Messenger 2 Enhanced High-Power Transmitter (M2EHPT-160)

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DEC 2012 Data Sheet

The most important thing we build is trust

Applications

- Helicopter Video Links
- Electronic News Gathering
- UAV/UGV
- High-Security Surveillance
- Repeater Transmitter
- Long Distance Mobile and Portable AV

Key System Features

- DO-160G Compliant
- Dual*** AVC HD/SD Encoder (Up to 1080p)
- Low System Latency (down to ˜44mS)
- Supports Dual Audio/Video/Data programs
  - Multi-Camera Support
    - Dual HD or HD/SD Combo
  - 3D Content Collection Support
  - Frame Rate Reduction (Increase Range!)
- COFDM Modulation (DVB-T 2 K or 4 K*** Carriers)
- Output Frequency: 1 to 7 GHz (In-Bands)
- Up to 15W Linearized Output Power
- Robust Link Performance with COFDM
  - Small, Rugged Enclosure
- Secure – Optional 128/256-bit Scrambling Option (AES)
  - SD/HD SDI formats up to 1080p
- DVB_ASI Compressed Audio/Video Out
- High-Throughput Option
- 9-32 VDC Supply Range
- Optional ARINC Mounting Shelf
- Companion COFDM Receiver with Maximal-Pre-Detect Diversity Reception
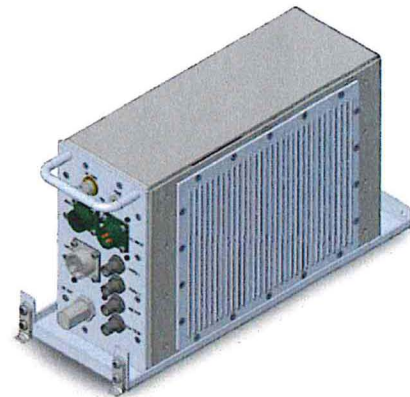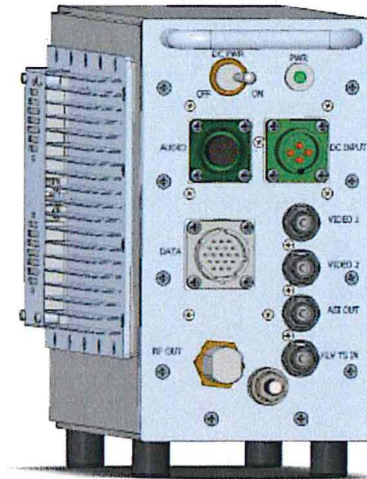
Optional ARINC Mounting Tray

The Messenger 2 Enhanced High Power Transmitter (M2EHPT-160) is a second generation ultra-low latency AVC HD/SD transmitter with dual HD/SD program capability which is DO-160G compliant. This transmitter is completely sealed, protected against aircraft power anomalies and spikes and each port is lightning protected. The RF output port which sends an RF signal to an Antenna on the outside of the aircraft can handle transients to 60,000 amps (peak).

The M2EHPT-160 combines all the features and capabilities of Cobham Tactical Communications & Surveillance's Messenger 2 AVC HD/SD Transmitter with the additional features listed in the Key System Features above. Key features include Dual HD/SD Audio/Video/Data processing with end-to-end system-level latencies of down to ˜44 ms when used with CS Receiver/Decoders.

The M2EHPT-160 accepts Standard Definition (SD) or High Definition (HD) 4:2:2 digital video or analog SD composite video analog stereo audio inputs (Mic or Line level) or optional Embedded Audio. The video is compressed according to the Advanced Video Compression (AVC)/h.264 specifications. The low-latency AVC Encoder supports the Baseline Profiles with resolutions from 480 to 1080 with, extensions to support either interlaced or progressive formats. The audio is compressed using MPEG Layer II compression. Low-rate user data up to 38.4 kBaud can be optionally supported. The audio, video and user data packets PES streams for each of the two programs (if running dual programs) are multiplexed with basic service data to indicate the service name and combine to a single multi-program Transport Stream(TS). The TS can be scrambled with optional AES scrambling system to provide protection in sensitive applications.

