TELEDYNE PARADISE DATACOM
A Teledyne Technologies Company

DVB S2

Vision Series
## PD80L L-Band Satellite Modulator/Modem

OVERVIEW

The Vision Series PD80 is an *80Mbps* DVB-S2 (Digital Video Broadcast) satellite modulator (also available as a modem). ASI and Gigabit Ethernet interfaces are supported.

Paired Carrier allows space segment reuse. It incorporates ViaSat's patented PCMA technology to overlay transmit and receive carriers in the same space segment reducing satellite bandwidth requirements by up to 50%.

Paired Carrier Operation
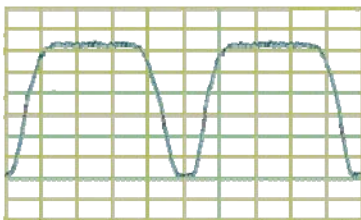
Paired Carrier
Disabled
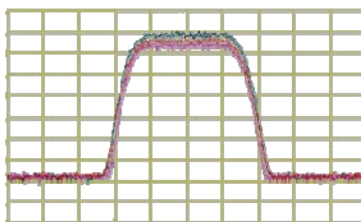
Paired Carrier
Enabled
Can save 50%
on space segment

FEATURES

- ▶ DVB-S2 (EN 302 307) Tx to 45Msps, Rx to 37.5Msps
- ▶ DVB-S2 Constant Coding and Modulation (CCM)
- ▶ DVB-S2 Variable Coding and Modulation (VCM) supporting up to 2 ASI streams optionally multiplexed with IP traffic and IP M&C
- ▶ DVB-S2 Adaptive Coding and Modulation (ACM) for point-to-point operation
- ▶ DVB-S (EN 300 421), DVB-SNG (EN 301 210) operation to 40Msps
- ▶ 950 - 2050MHz L-band in 100Hz steps
- ▶ **Paired Carrier** bandwidth re-use
- ▶ Inner Forward Error Correction (FEC) options of Viterbi[1], Trellis Code Modulation[1] (TCM) and Low Density Parity Code[2] (LDPC)
- ▶ Outer FEC options of concatenated Reed-Solomon[1] (RS) and Bose-Chaudhuri-Hocquenghem[2] (BCH)
- ▶ ASI and Gigabit Ethernet traffic options
- ▶ Rich IP feature set including routing, bridging, HTTP and TCP Acceleration, Header/Payload Compression, DHCP, IEEE 802.1p QoS, IEEE 802.1q VLAN, traffic shaping and diagnostic graphs. IP over DVB encapsulation supports MPE, ULE and Paradise PXE standards
- ▶ IPv6 compliant
- ▶ Compact 1U chassis

Vision Series
PD80L DVB·S2 L-band Satellite Modulator/Modem

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Main Specifications

Frequency	950 to 2050MHz (resolution 100Hz) (N-type connector)
Data Rate	DVB-S2: 50kbps to 100Mbps DVB-S/DSNG: 4.8kbps to 100Mbps 1bps resolution
Symbol Rate	DVB-S2 Tx: 100ksps to 45Msps DVB-S2 Rx: 100ksps to 37.5Msps DVB-S/DSNG: 9.6ksps to 40Msps
Impedance	50Ω
Return Loss	14dB typical
Frequency Reference Stability	<4E-8/yr
External Reference	Clocking only: 1 to 10MHz; 1kHz steps Clocking and RF frequency: 10MHz, 0dBm± 1dB

Traffic Interfaces

Traffic options:
Ethernet (10/100/1000 BaseT) IP traffic on RJ45 with processing capability of 50,000 packets per second
Quad ASI on 75Ω BNC female

Modulator

Output Power	0 to –30dBm (0.1dB steps)
Output Power Stability	±0.5dB, 0ºC to 50ºC
Transmit Filter Roll-off	20%, 25%, 35%
Phase Accuracy	±2º maximum
Amplitude Accuracy	±0.2dB maximum
Carrier Suppression	-30dBc minimum
Output Phase Noise	As IESS-316, nominally 3dB better
Harmonics	Better than –55dBc/ 4kHz in band
Spurious	Better than –55dBc/ 4kHz in band
Transmit On/Off Ratio	55dB minimum

Demodulator

Input Range	Minimum: -130+10 log (symbol rate) Maximum: -80+10 log (symbol rate)
Maximum Composite Signal	+10dBm
Wanted-to-composite Level	-102+10 log (symbol rate)
Frequency Sweep Width	±1kHz to ±32kHz up to 10 Msps (1kHz steps) ±10kHz to ±250kHz above 10 Msps (10kHz steps)
Acquisition Threshold	<5dB Es/No QPSK
Acquisition Time	Dependent on FEC, data rate and sweep width (at 9.6kbps, less than 1s at 6dB Es/No QPSK; at 10Mbps, less than 100ms at 6dB Es/No QPSK)
Clock Tracking Range	±100ppm minimum
Receive Filter Roll-off	20%, 25%, 35%
Performance Monitoring	Eb/No (range 0-15dB, ±0.2dB) Frequency offset (100Hz resolution) Receive signal level Buffer fill status
AGC Output	Buffered direct AGC output for antenna tracking, etc.

