

by a coil and its motion produces a voltage in the coil through Faraday's Law. It is an analog, not digital, device, like the vast majority of sensors in EE and it only measures motion in one direction (dimension) – in this case, in the vertical direction. We would need three such devices to measure a full 3D response.

Turning now to the frequency dependence, we have a weight suspended on a spring (actually springs in the geophone case). Most students quoted an analogy with an LC circuit, which was good. Now the problem is this: such a mechanical device, or its electrical analog, has a well-defined resonance frequency and possibly not much response apart from that resonance. Obviously users of the geophone would like to have a device that has some breadth to its frequency response. Some discussion of how the frequency response of the device might be broadened was therefore appropriate at this stage. Resistance added in an LC circuit; perhaps some damping in the actual spring/magnet setup. Returning to Faraday's Law, and the fundamental aspects of the device's response to ground motions, it is important to notice that the voltage induced in the coil surrounding the magnet varies as the rate of change of magnetic field and thus the device responds preferentially to higher-frequency ground vibrations. Finally, the spike! The device needs to be closely coupled to the ground to measure the ground vibrations properly. It is not hard to imagine a situation where the device is sitting loosely on the ground, responding to low-frequency motions but not responding at all to higher frequency motions.