



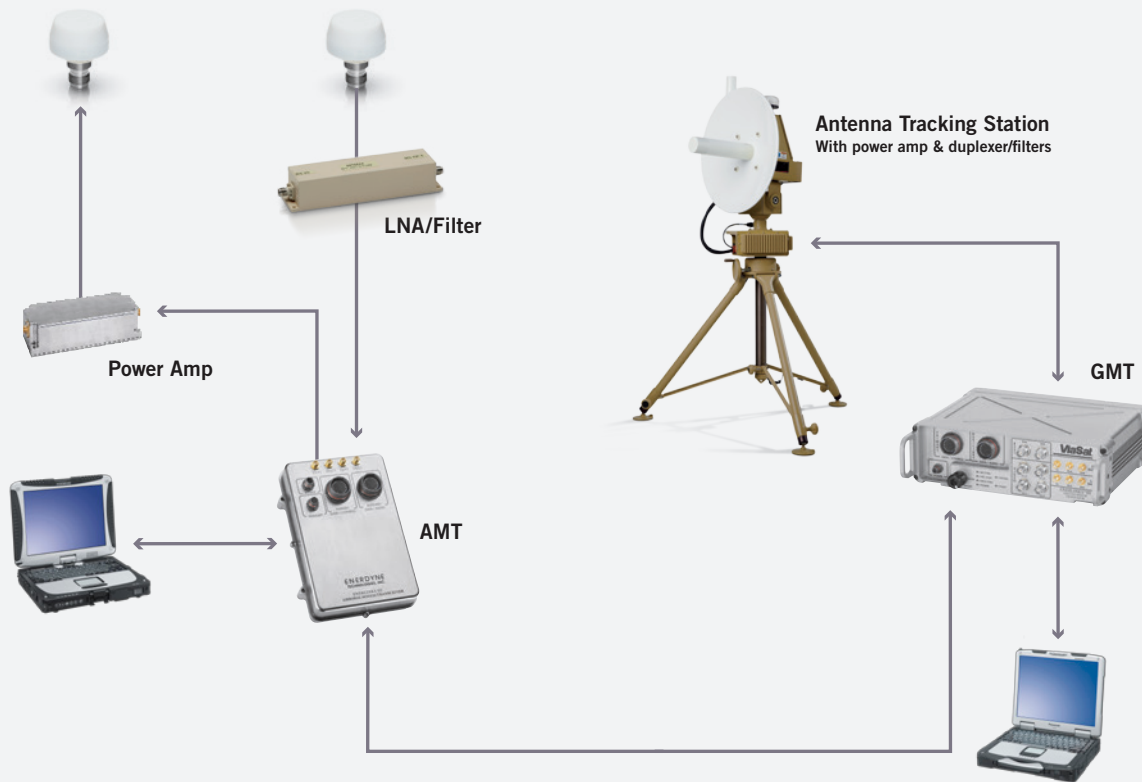
The EnerLinksIII™ system continues its legacy as the industry's most capable video data link for Intelligence, Surveillance and Reconnaissance (ISR) with the addition of integral H.264 compression for multiple High Definition video feeds. The EnerLinksIII AMT (Airborne Modem/Transceiver) can simultaneously compress and transmit 1 to 2 streams of High Definition video or 1 to 4 streams of Standard Definition video over a single downlink. With air-to-ground IP connectivity and MISB-compliant KLV metadata handling, the EnerLinksIII HD system is the only data link ready to work with today's advanced multiple-output sensors.

The EnerLinksIII HD system includes a GMT (Ground Modem/Transceiver) and high definition AMT. The AMT HD is I/O rich, with interfaces for TCP/IP or UDP/IP over Ethernet, two HD-SDI digital video ports, four NTSC/PAL analog video ports, multiple high-speed serial ports, two dedicated GPS ports, and two-way audio. The flexible I/O capability of EnerLinksIII HD allows the system to serve both as an ISR link and as a vehicle control link, minimizing equipment size, weight, power, and antennas. In addition to providing multiple channels of H.264 video compression, the system features selectable modulation bit rates, spectrally efficient Gaussian-shaped Minimum Shift Keying (GMSK) modulation, FEC with selectable code rates, and more.

