

Understanding the Importance of the Accelerometer's Center of Seismic Mass

Technical Paper 340
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The center of seismic mass (CSM) is the center of the sensing element contained within the accelerometer's case. The CSM is not necessarily in the physical center (center of gravity) of the accelerometer's case (see figure 1). This may differ between model numbers and manufacturers.

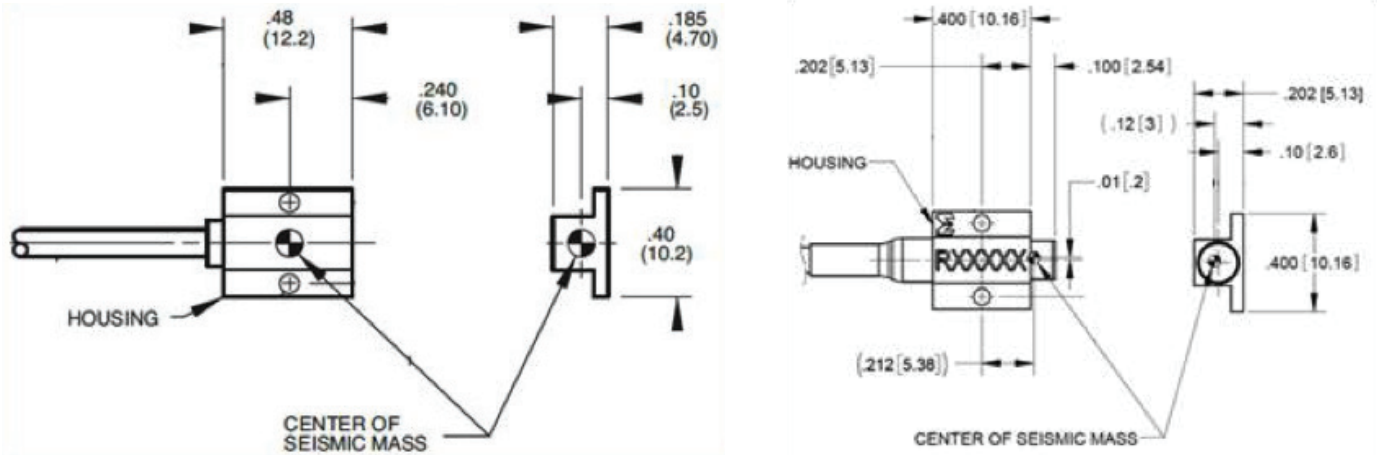


Figure 1: Showing two similar accelerometers manufactured by Endevco. The unit on the left CSM is in the center, while the accelerometer on the right has a CSM near the end, on the right.

If the above accelerometers are going to be used in a single axis configuration, the location of the CSM is of little (if any) importance as long as the position of the CSM is identified in case rotation information is to be derived. This paper will focus on the CSM of an accelerometer array in a triaxial configuration.



Figure 2: Example of a triaxial mounting block designed for use with accelerometers that have a center CSM

The first requirement is a triaxial mounting block that is similar to that shown in figure 2. In this case, the accelerometer mounting holes are oriented to ensure that the sensing direction of each unit converges at a common point, which is the effective CSM of the array. If the purpose of the triaxial accelerometer is just to measure linear acceleration from three orthogonal axes, the location of the CSM would be of little concern, and there is no need for convergence.

When does the CSM become an important factor? When the user is measuring angular rate, using linear accelerometers, then the CSM alignment between the three accelerometers is of importance since the derivation of angular rate requires that all three measurement axes be converged at a common point.

Replacing Accelerometers

If the user is replacing damaged accelerometers in an anthropomorphic test dummy (ATD), there are several suggestions:

- If replacing with the same make and model number, no changes are necessary.
- If replacement is from another provider with the same size, mounting configuration and CSM, no change is necessary assuming that the electrical characteristics, etc. match those of the original unit.
- If replacing any accelerometer with a different CSM, it will be necessary to either replace the software with a version that compensates for the change in CSM. The other alternative is to install a replacement-mounting block to accommodate the different CSM and the block's position might need to be changed.

Conclusion

In general, triaxial mounting blocks, provided by the accelerometer manufacturer, are designed to provide the correct intercept point (see figure 2). The user should contact the manufacturer for mounting block recommendations. Follow universal mounting procedures i.e., torque, smoothness, flatness, etc. to ensure maximum frequency response and amplitude accuracy. See Endevco TP317 (available on the Endevco web site) for more information on mounting.



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