



THE PANTHER

SHOCK & VIBRATION SENSOR/RECORDER

M O D E L E D R - 4

• *High Speed*

• *Large Memory*

• *Fast*

• *Powerful*

• *Precise*

...Defining the State-of-the-Art



IST Instrumented
Sensor
Technology



THE PANTHER

SHOCK & VIBRATION SENSOR/RECORDER

M O D E L E D R - 4

- Loaded With Memory
- Packed With Programmable Features
- Compact...Yet Completely Self-Contained, Self-Sensing, Self-Powered



Designed using the same high level IST engineering know-how that has set the standards for portable data recorders.



Record over 90 minutes of
2kHz, 3-axis flight vibration



Shock hardened for
harsh environments

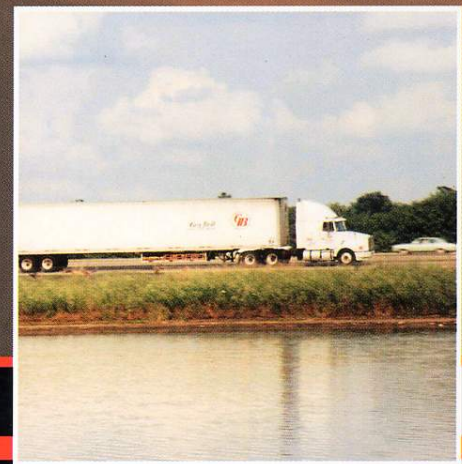
D E S C R

- Triggered Waveform Recording
- 3 & 6 - Channel Capabilities
- 12-bit A/D, 74dB Dynamic Range
- Programmable Digitization to 60 kHz
- Three Single-Ended Inputs
- Three Differential Inputs
- Internal PR Triaxial Accelerometer
- Constant-Current Excitation For Low-Bias PE Accels
- User Adjustable (DC) Offset Correction
- Programmable Time or Event-Based Triggering
- Programmable Anti-Alias Filter From 10 Hz to 60 kHz
- Programmable Gain Adjust
- 6 MB Onboard Memory, Expandable to 108 MB
- Programmable Data Memory Partitioning
- Sliding Window Overwrite™(*) Memory Management
- High Speed Parallel or Serial Port Data Communications
- RFI Flight Certified
- Intrinsically Safe
- Battery Powered for 30-60 Days

Use the PANTHER for...

- Flight Vibration Recording
- Crash Recording
- In-Depth Transportation Monitoring
- Random Vibration Test Spec Development
- Launch Vehicle Vibration
- Seismic Measurements
- Blast Recording
- Any Dynamic Measurement Project Requiring High-Speed, Large-Memory, Stand-Alone Measurement and Digital Recording

The PANTHER Model EDR-4 series recorders are self-contained, user-programmable acceleration sensor/recorders. The compact, 5 lb. package is designed for remote, stand-alone shock and vibration measurement and recording over extended time periods ranging from several hours to several weeks. The EDR-4 is a precision field measurement instrument offering major improvements in recording speed, onboard data storage, dynamic range, data management, and programmability features. The PANTHER is programmed for test using a standard PC serial or parallel port, along with IST's DynaMax DM-1 software module. After field recording data is transferred back to the host computer for processing and analysis. Each PANTHER is powered by a specially designed, user serviceable D-cell battery pack. The PANTHER's recording function is controlled by a custom designed recording and data management engine. The design is highly optimized for minimal power consumption while running at high, multi-channel digitization rates, and extremely large data memory storage capacities. During active recording acceleration signals are digitized to 12 bit resolution and stored in digital memory onboard the unit. The PANTHER offers from



