Small Deep Space Transponder

Fact Sheet

Key Features

- Deep Space Network Compatible
- X-band Receiver, X-band and Ka-band Exciters
- 2.5 dB Noise Figure (Nominal @25°C)
- -156 dBm Receiver Threshold
- Temperature Compensated Receiver VCO
- Low Exciter Spurious, Phase Noise and Allan Deviation
- Radio Science Mode (USO Input Available)
- 40 ns Maximum Ranging Delay Vairation
- 3 ns Maximum Carrier Delay Variation
- Bus Interface - Mil-Std 1553/1773 Options
- External Power Converter Synchronization Capability
- Operates Under Launch Environments
- Radiation and SEU Resistant
- Internal Telemetry Modulation Encoder
- Internal Command Detector
- Mounting in Either of Two Axes

Performance Characteristics

Transponder

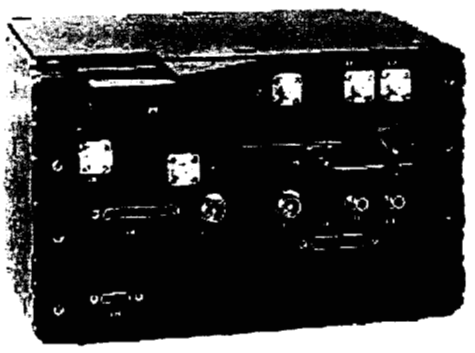
X-band Uplink Frequency Range	7.145-7.235 GHz
X-band Downlink Frequency Range	8.400-8.450 GHz
X-band Tx/Rx Ratio	880/749
Ka-band Downlink Frequency Range	31.800-32.300 GHz
Ka-band Tx/Rx Ratio	3360/749
Carrier Delay Variation	< 3ns p-p
Ranging Delay Variation	< 40 ns p-p

X-band Receiver

Noise Figure	<2.5 dB @ 25°C
Carrier Tracking Signal Range	-70 to -156 dBm
Carrier Loop BW (2-sided)	20 Hz nom. At threshold, expands to 200 Hz strong signal
Carrier Loop Damping Factor	0.5 @ 0 dB loop S/N
Tracking Range	>200 kHz about f0
Cmd Subcarrier Frequency	16 kHz
Cmd Subcarrier Mod Index	0.2 - 1.3 rad pk.
Ranging Filter Type	3-pole Chebychev
Ranging Filter BW	1700 kHz nominal
Temperature Stability	+/- 6.5 ppm (-40 to +50 °C)

Exciters (X- and Ka-band)

X-band Output Power	+ 12 dBm @ 25°C
X-band Residual Phase Noise	-20 dBc/Hz at 1 Hz offset -80 dBc/Hz at 100-100 kHz
Ka-band Output Power	+4.0 dBm @ 25°C
Frequency Stability, 0 to +50°C	5.0 ppm
Spurious and Harmonic Outputs	<-50 dBc
Phase Mod Linearity	10% to 2.0 rad pk.
Tlm Format	NRZ-L
Tlm Convolutional Encoding	15-1/2, 15-1/4, 15-1/6, 7-1/2
Tlm Subcarrier	Programmable, 2kHz to 4 Mhz sq wave.
Tlm Phase Deviation	0 to 90° peak
Ranging Modulation Index	Selectable, 2.1875, 4.375, 8.75, 17.5, 35° pk.
Differential One-way Ranigng Tones	19.2 MHz, Coherent with carrier
Direct Modulation Mode	Available
Bi-ϕ-L Coding	Available



	SDST	Mars Pathfinder Equivalent
Mass	3 kg	TMU: 0.435 kg DST: 4.000 kg CDU: 0.365 kg Ka-band Exciter: N/A
Power	12.9 W	TMU: 1.4 W DST+CDU: 13.1 W