The 4K HIGH-THROUGHPUT OPTION enables user-selectable options to set bandwidths from 6 MHz to 16 MHz and to double the throughput of our standard M2T **(Up to 63 Mbps)**. Using 4K carriers and the 16 MHz bandwidth, the link can support HD operation with >12 Mbps while running QPSK and 1/2 FEC. **This increases link robustness and provides an additional 13.5 dB increase in link margin (>4.7 x increase in operating range!) for the same throughput rate in a standard HD MPEG-2 DVB-T system!** With the 4K HIGH-THROUGHPUT OPTION you can run with fully DVB-T compliant 2K carriers and bandwidths of 6, 7, or 8 MHz.

When you switch to 4K carriers you can select 12, 14 or 16 MHz bandwidth. The 4K HIGH-THROUGHPUT OPTION is also useful when transmitting multiple video streams through one transmitter. This option requires a special receiver configuration. Please contact Cobham Sales for additional information.
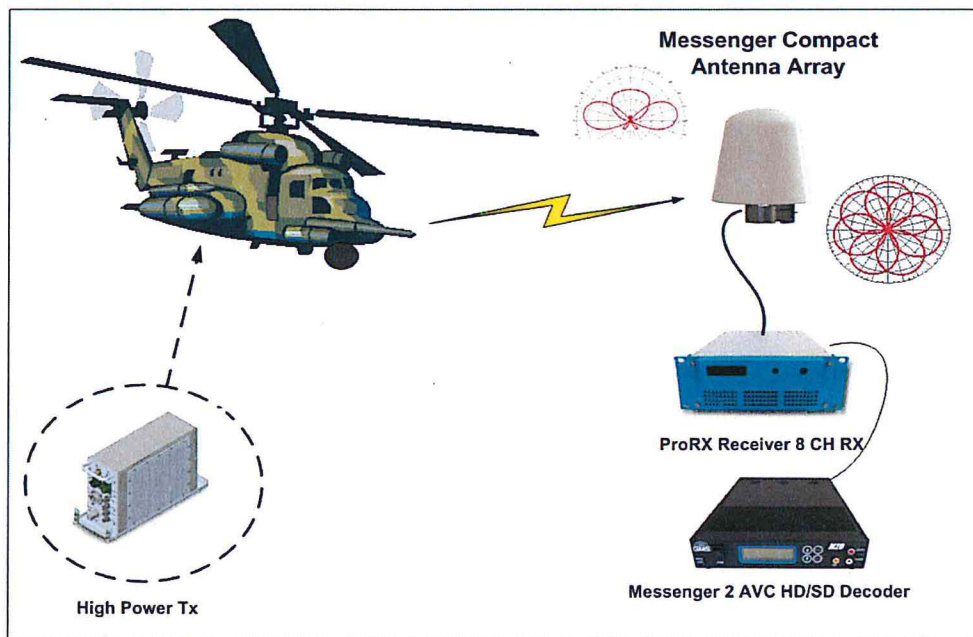
Typical Messenger Airborne Video System

Cobham Tactical Communications & Surveillance's Messenger 2 Enhanced Link (M2EL) includes the M2EHPT-160, Messenger Compact Antenna Array, Pro Receiver (ProRX), and the Messenger 2 Decoder (M2D). The M2EHPT-160 provides professional Audio/Video (A/V) interfaces and processing. All versions of the Messenger Link family use a

robust digital modulation system known as Coded Orthogonal Frequency Division Multiplexed (COFDM) that provides frequency diversity and powerful Forward Error Correction (FEC) algorithms. The ProRX provides up to eight channels Pre-Detect Maximal-Ratio Diversity Combining which can have many benefits including increased Signal Strength, Signal to Noise Ratio and combat short delay spread multipath reflections found in indoor environments. The ProRX outputs a transport stream over ASI or LAN Streaming. External Audio/Video/Data AVC Decoders, like the M2D support HD and SD AVC Decoding.