Improved laboratory simulation of transport environments



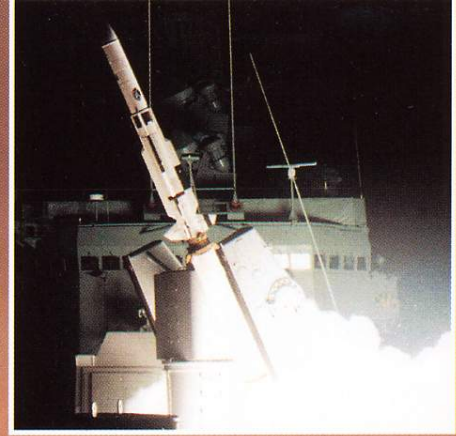
Built-in D-Cell battery pack



P T I O N

6 MB up to 108 MB of onboard data memory for waveform recording. For airborne applications the PANTHER is capable of recording upwards of 90 minutes of data while providing a 2kHz analysis bandwidth. For lower frequency ground transportation applications the unit is capable of recording continuously for several days before filling its memory. Data management in the PANTHER allows the unit to measure and record up to 32,000 individual 3-channel waveform sets comprising transient shock events or continuous vibration. The length of each event is user configurable enabling the unit to be tailored to particular measurement tasks. Acceleration recording can be configured for measurement from either the three internal (triaxial) accelerometer channels, or from up to three optional external accelerometer channel inputs.

The PANTHER EDR-4M6 model offers recording capability from six input channels simultaneously. The PANTHER also measures and records environment temperature using sensors built into the instrument. Optional external temperature and relative humidity sensors are also available.



Better characterize harsh launch environments

TOTAL EQUIVALENT RECORDING TIME (minutes) (EDR-4, 4M1, 4M4, 4M6)

	MB Hz	Total Onboard Memory			
		6	24	72	108
Analysis Bandwidth	50	230	920	2,760	3,910 min. (*)
	100	115	460	1,380	1955 min.
	500	23	92	276	391 min.
	1,000	11	44	132	187 min.
	2,000	6	23	69	98 min.

(*) Approximate-Max, Assuming Nyquist Digitization Rate



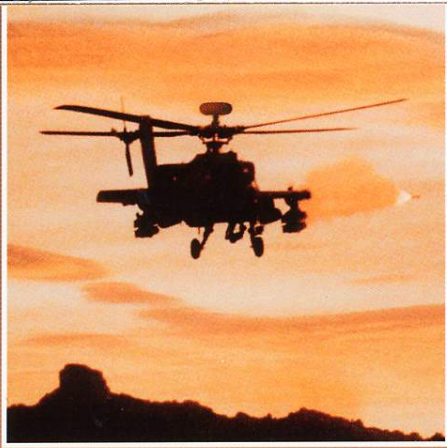
Accurately capture critical payload dynamics



IST recorders are EMI certified for flight testing

IST

Instrumented
Sensor
Technology



S I G N A L C O N D I T I O N I N G

The PANTHER model EDR-4 is supplied with three or six high speed input channels: three differential inputs or three single-ended inputs. Recording may be selected from either channel set for any given recording session. On the standard PANTHER EDR-4 the three differential channels are connected to an internally mounted, triaxial PR accelerometer. Single-ended channels are available as an option for external connection and use with voltage mode, piezoelectric accelerometers. The single-ended channels incorporate their own constant current excitation for powering voltage mode accelerometers. Other input signal conditioning configurations can be supplied on special order.

The PANTHER model EDR-4M1 is supplied with three external single-ended accelerometer input channels only and no internal accelerometers. The PANTHER model EDR-4M4 is supplied with three external differ-

ential input channels only and no internal accelerometers. The EDR-4M4 may be used with external piezoresistive accelerometers as well as strain gauges, load cells, and other types of bridge-type transducers.

User adjustable gain and analog low-pass filtering are also available on the input signal conditioning circuits. The unit employs 4th order Bessel LPFs with tunable 3dB cut-off frequencies from 10 Hz to over 50kHz. The recorder also provides user adjustable auto-zero offset correction which is tunable from a rate of no correction, (ie. absolute DC response) to a fast correction rate of 1% of full scale per second. This feature is designed to correct for transducer drift and DC offsets resulting from temperature variations, orientation changes, etc.

