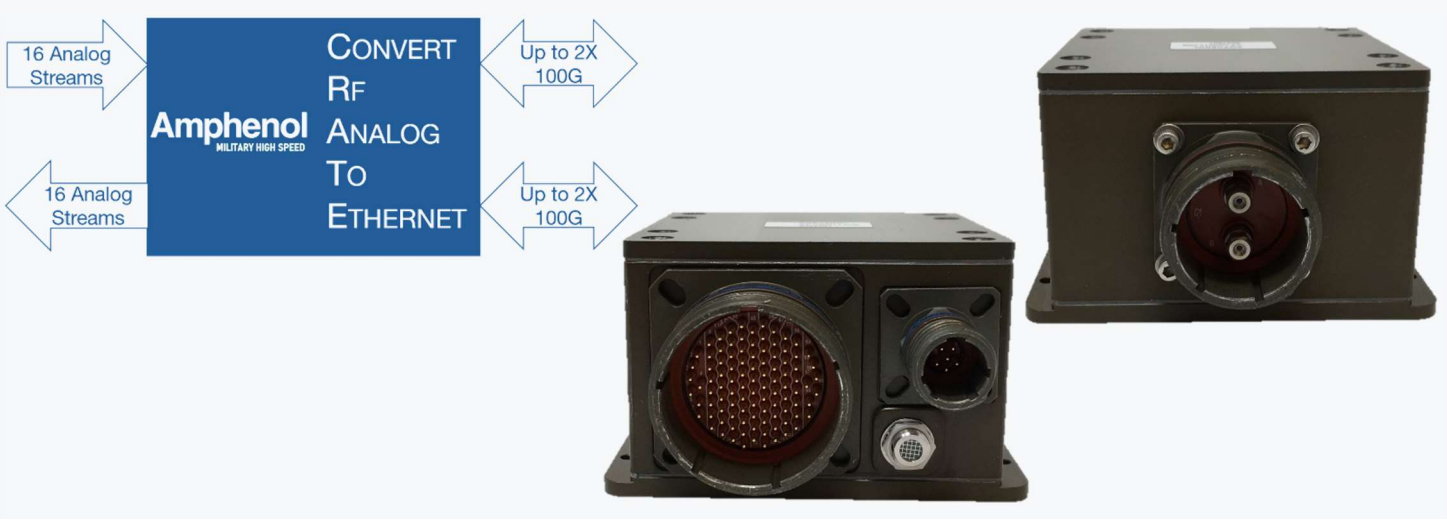
CRATE: CONVERT RF ANALOG TO ETHERNET

ANALOG TO DIGIAL AND DIGIAL TO ANALOG CONVERTER



DESCRIPTION

Wireless communications infrastructure continues to develop new protocols and waveforms for specific applications. Current systems suffer in their ability to work with separate protocols simultaneously and cannot capture signals with sampling rates in the magnitude of tens of MHz. Amphenol's Convert Radio Analog to Ethernet (CRATE), has been developed to mitigate those concerns by utilizing a high sampling rate to capture a large swath of bandwidth in this ever-growing system. CRATE provides an out of the box solution to meet the most stringent transmission and reception requirements. By utilizing the third-generation Xilinx Radio Frequency System on Chip (RFSoC), CRATE employs 16 ADCs capable of sampling rates up to 5 Gsps and 16 DACs capable of sampling rates up to 10 Gsps to concurrently transmit and capture signals, both known and unknown. Additionally, CRATE uses state-of-the-art fiber optic Ethernet transceivers to forward to other processing blocks for instantaneous demodulation of many signals.

FEATURES

- A singular RF frontend that can transmit/receive signals of arbitrary bandwidth and carrier frequencies
- Simultaneous transmission or reception of 16 channels
- Up to 5 Gsps sample rate on 14-bit ADCs on each channel
- Up to 10 Gsps sample rate on 14-bit DACs on each channel
- Distinct control of interpolation and decimation on all channels
- Independent digital step attenuators for each receive channel
- Run-time configuration of sampling rates, decimation, interpolation, center frequencies, Nyquist band selectivity, etc.
- Real-time calibration of ADC/DACs for improved spectral performance
- ADC configuration options: real input to real output, real input to I/Q output, and I/Q input to I/Q output
- Capable of synchronizing with other CRATE boards for increased number of channels
- (2) 100Gbps Ethernet point-to-point
- Physical Coding Sublayer (PCS)
- Encoding 256b257b
- Ethernet Forward Error Correction (FEC)
- Physical Medium Attachment sublayer (PMA)
- QSFP28 cabling

