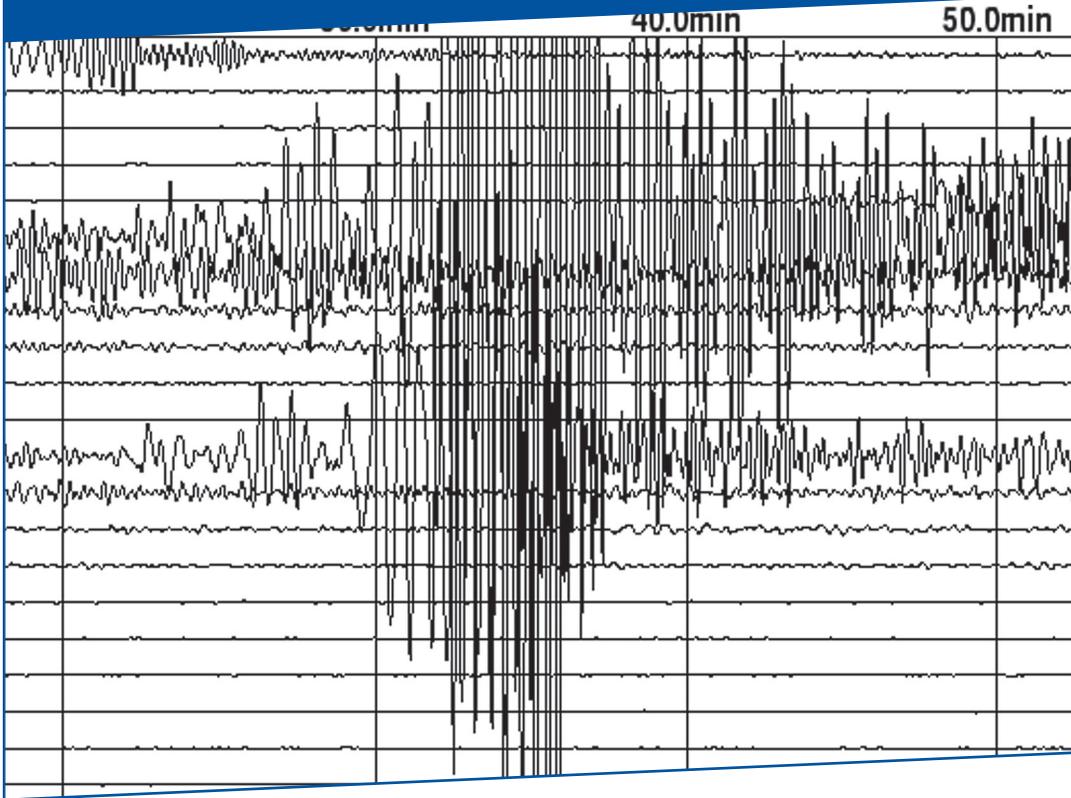




Event Monitoring Device (EMD)

DRK-S701 INSTALLATION AND OPERATION MANUAL



VERSION 2.2 - NOVEMBER 2015

PART NUMBER DRAM-BOOK

DO NOT DISCARD!

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Introduction

The EMD detects and measures seismic events and signals elevator controls to take appropriate action based on their magnitude. Properly installed, the EMD will detect a potentially dangerous seismic event and alert the controller to stop the car at the nearest floor to discharge the passengers. Auxiliary sensors, such as water detection in the pit, can be connected to it.

Because of the many features implemented in this system, it is essential to fully understand its operation. We strongly recommend that you read this manual thoroughly and familiarize yourself with the system and its operation.

EMD Features

- Dual tri-axis accelerometer technology for accuracy and reliability,
- Preset ASME A17.1 profiles with options for EN81 and ASCE25-97,
- Two user defined profiles with up to five frequency bands each,
- Ability to support an external seismic sensor, and
- Ability to support an auxiliary sensor for measurements of other events, such as a water detector in the pit.

The EMD is evaluated in accordance with ANSI/ASME A17.1 2013-10-21 and A17.5 2011-03-01. It is also evaluated in accordance with CAN/CSA B44, and B44.1.



