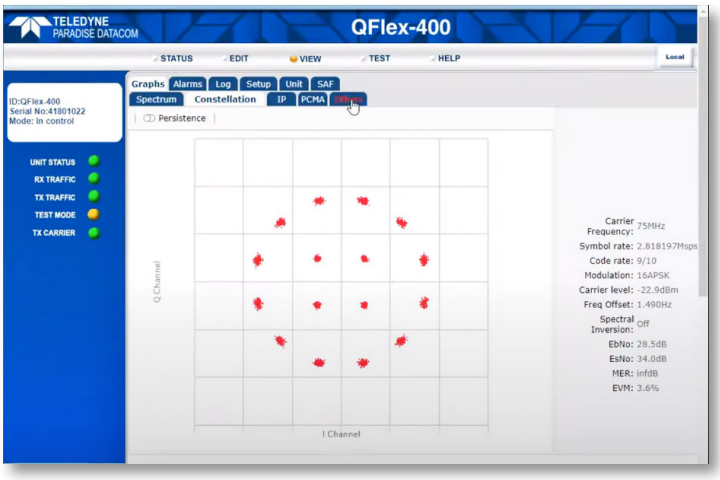
DVB-S2X, is between 20% and 60% more bandwidth efficient than its predecessor, DVB-S2.

XStream IP™ bandwidth-saving IP features include ACM, acceleration and traffic shaping.

Should environmental interference cause a failure in the on-line hub (e.g., the signal strength falls below a useable threshold), the standby **QMultiFlex-400** hub switches to the on-line state, resulting in uninterrupted traffic.

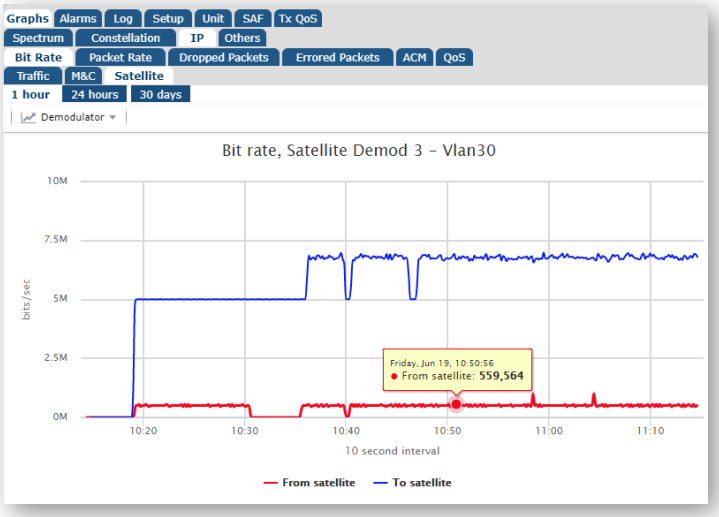
Optional Functionality

Powerful Onboard Test Equipment



Constellation view: The Rx Constellation Monitor can be used to check for correct modem operation including checking for signal distortion and phase noise. The persistence mode is useful for showing any long-term effects due to phase noise and interference.