**ENERLINKSIII HD SYSTEM
 AT-A-GLANCE**

- » Complete, fully integrated ISR data link system
- » Integral H.264 compression for multiple channels of HD and SD video
- » IP Gateway/Bridge connectivity between aircraft and ground networks
- » MISB compliant metadata handling (0604.1, 0601.4)
- » Security with AES-256 encryption
- » Provides LOS coverage to the horizon
- » Full-duplex, operates in L, S and C band
- » Software defined architecture allows addition of future waveforms
- » Bandwidth efficient, only 2.5 MHz needed per SD video transmission





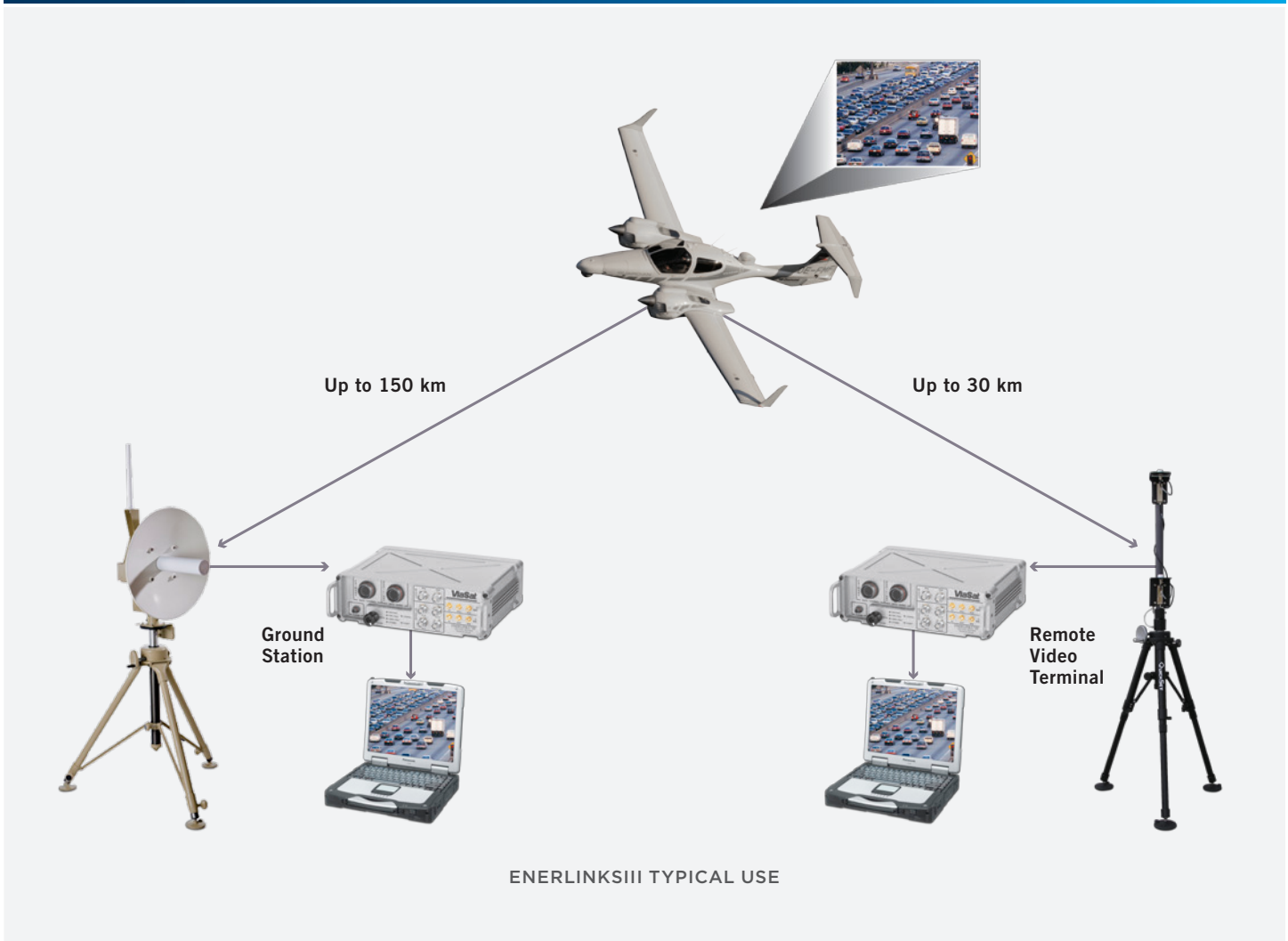
ENERLINKSIII HD C-BAND CONFIGURATION SHOWN