- G) DOWN BUTTON Used to scroll the LCD display down.
- H) ENTER/RESET BUTTON
Used to enter information on the LCD display.
- I) ALARM RESET BUTTON
Used to reset the unit after an ALARM event
- J) TROUBLE RESET BUTTON
Used to reset the unit after TROUBLE failure
- K) AUXILIARY RESET BUTTON
Used to reset the unit after an AUXILIARY event
- L) BATTERY SWITCH
This switch should be in the ON/down position during normal operation and in the OFF/up position during storage.
- M) USB INTERFACE (optional)
- N) RS-232 INTERFACE (optional)

Electrical connections

- O) DC INPUT (VIN and GND)
For 12/24VDC from the internal AC/DC power supply or from an external DC supply 500mA minimum.
- P) REMOTE SEISMIC SENSOR INTERFACE (RMT_X, RMT_Y, RMT_Z)
For a remote seismic sensor
- Q) AUXILIARY SENSOR INTERFACE (AUX)
For an auxiliary sensor for counterweight displacement interface
- R) ALARM REMOTE RESET (ALM_RST)
For remote reset after an ALARM event.
- S) AUXILIARY REMOTE RESET (AUX_RST)
For remote reset after an AUXILIARY event.
- T) REMOTE TEST (RMT_TST)
For triggering a test ALARM signal.
- U) ALARM NON-LATCHED RELAY (ALM_N_NO, ALM_N_COM, ALM_N_NC)
This is a NO/NC relay interface. The relay switches during an ALARM state. During a complete power failure this relay will default to the ALARM State as a fail-safe. The interface can support up to 5A.
- V) ALARM LATCHED RELAY (ALM_L_NO, ALM_L_COM, ALM_L_NC)
This relay switches during an ALARM state. During a complete power failure, this relay will remain in its set state. The interface can support up to 5A.
- W) TROUBLE LATCHED RELAY (TBL_L_NO, TBL_L_COM, TBL_L_NC)
This relay switches during a TROUBLE state. During a complete power failure, this relay will remain in its set state. The interface can support up to 5A.
- X) AUXILIARY LATCHED RELAY (AUX_L_NO, AUX_L_COM, AUX_L_NC)
This relay switches during an AUXILIARY state. During a complete power failure, this relay will remain in its set state. The interface can support up to 5A.
- Y) AC CONNECTION For 110/220VAC power.

Installing the EMD

Inspect the unit

The unit is shipped fully assembled and ready to install.

The unit is calibrated at the factory and set to ASME 17.1 standards.

Remove all packing material and inspect all parts for damage.

The user will need to supply appropriate ¼ inch mounting hardware.

Wall mounting

The EMD is factory-calibrated for mounting on a solid vertical surface such as a steel member or masonry wall rigid enough to completely transfer the vibrations from the building.

Mounting to flexible surfaces such as drywall is not advised. For proper and safe operation, it is important to make sure the vertical surface is plumb.

Drill holes to accommodate ¼ inch bolts or screws using the hole pattern shown on page 6. Use a level or plumb bob to get the hole pattern as square as possible. Once installed, the unit should be checked again for plumb and level. Use rigid shims or washers as needed to adjust the plumb.

Horizontal mounting

The EMD can also be mounted horizontally, but will need to be adjusted for this through orientation calibration (see 1) CALIBRATE on page 9). The unit must be mounted as level as possible. Use shims or washers as needed.

