THE PANTHER
SHOCK & VIBRATION SENSOR/RECORDER
MODEL EDR-4

• High Speed  • Large Memory

• Fast

• Powerful

• Precise

...Defining the State-of-the-Art
The Panther
Shock & Vibration Sensor/Recorder
Model EDR-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.
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

**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
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.

<table>
<thead>
<tr>
<th>MB</th>
<th>Total Onboard Memory</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6</td>
</tr>
<tr>
<td>50</td>
<td>230</td>
</tr>
<tr>
<td>100</td>
<td>115</td>
</tr>
<tr>
<td>500</td>
<td>23</td>
</tr>
<tr>
<td>1,000</td>
<td>11</td>
</tr>
<tr>
<td>2,000</td>
<td>6</td>
</tr>
</tbody>
</table>

(*) Approximate-Max, Assuming Nyquist Digitization Rate
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 differential input channels only and no internal accelerometers. The EDR-4M4 may be used with external piezoresistive accelerometers as well as strain guages, 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, ( i.e. 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.

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.

### PANTHER SPECIFICATIONS

#### 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

<table>
<thead>
<tr>
<th></th>
<th>EDR-4</th>
<th>EDR-4M1, M4</th>
<th>EDR-4M6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channels</td>
<td>3 (3)</td>
<td>3 (3)</td>
<td>6 (6)</td>
</tr>
<tr>
<td>12-bit</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Digitization Accuracy</td>
<td>Approximately 0.3 microvolts (less than 1 LSB of ADC), all models</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Speed</td>
<td>3</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>High Speed</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>180,000</td>
<td>180,000</td>
<td>360,000</td>
</tr>
<tr>
<td>Sampling Rate</td>
<td>6 (24, 72, 108)</td>
<td>6 (24, 72, 108)</td>
<td>12 (48)</td>
</tr>
<tr>
<td>Selectable</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Memory</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Time</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Dependents</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Memory</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Time</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Dependents</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

*Selectebale 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 frequency response
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
(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 control 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

9.6 to 115 kBaud all models

X
X
X

2, 5, 10, 50, 100, 200g all models

DC-250 Hz, DC-300 Hz, DC-400 Hz, DC-1000 Hz, DC-1600 Hz, DC-2400 Hz
User tunable continuous from 10 Hz to over 2 kHz 3dB cut-off
User tunable from 0 Hz to 1% of full scale per second
Voltage model piezoelectric, 0.5mV to 1000 mv/1g, all models

X

X

1 to 255 samples all models
0 to 65,535 samples all models

1 sample/10 sec to 1 sample/4 years, continuously selectable
32,000
32,000
32,000

Fixed or data dependent
2 to 65,535 all models
Limited by maximum event length cut-off
4 to maximum memory size all models

FS, FW, OW, SWO
FS, FW, OW, SWO
FS, FW, OW, SWO, SWO-EVP, CSP

User adjustable from 1 to 30 all models

Internal & optional external all models
-66 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

X
X
X

1 microsecond, +/- 1 min./m., approximate, all models
X
X

To within 1 microsecond using PLL SYNCH connection; simultaneous sample & hold on all high speed channels

D89 for RS-232 serial all models

10-32 microdot for external accelerometers
7 pin waterproof plug style for external differential, control, synch, parallel COM

60 days
60 days
60 days

16 days
16 days
16 days

12 months typical, all models (memory size dependent)

5.7" x 5.5" x 2.8" all models
Black Anodized Aluminum, water tight, gasket sealed
4.9 lb
4.9 lb
5.3 lb

-40 to + 70 deg C all models
-50 to + 20 deg F, all models

500g or 20 lb, 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 106 MB
24 to 106 MB
48 MB

3 single ended
3 single ended or differential
Internal and/or external

X
X
X

X
X
X

X
X
X

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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