

# A-Series AX-80 Satellite Modem



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The A-Series is a family of next generation satellite modem platforms built on versatile FPGA- and software-based architecture. The AX-80 product line supports DVB-S2X/S2 standards with utmost possible throughput up to bandwidths of 500 Msps. Exceptional analog and digital engineering provides teleport-grade devices with future-proof expandability.

Beyond DVB waveforms, A-Series devices can be extended to customized signal and data processing. Through an all-IP structure, the platform supports both native network operation as well as data streaming

over IP. Built-in encapsulators provide support for a wide range of formats plus specialized streaming like transparent baseband data, raw IQ information, space data formats and more.

The **AX-80 Satellite Modem** provides full IP connectivity over DVB links in the Gigabit-per-second-class. 10G Ethernet interfaces enable high-speed integration into terrestrial networks. Real-time monitoring and control together with powerful IP processing capabilities support the fastest link available over satellite.

## Key Features

- DVB-S2X - ETSI EN 302 307-2
- DVB-S2 - ETSI EN 302 307-1
- DVB-S2X modulations:  
QPSK to 256APSK normal, short, linear
- DVB-S2 modulations:  
QPSK to 32APSK; normal, short
- Symbol rates up to 500 Msps
- Data rate up to 3 Gbit/s per direction integrated
- Roll-Off: 35%, 25%, 20%, 15%, 10%, 5%
- Exceptionally clean signal output and internal processing
- Predistortion for automatic group delay and nonlinearity compensation
- Operates as layer 3 bridge or layer 3 router including traffic shaping / QoS functionality
- ACM controller open to various ACM systems
- GSE and MPE encapsulation integrated
- Customizable processing infrastructure for easy integration into large communication systems
- Flexible software architecture for easy extension and future virtualization of functionality
- **3 years warranty**

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## TX Signal Specifications

<b>Signal output L-band:</b>	Frequency: 950...2150 MHz Connector: N female Impedance: 50 Ohm Return Loss: > 16 dB Output power: -30...0 dBm 0.1 dB steps, ±0.5 dB accuracy Output power muted: < -85 dBm 10 MHz reference: 1.5 dB +/- 1.5 dB, switchable Phase Noise: -45 dBc/Hz @ 10 Hz -75 dBc/Hz @ 100 Hz -88 dBc/Hz @ 1 kHz -90 dBc/Hz @ 10 kHz -100 dBc/Hz @ 100 kHz -115 dBc/Hz @ 1 MHz Signal related spurs: < -55 dBc, nearby carrier < -50 dBc, unmodulated carrier, 950...2150 MHz
<b>Clock stability:</b>	Standard: ±2 x 10 <sup>-8</sup> after warm up, aging: ±1 x 10 <sup>-9</sup> per day, ±1 x 10 <sup>-7</sup> per year
<b>Symbol rate:</b>	Range: 5 Msps ... 500 Msps <i>depending on license TXS*</i> Step size: 1 sps
<b>DVB-S2X Modulation / Coding:</b>	ModCods: (normal FEC frame) QPSK 13/45, 9/20, 11/20 8PSK 23/36, 25/36, 13/18 16APSK 26/45, 3/5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 32APSK 32/45, 11/15, 7/9 64APSK 11/15, 7/9, 4/5, 5/6 128PSK 3/4, 7/9 256PSK 32/45, 3/4 ModCods: (short FEC frame) QPSK 11/45, 4/15, 14/45, 7/15, 8/15, 32/45 8PSK 2/15, 8/15, 26/45, 32/45 16APSK 7/15, 8/15, 26/45, 3/5, 32/45 32APSK 2/3, 32/45 ModCods linear: (normal FEC frame) 16APSK 1/2-L, 8/15-L, 5/9-L, 3/5-L, 2/3-L 32APSK 2/3-L 64APSK 32/45-L 256PSK 29/45-L, 2/3-L, 31/45-L, 11/15-L all according to ETSI EN 302307-2
<b>DVB-S2 Modulation / Coding:</b>	ModCods: (normal and short FEC frame; 9/10 normal FEC frame only) 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 Pilot insertion: on / off Physical layer scrambling: N = 0...262141 all according to ETSI EN 302307-1
<b>Time-slicing:</b>	Physical layer framing according to ETSI EN 302307 Annex M <i>w/ license TTS</i>
<b>Carrier ID:</b>	DVB-CID according to ETSI TS 103129
<b>Signal spectrum mask:</b>	α = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05 according to ETSI EN 302307
<b>Predistortion:</b>	<b>Contact factory for details.</b>