Forward Error Correction

Modulation	DVB-S2: QPSK, 8PSK, 16APSK, 32APSK DVB-S: QPSK DVB-DSNG: 8PSK, 16QAM
FEC	DVB-S2 (LDPC/BCH): 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 (note 32APSK is supported for Tx only) DVB-S: QPSK 1/2, 2/3, 3/4, 5/6 DVB-DSNG: 8PSK 2/3, 5/6, 8/9; 16QAM 3/4, 7/8

DVB-S2 Performance at PER 1e-6
Guaranteed Es/No (dB) for Short (16k) frames

	Rate 1/4	Rate 1/3	Rate 2/5	Rate 1/2	Rate 3/5	Rate 2/3	Rate 3/4	Rate 4/5	Rate 5/6	Rate 8/9	Rate 9/10
QPSK	-1.3	-0.4	0.5	1.9	3.0	3.5	4.4	5.2	5.6	6.7	
8PSK					6.5	7.3	8.6		9.9	11.2	11.3
16APSK					9.8	11.1	11.7	12.3	13.5		

DVB-S2 Performance at PER 1e-6
Guaranteed Es/No (dB) for Normal (64k) frames

	Rate 1/4	Rate 1/3	Rate 2/5	Rate 1/2	Rate 3/5	Rate 2/3	Rate 3/4	Rate 4/5	Rate 5/6	Rate 8/9	Rate 9/10
QPSK	-1.6	-0.7	0.3	1.5	2.8	3.4	4.3	5.0	5.5	6.5	6.7
8PSK					6.4	7.2	8.5		9.8	11.0	11.3
16APSK					9.7	10.8	11.6	12.2	13.4	13.7	

Paired Carrier

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Paired Carrier	Transmit and receive carriers are overlaid on top of each other in the same space segment. Echo cancellation techniques are used in the demodulator to cancel the transmit carrier and extract the wanted receive carrier signal
Paired Carrier data rate options	512kbps, 1024kbps, 2.5Mbps, 5Mbps, 10Mbps, 15Mbps, 20Mbps and 25Mbps traffic rate
Supported power asymmetry	-10dB to +10dB
Supported symbol rate asymmetry	Up to 12:1
Eb/No degradation	Typically < 0.5dB (0.7dB for 16QAM/16APSK with 10dB power asymmetry)
Mobile Operation	Uses GPS data to continually recalculate position relative to satellite, allowing uninterrupted operation in mobile environments (ships, etc.) anywhere in satellite footprint

Ruggedisation

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Ruggedisation Option	Recommended for modems being operated in particularly harsh environments. Replaces existing external fan with a more capable fan with greater airflow. Adds an extra internal fan assembly, consisting of two fans, to improve air flow inside the modem. Adds heatsinks to critical components to improve dissipation of heat. Improves cable fixing inside the modem to reduce modem susceptibility to vibration. Overall effect is to reduce the internal operating temperature of the modem by several degrees, causing less stress to the electronics and thereby increasing reliability and extending the mean time between failures.