The GMT provides all signal processing and I/O needed to complement the AMT HD functions, including a dual diversity RF receiver, demodulator, demultiplexer, and decompressors for the downlink signal and multiplexing, modulation and RF transmission for the uplink. The GMT also supports several diversity-combining receiver configurations that are useful to combat multipath fading, interference, and antenna shadowing. Every AMT HD data and audio input has a corresponding GMT output port. SD video can be viewed directly from GMT video output ports while both SD and HD compression video is transported over Ethernet for viewing. System settings and status for both airborne and ground modules may be controlled and viewed in real time through a serial command line interface or through a supplied web-based GUI.

Included with each EnerLinksIII HD system are power amplifier modules, integrated duplexer/LNA and filter LNA modules, and ground and aircraft antennas.

The EnerLinksIII HD system features a full duplex, variable bit rate modem that allows any user-selectable bit rate from 50 kbps to 11 Mbps.

Gaussian-shaped Minimum Shift Keying (GMSK) is used as the modulation waveform because receiver threshold performance with GMSK is as good as COFDM in the air to ground channel, and—unlike COFDM—GMSK allows the use of efficient class C power amplifiers that substantially reduce aircraft power consumption. The receiver uses all-digital techniques for demodulation and provides performance within tenths of a dB of theoretical performance. GMSK is spectrally efficient with very low out-of-band emissions. Coupled with the outstanding selectivity performance of the EnerLinksIII receiver, use of GMSK allows close spacing of transmissions in scenarios with multiple UAVs operating in the same airspace. The outstanding threshold performance of the EnerLinksIII HD system allows reliable transmission to the horizon using 5 watt RF power amplifiers in the aircraft and small,



low-cost, rugged antennas at the ground that can be manually pointed by unskilled personnel.

Turbo product code FEC is a key to the system's outstanding link performance. User selectable rates of approximately 1/2, 2/3 and 4/5 (as well as uncoded) are provided. The rate 4/5 code extends the range by a factor of nearly 4 beyond uncoded operation. Interleaving is available with user-selectable depth for burst interference protection.

The AMT and GMT can be configured with one of two frequency options:

- ✓ L-band (1700 to 1850 MHz) and S-band (2200 to 2500 MHz)
- ✓ Lower C-band (4400 to 4950 MHz) and upper C-band (5250 to 5850 MHz)

For a given option, the frequency band plan can be reversed (that is, a system can use L-band for the downlink and S-band for the uplink or vice versa).

STANDARD DATA FORMATS

The AMT accepts HD video in a variety of NTSC and PAL formats. MISB Standard 0601.4 compliant KLV metadata can be supplied to the AMT HD via Ethernet or the HD-SDI interface. The system maintains alignment of the metadata to individual video frames using the MISB Standard 0604.1 protocol. The GMT is capable of outputting multiple HD or SD H.264 compressed video streams and KLV frame-aligned metadata elementary streams encapsulated in an MPEG-2 transport stream. This stream can be viewed and archived with the EnerView™ viewer or with other standard viewers.

SPECIFICATIONS

INPUTS

Digital Video

- » HD-SDI (2); mini BNC connectors

Analog Video

- » NTSC, PAL, CCIR and RS-170 monochrome input
- » Composite video (4), or Y/C (2) selectable; SMA type connectors
- » Adjustments for brightness, contrast, tint, saturation

Digital Interface: Ethernet 100Base-T for IP-based data sources

Other Inputs

- » Asynchronous ports (6): RS-232 up to 115.2 kbaud or RS-422 up to 921.6 kbaud
- » Synchronous ports (clock and data): up to 10 Mbps, RS-422 or TTL, 2 ports in downlink
- » Audio (2): line levels (source), line levels (destination). Toll quality