Notes on wiring

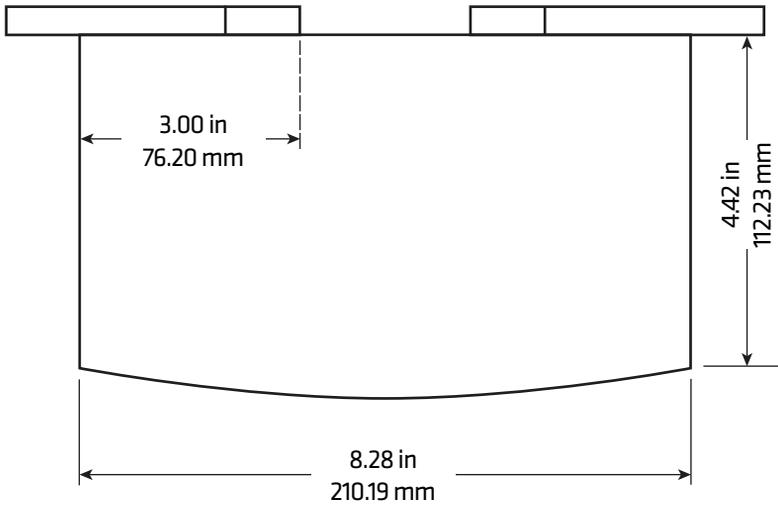
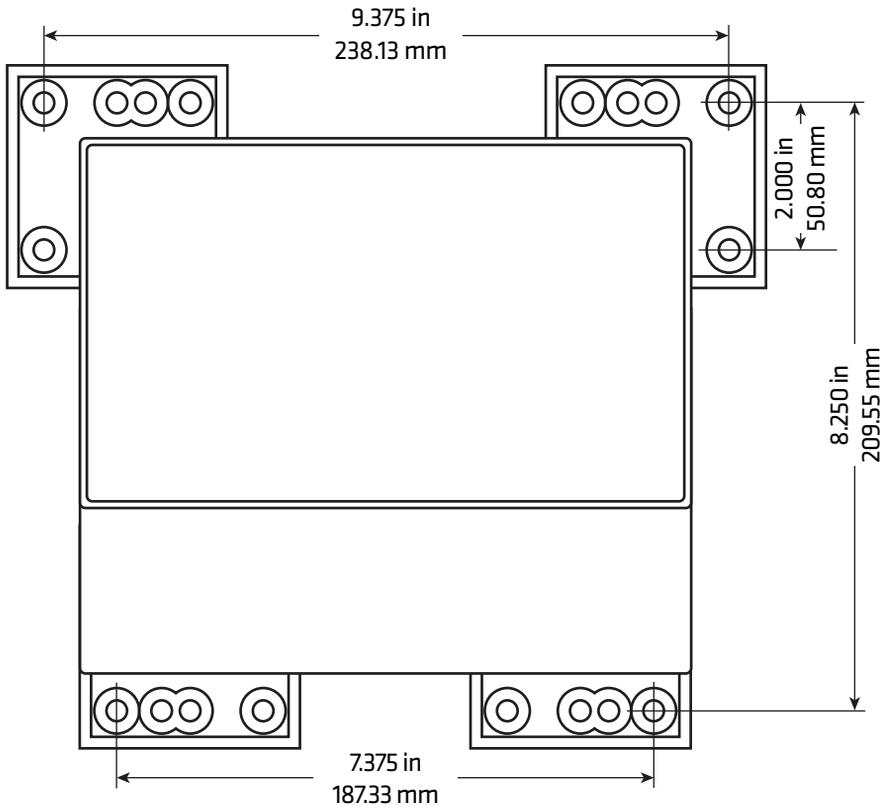
When wiring the EMD, please note:

accepted wire size is between 22-12 AWG,

accepted wire types are MTW, TK, TFF, TFN, TFFN, THHN, THW, THWN, TW and XHHW,

accepted wire temperature rating is 90°C or better, and

maximum fastener torque should not exceed 4.5 In-lbs.



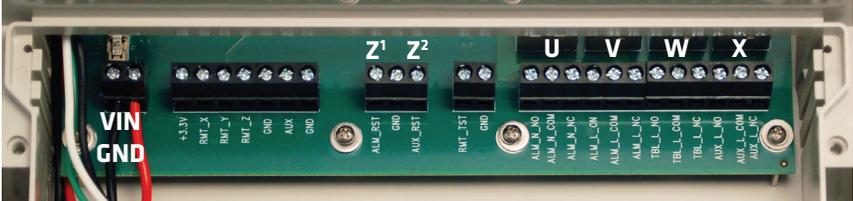
Powering the EMD

Choose AC or DC power

The EMD can use either AC or DC power. For AC, connect the appropriate conductors per code to the white/black/green wires at the bottom of the unit. Acceptable AC power is 100-240VAC, 47-63 Hz, 0.5A minimum. See page 5 for a listing of acceptable wire types.

For DC, remove the wires connected to the VIN and GND (these are the outputs from the internal power supply) at 12-24VDC at 1A minimum. Connect the positive DC lead to VIN and the negative to GND (VIN GND on the photo).

The EMD has knockouts at the bottom edge for conduit attachment.



Relays

Interfaces are provided to four relays; ALARM non-latching (U on the photo), ALARM latching (V on the photo), TROUBLE latching (W on the photo) and AUXILIARY latching (X on the photo). Each relay will support up to 30VDC at 5A with contact resistance of up to 50mΩ.

NOTE: California code requires the use of non-latching relays.

Remote resets

Interfaces are provided to allow for remote resetting after an ALARM state or an AUXILIARY state. Reset is triggered by externally closing the connection between either the alarm reset pin ALM_RST (Z¹ on the photo) and ground or the auxiliary reset pin AUX_RST (Z² on the photo) and ground. Note that both resets share a common ground connection. Reset active impedance is <1Ω and reset inactive impedance is >1MΩ. Remote reset may be initiated by a momentary contact push button located where desired.

