

A-Series AX-60-S02190

Space Mission Ground Modem



powered by



The A-Series is a family of next generation satellite modem platforms built on versatile FPGA- and software-based architecture. The AX-60 product line supports the full range of DVB-S2X/S2/S standards. 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-60-S02190 Space Mission Ground Modem** is the ground station counterpart for IQ Spacecom's XLink space terminal. Development and verification go hand in hand between space and ground segment to ensure compatibility for the mission phase. The established A-Series device platform enables seamless integration into global ground station systems.

Key Features

- CCSDS 231.0-B-3 TC uplinks
- CCSDS 131.0-B-3 TM downlinks
- DVB-S2X - ETSI EN 302 307-2
- DVB-S2 - ETSI EN 302 307-1
- CCSDS 131.3-B-1 CADU frames over DVB-S2
- Symbol rates from 10 ksp/s to 75 Msp/s
- Exceptionally clean signal output and internal processing
- 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

Signal output L-band:	Frequency: Connector: Impedance: Return loss: Output power: Output power muted: 10 MHz reference: Phase noise: Signal related spurs:	950...2150 MHz N female 50 Ohm > 16 dB -30...0 dBm 0.1 dB steps, ± 0.5 dB accuracy < -85 dBm 1.5 dB ± 1.5 dB, switchable -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 < -67 dBc, unmodulated carrier, 950...1900 MHz < -55 dBc, unmodulated carrier, 1900...2150 MHz < -45 dBc, unmodulated carrier harmonics, out of band
Clock stability:	Standard: Extended:	$\pm 2 \times 10^{-7}$ after warm up, aging: $\pm 2 \times 10^{-8}$ per day, $\pm 1 \times 10^{-6}$ per year $\pm 2 \times 10^{-8}$ after warm up, aging: $\pm 1 \times 10^{-9}$ per day, $\pm 1 \times 10^{-7}$ per year <i>w/ options EXT or RI</i>
Symbol rate:	Range CCSDS 231.0: Range DVB-S2X: Step size:	10 ksps ... 5 Msps 10 ksps ... 75 Msps <i>depending on license TXS*</i> 1 sps
CCSDS 231.0 Modulation / Coding:	Modulation: Carrier modulation mode: Randomizer: Coding:	BPSK QPSK PLOP-1 PLOP-2 on / off BCH 56/64 LDPC 64/128 or 256/512 all according to CCSDS 231.0-B-3
DVB-S2X Modulation / Coding: <i>w/ license DVB-S2XTX</i>	ModCods: (normal FEC frame) 16APSK 32APSK 64APSK 128PSK 256PSK ModCods: (short FEC frame) 16APSK 32APSK ModCods linear: (normal FEC frame) 64APSK 256PSK all according to ETSI EN 302307-2	QPSK 13/45, 9/20, 11/20 8PSK 23/36, 25/36, 13/18 26/45, 3/5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 32/45, 11/15, 7/9 11/15, 7/9, 4/5, 5/6 3/4, 7/9 32/45, 3/4 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 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
DVB-S2 Modulation / Coding: <i>w/ license DVB-S2XTX</i>	ModCods: (normal and short FEC frame; 9/10 normal FEC frame only) Pilot insertion: Physical layer scrambling:	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 on / off N = 0...262141 all according to ETSI EN 302307-1
Signal spectrum mask:	$\alpha = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05$ according to ETSI EN 302307	