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



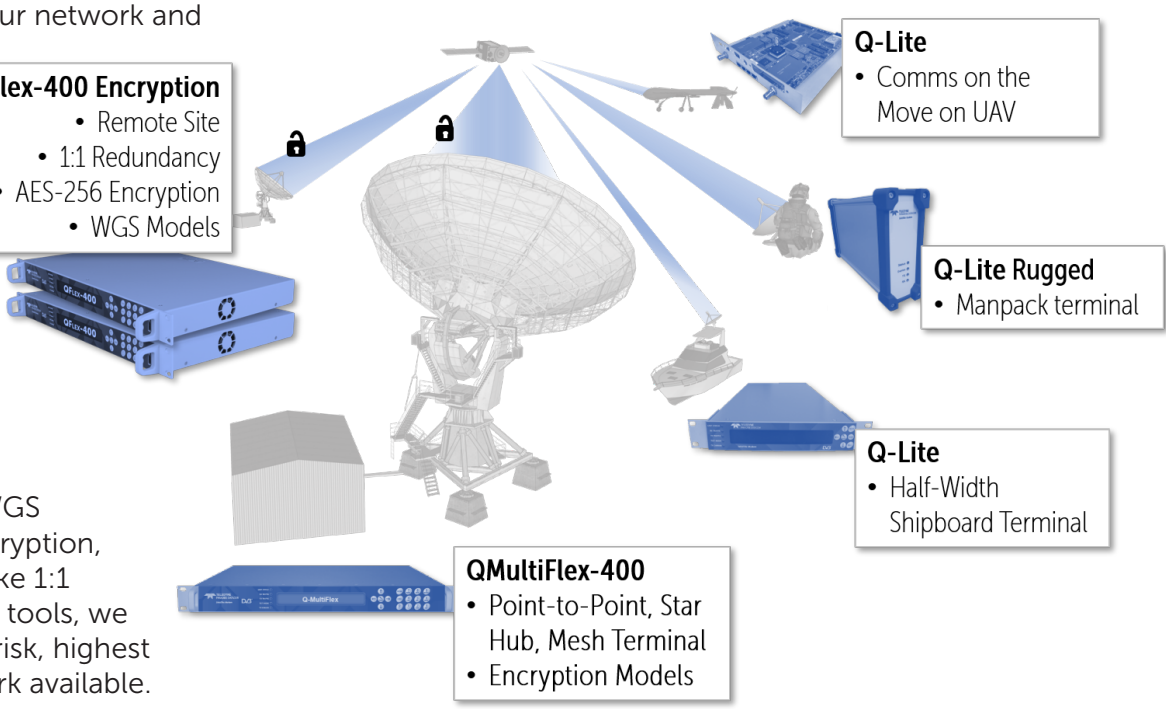
Key IP Metrics: IP graphs support the display of throughput (including errored and dropped packets) for transmit and receive in bits per second and packets per second for the terrestrial and satellite ports. The throughput can be viewed in real time and over one hour, 24 hours or 30 day time periods. The statistics for each demodulator can be viewed independently. It is also possible to view the throughput associated with each individual traffic stream as classified by the traffic shaping feature, pictured at left.

The Q-NET Family

Q-NET is a fabric that allows each of the Q-Series modems to seamlessly inter-operate giving you the ability to upgrade your network and re-use assets at will.

The different models have been thoughtfully designed to cover a wide variety of network situations flexibly and securely.

From models with WGS certification and encryption, to built-in features like 1:1 redundancy and test tools, we give you the lowest risk, highest return secure network available.



The Paradise Family of Secure SCPC Modems

Paradise SCPC Modems			Point-to-Point	Mesh	Point-to-MultiPoint, Star, Hybrid		Features of Note
					Hub	Remote Site	
Standard	1U 19" Rack	QFlex-400	✓			✓	PCMA+ enhanced carrier overlay available
		QMultiFlex-400	✓	✓	✓	✓	Optional Embedded Hub Canceller
		QFlex-400 P2MP	✓			✓	Configured remote
		QubeFlex	✓				Small Sat/LEO - support for CCSDS
		AXIOM-N	✓			✓	IP-centric modem
Small Form Factor	Rack Mount Half Width	Q-Lite Half Width	✓			✓	Mountable side-by-side in 1U rack space
		AXIOM-C	✓			✓	Compact IP-centric modem
	Rugged	Q-Lite Rugged	✓			✓	IP65 weatherproof outdoor modem
		AXIOM-R	✓			✓	IP67 IP-centric modem
	OEM Card	Q-Lite Card	✓			✓	For OEM integration
		AXIOM-X	✓			✓	Our smallest modem

All modem models except QubeFlex are also available as **encrypted models**, capable of TCP/IP packet payload encryption using symmetric AES with 256-bit keys. Note that these models are export controlled.
The QFlex-400, Q-Lite, Q-Lite Half Width and Q-Lite Rugged models are also available as **WGS-certified** models.

Main Specifications

Frequency	**L-band:** 950 to 2,450MHz (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

Modulator

Operating Modes	DVB-S2 (EN 302 307-1) & DVB-S2X (EN 302 207-2)
Data Rate	55kbps to 345Mbps (1bps resolution)
Symbol Rate	150ksps to 70Msps (1sps resolution)
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 Spectral Roll-off	**DVB-S2/S2X** 5%, 10%, 15%, 20%, 25%, 35%
Phase Accuracy	±2° maximum
Amplitude Accuracy	±0.2dB maximum
Carrier Suppression	-30dBc minimum
Output Phase Noise	As EN 302 307-1 & EN 302 307-2
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

