

## Key Features and Benefits

- Single-system data source for PCM (Chapter 4 and Chapter 8), MIL-STD-1553, Video, Ethernet, ARINC-429, IRIG-B, IRIG-G, UART, 1PPS, and Discrete data
- All data channels precisely time synchronized
- 1 microsecond resolution *time-of-transmission* embedded as data in PCM, 1553, Ethernet, ARINC-429, and UART channels
- 1 millisecond resolution time overlay in video channels
- Embedded GPS receiver for UTC synchronization
- Optionally generates 16PP194 words on MIL-STD-1553 Bus
- Includes software to analyze data content and time stamping of **IRIG 106 Chapter 10** format recordings of the METS data streams

### Single-System Source for Multiple Channel Types

The METS-231 is a single-system data source that generates known data with known timing for PCM, MIL-STD-1553, Video, Ethernet, ARINC-429, IRIG-B, IRIG-G, UART, and Discrete data types.

### PCM

METS-231 provides eight PCM output channels. Each output channel provides clock and data in both TTL and RS-422 signal levels. Each output channel is driven by one of four programmable Chapter 4 PCM generators or by the Chapter 8 PCM generator.

Each Chapter 4 PCM generator supports five predefined PCM frame formats and one user defined format. Selected bit rates ranging from 200 Kbps to 20 Mbps are supported. Each generator can also be programmed to periodically truncate a minor frame to allow testing of a decommutator's frame synchronization logic.

For Chapter 4 PCM streams, a one microsecond resolution time-of-transmission of the first bit of each minor frame is sent as data in the minor frame.

The Chapter 8 PCM generator provides the IRIG 106 Chapter 8 stream corresponding to the messages being sent on the METS MIL-STD-1553 channel. Both Chapter 8 minor frame time stamps and Chapter 8 command word time stamps are generated.

### MIL-STD-1553

METS-231 provides a MIL-STD-1553 output channel. Both Bus A and Bus B are provided. The METS-231 supports seven 1553 frame formats. These formats encompass all standard message types, including BC-RT, RT-BC, RT-RT, Mode Codes, and Broadcasts. The METS-231 also provides formats for special purpose testing. This includes formats with missing responses, protocol violation errors, and embedded 16PP194 words. Bus loading can be programmed from 1 HZ to 100 percent, including dynamic bus loading.

A one microsecond resolution time-of-transmission of the first bit of the command word is sent as data in messages containing a sufficient number of data words.

### Video

METS-231 provides two video channels. Each channel can overlay a millisecond resolution time on an external video signal. Composite or S-Video inputs are supported. Each channel can also generate a color bar output or a fixed color output. Both composite and S-Video outputs are provided simultaneously.

### Ethernet

METS-231 provides two 10BaseT/100BaseT Ethernet output channels. Output formats include single-frame, multi-frame, and error-frame (CRC error, short-frame, and long-frame). Network loading of 1-100 percent is supported. A one microsecond resolution time-of-transmission of the first bit of each frame is embedded as data within the frame.

### ARINC-429

METS-231 provides 12 ARINC-429 output channels. Both fast/slow speeds and bus loading of 1-100 percent are supported. Optionally, words with parity errors can be generated. A one microsecond resolution time-of-transmission of the first bit of each word group is embedded as data within the word group. Drivers for an additional 4 output channels (slaved to channels 1-4) are provided.

### IRIG-B and IRIG-G

METS-231 generates IRIG-B and IRIG-G time codes. The time is generated in both amplitude modulated format and digital format. Digital time codes are provided in TTL and RS-422 signal levels.

### UART

METS-231 provides one UART channel in both RS-232 and RS-422 signal levels. Baud rates from 9600 to 115,200 are supported. The UART channel can be

configured to generate even parity, odd parity, or no parity.

The METS-231 UART channel generates a stream of data packets. A one microsecond resolution time-of-transmission of the first bit of each packet is embedded as data within the packet.

### Discrete

The METS-231 provides two independent TTL discrete output channels. Each channel can be programmed to generate precisely timed pulse streams.

### 1 Pulse Per Second

The METS-231 provides a 1 PPS output. The 1PPS output is provided in both TTL and RS-422 signal levels. When utilizing the internal GPS receiver as the time reference, the METS 1 PPS is aligned with UTC ( $\pm 250$  nanoseconds).

### METS Timing

The METS-231 contains an internal GPS receiver which can be used as the system time reference. In this configuration, METS maintains submicrosecond synchronization to UTC. An external IRIG-B signal can also be used as the system time reference. In the absence of an external time source, METS utilizes an internal oscillator as the system time reference.

### Small, Efficient Packaging

The METS-231 is packaged in a 2U 19-inch rack mount chassis.

### METS Software, including IRIG 106 Chapter 10 Validation

The METS-231 includes software to configure the METS unit. Also included is software to validate IRIG 106 Chapter 10 format recordings of the METS data streams. The validation tests include data content analysis and data time stamping analysis.

