



The EnerLinksII® DVA (Digital Video over Analog) System is an advanced digital signal processing system that transforms any existing L, S or C-band analog FM video communications link into a robust, flexible digital video and IP data link using the installed airframe ISR transmitter, power amplifier, filter and antenna. The system simultaneously transmits high quality compressed H.264 video and UDP/IP network traffic in the same bandwidth previously required to send only analog video. Use of modern FEC techniques improves link margin by 12 dB over the analog system. All this and more can be achieved without modification of the RF hardware.

The aircraft downlink system supports a wide range of sensor inputs including analog or digital video, IP data, GPS, or other serial data. Integrated H.264 or MJPEG compression is included and compressed video and data are multiplexed together and FEC coded. By means of digital signal processing techniques, the FEC coded bit stream is used to form an analog pre-modulation signal that feeds the existing analog video FM transmitter.

Because the pre-modulation waveform is designed to have bandwidth and amplitude comparable to an analog video signal, it can be transmitted using the analog video FM modulator without modification. The DVA can be placed anywhere between the onboard sensors and the FM transmitter. Requiring less than 10 watts and occupying less than 38 cubic inches, it needs but a 28V supply and a location on the aircraft.

EnerLinksII DVA System At-A-Glance

- » Single digital card converts any analog FM video data link to a high performance digital link without changing UAV RF components
- » IP ready — streams output from network cameras, and IP-based sensor data
- » Reliable range coverage to the horizon with EnerLinksII receiver
- » Bandwidth and spectrum efficiency
- » AES-256 Encryption

» This digital system upgrade delivers up to 12dB in measurable link margin over an analog link, or equivalently up to 4x range performance.

Conversion from an analog to a digital ISR data link has always required significant systems re-engineering of the airborne platform. The EnerLinksII DVA system substantially eliminates UAV re-engineering and provides all the benefits of digital processing. It includes IP sensor data, metadata, standardized video compression, extended-range performance, bandwidth and spectrum utilization, and now includes AES-256 encryption. Analog bypass modes allow complete interoperability with predecessor analog systems enabling a painless, gradually phased upgrade program.