A P P L I C A T I O N S

The PANTHER has been designed for applications requiring remote, unattended recording of high speed dynamic phenomenon over relatively long periods of time. The rugged, shock hardened unit is ideal for conducting unattended recording sessions in harsh environments. Features available in the PANTHER make it an ideal instrument for applications ranging from in-depth transportation studies and laboratory simulations, to aircraft and spacecraft flight vibration recording to vehicular crash recording.

To discuss what the PANTHER can do for your data acquisition projects call an IST applications engineer today.

P A N T H E R S P E C I F I C A T I O N S

DATA ACQUISITION

#Selectable High Speed CHs
#Simultaneous High Speed CHs
Digitization
Noise Level
#Low Speed CHs:
#Simultaneous Low Speed CHs
#Trigger CHs
High Speed Digitization Rate
Low Speed
Digitization, Aggregate MAX, sps

DATA STORAGE

MegaByte-Battery Backed RAM

DATA MANAGEMENT

Fill & Stop Memory Mode (FS)
Fill & Wrap Memory Mode (FW)
Overwrite Memory Mode (OW)
Sliding Window Overwrite (SWO) Mode™
SWO with Event Type Partitioning (SWO-ETP)
SWO with Channel Set Partitioning (SWO-CSP)
Sliding Window Size
#Separate Time Windows
#Triggered Events Per Window

EDR-4	EDR-4M1, M4	EDR-4M6
3 (3)	3 (3)	6 (6)
3	3	6
12-bit	12-bit	12-bit
Approximately 0.3 microvolts (less than 1 LSB of ADC), all models		
3	3	8
4	4	8
1	1	2
0.001 to 60,000 sps/Channel all models		
1 sample per 24 Hr to 16 samples/sec all models		
180,000	180,000	360,000
6 (24, 72, 108)	6 (24, 72, 108)	12 (48)
X	X	X
X	X	X
X	X	X
X	X	X
X	X	X
X	X	X
Selectable 1 minute to 30 days		
Selectable 1 to 100		
Memory dependent, 2 to 32,000		

DATA COMMUNICATIONS

Standard Serial RS-232

High Speed Parallel Port

SENSORS

Internal Accelerometer: Piezoresistive Triaxial
Accelerometer fs Range Choices
Accelerometer Frequency Responses
2g, 5g, 10g, 50g, 100g, 200g
Signal Filtering: 4th Order Bessel Anti-Aliasing
Automatic Auto-Zero Offset Correction
External Accelerometers

PROGRAMMABILITY

High Speed Sample Rate
Trigger Selection
Triggering
Amplitude Threshold
Separate Channel Thresholds
Duration (time at level) Threshold
Separate Channel Thresholds or Resultant
Trigger Duration Threshold
Time Trigger Delay
(forced time delay between triggered recordings)
Time Triggered Recording
Maximum Number of Events
Event Length
Pre-trigger samples
Post-trigger samples
Maximum Event Length Cutoff
Memory Modes
Channel Gain

OPERATIONAL

Temperature Recording
Range/Resolution
Humidity Recording
Range/Resolution
Usable Temperature Range
Date & Time Tagged to each Acceleration Event
Clock Resolution/Accuracy
Auto ON and OFF times
Synchronization: Master/Slave Among Multiple EDR-4

Connectors

Battery @ 500 sps/CH
(Typ., Alkaline D-Cells, 6MB Memory) @ 15000 sps/CH

Data Memory Backup

PHYSICAL

Size
Housing
Weight
Operating Temperature Range
Shock Fragility

STANDARD ANALYSES

(with DM-1 Software Package)

OPTIONAL ANALYSES

HARDWARE OPTIONS

Memory expansion
External channel inputs
Relative humidity sensor
Global positioning system (GPS), with Field-Link
Auxiliary battery pack
Hand-held remote trigger (HRT-1)
Remote alarm module (RALM-1)