Battery backup

The EMD is designed to use either one or two Tenergy 18650 3.7V Li-Ion batteries. One 2600mAH battery should last about 18 hours. Using two batteries will double this. Flip the switch to ON when the unit is in service to keep the battery charged.

CAUTION: This battery may present a risk of fire or explosion when heated above the manufacturer's recommended charge/discharge temperature of 212°F/ 100°C or incinerated. Use of any other battery may result in risk of fire or explosion. Dispose of used batteries promptly and properly. Keep away from children. Do not disassemble or dispose of them by burning.

Setting up the EMD

Initial power up

Once the unit is wired and the battery back-up switched on, the unit can be powered up. Two seconds after power-up, the LCD display should read:

```
DRK-S701  
EXTERNAL POWER
```

If the display reads BATTERY BACKUP instead of EXTERNAL POWER, disconnect the unit and make sure the unit is connected to your preferred power source. Power up the unit again.

On external power, the display will read:

```
PRESS ENTER  
FOR SETUP
```

for three seconds. Press the ENTER button to reach the SETUP menu. If ENTER is not pressed, the display will default to a time/date/status reading (these will need to be set - see below.) Press either the ENTER or the FUNCTION/EXIT button to access the SETUP menu, which should read:

```
1) CALIBRATE    <-  
2) SYSTEM TEST
```

Pressing the UP/DOWN buttons will scroll the display through the full menu of options. Options 1 - 6 are for setting up the unit. Options 7 - 9 are for retrieving data:

```
1) CALIBRATE  
2) SYSTEM TEST  
3) SENSOR SETUP  
4) RELAY SETUP  
5) TIME/DATE  
6) POWER SETUP  
7) LOG  
8) SENSOR DATA  
9) SYSTEM DATA  
10) EXIT
```

Setting up the EMD continued

1) Calibrate

NOTE: Calibration is NOT required if you mounted the EMD per installation instructions on page 5.

Use this SETUP option only if you have mounted the unit to a horizontal surface.

Select 1) CALIBRATE from the SETUP menu and press the ENTER button. Use the UP/DOWN keys to select INT ORIENT CAL and press ENTER. The display should read CALIBRATING DO NOT MOVE UNIT. The other menu option, INT OFFSET CA, is for factory use only.

When finished, the display should read COMPLETE UNIT HORIZONTAL before returning to the SETUP menu. If the display reads UNIT MOUNT ERROR, the unit is too far off level and plumb and must be adjusted until it is within limits.

2) System test

Use this SETUP option to run the automatic test routine. Select 2) SYSTEM TEST, press ENTER and select SELF TEST.

If an error is detected, the unit will go to TROUBLE and display time/date and the word TROUBLE followed by a four-digit code. If there are multiple problems, the trouble code with the lowest number will be displayed. That problem must be corrected before any other codes are shown. Trouble codes are shown on page 13.

SYSTEM TEST also allows manual relay testing.

Select SYSTEM TEST and press ENTER to select the RELAY TEST option.

Press ENTER to get to a menu with five relay switching options; 1) ALL (switch all relays), 2) ALARM LATCH (for the latching alarm relay), 3) ALARM NON-L (for the non-latching alarm relay), 4) TROUBLE (for the trouble relay) and 5) AUXILIARY (for the auxiliary relay). Selecting any of these options displays a screen saying:



Use the UP/DOWN buttons to switch between states and press ENTER to confirm.

To get an audible signal for the state of the relay, select SYSTEM TEST and press ENTER to select the AUDIBLE option. The NORMAL/TRIGGERED screen should appear.

Use the UP/DOWN keys to set the relay to TRIGGERED and press ENTER. This will evoke the audio/visual response for the TROUBLE relay.

Press ENTER again to get the response for the AUXILIARY relay. Press ENTER a third time to get the ALARM response. If you repeat this sequence with the relays in the NORMAL mode, you will get no signal (meaning that the relays are in a normal condition).

Setting up the EMD continued

Alarm signals

Condition	Audible	Alarm LED ("B" on page 3)
Trouble Normal	None	Off
Auxiliary Normal	None	Off
Alarm Normal	None	Off
Trouble Triggered	Slow Beep	Green
Auxiliary Triggered	Medium Beep	Yellow
Alarm Triggered	Fast Beep	Red

3) Sensor set up

Use the SENSOR SETUP option to configure the internal seismic sensor to your preferred profile – for elevators, the suggested profile is ASME 17.1. An external seismic sensor or an auxiliary sensor may also be enabled and thresholds set. For most installations, setting the internal sensor is sufficient.