EnerLinksII Ground Modem/Receiver

Key Features

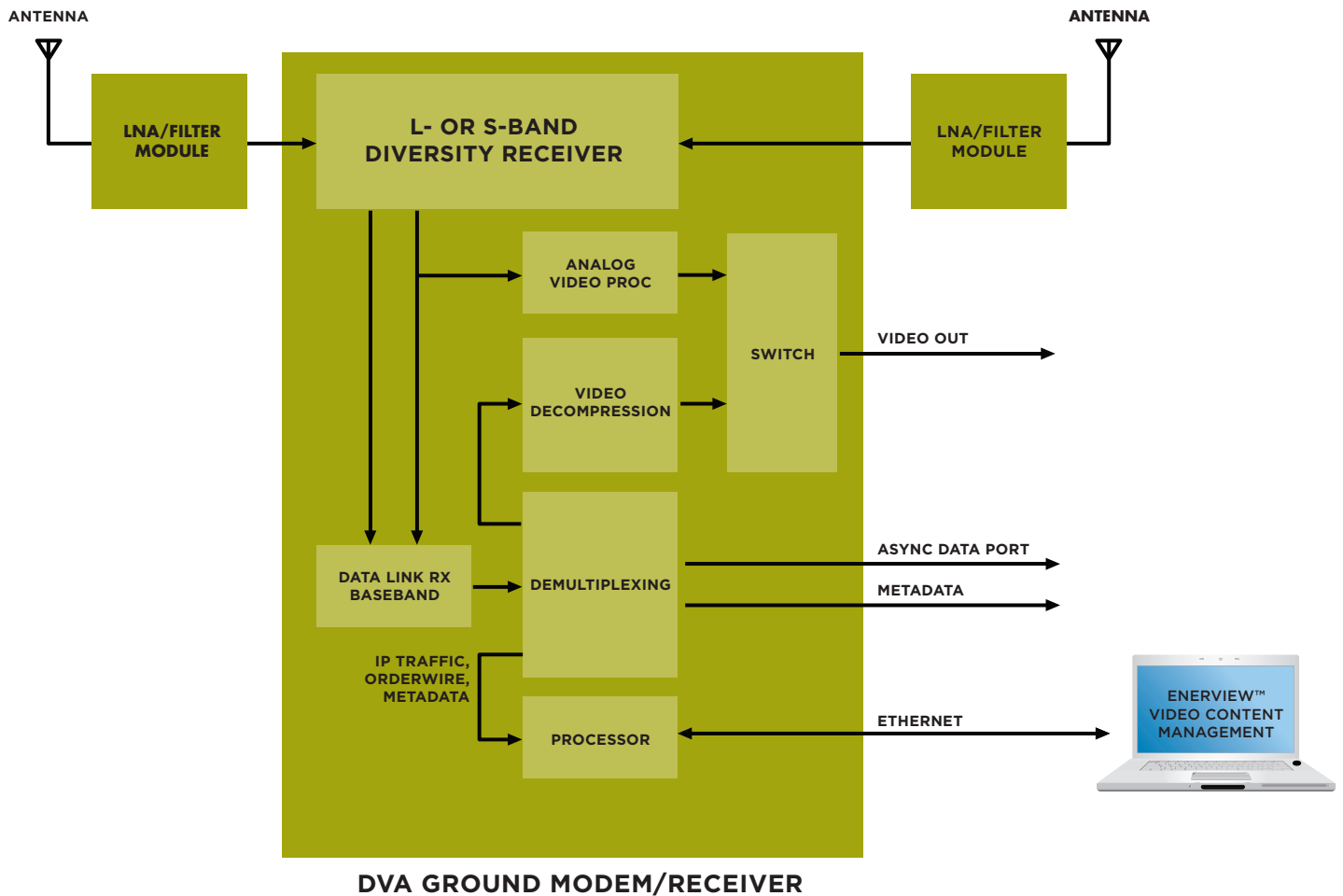
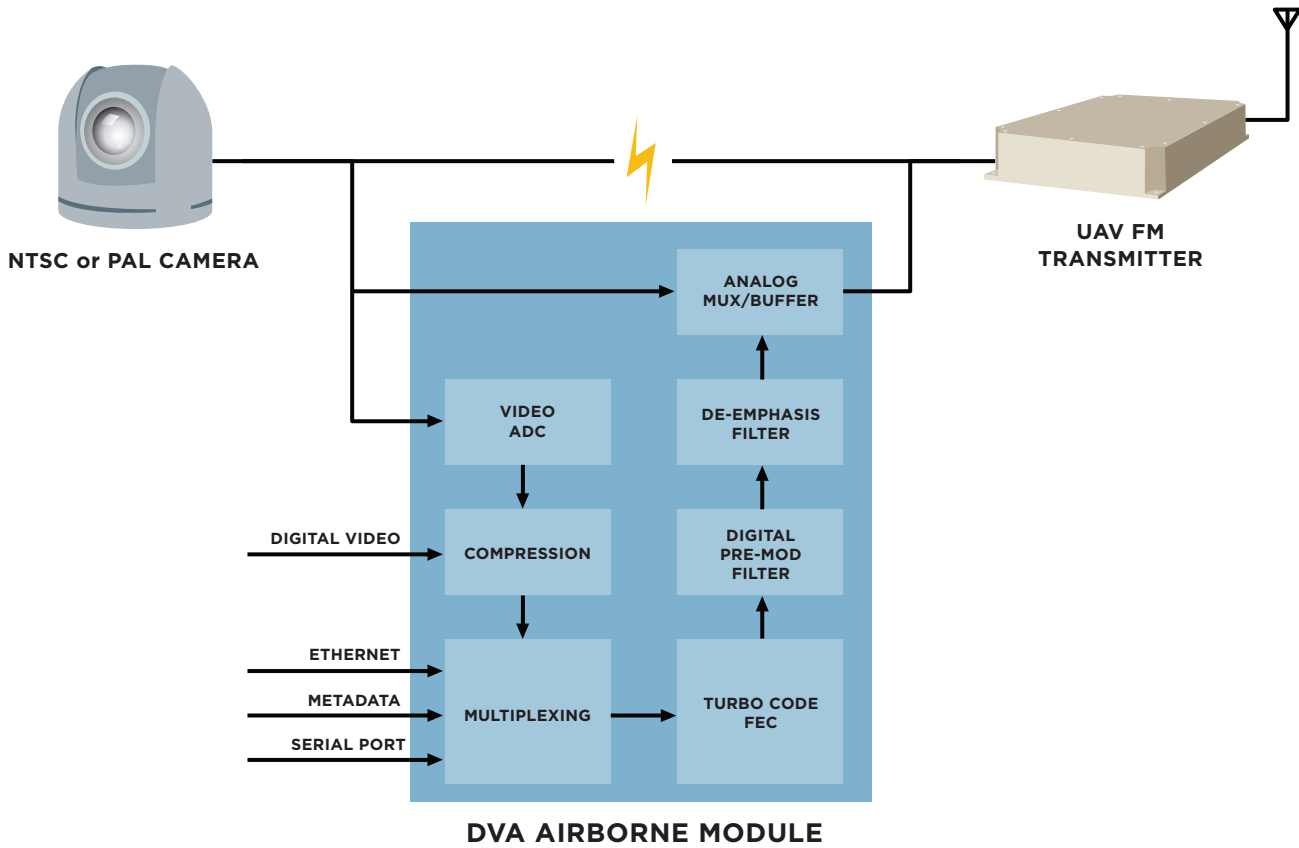
- » User selectable H.264 or MJPEG video compression
- » Multiplexes IP data, compressed digital video, and asynchronous data
- » Aggregate bit rate up to 5 Mbps with powerful turbo product code FEC at selectable rates: 1/2, 2/3, 4/5 or uncoded
- » Receiver threshold of -96 dBm at 5 Mbps, rate 4/5 FEC without diversity
- » Optimized for small, lightweight, low-power aircraft platforms
- » Ground-based, built-in space diversity receiver mitigates common multipath fades
- » Analog bypass modes in both aircraft and ground equipment allow complete backwards compatibility with predecessor systems