EDR-4

EDR-4M1, M4

EDR-4M6

	EDR-4	EDR-4M1, M4	EDR-4M6
	9.6 to 115 kBaud all models		
High Speed Parallel Port	X	X	X
	X		(X)
	2, 5, 10, 50, 100, 200g all models		
	DC-250 Hz, DC-300 Hz, DC-400 Hz, DC-1000 Hz, DC-1500 Hz, DC-2400 Hz User tunable continuous from 10 Hz to over 2 kHz 3dB cut-off User tunable from zero (0) to 1% of full scale per second		
	Voltage model piezoelectric, 0.5mA, 3.6V bias, .5mv/g to 1000 mv/g, all models		
High Speed Sample Rate	X	X	X
Trigger Selection	Internal or external channels and/or external trigger input, all models		
Triggering	X	X	X
Amplitude Threshold	X	X	X
Separate Channel Thresholds	X	X	X
Duration (time at level) Threshold	X	X	X
Separate Channel Thresholds or Resultant	X	X	X
Trigger Duration Threshold	1 to 256 samples all models		
Time Trigger Delay (forced time delay between triggered recordings)	0 to 65,535 samples all models		
Time Triggered Recording	1 sample/10 sec to 1 sample/4 years, continuously selectable		
Maximum Number of Events	32,000	32,000	32,000
Event Length	Fixed or data dependent		
Pre-trigger samples	2 to 65,535 all models		
Post-trigger samples	Limited by maximum event length cut-off		
Maximum Event Length Cutoff	4 to maximum memory size all models		
Memory Modes	FS, FW, OW, SWO	FS, FW, OW, SWO	FS, FW, OW, SWO, SWO, SWO-EVP, CSP
Channel Gain	User adjustable from 1 to 30 all models		
	Internal & optional external all models -60 to +80 deg C / +/- 0.25 deg C all models Optional (internal & external) all models 0 to 100% RH / +/- 0.25% RH all models 1 to 60 deg. C all models		
Temperature Recording	X	X	X
Range/Resolution	1 microsecond, +/- 1 min./mo., approximate, all models		
Humidity Recording	X	X	X
Range/Resolution	To within 1 microsecond using PLL SYNCH connection; simultaneous sample & hold on all high speed channels		
Usable Temperature Range	DB9 for RS-232 serial all models		
Date & Time Tagged to each Acceleration Event	10-32 microdot for external accelerometers		
Clock Resolution/Accuracy	7 pin waterproof plug style for external differential, control, synch, parallel COM		
Auto ON and OFF times	60 days	60 days	30 days
Synchronization: Master/Slave Among Multiple EDR-4	16 days	16 days	16 days
Connectors	12 months typical, all models (memory size dependent)		
	5.7" x 5.5" x 2.9" all models		
Battery @ 500 sps/CH (Typ., Alkaline D-Cells, 6MB Memory) @ 15000 sps/CH	Black Anodized Aluminum, watertight, gasket sealed		
Data Memory Backup	4.9 lb	4.9 lb	5.3 lb
	-40 to + 70 deg C all models		
	500g or 20 x fs, all models		
	3- channel acceleration waveform graphics Resultant acceleration waveforms Spreadsheet tabulation of max, min, peak, duration, RMS, crest factor, velocity change, temperature, humidity, dew point, battery volt. Data editing and sorting by selected event parameters Digital filtering-low pass, high pass, bandpass		
	DM-2 Velocity and displacement waveforms DM-3 Power spectral density (PSD) calculation and analysis DM-4 Shock response spectrum (SRS) calculation and analysis DM-5 Packaging drop height-equivalent impact, Zero-G free fall, package trajectory animation, impact direction & type. DM-6 ISO ride quality profile calculation DM-7 Jerk waveform calculation and display		
	24 to 108 MB	24 to 108 MB	48 MB
Memory expansion	3 single ended	3 single ended or differential	single ended or differential
External channel inputs	Internal and/or external		
Relative humidity sensor	X	X	X
Global positioning system (GPS), with Field-Link	X	X	X
Auxiliary battery pack	X	X	X
Hand-held remote trigger (HRT-1)	X	X	X
Remote alarm module (RALM-1)	X	X	X

() = Optional Sliding Window Overwrite (SWO)™ is a trademark of Instrumented Sensor Technology, Inc.

* Sliding Window Overwrite (SWO) mode is patented by Instrumented Sensor Technology, Inc.

10/03

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