

Team 12

Instrumented Sensor Technology, Inc. Capstone Design Topic

Topic: RMS G-meter

Product Description:

The RMS G-meter is a microprocessor-based device that displays and updates in real time the RMS values of the acceleration levels to which it, itself, is exposed, in one axial direction.

This device consists of a single-axis accelerometer, signal conditioning/filtering, A/D converter, micro-controller, LCD display, and battery power supply. Once turned on, the user may first select either Peak mode, Average mode, or Integrated RMS mode. In the Peak Mode, the device updates the highest RMS value it has measured since it was activated. In the Average mode, the device simply displays the averaged RMS value of signal over the entire time it has been active. In the Integrated RMS mode it reports the sum total of all RMS samples computed since activation (total integrated RMS).

Once the mode is selected, the microcontroller commences to sample the analog signal from the accelerometer for a predetermined period of time—e.g., 3 seconds—at a predetermined sample rate of 1000 samples/sec. Once the data is acquired, the microcontroller then performs an RMS calculation on the data block. After this value is computed, the averaged and peak values are updated, and the displayed value is then updated. Subsequently, this process is repeated, indefinitely, until the device is turned off.

Prototype Specifications:

Bandwidth: DC to 500 Hz
Low Pass filter: 4-pole Butterworth, 500 Hz 3db cut-off frequency
G-range: 5 g full scale
Precision: 1%
Display update: Once every three seconds
Display format: xx.xx (g-rms)
Power Supply: 9 volt battery. AC/DC adaptor optional.
Battery life: 24 hours of continuous operation, minimum. Low power version for shipment monitoring in development.

Applications:

This g-meter would have useful, industrial applications in machinery monitoring, turbine vibration monitoring, paper mill vibration monitoring, industrial package testing, packaging ship testing (for vibration exposure), and various types of shock and impact testing, where a simple real-time display of the test data is adequate.

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