For these airborne applications, the net effect of these eight antennas and the diversity properties of the COFDM receivers are to provide unbroken aircraft coverage over a hemispherical-pattern without resort to moving parts (mechanical auto trackers). Note that from a system standpoint the dip at the cross-over point between any of the two antenna elements will be eliminated due to the Pre-Detect Diversity Combining gain of the PRORX receiver. This provides excellent coverage over a modified OMNI pattern.

One of the biggest problems encountered in the transition from an analog to a digital A/V platform has been the inherent digital coding delay that, in some digital systems, are 1.5 seconds or more for HD. The M2EHPT-160 employs a specially designed 'Ultra-Low Delay' coding technology, which provides down to ˜44 ms (˜1 frame) end-to-end system delay when using Cobham Tactical Communications & Surveillance's AVC Decoder. This ensures that the picture you see is what is happening now which is crucial for applications such as sports coverage, surveillance, and law enforcement, where personnel are reacting to real-time events.

The M2EHPT-160 can optionally provide time-correlated KLV-1 and KLV-2 META*** data processing*D that is used in Airborne Surveillance Applications and Geospatial determination. The META data can be extracted from the SDI/HD-SDI video's ancillary data space or input on a separate RS-422 interface.

LAN/IP Port

The M2EHPT-160 contains a 10/100BaseT LAN interface that can be used both for Control & Status monitoring and for optional Transport Stream (TS) streaming in and out of the device. The MAC address can be assigned automatically via a DHCP server or via manual settings. Control & Status monitoring is accomplished via a WEB browser application that launches from the device. TSs can be sent out or in via UDP/IP transfer protocols.

3D Support***

3D is a very new area in the Broadcast industry. From a content collection standpoint it is normally accomplished with two separate cameras that are GEN-LOCKED together, outputting two separate video signals.
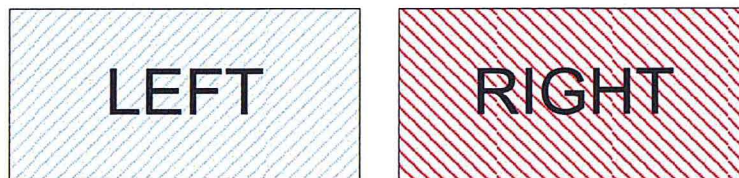
Content Collection Format

The encoder maintains a frame by frame synchronization as it goes through its processing. If one frame from one of the cameras skips for some reason, the frame from the other camera is dropped.

Specifications:

RF Output

Output Frequency: 1 to 6.4 GHz (In-Bands)
Frequency Resolution****: 100 KHz or 1 MHz
Frequency Accuracy: (+/-) 2.5 ppm (High-G Crystal Optional)
Bandwidth: Selectable

6, 7, 8 MHz Standard
12, 14, 16 MHz Optional

RF Output Power: Up to 15W (Model Dependent), Adjustable
Output Impedance: 50 Ohms with VSWR <1.5:1
Connector: N-F

Video Encoding (HD)

Video Processing Capability: Single Video input, Dual Video Inputs*** (processing of each input can be independently set for all encoder parameters)
3D Modes: Content collection (Separate inputs from two cameras that are GENLOCKed)
Interfaces: Dual HD-SDI/SDI
HD-SDI Standards: SMPTE-292M, -296M, -274M, -424M
HD-SDI SDI Connectors: BNC-F
Compression Standard: AVC/H.264
(Per ISO/IEC 14496-10 with interlaced extensions)
Motion Est. Range: (+/-) 192 Horiz., (+/-) 128 Vert.
Video formats/resolutions supported:

Format	Resolution @ Frame Rate
1080i	1920x1080 @ 23.98/24/25/29.97/30 fps
1080PsF	1920x1080 @ 23.98/24/25/29.97/30 fps
1080p	1920x1080 @ 23.98/24/25/29.97/3050/ 59.94/60 fps
720p	1280x720 @ 50/59.94/60 fps

Variable GOP Structure: I-only and IP
PsF supported with INTERLACED FORMAT
Profiles supported: BP@HL with interlaced extensions
- Video bit rates: HDTV to 50 Mbps