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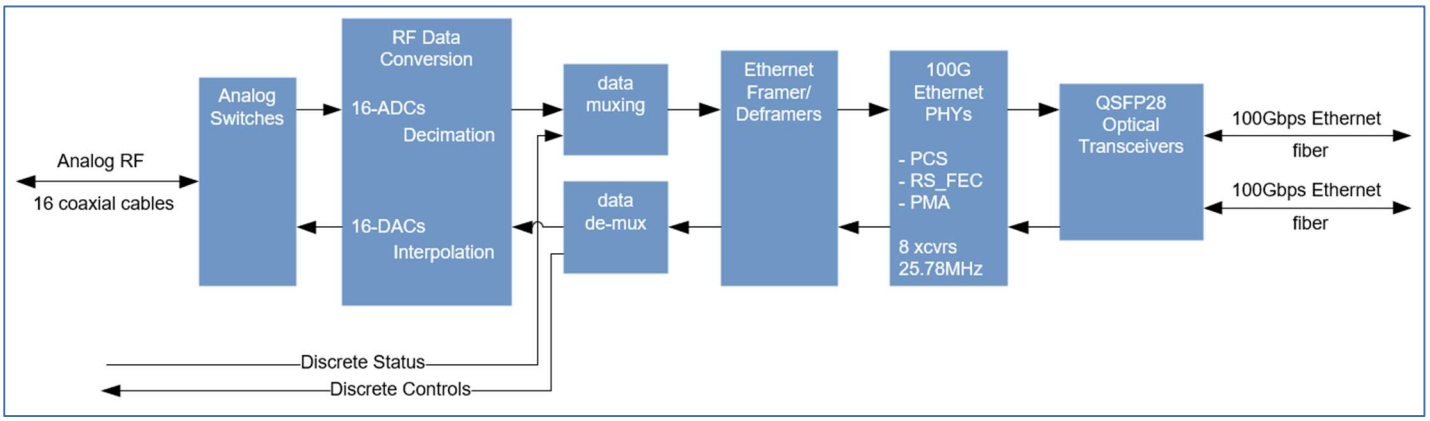
ORDERING INFORMATION

PART NUMBER	DESCRIPTION
CF-02FA00-09X	CRATE: 16 channel ADC/DAC with discrete status and control signals

To complete part number, X is key rotation (N, A, B, C, D, E)

BLOCK DIAGRAM



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RF CHARACTERISTICS

ANALOG-TO-DIGITAL CONVERTER (ADC)

PARAMETER	VALUE	UNITS
Resolution	14	bits
Maximum Sample Rate	5	Gsps
RF Maximum Input Frequency	6	GHz
Full Scale Input Power (w/ controllable attenuator bypassed)	1	dBm
Full Scale Input Power (w/ controllable attenuator greater than 15dB)	14.6	dBm
Controllable attenuator range	0 - 27	dB
Auto attenuation amount (when over-voltage asserted)	15	dB
Analog input bandwidth (Full-power to -3dB point)	6	GHz
Adjacent channel leakage ratio (ACLR) using 64QAM, 0dBFS, PAPR=6.5dB, F_in=3.5GHz, BW=18MHz	-65	dBc
Noise spectral density (NSD) across first Nyquist zone with -1dBFS carrier at 2.4GHz	-152	dBFS/Hz
Spurious free dynamic range (SFDR) (excludes HD2 and HD3, includes OIS and GTIS) with -1dBFS carrier at 2.4GHz	83.5	dBc
Second-order harmonic distortion (HD2) with -1dBFS carrier at 2.4GHz	-67	dBc
Third-order harmonic distortion (HD3) with -1dBFS carrier at 2.4GHz	-65	dBc
Two-tone third-order inter-modulation distortion (IM3) at F_in=2.4GHz at -7dBFS and 20MHz delta	-75	dBc
Gain/time interleaving spurs (GTIS) with -1dBFS carrier at 2.4GHz	-87	dBc
Offset interleaving spur (OIS) with -1dBFS carrier at 2.4GHz	-86	dBc

DIGITAL-TO-ANALOG CONVERTER (DAC)

PARAMETER	VALUE	UNITS
Resolution	14	bits
Maximum Sample Rate	9.85	Gsps
Analog input bandwidth (Full-power to -3dB point)	6	GHz
Maximum output power	6.5	dBm
Variable output power range at 240 MHz	24	dB
Variable output power range at 3500 MHz	20	dB
Variable output power range at 3500 MHz	15	dB
ACLR with Fc=2.4GHz, 3.84MHz QPSK, and PAPR=7.6dB (low noise mode)	-78.4	dBc
Spurious out-of-band (OOB) emissions with Fc=2.4GHz, 3.84MHz QPSK, and PAPR=7.6dB (low noise mode)	-83.7	dBm/MHz
NSD with 0dBFS carrier at 2.4GHz (low noise mode)	159.9	dBm/Hz
SFDR (excludes HD2 and HD3) with 0dBFS carrier at 2.4GHz (low noise mode)	73.6	dBc
HD2 with 0dBFS carrier at 2.4GHz (low noise mode)	-63	dBc
HD3 with 0dBFS carrier at 2.4GHz (low noise mode)	-72.5	dBc
IM3 at F_out=2.4GHz at -6dBFS and 20MHz delta (low noise mode)	-76.6	dBc

DIGITAL TRANSPORT NETWORK

FEATURES

- (2) 100GbE (Gigabit per second Ethernet)
- Custom Ethernet Frame payload framer
- Point-to-point connections
- Physical Coding Sublayer (PCS)
- Forward Error Correction
- Physical Medium Attachment (PMA) sublayer
- Line rate 103.125Gbps
- 16 fibers (8 RX, 8 TX)

NETWORK FRAMING

PORT DESCRIPTIONS

RF INTERFACE (ELECTRICAL)

Name	Number	Type	Direction	Description
rf_rx_tx	16	coax	½ duplex	Inputs to the ADCs, outputs from the DACs
control	TBD	discrete	Output	Control and configuration to the RF circuits
status	TBD	discrete	Input	Status from the RF circuits

ETHERNET INTERFACE (OPTICAL)

Name	Number	Type	Direction	Description
eth_A_tx	4	Fiber	Output	Ethernet A transmit positive
eth_A_rx	4	Fiber	Input	Ethernet A receive positive
eth_B_tx	4	Fiber	Output	Ethernet B transmit positive
eth_B_rx	4	Fiber	Input	Ethernet B receive positive

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