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C/TT-520 S-BAND MULTIMODE TRANSPONDER

TRANSPONDER	
Transmitter	
Frequency, F_{tx}	S-Band, 2200 to 2300 MHz (selectable; factory preset) turnaround ratio 240/221
Antenna Impedance	50 Ohms
RF Output Power	5-20 W on orbit selectable in 3 modes
TDRSS Network Mode (450-SNUG)	Modulations: BPSK, QPSK, OQPSK, SQPN Data rates: 125 bps to 300 kbps
Ground Network Mode (GN)	Modulations: BPSK, QPSK, OQPSK Data rates: 1 kbps to 6 Mbps
C2V2 Mode (NASA SPP-50394)	Modulations: SQPN, SQPSK Data rates: 18 ksps to 3 Msps
Ranging Latency	< 1 µx
Modulation Filter	Raised cosine, NTIA-compliant
Control	FEC on/off, encrypt on/off; mode select; RF power; TX on/off, coherent on/off, PN on/off, mod filter on/off, mod source select (external, PN or square-wave)
Status	RF output power, temperature secondary voltage
Receiver	
Frequency	S-Band, 2025 to 2110 MHz (settable at manufacture)
Noise Figure	2.5 dB max; 3.5 dB EOL
Antenna Impedance	50 Ohms
Dynamic Range	-137 dBm to -17 dBm (+20 dBm max w/o damage)
Sensitivity	-124 dBm @ 1 x 10-5 BER for 2 kbps data rate -137 dBm @ 1 x 10-5 BER for 125 bps data rate
Acquisition Range	± 1.5 kHz TDRSS mode ± 110 kHz GN mode
Tracking Range	± 160 kHz
Doppler Rates	TDRSS & C2V2; 70 Hz/s (125 bps); 380 Hz/s (>1 kbps); GN; 35 kHz/s
TDRSS Network Mode (450-SNUG)	Modulations: SS-BPSK, SS-UQPSK, PM/BPSK on 8 kHz Subcarrier Data rates: 125 bps to 300 kbps
Ground Network Mode (GN)	Modulations: BPSK Data rates: 2 kbps to 3 Mbps
Ground Network (GN) Subcarrier Mode	Modulations: BPSK on 8/16 kHz Subcarrier Data rates: 2 kbps
C2V2 Mode (NASA SPP-50394)	Modulations: SS-BPSK, SS-UQPSK, BPSK Data rates: 36 kbps to 1 Mbps
Data Format	NRZ-L, NRZ-M
Range Channel	18-stage truncated sequence per 450-SNUG
Control/Status	RS-422 UART 2400 baud
Control	Mode select, FEC on/off Encrypt on/off, Rx test
Status	AGC, frequency offset, temperature, secondary voltage, lock indicators: PN/carrier/subcarrier/bit sync
Physical	
Volume	8.6" L x 4.1" W x 4.6" H w/o diplexer 9.5" L x 5.7" W x 4.6" H with diplexer
Weight	6.5 lb (2.95 kg) w/o diplexer < 9.0 lb with diplexer



Our most robust and flexible S-Band product to date, the model C/TT-520 S-Band multimode transponder provides full-duplex communications with a variety of NASA networks and protocols. It leverages the latest available technologies, traditionally tested and screened in accordance with EEE Level 2 parts program methods. It is ideally suited to the harsh realities of space communications. The C/TT-520 features receive data rates from 125 bps to 3 Mbps and transmit rates up to 6 Mbps. It maximizes throughput while maintaining a noise figure of 2.5 dB and implementation loss of 1.5 dB – assuring robust link closure under even the most marginal of conditions.

The C/TT-520 provides accurate ranging using both Tracking and Data Relay Satellite System (TDRSS) long code pseudo-random noise (PN) ranging and Doppler turnaround ranging. PN ranging meets the stringent requirements of the TDRSS Space Network.

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Compatible systems include the TDRSS, Space Network, the NASA Ground Network, the NASA Deep Space Network and the Universal Space Network. The C/TT-520 also supports the Common Communications for Visiting Vehicles protocol used on the International Space Station and is a flexible hardware and firmware solution adaptable to a variety of missions and applications.

TRANSPONDER	
IO Characteristics	
I/O Type	3.3 V RS-422
Rx Outputs	Redundant command data/clock serial status, lock indicators
Rx Inputs	Control, reset, AUX data
Tx Inputs	Redundant TxData I/Q, clock
Power	
Input Voltage	22 to 36 VDC
Input Power Rx Only	<8 W max
Input Power RX & Tx	5 W output: <39 W 20 W output: <80 W
Environmental	
Temperature	-40 °C to +70 °C (non-operating) -10 °C to +60 °C (operating)
Random Vibration	18.4 grms, 3-axis
Pyrotechnic Shock	1400 (1 kHz to 10 kHz)
Altitude	Unlimited
Total Dose	20 kRad(Si) min
Latch-Up LET	> 75MeV/mg/cm^2

VERSATILITY

The C/TT-520 is configurable to suit both your mission and your spacecraft bus. Selectable parameters include RF frequency, 1 of 85 gold codes, receive and transmit data rates, receive and transmit modulations, RF output power, encryption/decryption, convolutional encoding, Viterbi decoding and Reed Solomon encoding/decoding. Available interfacing includes RS-422, low-voltage differential signaling, universal asynchronous receiver-transmitter and SPI.

EXPERT SUPPORT

The C/TT-520 is designed, built, assembled and tested all within one facility and is serviced and supported by engineering professionals with decades of spaceflight design experience. Every C/TT-520 delivered is accompanied by domain expertise in parts, materials, radiation analysis, mechanical engineering, power supply design, digital signal processing, radio frequency design and manufacturing engineering. For most applications, existing data items can be provided for review, reducing the analysis and testing required.

C/TT-520 S-Band Multimode Transponder

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L3Harris Technologies is an agile global aerospace and defense technology innovator, delivering end-to-end solutions that meet customers' mission-critical needs. The company provides advanced defense and commercial technologies across air, land, sea, space and cyber domains.

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