Specifications are subject to change

# A-Series AX-80 Satellite Modem

## RX Signal Specifications

<b>Signal input L-band:</b>	Frequency: 950...2150 MHz Connector: 1x N female Impedance: 50 Ohm Return Loss: > 13 dB Input power: -55...-10 dBm total aggregate power						
<b>Symbol rate:</b>	Range: 5 Msps ... 500 Msps <i>depending on license RXS*</i> Acquisition bandwidth: $\pm$ selected symbol rate / 2 Tolerance: $\pm$ 1% of selected symbol rate						
<b>DVB-S2X Modulation / Coding:</b>	<table border="0"> <tr> <td>ModCods: (normal FEC frame)</td> <td>QPSK 13/45, 9/20, 11/20 8PSK 23/36, 25/36, 13/18 16APSK 26/45, 3/5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 32APSK 32/45, 11/15, 7/9 64APSK 11/15, 7/9, 4/5, 5/6 128PSK 3/4, 7/9 256PSK 32/45, 3/4</td> </tr> <tr> <td>ModCods: (short FEC frame)</td> <td>QPSK 11/45, 4/15, 14/45, 7/15, 8/15, 32/45 8PSK 2/15, 8/15, 26/45, 32/45 16APSK 7/15, 8/15, 26/45, 3/5, 32/45 32APSK 2/3, 32/45</td> </tr> <tr> <td>ModCods linear: (normal FEC frame)</td> <td>16APSK 1/2-L, 8/15-L, 5/9-L, 3/5-L, 2/3-L 32APSK 2/3-L 64APSK 32/45-L 256PSK 29/45-L, 2/3-L, 31/45-L, 11/15-L all according to ETSI EN 302307-2</td> </tr> </table>	ModCods: (normal FEC frame)	QPSK 13/45, 9/20, 11/20 8PSK 23/36, 25/36, 13/18 16APSK 26/45, 3/5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 32APSK 32/45, 11/15, 7/9 64APSK 11/15, 7/9, 4/5, 5/6 128PSK 3/4, 7/9 256PSK 32/45, 3/4	ModCods: (short FEC frame)	QPSK 11/45, 4/15, 14/45, 7/15, 8/15, 32/45 8PSK 2/15, 8/15, 26/45, 32/45 16APSK 7/15, 8/15, 26/45, 3/5, 32/45 32APSK 2/3, 32/45	ModCods linear: (normal FEC frame)	16APSK 1/2-L, 8/15-L, 5/9-L, 3/5-L, 2/3-L 32APSK 2/3-L 64APSK 32/45-L 256PSK 29/45-L, 2/3-L, 31/45-L, 11/15-L all according to ETSI EN 302307-2
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<b>DVB-S2 Modulation / Coding:</b>	<table border="0"> <tr> <td>ModCods: (normal and short FEC frame; 9/10 normal FEC frame only)</td> <td>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</td> </tr> <tr> <td>Auto detection:</td> <td>Modulation- and FEC-type pilots on / off CCM / VCM / ACM</td> </tr> <tr> <td>Physical layer scrambling:</td> <td>N = 0...262141 all according to ETSI EN 302307-1</td> </tr> </table>	ModCods: (normal and short FEC frame; 9/10 normal FEC frame only)	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	Auto detection:	Modulation- and FEC-type pilots on / off CCM / VCM / ACM	Physical layer scrambling:	N = 0...262141 all according to ETSI EN 302307-1
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Physical layer scrambling:	N = 0...262141 all according to ETSI EN 302307-1						
<b>Time-slicing:</b>	Physical layer framing according to ETSI EN 302307 Annex M <i>w/ license RTS</i>						
<b>Signal spectrum mask:</b>	$\alpha = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05$ according to ETSI EN 302307						

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# A-Series AX-80 Satellite Modem

