

# HRMS - High Rate Modem System



On-Orbit Reprogrammable Radio

Frequency Plans for Independent Receive and Transmit Channels

Pre-integration with General Dynamics Type 1 Crypto Products

Reconfigurable DVB-S2 Waveform Support

Mission Life: 3 – 5 years (LEO/MEO/GEO)

## Overview

By using a combination of FPGAs and GPPs for signal processing, the High Rate Modem System (HRMS), pronounced “Hermes”, supports reprogrammable frequency plans without requiring hardware changes. HRMS provides interface compliant physical layer data handling, data routing, forward error correction coding, and modulation in accordance with industry standards (e.g., DVB-S2). Additionally, it bolsters multi-band and multi-waveform support in a single module. This architecture provides flexible RF interfaces for a variety of user data.

## 50 Years of Space Communication Success

General Dynamics has over 50 years of experience designing and manufacturing high reliability space electronics for NASA and the Department of Defense. From the S-Band transponders used by the Apollo astronauts who landed on the Moon and communicated back down to Earth, to the X-Band system for the Mars Exploration Rovers. Our proven space electronics provide reliable Earth-to-spacecraft and spacecraft-to-spacecraft communications.

General Dynamics supplies the tracking, telemetry, and control (TT&C), precision navigation and timing, and crosslink equipment for missions of human space flight, International Space Station rendezvous, near-Earth observation, tracking and data relay, lunar, and deep space exploration.

Our flight-proven subsystem components make us a trusted leader in complex space communications and data handling electronics, miniaturized power components, on-board software processes and development. We comply with CMMI level-3 systems and embedded software processes.

# HRMS - High Rate Modem System

## Interfaces

- Input Voltage: 28 VDC nominal
- DC Power Consumption: ~ 75 W (Typ) (TBR)
- LVDS/SpW (ECSS-ST-E-50-12C), 1000Base-T, JTAG, 10GBASE-KR available on request.
- Transmit Center Frequency: 7750-8400 MHz
- Receive center frequency: 2025-2120 GHz
- Other RX/TX bands and frequencies are available on request
- Analog Telemetry
- DVB-S2 compliant
- FEC Encoding/Decoding: LDPC, + BCH

## Memory

- 4 GB MRAM processing memory
- 4 GB MRAM boot memory
- Enables on-orbit reprogramming

## Physical/Environmental

- Size : 12.5 in x 5.5 in x 3 in (TBR)
- Weight: ~11 lbs (TBR)
- Temp: -24° C to +61° C
- Designed for LEO/MEO/GEO orbits

## Receiver Features

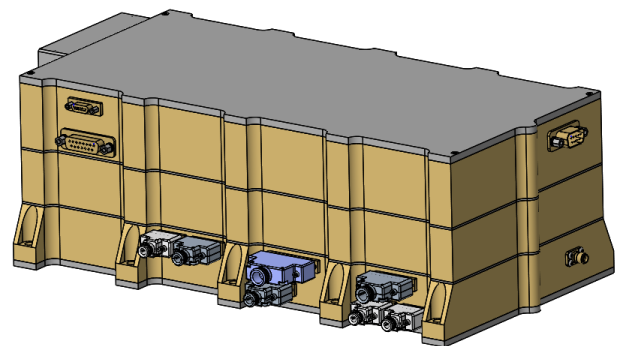
- Modulations: QPSK, 8PSK, 16APSK, 32APSK
- CCM Coding Rates: standard DVB-S2
- Receive Rates: up to ~720 Mbps (Full Duplex)
- Receive Noise Figure: ~ 3 dB

## Transmitter Features

- Transmit waveforms: DVB-S2. Additional waveform support available depending on application
- Frequency agile waveform support capability
- Transec options: AES-256 (TBR)
- Transmit Rates: up to ~10 Gbps
- Transmit Output Power: ~ 0 dBm (TBR)
- Built in TX attenuation control 0-32 dB in ,5dB steps
- Transmit Spurious Outputs & Harmonics: ~ -40 dBc

## External Crypto Support

- Compatible with General Dynamics Type 1 AXL



HRMS Conceptual Figure

**GENERAL DYNAMICS**

Mission Systems

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