# CXS-610
## STDN/USB/DSN TRANSPONDER

**L3 continues the tradition of meeting high-reliability and radiation hardening mission requirements with over 300,000-hours of successful on-orbit operations since 2007.**





L3 Telemetry & RF Products (L3 T&RF) is a primary domestic supplier of Telemetry, Tracking and Command (TT&C) Transponders offering proven designs and flexibility for short-term, as well as long-term applications.

The CXS-610 builds upon our strong flight heritage from the very similar CXS-810 (SGLS) transponder. It continues the tradition of meeting high-reliability and radiation hardening mission requirements with over 300,000-hours of successful on-orbit operation since 2007.

The CXS-610 is the high-reliability choice for a STDN-compatible transponder. It provides TT&C between STDN and DSN ground systems and NASA or ESA satellites, and can also be used for commercial TT&C applications.

The CXS-610 is a Technology Readiness Level 9 (TRL-9) design, currently in-orbit on several successful NASA programs. Similar STDN transponders, (CXS-600B), have also successfully flown on many NASA and commercial satellites, including the Lunar Prospector mission. The mission ended in 1999.

The CXS-610 utilizes a custom radiation-hardened, multi-function ASIC which results in reduced mass, power consumption, footprint and improved performance. Ranging, coherency, convolutional encoding, code conversion, direct modulation and subcarrier modulation are all standard features.

Optional configurations include custom interface characteristics for command function inputs, telemetry outputs and integrated diplexer capabilities.

### FEATURES

- STDN/USB-compatible transponder
- BPSK/PM downlink
- Utilizes multi-function ASIC for improved performance
- Flight-proven
- High-reliability, radiation-hardened
- 15-year mission life
- Diplexer (optional)

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## STDN/USB/DSN TRANSPONDER

## SPECIFICATIONS

### RECEIVER/DEMODULATOR

| | |
|---|---|
| Receive frequency | 2025 to 2120 MHz |
| Carrier tracking range | ±140 kHz |

### CARRIER ACQUISITION

| | |
|---|---|
| Threshold | -124 dBm |
| Carrier tracking threshold | -127 dBm |

### ACQUISITION TIME

| | |
|---|---|
| Acquisition sweep rate | 35 kHz/sec @ -110 dBm<br>1 kHz/sec @ threshold |
| Noise figure | 5 dB maximum |
| Dynamic range | -40 dBm (to threshold) |
| Spurious response | > 60 dB below desired response |

### RANGING CHANNEL

| | |
|---|---|
| Bandwidth<br>(optional bandwidths available) | 1.5 kHz to 819 kHz |
| Delay | 2.5 µs maximum |
| Delay variation | ±40 ns maximum |
| Uplink modulation index | 0.22 to 0.5 radians |
| Turnaround ratio | 1:1 (nominal) |

### COMMAND CHANNEL

| | |
|---|---|
| Modulation index | 1.35 radians |
| Subcarrier frequency | 16 kHz |
| Data rate<br>factory preset | 4000, 2000, 1000, 500 bps, |
| Threshold (10-6 BER) | -120 dBm at 2 kbps |

### OUTPUT INTERFACE

| | |
|---|---|
| Outputs | CMOS or RS-422 |

### TRANSMITTER/BASEBAND

| | |
|---|---|
| Transmit frequency | 2200 to 2300 MHz |
| Coherent turnaround ratio | 240/221 |
| Frequency stability | ±20 ppm |
| RF power | 5 W minimum |
| IPM | < 3.5 ° rms (ambient) |
| IAM | < 1% |

### TELEMETRY CHANNEL

| | |
|---|---|
| Bandwidth | 100 Hz to 10 MHz |
| Peak phase deviation | 3 radians maximum |
| Subcarrier frequencies | 1.024 MHz or 1.7 MHz |
| Subcarrier stability | ±0.005% |
| Direct carrier modulation | 8.0 Msps (NRZ) maximum |
| BPSK | 4.0 Msps maximum, 20 dB carrier null |

### SUBCARRIER BPSK

| | |
|---|---|
| Modulation rates | 1.024 MHz:128 kbps maximum,<br>1.7 MHz: 256 kbps maximum |
| Convolutional encoding | R = 1/2, K = 7 (CCSDS or JPL type) |
| Command type | 28 or 5 V latching relay |

### INPUT INTERFACE

| | |
|---|---|
| | RS-422 |

### POWER REQUIREMENTS

| | |
|---|---|
| Input voltage | +28 VDC or +70 VDC |
| Power consumption | Transmitter: 35 W maximum<br>Receiver: 5.5 W maximum |
| Over/Reverse voltage | Provided |

### GENERAL

| | |
|---|---|
| Dimensions | 5.5 in. L x 8.8 in. W x 3.08 in. H |
| Weight | 5.8 lb. maximum |

### ENVIRONMENTAL

| | |
|---|---|
| Temperature | -24 °C to +61 °C |
| Vibration | 19 Grms |
| Altitude | Unlimited |
| EMI | MIL-STD-461C/D (tailored) |
| Radiation | 100 krads (chassis) |

### OPTIONS

Auto Acquisition, Custom Interfaces, Simultaneous Transmitter Dual-mode Modulation, Diplexer


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