Video Encoding (SD)

Video Processing Capability: Single Video input, Dual Video Inputs*** (processing of each input can be independently set for all encoder parameters)
3D Modes: Content collection (Separate inputs from two cameras that are GENLOCKed)
Interfaces: Dual SDI and Dual Composite or Dual HDMI and Dual Composite (Option)
SDI Standards: SMPTE-259M
SDI/Composite Connector: BNC-F (Same as HD-SDI connector)
Compression Standard: AVC/H.264
(Per ISO/IEC 14496-10 with interlaced extensions)
Motion Est. Range: (+/-) 192 Horiz., (+/-) 128 Vert.
Video format standards: NTSC or PAL

Format	Resolution @ Frame Rate (frames per second)
576i	720x576 @ 25/29.97 fps (PAL)
480i	720x480 @ 25/29.97 fps (NTSC)

Variable GOP Structure: I-only and IP
Profiles: BP@ML with interlaced extensions
- Video bit rates: to 25 Mbps

Audio Encoding

Analog Audio Inputs: Qty 4 Total, Two Dual, Line-Level and Dual Mic-Level, Single-Ended or Differential, Clip Level 12 dB
Mic Bias: 5 V
Input Impedance: 600 Ohms (Line),
2 k Ohms (Mic)

Standards: SMPTE-272M, -299M
Digital Audio: Dual Embedded (2-channel) per Video input
Embedded Audio Format: SMPTE 299M
Compression Standard: MPEG-1 Layer 2
Bit rates: 256 Kbit/s per channel
Sampling Frequency: 32 KHz, 44.1 KHz, or 48 KHz
THD: <0.1 % max.
Response: 20 Hz to 12 KHz, (+/-) 0.25 dB
Crosstalk: >55 dB min
S/N: >50 dB RMS
Connector: P/O Multipin Connector

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Transport Stream
Standard: per ISO/IEC 13818-1
Packet Size: 188 Byte
Format: AVC/H.264/MPEG-4 Part 10 encapsulated into an MPEG Transport Stream
Specification: ITU-T Rec. H.222.0 Amendment 3
Bit Rate: Automatically set from active service settings.
ASI Output
Connector: BNC-F

Modulation
Modulation Type: COFDM w/QPSK, 16-QAM, or 64-QAM

Standard: DVB-T compliant
FEC: 1/2, 2/3, 3/4, 7/8
Guard Intervals: 1/32, 1/16, 1/8, 1/4
COFDM Carriers: 2K Carriers

High Throughput Option
FEC: 1/2, 2/3, 3/4, 7/8
Guard Intervals: 1/32, 1/16, 1/8, 1/4
COFDM Carriers: 4K Carriers

Program Identification
The unit allows the user to set-up a unique Provider Name and Service Name for each active program.

Scrambling Option
Type: 128/256 Bit Advanced Encryption Standard (AES-C)
Key Storage: User Controlled, volatile or non-volatile

User Data
Protocol: RS-232C, Asynchronous, 8 Bits, No Parity, 1 Stop Bit
Data Rate: Selectable, Up to 115 KBaud
User Data PID: Selectable
Connector: P/O Multipin Connector

Key Length Value (KLV) *** Metadata*[D]
Implementation of the KLV Metadata meets standards set by the National Geospatial-Intelligence Agency (NGA) Motion Imagery Standards Board (MISB). The KLV Metadata is input into the M2EHPT-160 either via embedding it in the VANC space of the HD-SDI/SDI input interface and/or the separate serial RS-422 interface.

Time Stamping*[D]
Processes External VANC extracted UTC#1 and SMPTE-12M time stamps from the digitized Video stream input of the HD-SDI/SDI input interface. The secondary UTC#2 is also generated using an external 1PPS signal and EIA-232/422 serial configuration commands.

Time Stamp Processing*[D]
The Picture Timing SEI messages allow each Video frame to be assigned a time value. This time can represent time of origin, capture, or alternative ideal display. As such, it can be used to navigate to a frame with a particular time.