Specifications are subject to change

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RX Signal Specifications

Signal input L-band:	Frequency: Connector: Impedance: Return Loss: Input power: LNB DC-Feed	950...2150 MHz 680...2300 MHz <i>w/ licenses RXL680 and RXL2300</i> 1x F female 75 Ohm > 13 dB -70...-10 dBm total aggregate power 13.5 V or 18 V switchable 450 mA max. current, short circuit protected 22 kHz tone on/off, DISEqC 1.1
Symbol rate:	Range CCSDS 131.0: Range DVB-S2X: Acquisition bandwidth: Tolerance:	100 ksps ... 60 Msps <i>depending on license RXS*</i> 100 ksps ... 75 Msps <i>depending on license RXS*</i> see Doppler compensation $\pm 1\%$ of selected symbol rate
Doppler compensation:	Max. absolute rate: Max. change of rate:	Doppler compensation is directly related to signal bandwidth. $\pm 0.2 \cdot$ symbol rate in Hz or ± 1.8 MHz whatever limit applies first $\pm 0.0012 \cdot$ symbol rate in Hz/s
CCSDS 131.0 Modulation / Coding:	Modulation: Randomizer: Coding: Transfer frame lengths:	BPSK QPSK Contact factory for QPSK, 8PSK or 4D-8PSK TCM support. on / off Reed-Solomon 223/255 or 239/255 Convolutional 1/2, 2/3, 3/4, 5/6, 7/8 separate or concatenated Contact factory for support of LDPC or Turbo codes. 100...2048 Bytes all according to CCSDS 131.0-B-3
DVB-S2X Modulation / Coding: <i>w/ license DVB-S2XRX</i>	ModCods: (normal FEC frame) ModCods: (short FEC frame) ModCods linear: (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 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 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
DVB-S2 Modulation / Coding: <i>w/ license DVB-S2XRX</i>	ModCods: (normal and short FEC frame; 9/10 normal FEC frame only) Pilot insertion: Physical layer scrambling:	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 on / off N = 0...262141 all according to ETSI EN 302307-1
Signal spectrum mask:	$\alpha = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05$ according to ETSI EN 302307	

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Data Processing and Device Specifications

Device connectors:	Data network: M&C network: 10 MHz reference input: Alarm:	1x Ethernet RJ-45, 10/100/1000Base-T auto sensing 1x Ethernet RJ-45, 10/100/1000Base-T auto sensing BNC female, 50 Ohm <i>w/ option RI</i> DSUB-9 female <i>w/ option RI</i>
Network operation: <i>w/ licenses DVB-S2XTX and DVB-S2XRX</i>	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 Contact factory for customized IP-to-baseband data handling. Contact factory for customized ACM messaging formats. 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 Contact factory for other encapsulation formats. 360 Mbps or 80000 pps rx+tx processing, subject to prevailing modem limits maximum rates can vary in combination with complex internal processing
Stream inputs:	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
Stream outputs:	Interfaces: Baseband data: 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 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
Frontpanel interface:	LCD-Display 2x40 characters, 4 cursor keys, 4 function keys VFD-Display 2x40 characters, 4 cursor keys, 4 function keys	<i>w/ option EXT</i>
Remote monitoring and control:	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
Temperature range:	Operating: Storage: Relative humidity:	0°C...50°C -30°C...60°C <i>w/ option EXT</i> -30°C...80°C < 95% non condensing
Mains power:	Input: Consumption: Connector: Fuse:	100...240 V AC nominal, 90...264 V AC max, 50...60 Hz 65 VA / 45 W typical IEC C14 2x 3.15 A time-lag fuse
Dimension and weight:	483 x 44 x 505 mm ³ (WxHxD), 1 RU 19" up to approx. 10 kg depending on device type	

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Order information:

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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
EXT extended operating temperature range of -30°C...60°C

License based throughput:

License based throughput performance is field-upgradable by uploading a license file to the device. Either a symbol rate or a data rate based license has to be selected. License model can be changed in field.

TXSxx symbol rate based transmission license for xx Msps
select from: **TXS15, TXS30, TXS45, TXS60, TXSmax**
TXSmax supports full throughput according to specification or device limits

RXSxx symbol rate based reception license for xx Msps
select from: **RXS15, RXS30, RXS45, RXS60, RXSmax**
RXSmax supports full throughput according to specification or device limits

License based functions:

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

RXL680 extended L-band input down to 680 MHz
RXL2300 extended L-band input up to 2300 MHz
DVB-S2XTX DVB-S2X transmission and network operation
DVB-S2XRX DVB-S2X reception and network operation
IQ IQ constellation data output over IP