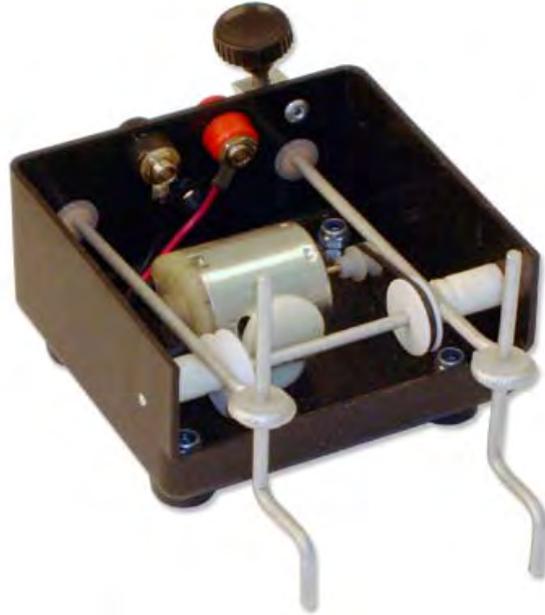


## **613-0060 (40-600) Wave Generator**



**Introduction:** Waves are an interesting part of physics. Waves are, essentially, spatial disturbances transported, often through a medium, but not always. Electromagnetic radiation, for example, needs no medium. Essentially, a wave is energy that is transported separately from matter. An earthquake is a good example. Although earthquakes release vast amounts of energy, the energy does not need matter to carry it along. The rocks at the epicenter are not transported along with the energy the earthquake releases. A medium must be flexible and elastic in order for waves to pass through.

Wave theory is an unusual branch of physics, mainly because waves are not well understood. Also, waves are most often studied irrespective of their source. This means that the wave is considered as its own entity, regardless of how it was produced. However, all waves share certain characteristics. They all consist of *troughs* and *crests*. This means that they have high and low points. Also, these troughs and crests move. As the waves propagate, the crests and troughs will move together always maintain their relationship to each other. In other words, a wave can be seen as a single entity composed of a crest and a trough, moving through space. The crest height is always equal to the depth of the trough. There are two major types of waves: longitudinal, which run parallel to the direction the waves propagate in, and Transverse, which run perpendicular to the direction the waves propagate in.

A wave generator is a device that is designed to produce waves of equal amplitude and frequency. This enables precise experiments to be performed on the waves.

**Description:** The device consists of a small motor that drives a belt connected to an axle. This axle has two bumpers, which are offset from the center. As the axle spins, the bumpers cause two arms to oscillate up and down. This in turn drives two hands that can agitate a liquid or perform other experiments.

**Operation:** To use your wave generator, you will need a low voltage power supply, a tank of water or other liquid and possibly other materials, depending on the experiments you wish to perform. See below.

On the rear of the wave generator you will find two jacks for banana plugs. Use these to attach the generator to your power supply. The hands fit into soft rubber holders on the ends of the arms.

Place your wave generator so that the hands sit in a tank of water. Start with a voltage of 4V; this is the minimum the generator needs to operate. Higher voltages will cause the arms to oscillate faster, thus increasing the frequency of the waves. On the rear of the generator is a screw, which can be turned to make it shorter or longer. This in turn affects the space the arm has to oscillate, which changes the amplitude of the wave.

The bumpers on the axle of the generator can be turned. If they are turned opposite to one another, the arms will oscillate opposite to each other. This produces two waves instead of one.

You can observe the waves created in water by the wave generator easier if you suspend a small bottle of food coloring or other dye between the hands. You can use a binder clip or similar to do this. Set the bottle so that it releases dye at a slow, steady rate. This will cause the dye to follow the pattern of the waves, making them easier to see.

If you have access to a seismograph, you can attach a pen to one of the arms of the generator. When the paper is run beneath it, the pen will sketch the shape of the wave. Try altering the frequency and amplitude to produce different drawings.

For a more visual demonstration, attach springs or strings to the arms of the generator. Secure the other end an appropriate distance away. When you activate the generator, the springs will show the shape of the wave. At precisely the right frequency and amplitude, the spring will show standing waves; that is, waves that appear not to move. Returning waves canceling out the outgoing waves except where the amplitudes exactly equal each other causes this.

**Warranty and Parts:**

We replace all defective or missing parts free of charge. Additional replacement parts may be ordered toll-free. We accept MasterCard, Visa, checks and School P.O.s. All products warranted to be free from defect for 90 days. Does not apply to accident, misuse or normal wear and tear. Intended for children 13 years of age and up.