The H.264 format, specified in ISO/IEC 14496-10 provides for an optional time stamp to be defined in the Supplemental Enhanced Information (SEI) message. The picture timing SEI message (pic_timing) specified HH:MM:SS:FF IAW RP 0604 page 5. Additionally, the standard allows for user data to be associated with a particular Video frame using the User Data Unregistered SEI Message. The primary M2EHPT-160 time stamp UTC#1 is inserted into the pic_timing SEI element of the NAL packets in the H.264's output stream. The secondary M2EHPT-160 time stamp UTC#2 is a 64 bit value indicating the number of microseconds since August 23rd 1999 and is inserted into the unregistered user data SEI element.

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Output Requirements
Serial Output*[D]
The M2EHPT-160 outputs MPEG-2 TS data with the following format:

- EIA-422 SSI Synchronous Serial Interface IAW EN 50083-9
  - Output Video data rate from 128kbps to 10.7 Mbps 1 kbps resolution.
  - The M2EHPT-160 outputs an MPEG-2 compliant Transport Stream (TS) that not only contains H.264 compressed motion imagery, but also contains time-synchronized metadata and compressed Audio.
    - The MPEG-2 TS output of either EIA-422 (constant bit rate) or Ethernet format operates at a bit rate ranging from 128 kbps to 10.7Mbps adjustable in 1 kbps increments.
    - The M2EHPT-160 is able to operate with an external clock input from the RF communications data link as well as with its own internal clock source.

Ethernet Streaming
The M2EHPT-160 contains an IEEE 802.3u 10/100Base-TX Ethernet interface. The MPEG-2 TS can be encapsulated in UDP/IP packets IAW RFC 3984. The M2EHPT-160 is configurable to send Multicast IP packets without receiving a join request.

RTP is a packetization protocol that may be used in conjunction with the User Datagram Protocol (UDP) to transport real-time multimedia data across networks that use the Internet Protocol (IP). UDP is preferable to the Transmission Control Protocol (TCP) for real-time applications because it offers low-latency transport across IP networks.

Remote Control & Status
M2EHPT-160 can be controlled through its USB control port via an optional MS Windows based Control Application. Additionally, a WEB server is provided through the LAN interface.

Connectors
RF Output: N-F
#1 Video SD/HD SDI in or SD Composite: BNC-F
#2 Video SD/HD SDI in or SD Composite: BNC-F
DVB_ASI out: BNC-F
KLV TS IN: BNC-F
Audio/KLV: p/o PT02E-12-10P, J7
Data: p/o PT02E-14-19P, J6
DC Power: PT02E-12-4P, J8
Pin A & B: +VCC
Pin C & D: GND

Physical Dimensions:
4.76" (W) x 10.5" (D) x 7" (H)
12.1 cm x 26.67 cm x 17.78 cm
Weight: 8.45 lbs (3.83 kgs)
Environmental:
- Operational Temperature: -10 to 70 C
- Humidity: Up to 100% non-condensing

Optional ARINC Mounting Shelf
        ATR ½ SHORT/SHORT

Control
M2HPT can be controlled through its USB-1 or RS-232 control port via the supplied MS Windows based control application. A Cobham remote control unit (RCU) is available.

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Compliance:
Designed and tested to DO-160G
CE Mark*^{M} FCC*^{M}

DC Power
DC Input Voltage Range: +9 to +32 VDC
DC Current: See Table below.

BAND	Watts	Current in Amps@12Vdc	Current in Amps @+28Vdc w/DC to DC converter approx. 87% efficiency
L band	10	4.0	1.9
S band	10	4.5	2.2
C band	15	5.9	2.9
C band	10	4.7	2.3
C band	7	4.4	2.1

Notes
* When used in Ultra-Low Latency mode (down to <44 ms) (Intra-Refresh) with Cobham Tactical
   Communications & Surveillance's Messenger 2 Decoders and Receiver Decoders.
** With 4 K High-Throughput Option on M2ECHPT
*** Option
**** Frequency Band Dependent
*^{M} Model Dependent
*^{D} In-Development

Datasheet
100-DS0444X1

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