Ethernet Traffic

Throughput Performance	*The maximum modem throughput depends on IP traffic format and the features enabled. Bridged IP/UDP data can be processed up to the modem maximum data rate. Please seek assistance from Paradise Datacom in evaluating your particular requirements.*
Routing and Bridging	Bridging (standard). Static routing (standard). Dynamic routing option: RIP V1, V2; OSPF V2, V3; BGP V4
TCP Acceleration Option	Typical throughput level of 90% of link capacity. IP Traffic card option: Supports 5,000 concurrent accelerated TCP connection limit (plus at least 35,000 unaccelerated TCP connections) up to the modem maximum data rate. IP Traffic card includes HTTP Acceleration (reduces web page download times)
Header Compression Option	IP Traffic card option. Robust Header Compression to RFC 3095. Reduces Ethernet/IP/UDP/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 Option	Uses Deflate algorithm (RFC 1951) to compress all TCP/IP packets (TCP and UDP), typically resulting in compression of payloads by 50%
Traffic Shaping Option	Provides guaranteed throughput levels for IP streams, using Committed Information Rate and Burst Information Rate settings. Stream differentiation is by IP address, IEEE 802.1p priority class, Diffserv DSCP class or MPLS EXP field
Encryption Option	Encrypts all IP traffic using AES with 256-bit keys
IPV6	Provided as standard. Dual IPV4/IPV6 TCP/IP stack allowing use of both IPV4 and IPV6 addresses for bridging and routing of traffic
VLAN Support	IEEE 802.1q VLAN support (standard)
	IEEE 802.1p Quality of Service (packet prioritisation) using strict priority or fair weighting queuing
DHCP, SNMP	DHCP (standard) for automatic allocation of M&C IP address. SNMP (standard) v1, v2c and v3
Web Server	Embedded web server M&C interface (standard)
IP Diagnostic Graphs	Shows Tx, Rx throughput (bps, pps); dropped, errored packet counts (standard)
Operating mode	Can be operated in standalone, 1:1 or 1:N redundancy configuration.
IP over DVB Encapsulation Option	Supports encapsulation/decapsulation of MPE, ULE and Paradise PXE
DVB-S2 IP Multistreaming	Point-to-multipoint CCM and VCM multistreaming. VCM allows the FEC error correction to vary for each remote
DVB-S2 ACM Option	Dynamically varies modcod with varying link conditions, maximising throughput at all times by converting unused link margin into additional throughput

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BUC/LNB Facilities	
BUC Power Supply Options	Mains input, +48V DC 2A output (100W) to BUC via Tx IFL
	Mains input, +24V DC 4A output (100W) to BUC via Tx IFL
	Mains input, +48V DC 3.5A output (200W) to BUC via Tx IFL
	Mains input, +24V DC 6A output (200W) to BUC via Tx IFL
	+48V DC input, +48V DC 3.5A output (200W) to BUC via Tx IFL
	+/-48V DC input, +24V DC 6A output (200W) to BUC via Tx IFL
	+/-48V DC input, +48V DC 3.5A output (200W) to BUC via Tx IFL
LNB Power (standard)	+15/24V 0.5A DC to LNB via Rx IFL - user configurable
FSK Control Option	Requires a BUC power supply to be fitted. Allows monitor and control of a compatible BUC from the modem, via the Tx IFL
10MHz Reference via IFL Option	10MHz may be provided via the Tx IFL to the BUC (between 0 & –3dBm) and via the Rx IFL to the LNB (between 0 & +3dBm)

Mechanical/Environmental	
Size	1U chassis – 410mm deep, excluding front panel handles and rear panel connectors and fans
Weight	3.5kg
Power Supply	100-240VAC, +6%, -10%, 1A @100V, 0.5A @ 240V, 47-63Hz Fused IEC connector (live and neutral fused); 48Volts DC option
Safety Standards	EN60950-1
Emission and Immunity	EN55022 Class B (Emissions) EN55024 (Immunity)
Operating Temperature	0 to 50ºC
Humidity	95% relative humidity, non-condensing
Compliance	FCC, CE and RoHS compliant
Alarm Relays	4 Independent Form C relays for unit, Tx, Rx and backward alarms
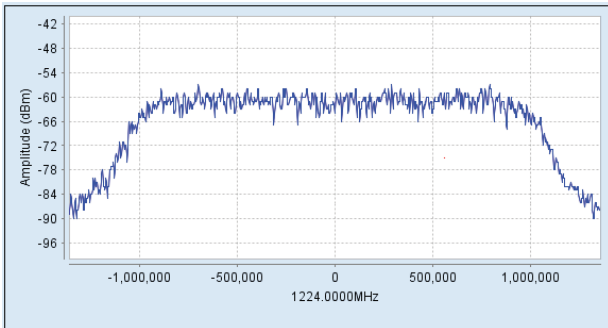
Built-in Receive Spectrum Analyser and Receive Constellation Display for channel diagnostics.
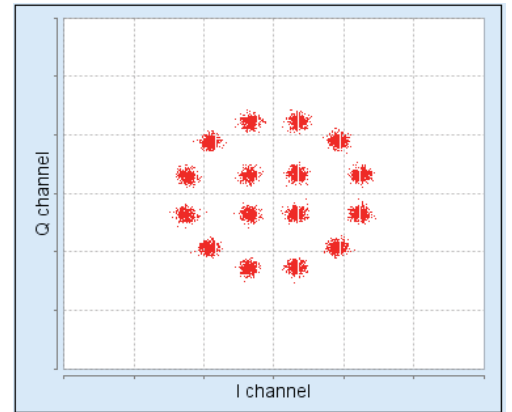
Adaptive Coding and Modulation (ACM)

Adaptive Coding and Modulation uses Rx feedback to the Tx to respond to changes in channel conditions to optimise throughput.

