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# CXS-2000 DUAL-BAND, MULTIMODE SATELLITE TRANSPONDER

## Telemetry, tracking and command (TT&C)

The CXS-2000 provides TT&C between U.S. Air Force satellite control facilities and military satellites. It is the U.S. Department of Defense's standard for programs that require high reliability for Space-Ground Link System (SGLS) and Unified S-band (USB)-compatible transponders.

The CXS-2000 transponder builds upon L3Harris' strong flight heritage and continues the tradition of meeting high reliability and radiation hardening mission requirements with more than 1,600,000 hours of successful on-orbit operation across numerous DoD/Military programs (TRL-9). It is fully compatible with external encryption/decryption devices such as L3Harris' MCU-110C.



SPECIFICATIONS			
	SGLS (L-BAND)	USB (S-BAND)	3RD RX INPUT (S-BAND)
<b>Receiver/demodulator</b>			
Receive frequency	1.76 – 1.84 GHz	2.025 – 2.120 GHz	1.9325 GHz
Carrier tracking rate/range	10 kHz/sec, ± 100 kHz		
<b>Carrier acquisition</b>			
Threshold (with modulation)	-113 dBm	-119 dBm	-80 dBm
<b>Acquisition time</b>			
With modulation	0.8 s maximum	1.2 s maximum	20 s maximum
Search mode only	2.0 s maximum	NA	Search mode only
Noise figure	3.5 dB maximum		5 dB maximum
<b>Ranging channel</b>			
Type	PRN or tone	NA	
Delay	3.5 μsec	NA	
Delay variation	± 120 nsec	NA	
Turnaround ratio	1:1	NA	
<b>Command channel</b>			
Modulation types	AM/FSK/PM	BPSK/PM	BPSK/3.1 MHz subcarrier
Modulation index	1.0 radians	1.0 radians	1.57/1.0 radians
PM subcarrier frequency	NA	16 kHz	3.1 MHz (optional)
FSK tone frequencies	65, 76, 95 kHz	NA	NA
Data rate	1 or 2 kbps	1,2 or 4 kb	32 or 64 kbps
Threshold (10 <sup>-6</sup> BER)	-110 dBm (2 kbps)	-113 dBm (2 kbps)	-82 dBm
SGLS & USB	Direct BPSK modulation data rates to 1 Mbps		NA

### KEY FEATURES

- > Dual-band USB and SGLS transponder
- > Multimode modulation in PM,FSK, AM, BPSK and optional QPSK
- > Flight proven
- > High reliability, radiation hardened
- > 15-year mission life
- > Triplexer (optional)

## SPECIFICATIONS – CONTINUED

	SGLS (L-BAND)	USB (S-BAND)	3RD RX INPUT (S-BAND)
<b>Output data interface</b>			
Outputs (RS422 or LVDS)	“S”, “0”, “1”, clock, data clock, ramp lock, CDU lock		
<b>Transmitter/baseband</b>			
Transmit frequency	-2200 to 2300 MHz		
Coherent turnaround ratio	256/205 (SGLS)	240/221 (USB)	NA
Frequency stability	± 20 ppm		
RF power	5 W minimum, 8 W option, low power port (-5 dBm)		
Output protection	No damage; open or short circuit		
IPM (100 Hz to 1 MHz)	< 2 ° rms (ambient) non-coherent, < 3.5° rms coherent		
IAM	< 2%		
<b>Telemetry channel</b>			
Peak phase deviation	3 radians maximum		
Subcarrier frequencies	1.024		
Subcarrier stability	± 0.005%		
Direct carrier modulation rates	8 Msps (NRZ) maximum		
Subcarrier modulation rates	128 kbps maximum		
<b>Downlink forward error correction (FEC)</b>			
Encoding	Rate 1/2 convolutional encoding rate 7/8 reed-solomon		
<b>Input data interface</b>			
Device type	RS-422 or LVDS		

The CXS-2000 implements a space-qualified, radiation hardened, field-programmable gate array (FPGA)- based design. It provides a fully configurable architecture while maintaining a reduced mass, power consumption, footprint and improved performance.

The transponder operates directly at L- and S-Band, with ranging and coherency as well as convolutional and reed-solomon encoding. Other standard features include direct modulation, binary phase shift keying (BPSK) and subcarrier modulation. Within the same mechanical envelope, a 1553 interface for commands and telemetry is also available.

L3Harris brings more than five decades of experience in TT&C. The engineering analyses, manufacturing and quality processes used for the unit’s production are consistent with the industry’s high reliability standards.

## POWER REQUIREMENTS

Input voltage	+28 VDC or +70 VDC
Receive only	12 to 16 W maximum
Transmit and receive	46 to 56 W maximum
Over/reverse voltage	Omnidirectional
Current limiting	50 watts
Command inputs	28 V latching relay, serial interface

## GENERAL

Temperature (qual)	+28 VDC or +70 VDC
Vibration	15 Grms
Altitude	Unlimited
EMI	MIL-STD-461F (tailored)
Radiation	100 krads (chassis), >25krads (part)

## OPTIONS

Serial interface for command and/or telemetry data.  
\*Power consumption and weight varies with options selected

### CXS-2000 Dual-band Multimode Satellite Transponder

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