

# ConDR – Configurable Digital Radio



Selectable Waveforms and Frequency Plans

Independent Receive and Transmit Channels

SGLS, USB, PM/PCM, BPSK, QPSK and  
OQPSK Modulation, 16APSK (Capable)

Mission RF Interfaces (L-Band and S-Band)

Compatible with multiple cryptographic solutions  
(Ex: KG 501, MCU 110)

Standard Level 3 Space Hardware

## Overview

By using FPGAs for signal processing, the ConDR supports selectable frequency plans without requiring hardware changes. ConDR provides interface compliant physical layer data handling, data routing, forward error correction coding, and modulation in accordance with industry standards (Ex: SGLS and USB.) 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.

# ConDR – Configurable Digital Radio

## Interfaces

- Input Voltage: 21 to 36 VDC (28 VDC nominal)
- DC Power Consumption: 16 W
- Frequency Stability: 10 ppm
- Output Power: +7 dBm
- Telemetry Outputs:
  - Carrier lock, Bit Sync Lock, AGC TLM, Loop Stress TLM, Temperature
- Receive center frequency: L and S-band
  - Two independent receive channels available. Channel selection varies with waveform and use case.
- Transmit center frequency: L and S-band
  - Single Transmit channel. Channel section varies with waveform and use case.
- SGLS and USB Compliant
- Supports PN and Tone ranging
- RX FEC Decoding: Convolutional rate K = 7
- Stable Frequency Reference
- RS422 interface (Additional interfaces available)

## Physical/Environmental

- Size < 9.40" x 7.3" x 2.30"
- Mass < 6 lbs
- Vibration > 6 grms
- Temp. Limits: -24 C to +61 C

## Available Receiver Features

- Receive waveforms: SGLS, USB, BPSK, BPSK on subcarrier @ 1 radian, QPSK, OQPSK, and PM/PCM @ 1 radian. Additional waveforms can be supported depending on specific application
- Receive PCM/line Codes: NRZ-L, M, S; Bi-phase-L, M, S
- Receive Rates:
  - SGLS: 1 – 2 kbps
  - USB: 4 kbps (on 16 kHz subcarrier)
  - BPSK: 2 kbps, 100 kbps, 1Mbps
  - BPSK on 1.25 or 1.7 MHz subcarrier @ 1 radian: 32 kbps, 100 kbps
  - QPSK/OQPSK: 4 Mbps
  - PM/PCM: 1 Mbps @ 1 radian
  - Additional receive data rates and mod indices can be supported depending on application

## Available Transmitter Features

- Transmit waveforms: BPSK, BPSK on subcarrier @ 1 radian, PM/PCM @ 1 radian, QPSK, and OQPSK. Additional waveforms can be supported depending on specific application.
- Transmit PCM/line Codes:
  - NRZ-L, M, S
  - Bi-phase-L, M, S (Not applicable on QPSK and SQPSK)
- TX FEC Encoding: AFSCN Convolutional Encoding
- Transmit Rates:
  - 16APSK: 100 Mbps (Capable)
  - QPSK/OQPSK: 64 kbps or 200 kbps, 50 Mbps
  - BPSK: 32 or 100 kbps, 25 Mbps
  - BPSK on 1.024, 1.25 or 1.7 MHz subcarrier @ 1 radian: 32 or 100 kbps
  - PM/PCM: 32 or 100 kbps, 2 Mbps @ 1 radian
  - Additional transmit data rates and mod indices can be supported depending on application TLM Modulation Modes: Subcarrier, BPSK (to 15 Mbps), QPSK (to 30 Mbps) upgradeable to 100 Mbps



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D-ConDR-01-0322  
PRI-2203-0021