DIGITAL TRANSFORMATION FOR TUAS ANALOG LINKS



A compatible EnerLinksII Ground Modem/Receiver (GMR) provides the requisite signal processing and I/O to deliver the original sensor and telemetry content for display, exploitation or dissemination. It operates at either L-band (1710-1850 MHz) or S-band (2200-2500 MHz) and has a powerful diversity receiver capability that can operate as either an antenna space diversity or a frequency diversity receiver. Digital video data can be distributed from the GMR via any IP network for display, storage, and retrieval using the Windows-based EnerView™ player/manager application.

Like the EnerLinksII data link system whose protocols and waveforms it shares, the DVA system has unsurpassed RF coverage. The GMR uses a high-performance all-digital bit synchronizer that acquires in milliseconds and reliably maintains lock, even at a signal-to-noise ratio less than 0 dB. The turbo product code FEC provides near error-free performance when the modem produces a BER less than 1%. This yields a receiver threshold of -96 dBm; 12 dB better than most analog FM receivers. When the digital diversity combining feature is used in channels impacted by multipath fading, an additional 6 dB of improvement can often be obtained.



DVA SENSOR INPUTS

Analog Video:

- » NTSC, PAL, CCIR and RS-170
- » Adjustments for brightness, contrast, tint, and saturation
- » One composite video input

Digital Video: BT.656 over SD-SDI

Network Traffic: UDP/IP or TCP Proxy over 10/100BaseT Ethernet

Metadata: Via UDP/IP over 10/100BaseT. Can be time associated to video.