Demodulator

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:** 55kbps to 197Mbps **Total for all inbounds combined:** Up to 338Mbps 1bps resolution
Symbol Rate	**Each DVB-S2X inbound:** 150ksps 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

Mechanical/Environmental

Size	1U chassis, 285mm deep excluding front panel handles and rear panel connectors and fans
Weight	3kg
Power Supply	90 to 264VAC, 50/60Hz, 1.9A Fused IEC connector (live and neutral fused); 48V DC option
Compliance	FCC, CE and RoHS compliant
Safety Standards	EN62368-1:2014,Edition 2
Emissions & Immunity	**Emissions:** EN 55032:2015 Class A **Immunity:** EN 55032:2017
Temperature	Standard: 0 to 50°C; Storage: -20°C to 70°C
Humidity	95% relative humidity, non-condensing

Network Control

Description	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	A simple interface to allow all Q-series modems in a network to be monitored and controlled from a single desktop application. 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 & 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, Tx, Rx and deferred alarms

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

Forward Error Correction

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

Embedded Hub Canceller

Hub Canceller BW	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. 100kHz to 72MHz
Data Rate Options *Linked to Tx data rate*	256kbps, 512kbps, 1024kbps, 2.5Mbps, 5Mbps, 10Mbps, 15Mbps, 20Mbps, 25Mbps, 30Mbps, 40Mbps, 50Mbps, 60Mbps, 80Mbps, 100Mbps and 200Mbps traffic rate
Carrier Power Asymmetry	This is the ratio of the outbound carrier power and the sum of all the inbounds **Power:** -10dB to +10dB
Carrier Symbol Rate Asymmetry	This is the ratio of the outbound symbol rate and the sum of all the inbounds. **Symbol rate:** Up to 10:1
Eb/No Degradation	Typically less than 0.2dB
Delay Range	0 to 330ms
Cancellation Ratio	Typically 28dB

Utilities Card

Description	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

Optional Functionality

Ethernet: Standard Features

Bridging and Static Routing	**Trunking mode:** Hardware Layer 2 switch supporting 338Mbps bi-directional traffic at up to 200,000 packets per second **Layer 2 bridge & Layer 3 router:** Software processing capability nominally 150k packets per second. However, this is derated when internal optimisation features are enabled
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
SNMP	SNMP v1, v2c & v3
Access Control Lists	IP Access Control List for M&C
Network Time Protocol (NTP)	NTP client synchronises modem time & date to NTP server
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
Virtual Routing & Forwarding	VRF supports multiple modem routing tables, allowing inter-VLAN routing
Ethernet MTU Size	Standard: 10k bytes

XStream IP™ Tier 1

Description	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 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 Option

Description	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 Option

Description	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

Encryption

AES-256 Encryption	Supported on the QFlex-400E P2MP model only. The QFlex-400-E™ P2MP is identical to the standard QFlex-400™ P2MP in every other respect

