

12005 Accelerometer Puck

Purpose:

A liquid accelerometer is mounted on a large puck for use on an air table.

Required Accessories:

Air Table, syringe, food coloring, pulley, small mass, a small piece of line or string

Optional Accessories:

Still (flash) camera, Video camera

Initial Assembly:

The Large Puck is assembled to the base of the Liquid Accelerometer using the two machine screws supplied. Filling the accelerometer is described below.

Principles of use:

The accelerometer puck can be used to indicate and measure both linear and rotational acceleration. When the accelerometer on the puck is at rest or moving with constant velocity, the liquid surface will be horizontal. If the velocity is not constant, the liquid surface will be inclined. If the surface falls along a straight line, all parts of the device are experiencing the same acceleration. If the surface is curved, each part is at a different acceleration, since the slope of the surface is a measure of the magnitude and an indication of the direction of the acceleration.

Operation:

Remove the threaded screws from the face of the accelerometer. Add a drop of food coloring to a small beaker of water, and stir thoroughly. Inject (or pour) the water into the accelerometer until it is about half full. Carefully adjust the water level until it passes through the “origin” of the printed graph image. Replace the screws. Mount the liquid accelerometer in the prepared slot on the puck base and carefully tighten the thumbscrews to retain it. Check that the device is secure, plumb, and centered.

Level the air table. Insert a threaded pivot post into the center of the air table. If the center of the air table does not have a threaded insert, use the universal pivot (POPrivet) instead. Place the assembled puck over the post. Turn on the air and slowly rotate the puck. Can you explain the shape of the water surface? Try rotating the puck at different rates. How does the liquid surface change? Can you explain this? Remount the liquid accelerometer a bit off center on the base, and spin it again. What is the same? What is different? If you could mount the edge of the accelerometer just over the central hole in the base, can you sketch what the water surface would look like if it were spinning slowly? What would your sketch look like if the device were spinning more rapidly?

Remove the pivot post. Attach a pulley to the edge of the air table. Using a small piece of line or string, apply a constant force to the puck by letting the small mass fall. Turn on the air and allow the puck to move across the table. What happens to the liquid surface? Change the mass and repeat the experiment. How does the liquid surface vary with the applied force? The slope of the surface can be examined by eye. The consensus of simultaneous observers seems to work the best in the absence of a still camera, or video camera.

Can you devise a method of calibrating the accelerometer puck so that it reads directly in m/sec^2 or in units of “g”?

Time Allocation:

Five minutes of initial assembly is required for this product. Individual experiment times will vary depending on needs of students and methods of instruction, but preparation, demonstrations and observations normally will not exceed one class period.

Feedback:

If you have a question, a comment, or a suggestion that would improve this product, you may call our toll free number.