GPS 1 PPS (pulse per second): 1 TTL/CMOS input used for Metadata timing

Data Service: 1 RS-232 port at rates up to 115 kbaud

- » Asynchronous Data
- » GPS (NMEA 0183)

INTEGRATED VIDEO COMPRESSION

- » Frame rate up to 30 FPS (NTSC) or 25 FPS (PAL)
- » Metadata tagged and time-associated to individual frames

H.264:

- » Baseline Profile Codec (level 3), I and P frames
- » Resolutions NTSC: 640x480, 640x240, 320x240
- » Resolutions PAL: 720x576, 352x288
- » Bit rate adjustable from 600 kbps to 5 Mbps

MJPEG:

- » Automatically adjusts frame rate to fill available multiplex bandwidth
- » Compression Ratio: User adjustable in 240 steps
- » Resolutions NTSC: 560x480, 560x240, 280x240
- » Resolutions PAL: 560x576, 560x288, 280x288

METADATA

- » KLV format, MISB RP0604 synchronization to H.264 video
- » GPS tagged to MJPEG video frames using RTC
- » MJPEG Time stamped via real-time clock

Multiplexing: Flexible EnerLinksII interoperable multiplexing dynamically allocates bandwidth and transports any combination of:

- » 1 compressed video stream
- » Network traffic (UDP/IP — max rate of IP traffic is user selectable)
- » Asynchronous (serial port) data
- » Metadata
- » Multiplexer aggregate rate from 50 kbps to ~5 Mbps

DATA LINK

FEC: Turbo Product Code with user selectable rates 1/2, 2/3, 4/5 and uncoded (rates are approximate). Soft decision decoding.

Modulation: Gaussian-filtered FSK with BT = 0.5

- » User selectable modulation rates from 35 kbps to 5 Mbps
- » Premodulation signal amplitude is user programmable
- » Selectable de-emphasis filter for use with analog video transmitters having pre-emphasis
- » Aircraft DVA card operates with most L-band (1710-1850 MHz) or S-band (2200-2500 MHz) FM video transmitters
- » Analog video bypass mode for backwards compatibility with legacy analog video systems

GROUND RECEIVER UNIT

Diversity receiver: dual antenna space or frequency diversity with options for L- or S-band. Selection diversity algorithm chooses best receiver based on block CRC's on each 4096 block.

- » Analog video bypass mode for backwards compatibility
- » All sensor data is streamed out over IP network via multicast or unicast
- » Operates with EnerView client viewer package and viewers based on industry standard video over IP transport protocols

RECEIVER SENSITIVITY (dBm at LNA input)

	>2.5 MBPS	≤2.5 MBPS	<1 MBPS
Rate 1/2	-97	-100	-103
Rate 2/3	-96	-99	-102
Rate 4/5	-95	-98	-101
Uncoded	-85	-88	-91

CONTROL & CONFIGURATION

GUI via web-based interface over Ethernet, or Command line interface via serial port

INPUT POWER

Airborne System

- » 28 VDC MIL-STD-704D
- » Power consumption < 8 watts

Ground System

- » 24 VDC ±4 V
- » Power consumption < 30 watts

ENVIRONMENTAL

Airborne System

- » Operating Temp: -20° to +60°C
- » Non-operating Temp: -40° to +85°C
- » Altitude: 70,000 feet
- » Humidity: to 95% non-condensing

Ground System

- » Fanless chassis
- » Operating Ambient Air Temperature: 0° to +60°C
- » Non-operating: -40° to +85°C
- » Vibration: consistent with section 514.4 category 20 of MILSTD-810F Procedure 1, Figure 514.5 C-3 (wheeled vehicles)
- » Submersible in 1 meter water per MIL-STD-810F

SIZE (L x W x H):

Airborne unit: 4.75" x 5.25" x 1.425"

Ground unit: 7.9" x 10.5" x 3.2"

WEIGHT

Airborne unit: 1.36 lbs

Ground unit: 8.5 lbs



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