Select 3) SENSOR SETUP from the SETUP menu and press ENTER. Scroll to INT SEISMIC and press ENTER. Select ENABLE with the ENTER button. This will display four options. Option 2 is ASME A17.1. For elevator applications, scroll to that selection and press ENTER. For all other applications, select applicable code option or user-defined profile.

If you are setting up an external seismic sensor, return to 3) SENSOR SETUP, press ENTER, scroll to EXT SEISMIC and press ENTER. Select ENABLE with the ENTER button. This will display four options. Option 2 is ASME A17.1. Scroll to that selection and press ENTER.

If you are setting up an auxiliary sensor, return to 3) SENSOR SETUP, press ENTER, scroll to AUXILIARY and press ENTER. NOTE: This is for setting up the auxiliary sensor which may be used for ring-on-a-string (ROS) counterweight detector. The display should read:

```
TRIP TIME 01.00s
UP/DOWN =>ENTER
```

NOTE: Trip time is related to connection of auxiliary to ground input. Pressing the UP or DOWN buttons will change the trip time (the trigger for the ROS). Press ENTER when the trip time is at the desired level.

```
TRIGGER ON SHORT
UP/DOWN =>ENTER
```

4) Relay setup

Generally, there is no need to change the factory settings for the four relays. The two ALARM relays operate in tandem, and the TROUBLE and AUXILIARY relays operate separately. The auxiliary relay when properly configured in step 3 may be used as a ring and string input. This is the default auxiliary relay function. If a different configuration is required, contact Draka Elevator.

Setting up the EMD continued

5) Time/Date

Use the TIME/DATE option to set the unit's internal clock. Select 5) TIME/DATE and press ENTER. The display should read:



Use the UP/DOWN buttons to set the month number (01 = Jan, 02 = Feb, etc.) and press ENTER. The display will prompt you through setting up the day, hour and minute using the UP/DOWN buttons and pressing ENTER to confirm the selection. Once the MINUTE value has been entered, the display will return to the SETUP menu.

6) Power setup

Use the POWER SETUP option to set how long the LCD will remain on after a button has been pressed. The options vary depending with the power supply and the use of the display backlight. The default settings are for:

LCD with external power (LCD-EXT): 5 minutes

LCD backlit with external power (BKLIGHT-EXT): 2:30 minutes

LCD with battery power (LCD-BATT): 20 seconds

LCD backlit with battery power (BKLIGHT-BATT): 10 seconds

To change the factory settings, select 6) POWER SETUP and press ENTER. The display should show four options: 1) BKLIGHT-EXT, 2) LCD-EXT, 3) BKLIGHT-BATT, and 4) LCD-BATT. Scroll to the desired setting and press ENTER. The display should read:



Use the UP/DOWN buttons to adjust the time. Lightly pressing the UP/DOWN will change the value by one second. Fully pressing the button will scroll the seconds. Press ENTER to confirm the time. The display will return to the SETUP menu.

Once you have performed these steps, run SYSTEM TEST once more to confirm operational status.

When the relay test function is triggered, the unit sends a signal to the controller to signal an event. The controller then decides what actions to take according to local code requirements.

7) Inspection and Test

To test the system, push and hold the optional REMOTE TEST button for 3 seconds. If there is no REMOTE TEST button on your unit, use a wire to momentarily jump the remote test terminals (T on the diagram on page 3) for 3 seconds.

Viewing data on the EMD

7) Log

The EMD logs events, (seismic ALARM, AUXILIARY and TROUBLE) for later review. Select 7) LOG from the SETUP menu and press ENTER. A typical log entry will look like this:

```
#001 INT SMC  
03/04/14 06:12:11
```

showing the numerical order and type of event, its date and its time of occurrence.

If more information on an event is desired, press ENTER to display specific data for that event. The data can be viewed by scrolling with the UP / DOWN buttons. When done, press EXIT to return to the list of events. Typical events are:

Internal Seismic:

Int. Seismic	(description of event)
X-Y at 0.8g	(triggering item)
Freqs 2	(triggering frequency band)
03/04/13	(date)
06:11:12	(time)

External Seismic:

Ext. Seismic	(description of event)
X-Y at 0.8g	(triggering item)
Freqs 2	(triggering frequency band)
03/04/13	(date)
06:11:12	(time)

Auxiliary Sensor:

Auxiliary	(description of event)
2.10 volts	(triggering voltage)
03/04/13	(date)
06:11:12	(time)

Trouble:

Trouble	(description of event)
Error 1002	(first error code)
Error 2010	(other error codes to the last one)
03/04/13	(date)
06:11:12	(time)

Trouble error codes are explained on page 13.

