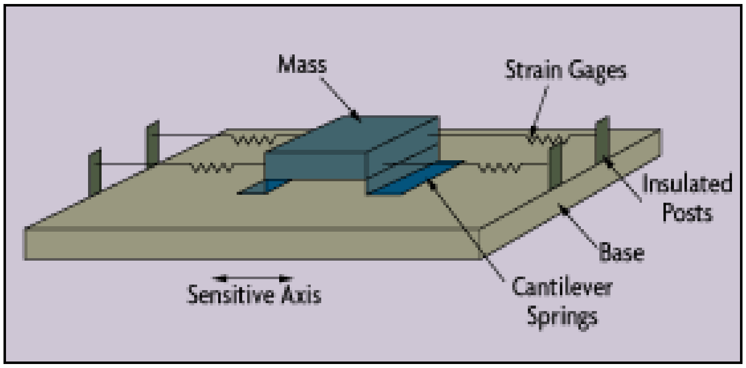
Accelerometer

An accelerometer is a device that measures the vibration, or acceleration of motion of a structure. The force caused by vibration or a change in motion (acceleration) causes the mass to "squeeze" the piezoelectric material which produces an electrical charge that is proportional to the force exerted upon it. Since the charge is proportional to the force, and the mass is a constant, then the charge is also proportional to the acceleration.



There are two types of piezoelectric accelerometers (vibration sensors). The first type is a "high impedance" charge output accelerometer. In this type of accelerometer the piezoelectric crystal produces an electrical charge which is connected directly to the measurement instruments. The charge output requires special accommodations and instrumentation most commonly found in research facilities. This type of accelerometer is also used in high temperature applications (>120C) where low impedance models cannot be used. The second type of accelerometer is a low impedance output accelerometer. A low impedance accelerometer has a charge accelerometer as its front end but has a tiny built-in micro-circuit and FET transistor that converts that charge into a low impedance voltage that can easily interface with standard instrumentation. This type of accelerometer is commonly used in industry. An accelerometer power supply provides the proper power to the microcircuit 18 to 24 V @ 2 mA constant current and removes the DC bias level, they typically produces a zero based output signal up to +/- 5V depending upon the mV/g rating of the accelerometer.

Accelerometer Specifications
Dynamic Range is the +/- maximum amplitude that the accelerometer can measure before distorting or clipping the output signal. Typically it is specified in terms of g's.

Frequency Response is determined by the mass, the piezoelectric properties of the crystal, and the resonance frequency of the case. It is the frequency range where the output of the accelerometer is within a specified deviation, typically +/- 5%. g 1g is the acceleration due to the earth's gravity which is 32.2 ft/sec2, 386 in/sec2 or 9.8 m/sec2.

High Frequency Limit is the frequency where the output exceeds the stated output deviation. It is typically governed by the mechanical resonance of the accelerometer.

Low Frequency Cut-off is the frequency where the output starts to fall off below the stated accuracy. The output does not "cut-off" but the sensitivity decreases rapidly with lower

frequencies.
Noise - Electronic noise is generated by the amplifying circuit. Noise can be specified either broad band (specified over the frequency spectrum) or spectral - designated at specific frequencies. Noise levels are specified in g's, i.e. 0.0025 g 2-25,000 Hz. Noise typically decreases as frequency increases so noise at low frequencies is more of a problem than at high frequencies.

Resonance Frequency is the frequency at which the sensor resonates or rings. Frequency measurements want to be well below the resonance frequency of the accelerometer.

Sensitivity is the output voltage produced by a certain force measured in g's. Accelerometers typically fall into two categories - producing either 10 mV/g or 100 mV/g. The frequency of the AC output voltage will match the frequency of the vibrations. The output level will be proportional to the amplitude of the vibrations. Low output accelerometers are used to measure high vibrational levels while high output accelerometers are used to measure low level vibrations.

Temperature Sensitivity is the voltage output per degree of measured temperature. The sensors are temperature compensated to keep the change in output to within the specified limits for a change in temperature.

Temperature Range is limited by the electronic micro circuit that converts the charge to a low impedance output. Typically the range is -50 to 120C.