Ordering: QMultiFlex-400™ Encryption

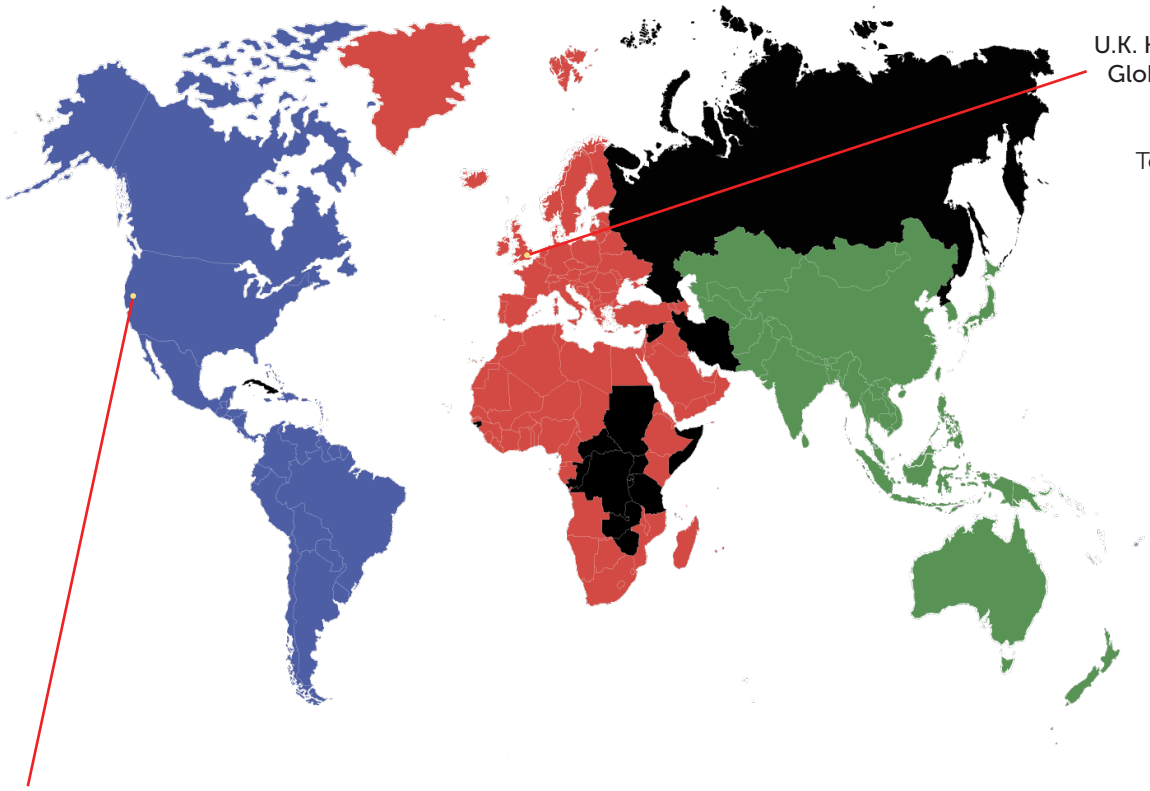
Standard Features		Description
Base Unit *Note: Mod and/or Demod options must be selected to make the unit functional*	☑	**Front-panel keypad and display** AES-256 Encryption **IF operation 50 to 180MHz. L-band operation 950 to 2450MHz; IF/L-band Tx/Rx N-type connectors** **High-stability 10MHz reference (for BUC/LNB)** **4-port Gigabit Ethernet switch for M&C and traffic; all features described under Ethernet Standard Features** **All features described under Test Facilities** **AC mains input** (unless DC input option selected) **X-StreamIP Tier 1:** provided as standard with any Modulator Option; includes: **Traffic Shaping:** CIR/BIR/priority settings for IP streams classified by VLAN ID, IP address, IEE 802.1p priority & Diffserv DSCP **IP-over-DVB Encapsulation:** transmission of IP packets and Ethernet frames over DVB-S2/S2X using Ethernet Multi-Stream (EMS) encapsulation
Optional Features		
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**, 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. **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:** requires Modulator Option; includes: DVB-S2/S2X point-to-multipoint VCM (up to 6 streams in shared outbound, each with its own modcod) DVB-S2/S2X point-to-multipoint ACM (dynamic adjustment of all outbound modcods to maximize data rate)
	☐	**XStream IP™ Tier 3:** applies to Tx and Rx; does not require XStream IP™ Tier 1 or Tier 2 options; supports all enabled demodulators; includes: TCP Acceleration: Supports up to 4,400 concurrent accelerated TCP connections at up to 100Mbps
Geographical Redundancy	☐	Enables the QMultiFlex-400 Hub Geo-redundancy feature. (Requires a second suitably licenced QMultiFlex-400 Modem and L2/L3 connectivity between the two geo diverse sites.)

(Continued on following page)

Ordering: QMultiFlex-400™ Encryption Continued

Hub Canceller (Supporting DVB-S2 and DVB-S2X waveforms) Subject to prevailing modem data rate limits. Occupied bandwidth: minimum 100kHz-72MHz 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 up 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 AC input, 24V 200W DC to Tx BUC
	◯	**AC In & 48V Out:** P3554 AC input, 48V 200W DC to Tx BUC
	◯	**48V In & 24V Out:** P3555 48V DC input; +24V 200W DC to Tx BUC
	◯	**48V In & 48V Out:** P3556 48V DC input; +48V 200W DC to Tx BUC

Global Sales Offices



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

Refer to the website or contact Sales or Customer Support for the latest product information. The modem is classified ECCN 5A002.a.1 and is subject to U.S. Department of Commerce export control. Export re-export or diversion contrary to U.S. law is prohibited.