Trouble error codes

Error codes consist of four digits. The first is a Category Indicator, the second is reserved for future use, and the final two are the error number. The Category Indicators are:

- 1) Power Error
- 2) Relay Error
- 3) Sensor Error
- 4) Environment Error
- 5) I/O Error

The table below shows the complete list of errors:

Digit	Reserve Digit	Error Number	Description
1	0	01	Input voltage out of range
1	0	02	DC-DC output voltage out of range
1	0	03	Battery failure
1	0	04	Battery charging error
2	0	05	Alarm Latching Relay set error
2	0	06	Alarm Latching Relay reset error
2	0	07	Trouble Latching Relay set error
2	0	08	Trouble Latching Relay reset error
2	0	09	Auxiliary Latching Relay set error
2	0	10	Auxiliary Latching Relay reset error
2	0	11	Alarm Non-latching Relay error
3	0	12	x-axis accelerometer error
3	0	13	y-axis accelerometer error
3	0	14	z-axis accelerometer error
4	0	15	Internal temperature error
5	0	16	FUNCTION/EDIT Button Error
5	0	17	UP Button Error
5	0	18	DOWN Button Error
5	0	19	ENTER Button Error
5	0	20	ALARM RESET Button Error
5	0	21	TROUBLE RESET Button Error
5	0	22	AUXILIARY RESET Button Error
3	0	23	Remote Seismic Sensor X Input Error
2	0	24	Alarm Non-latching Normally Open Relay Error
2	0	25	Alarm Non-latching Normally Closed Relay Error
3	0	26	Remote Seismic Sensor Y Input Error
2	0	27	Alarm Latching Normally Open Relay Error
2	0	28	Alarm Latching Normally Closed Relay Error
3	0	29	Remote Seismic Sensor Z Input Error
2	0	30	Trouble Latching Normally Open Relay Error
2	0	31	Trouble Latching Normally Closed Relay Error
5	0	32	Alarm Error Reset Input Error
5	0	33	Auxiliary External Reset Input Error
5	0	34	Auxiliary Sensor Input Error
5	0	35	Remote Test Input Error
2	0	36	Auxiliary Latching Normally Open Relay Error
2	0	37	Auxiliary Latching Normally Closed Relay Error
4	0	38	Unit out of Level
4	0	39	Unit out of Plumb

Viewing data on the EMD continued

8) Sensor data

Real-time sensor data can be accessed by scrolling to SENSOR DATA and pressing enter.

Seven options are shown:

- 1) INT SEISMIC (internal seismic sensor acceleration)
- 2) EXT SEISMIC (external seismic sensor acceleration)
- 3) AUXILIARY (auxiliary sensor voltage)
- 4) TEMP (ambient temperature °C)
- 5) VOLTAGE (input voltage)
- 6) BATT (battery voltage)
- 7) FREQ RESPONSE (seismic wave frequencies across five bands).

Use the UP/DOWN buttons to highlight the device whose data you want to view.

Typical displays for the internal and external seismic sensors show the acceleration along the X, Y and Z-axis in Gs:

```
X=-0.07  Y=-0.05  
Z=-0.98 (g)
```

The Frequency response option displays the internal seismic sensor. The first entry the axis the data is being measured in. This is followed by current acceleration in all five frequency bands:

```
XY0 0.14  0.03  
0.01  0.02  0.00
```

The other options display appropriate temperatures/voltages.

9) System data

Selecting SYSTEM DATA from the SETUP menu and pressing ENTER will display a list of general information and specific parameters about the EMD. Options include:

Model number

Software version

Calibration status (horizontal or vertical)

Primary internal accelerometer (0g voltages for the sensor)

Primary internal accelerometer 1g offset (1g voltages for the sensor)

Secondary internal accelerometer (0g voltages for the sensor)

Secondary internal accelerometer 1g offset (1g voltages for the sensor)

Power source (external or battery)

Internal sensor setting (ASME 17.1)

External sensor setting (ASME 17.1)

Auxiliary sensor setting (activation voltage threshold)

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