By varying the error correction strength to match atmospheric conditions, link margin is converted into useful bandwidth. Modulation and FEC rate (modcod) is dynamically matched to the current Es/No.

The symbol rate is kept constant, changing the terrestrial data rate up or down with Es/No.

Changes in modcod are transparent at the receiver.

Deployments of ACM have reported throughput increases of up to 100%.
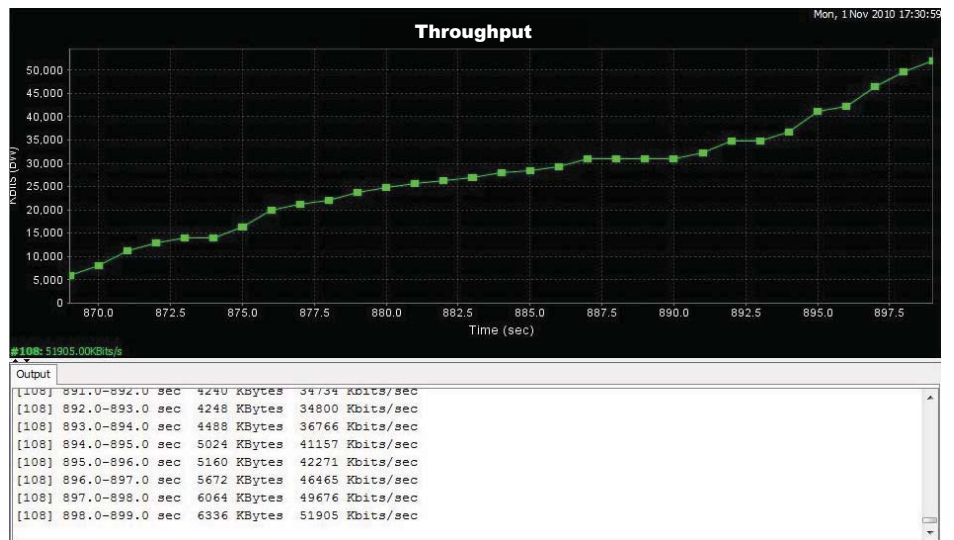
Graph showing modem data throughput increasing over time by a factor of 10 as the available Es/No increases.

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Fully configurable - only pay for what you need!

