GENERAL DYNAMICS
Mission Systems

S-BAND TDRSS / DSN TRANSPONDER

Normal and Inverse Modes

Space Network Compatible

Deep Space Network Compatible

Designed for Manned Missions

EFT-1 version TRL9 (non DSN Mode)

Exploratory Missions (EM) versions TRL7 2016, TRL9 2018

This S-Band Transponder (SBT), developed by General Dynamics, can communicate with both NASA's Space Network (SN) and Deep Space Network (DSN). Four user selectable frequencies are available including the SN multiple access frequency. Additionally the SBT can function as an inverse SN transponder allowing communication and ranging between two spacecraft or another element on the end of the same link. The SBT's extensive functionality should satisfy the needs of almost every near-earth mission.

Features

- Supports Multiple and Single Access SN Services
- Normal (Point A) and Inverse (Point B) SN Modes
- PN Code Plug: 85 user selectable codes
- Meets SNUG downlink requirements
- Supports DSN ranging and Doppler Services
- Operates Under Launch Environments
- Radiation and SEU Resistant

Performance Characteristics

Transponder

Standard Channels

Link Type	Unit Transmit Frequency (MHz)	Unit Receive Frequency (MHz)	Maximum Bandwidth (MHz)	Comment
CTN1 SN	2200-2300	2025-2220	6	Band 2 – Long Haul
CTN2 SN	2200-2300	2025-2220	6	Band 1 – Long Haul
CTN1 DSN	2200-2300	2025-2220	5	Band 2
CTN2 DSN	2200-2300	2025-2220	5	Band 1
Prox-Ops	2200-2300	2025-2220	6	Band 3, Prox-Ops, Point A Mode
Prox-Ops	2200-2300	2025-2220	6	Band 4, Prox-Ops, Point B mode

- Other S-band Frequencies Factory Programmable
- S-Band Point A TX/RX Ratio: 240/221

Return Link Modes

Link Type Coded	Coded Symbol Rate	Data Group	Mode	Doppler Measurement	PN Ranging	Modulation	PN Spreading
DG1 coherent mode 1	≥ 18 Ksps ≤ 600 Ksps	DG1 Coherent	Mode 1	Two Way	Yes	Balanced SQPN	Yes
DG1 non-coherent mode 2	≥ 18 Ksps ≤ 600 Ksps	DG1 Non-Coherent	Mode 2	One Way	No	Balanced SQPN	Yes
DG2 coherent	≥ 600 Ksps ≤ 6 Msps	DG2 Coherent		Two Way	No	Balanced SQPSK	No
DG2 non-coherent	≥ 600 Ksps ≤ 6 Msps	DG2 Non-Coherent		One Way	No	Balanced SQPSK	No
DG1 coherent mode 3	≥ 300 Ksps ≤ 6 Msps	DG1 Coherent	Mode 3	Two Way	Yes	Spread Spectrum Unbalanced (Q/I = 4:1) QPSK	Yes
PM with PN ranging on carrier coherent	≤ 2 Msps			Two-Way Three-Way	Yes	PM of data and ranging signal with residual carrier	No
PM with PN ranging on carrier non-coherent	≤ 2 Msps			One-Way	No	PM of data and ranging signal with residual carrier	No

Forward Link Modes

Coded Symbol Rate	Link Type	PN Spread	Modulation	PN Ranging
≥ 18 Ksps ≤ 300 Ksps	Operational Single Access	Yes	Spread Spectrum Unbalanced QPSK (I/Q = 10:1)	Yes
≥ 300 Ksps ≤ 6 Msps	Operational Single Access	No	BPSK	No
≤ 2 Msps	PM with PN ranging on carrier	No	PM of data and ranging signal with residual carrier	Yes

S-Band Receiver

- Noise Figure: 3.3 dB typical @ +25°C
- Carrier Tracking Signal Range: -40 to -98 dBm
- Tracking Range: ±160 kHz minimum
- Temperature Stability: ±0.3 ppm (+10 to +40°C), ±1 ppm (-10 to +55°C)

S-Band Exciter

- Output Power: +12.5 dBm ± 2.5 dB, adjustable 0 to -70dB in 1dB steps
- Frequency Stability: : ±0.3 ppm (+10 to +40°C), ±1 ppm (-10 to +55°C)
- Harmonic Outputs: < -60 dBc

Phase Noise

	Non-coherent		Coherent		
Range	**Static**	**Vibe**	**Static**	**Vibe**	**Units**
1 - 10 Hz	7.50	10.00	1.00	NA	° rms
10 - 100 Hz	1.50	5.50	1.00	NA	° rms
100 Hz - 1 kHz	0.50	2.40	1.00	NA	° rms
1 kHz - 6 MHz	1.00	2.40	1.50	NA	° rms

General

- Mass: 10.7 lbs (4.9 kg) maximum
- Input Supply Voltage: 95 to 136 VDC
- Input Supply Power:
- Receiver Only: 13.8 W nominal
- Receiver + Exciter: 18 W nominal
- Envelope Size: 7.575"L x 8.92"W x 6.00"H
- Radiation Total Dose: 40 krads (Si) minimum, most parts 100 krads (Si)
- Qual. Temperature Range: -35 to +76° C maximum
- Operating vibration: 25.8 grms
- Survival vibration: 37.8 grms

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