## Data Processing and Device Specifications

<b>Device connectors:</b>	Data network: M&C network: 10 MHz reference input: 1 PPS input: Alarm:	6x Ethernet RJ-45, 10/100/1000Base-T auto sensing 2x SFP+ adapter slot for optical GbE or optical/copper 10GbE <b>Contact factory for available SFP+ modules.</b> 1x Ethernet RJ-45, 10/100/1000Base-T auto sensing BNC female, 50 Ohm <i>w/ option RI</i> BNC female, 50 Ohm <i>w/ option RI</i> DSUB-9 female <i>w/ option RI</i>
<b>Network operation:</b>	IP network connectivity:  IP traffic shaping/QoS:  Baseband traffic shaping/QoS:  Data encapsulation:  IP data rate limits:	Layer 3 Bridge or Router for IPv4 packet transmission, IPv6 on request 256 IP/subnet routes towards satellite 64 baseband channels with independent DVB-S2X and encapsulation settings ACM MODCOD range and Es/N0 sensitivity independent per channel <b>Contact factory for customized IP-to-baseband data handling.</b> <b>Contact factory for customized ACM messaging formats.</b> 255 independent rules Guaranteed and limited bandwidths Fixed or dynamically integrated into ACM by binding to MODCOD Match criteria: source/destination IP subnet, source MAC, UDP/TCP port ranges, TOS/DS field, packet size configurable baseband channel limits based on symbol rate guaranteed and limited bandwidth individually configurable Generic Stream Encapsulation (GSE) according to ETSI TS 102606 Multiprotocol Encapsulation (MPE) according to ETSI EN 301192 <b>Contact factory for other encapsulation formats.</b> 6 Gbps or 1 Mpps rx+tx processing, subject to prevailing modem limits maximum rates can vary in combination with complex internal processing
<b>Stream inputs:</b>	Interfaces:  Baseband data:	2x RTP/UDP/IP over Ethernet according to IETF RFC 2250 Multicast and IGMPv3 support 2 streams for direct input of baseband frames individually assignable to baseband channels configurable UDP/IP-based flow control <i>w/ license BBI</i>
<b>Stream outputs:</b>	Interfaces: Baseband data:  Transport stream:  IQ data:  CCSDS CADU frames:	1x RTP/UDP/IP over Ethernet according to IETF RFC 2250 direct output of baseband data w/o filtering padding selectable <i>w/ license BBO</i> transport stream from DVB carriers 1 ISI selectable from DVB-S2 multistream carriers <i>w/ license TSO</i> raw IQ data after demodulation signed 8-bit I and Q values for each symbol decimator selectable to reduce bandwidth occupation <i>w/ license IQ</i> extraction of CCSDS CADU frames from DVB-S2 automatic detection of frame length <i>w/ license CCSDS131.3</i>
<b>Frontpanel interface:</b>	LCD-Display 2x40 characters, 4 cursor keys, 4 function keys	
<b>Remote monitoring and control:</b>	Protocol: Connection: Protocol: Connection:	SNMP UDP/IP over Ethernet/RJ-45 or in-band via satellite link HTTP web browser interface TCP/IP over Ethernet/RJ-45 or in-band via satellite link
<b>Temperature range:</b>	Operating: Storage: Relative humidity:	0°C...50°C -30°C...80°C < 95% non condensing
<b>Mains power:</b>	Input: Consumption: Connector:	100...240 V AC nominal, 90...264 V AC max, 50...60 Hz 150 VA / 150 W typical IEC C14
<b>Dimension and weight:</b>	483 x 98 x 505 mm <sup>3</sup> (WxHxD), 1 RU 19" up to approx. 14 kg depending on device type	

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# A-Series AX-80 Satellite Modem

## Order information:

**AX-80** Satellite Modem

## Hardware options:

Hardware options have to be defined with the order and are not field-upgradable. Not all device types may support all combinations. Contact factory with specific requests.

**RI** external 10 MHz reference input

## License based throughput:

License based throughput performance is field-upgradable by uploading a license file to the device.

**TXSxxx** symbol rate based transmission license for xxx Msps  
select from: **TXS125** (default), **TXS250**, **TXS400**, **TXS500**

**RXSxxx** symbol rate based reception license for xxx Msps  
select from: **RXS125** (default), , **RXS250**, **RXS400**, **RXS500**

## License based functions:

License based functions are field-upgradable by uploading a license file to the device.

**TTS** DVB-S2X time-slicing support for transmission  
**RTS** DVB-S2X time-slicing support for reception  
**BBI** direct baseband frame input streaming over IP  
**BBO** direct baseband frame output streaming over IP  
**TSO** transport stream over IP output  
**TAB** DVB table insertion for MPE encapsulation  
**IQ** IQ constellation data output over IP  
**CCSDS131.3** decapsulation of CCSDS CADU frames from DVB-S2/S2X signals