	Options	Description
PD80L L-band Base Modem	✓	Filter roll-off factors: 20%, 25%, 35% L-band: 950 - 2050MHz in 100Hz steps PID filtering and PID monitoring Remote web browser based monitoring tools (Spectrum Display, Constellation Monitor and link performance versus time) SMTP email client for status monitoring SNMP v1, v2c & v3 for modem M&C DHCP allowing M&C IP address to be allocated dynamically via external DHCP network server * Must select DVB options below
DVB-S TX		Transmit DVB-S compliant (to EN300421) to 40Msymbol/s. QPSK modulation, provides Viterbi FEC Rates 1/2, 2/3, 3/4, 5/6, 7/8 and Reed-Solomon Outer FEC
DVB-S RX		Receive DVB-S compliant (to EN300421) to 40Msymbol/s. QPSK modulation, provides Viterbi FEC Rates 1/2, 2/3, 3/4, 5/6, 7/8 and Reed-Solomon Outer FEC
DVB-DSNG TX		Transmit DVB-DSNG compliant to EN301210 to 40Msymbol/s. 8PSK and 16QAM modulation Includes DVB-S TX
DVB-DSNG RX		Receive DVB-DSNG compliant to EN301210 to 40Msymbol/s. 8PSK and 16QAM modulation Includes DVB-S RX
DVB-S2 CCM TX		Transmit DVB-S2 compliant to EN302307 (excluding 32APSK) to 45Msymbol/s with Constant Coding and Modulation (CCM) mode Includes DVB-S TX and DVB-DSNG TX
DVB-S2 CCM RX		Receive DVB-S2 compliant to EN302307 (excluding 32APSK) to 37.5Msymbol/s with Constant Coding and Modulation (CCM) mode Includes DVB-S RX and DVB-DSNG RX
DVB-S2 VCM Multistreaming		Variable Coding and Modulation (VCM) allows multiplexing of up to 2 ASI streams with IP traffic and IP M&C onto a single carrier, with per stream selection of modulation, FEC rate, DVB-S2 frame size and pilots
DVB-S2 ACM TX		Requires DVB-S2 CCM TX. (Note that ACM RX operation is free of charge subject to the modem having the **DVB-S2 CCM RX** feature enabled.)
DVB-S2 32APSK Tx		Adds support for DVB-S2 32APSK to TX (DVB-S2 32APSK for RX is not currently supported)
Traffic Interface Hardware Options		IP Traffic card with Ethernet Bridge and static routing as standard. Includes HTTP Acceleration (by prefetching web page inline objects to reduce web page download time). Includes TCP Acceleration up to 16,896kbps
		Quad ASI card. Supports both 188 and 204 byte MPEG2 TS packets. **Use of multiple ports is subject to other features purchased**
IP Traffic Card Options		Adds TCP acceleration up to 25Mbps on IP Traffic card - requires IP Traffic card
		Adds TCP acceleration up to 55Mbps on IP Traffic card, subject to prevailing data rate limits - requires IP Traffic card and requires 25Mbps acceleration option
		Adds Robust Header Compression to RFC 3095 and RFC 4815 (IP/UDP/RTP), plus RFC 4995 and RFC 4996 (IP/TCP) at throughput rates to 29kpkts/s (1-way), 22kpkts/s (2-way); includes Ethernet header compression - requires IP Traffic card
		Encapsulation of IP packets and Ethernet frames over DVB uses Paradise eXtreme Protocol (PXE), Multi Protocol Encapsulation (MPE) or Ultra Lightweight Encapsulation (ULE) protocols, includes Static Routing - up to 64 static routes
		Adds Dynamic Routing, supports RIP, OSPF and BGP, plus 64 static routes
		Adds IP Traffic Shaping: Supports allocation of CIR and BIR plus priority for IP Streams identified by IP Address, Diffserv Class, IEEE 802.1p priority tag or MPLS EXP field
Quad ASI Card Option		Multistream ASI support, requires DVB-S2 and Quad ASI card
AUPC		Adds end-to-end AUPC operation only when IP Traffic used - requires TX and RX operation and IP Traffic card Adds self maintain AUPC operation for IP or ASI Traffic - requires TX and RX operation
24V 100W BUC PSU		P3532 AC Input, 24V 100W DC to Tx BUC **(hardware option)**
48V 100W BUC PSU		P3531 AC Input, 48V 100W DC to Tx BUC **(hardware option)**
24V 180W BUC PSU		P3536 AC Input, 24V 180W DC to Tx BUC **(hardware option)**
48V 180W BUC PSU		P3535 AC Input, 48V 180W DC to Tx BUC **(hardware option)**
48V DC Input		K3002 48V DC Primary power input in place of 100-240V AC input **(hardware option)**
48V in & 24V BUC PSU		K3002 + P3538 Floating 48V DC Input, 24V 180W DC to Tx BUC **(hardware option)**
48V in & 48V BUC PSU		K3002 + P3537 Floating 48V DC Input, 48V 180W DC to Tx BUC **(hardware option)**
+48V in & 48V BUC PSU		K3002 + P3539 +48V DC Input, +48V 180W DC to Tx BUC **(hardware option)**
FSK Control		Controls and monitors single-box Paradise Datacom BUC from the Modem **(hardware option)**
Paired Carrier (carrier re-use) *subject to prevailing modem data rate limits. Minimum occupied bandwidth limit of 25kHz, and maximum occupied bandwidth limit of 36MHz*		P3603 - Paired Carrier Ready, allows carriers to be overlapped thereby reducing the required satellite bandwidth. **(hardware option)** - requires additional cumulative software options below depending upon data rate required
		Paired Carrier up to 512kbps traffic rate - requires Paired Carrier Ready option
		Extends Paired Carrier up to 1024kbps traffic rate - requires 512kbps option
		Extends Paired Carrier up to 2.5Mbps traffic rate - requires 1024kbps option
		Extends Paired Carrier up to 5Mbps traffic rate - requires 2.5Mbps option
		Extends Paired Carrier up to 10Mbps traffic rate - requires 5Mbps option
		Extends Paired Carrier up to 15Mbps traffic rate - requires 10Mbps option
		Extends Paired Carrier up to 20Mbps traffic rate - requires 15Mbps option
		Extends Paired Carrier up to 25Mbps traffic rate - requires 20Mbps option
		Extends Paired Carrier up to 40Mbps traffic rate - requires 25Mbps option
		Extends Paired Carrier up to 50Mbps traffic rate - requires 40Mbps option
		Extends Paired Carrier up to 60Mbps traffic rate - requires 50Mbps option
		Extends Paired Carrier up to 80Mbps traffic rate - requires 60Mbps option
Ruggedisation		Adds extra ruggedisation for harsh environments

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