VIDEO COMPRESSION

H.264

- » 1 to 2 simultaneous HD channels
- » 1 to 4 simultaneous SD channels
- » Baseline Profile Codec (level 3), I and P frames
- » HD Formats: 1920x1080p30; 1920x1080p29.97; 1920x1080p25; 1280x720p60; 1280x720p59.94; 1280x720p50; 1280x720p30; 1280x720p29.97; 1280x720p25; 1080p30; 720p60
- » SD Formats: NTSC 720x480; PAL 720x576
- » Automatically adjusts video bit rate to fill available multiplex bandwidth

METADATA

- » KLV format MISB Standard 0604.1 synchronization to H.264 video

MULTIPLEXED DATA

- » Dynamic allocation of bandwidth transporting any combination of: Compressed Video (1 to 4 channels H.264)
- » IP Data
- » Supports IP gateway or proxy bridge between an aircraft subnet and a ground subnet
- » Asynchronous Data
- » Synchronous Data
- » Audio: 2 channels

DATA LINK

Turbo Product Code FEC: user-selectable options for:

- » Uncoded operation
- » Rates 4/5, 2/3 or 1/2

Interleaving: row column interleaver for burst interference mitigation

- » Row length equal to one FEC code block
- » Options for numbers of rows up to 1 Mbit total interleaver depth
- » Option for interleaver off

Modulation: Gaussian-filtered Minimum Shift Keying (GMSK).

User-selectable modulation bit rates from 50 kbps to 11 Mbps in 1 bps increments

Optional Encryption: AES-256

RF FREQUENCY

User selectable in 500 kHz steps

L/S band: 1700 to 1850 MHz (L-band) & 2200 to 2500 MHz (S-band)

C-band: 4400 to 4950 MHz (lower C-band) and 5250 to 5850 MHz (upper C-band) Either band can be used for uplink or downlink

Optional RF Frequency C-band feature: RX and TX in 4400 to 4800 MHz band

RF FREQUENCY (CONTINUED)

RF Bandwidth: Scales with modulation bit rate (<12 MHz at -20 dBc, <24 MHz, -50 dBc at 10 Mbps)

Receiver Sensitivity (dBm at LNA input):

FEC CODING	THRESHOLD
Rate 1/2	-169 + 10log10 (modem bit rate in bps) (e.g., at 10 Mbps, threshold is -99 dBm)
Rate 2/3	-168 + 10log10 (modem bit rate in bps) (e.g., at 10 Mbps, threshold is -98 dBm)
Rate 4/5	-167 + 10log10 (modem bit rate in bps) (e.g., at 10 Mbps, threshold is -97 dBm)
None	-157 + 10log10 (modem bit rate in bps) (e.g., at 10 Mbps, threshold is -87 dBm)

CONTROL & CONFIGURATION

- » GUI via web-based interface over Ethernet or Command line interface via serial port or USB
- » Airborne system can be accessed and controlled from the ground

ENVIRONMENTAL

Airborne System

- » Cooling by conduction to the mounting baseplate
- » **Operating Temperature** -20° to +70° C baseplate
- » **Non-operating Temperature** -40° to +85° C
- » **Altitude** 70,000 feet
- » **Humidity** To 95% non-condensing
- » **Shock and Vibration** Consistent with fixed-wing and helicopter environments
- » Submersible in 1 meter water

Ground System

- » **Fanless chassis**
- » **Operating Ambient Air Temperature** 0° to 60° C
- » **Non-operating Temperature** -40° to +85° C
- » **Vibration** consistent with mobile shelter installation and operation
- » Submersible in 1 meter water

PHYSICAL CHARACTERISTICS

Size

- » **Airborne unit (LxWxH)** 7.5 x 5 x 1.8 in.
- » **Ground unit (LxWxH)** 7.9 x 10.5 x 3.2 in.

Weight

- » **Airborne unit** 3.2 lb
- » **Ground unit** 8.5 lb

Power

- » **Airborne System**
 - 28 VDC +/-4 VDC
- » **Ground System**
 - 28 VDC +/-4 VDC



CONTACT

SALES

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