### Timing Specifications

Time Synchronization Sources:	GPS (Internal GPS Receiver) External IRIG-B
UTC Synchronization:	±250 nanoseconds (with sufficient GPS satellites)
Flywheel Performance:	10 PPM (when not using internal GPS or external IRIG)

### Chapter 4 PCM Specifications

Number PCM Generators:	4 (plus Chapter 8 Stream)		
Number Channels:	8 (clock and data)		
Output Signal Levels:	LVTTTL and RS-422		
PCM Formats:	Format	Bits/Minor	SyncPattern
	1	512	FE6B2840
	2	8,192	FE6B2840
	3	4,096	FE6B2840
	4	88	EB90
	5	240	FAF320
	6	User Defined	User Defined
PCM Codes:	NRZ-L, RNRZ-L, Bi-Phase-L (per channel)		
Supported Bit Rates:	200K, 500K, 1M, 2M, 5M, 10M, 20M		
Truncated Frame Interval:	0-63535 minor frames		
Embedded Time:	Each minor frame has an embedded time-of-transmission with one microsecond resolution.		

### Chapter 8 PCM Specifications

Stream Contents:	Stream contains data from METS MIL-STD-1553 bus encoded as Chapter 8 PCM
Channel Output Mapping:	Can be mapped to any of the 8 PCM outputs
Output Signal Levels:	LVTTTL and RS-422
PCM Codes:	NRZ-L, RNRZ-L, Bi-Phase-L (per channel)
Bits Per Minor Frame:	6144 (256 24-bit words including sync)
Supported Bit Rates:	200K, 500K, 1M, 2M, 5M, 10M, 20M
Minor Frame Time Stamping:	Each minor frame is stamped with TimeHigh, TimeLow, and Microseconds per Chapter 8
Command Word Time Stamping:	Each command word is stamped with TimeHigh, TimeLow, and Microseconds per Chapter 8. Only the first command word of each RT-to-RT message is stamped.

### MIL-STD-1553 Specifications

Number Channels:	1 (Bus A and Bus B)	
Coupling:	Transformer Coupled	
Frame Formats:	Format	Description
	1	Single Message
	2	Multi-Message #1
	3	Multi-Message #2
	4	Mode Codes
	5	No Response
	6	Protocol Errors
	7	16PP194
Bus Loading:	1 Hz, 10 Hz, 15 Hz, 30 Hz, 10% through 100% (in 10% increments). Bus loads less than 100% also support dynamic loading.	
Programmable Ramp Words:	One 16-bit word with programmable start value, increment value, and upper limit	
Embedded Time:	Selected messages have an embedded time-of-transmission with one microsecond resolution.	

### Video Specifications

Number Channels:	2 input channels, 2 output channels
Formats:	Composite/S – Video, NTSC/PAL
Video Sources:	External video input Internally generated color bars or fixed color
Time Overlay:	Long format (DDD HH:MM:SS.mmm) Short format (HH:MM:SS) Programmable X, Y location
Switching:	Outputs can be driven by either input.

### Ethernet

Number Channels:	2								
Speeds:	10BaseT, 100BaseT								
Frame Formats:	<table><thead><tr><th>Format</th><th>Description</th></tr></thead><tbody><tr><td>1</td><td>Single Frame</td></tr><tr><td>2</td><td>Multi-Frame</td></tr><tr><td>3</td><td>Error Frame</td></tr></tbody></table>	Format	Description	1	Single Frame	2	Multi-Frame	3	Error Frame
Format	Description								
1	Single Frame								
2	Multi-Frame								
3	Error Frame								
Bus Loading:	1-100 percent								
Embedded Time:	Frames have an embedded time-of-transmission with one microsecond resolution.								

### ARINC-429 Specifications

Number Channels:	16 (12 independently programmable, 4 slaved)						
Bus Speeds:	Low (12.5 KHz) & High (100 KHz)						
Frame Formats:	<table><thead><tr><th>Format</th><th>Description</th></tr></thead><tbody><tr><td>1</td><td>Standard</td></tr><tr><td>2</td><td>Errors</td></tr></tbody></table>	Format	Description	1	Standard	2	Errors
Format	Description						
1	Standard						
2	Errors						
Bus Loading:	1-100 percent						
Embedded Time:	Data transmitted includes time-of-transmission with one microsecond resolution.						

### Time Code Output Specifications

Number Channels:	1 channel IRIG-200 Code B 1 channel IRIG-200 Code G
Output Signal Levels:	Amplitude Modulated (5 Vpp) Digital LVTTTL and RS-422
Digital Codes:	Standard and Modified Manchester

### Time Code Input Specifications

Supported Code:	IRIG-200 Code B
Modulation:	Amplitude Modulation (0.5-6.0 Vpp)
Termination:	75 Ohm
Coupling:	AC

### UART Specifications

Number Channels:	1
Output Signal Levels:	RS-232 and RS-422
Baud Rates:	9600, 19200, 38400, 57600, 115200
Bits Per Word:	8
Parity:	Even, Odd, None
Embedded Time:	Each packet has an embedded time-of-transmission with one microsecond resolution.

### Discrete Specifications

Number Channels:	2
Output Signal Levels:	LVTTTL
Pulses Per Burst:	1-255
Time Between Pulses:	200 milliseconds through 25,500 milliseconds in 100 millisecond intervals
Burst Period:	1-255 seconds

### 1 Pulse Per Second Specifications

Number Channels:	1
Output Signal Levels:	LVTTTL and RS-422
UTC Synchronization:	±250 nanoseconds (with sufficient GPS satellites)

### Software

System Requirements:	10 MB disk storage, 512 RAM, 1 RS-232 COM, Microsoft Windows® XP
Configuration Utility:	Utility to configure the METS-231
IRIG 106 Chapter 10 Validator:	Utility to analyze METS data recorded in IRIG 106 Chapter 10 format for data content and time stamping performance of recorder.

*Specifications subject to change without notice.*