

OPERATING INSTRUCTIONS

Motorized Wave Generator No. 31943

1. Introduction

The Motorized Wave Generator creates model waves through manual or automatic operation. The apparatus is particularly suitable for observing the elements of wave motion, including amplitude, period, wavelength, phase, speed, and number of vibrations. It can also be used to study many simple and sophisticated wave behaviors, including:

- Simple harmonic vibrations
- Motion through a transmitting medium
- Progressive waves
- Reflections at free and fixed ends
- Overlapping waves
- Standing waves
- Resonance and transmission of energy

The apparatus may also be used for the observation of Melde's effect, partial reflections, moments of inertia, and more, if the lateral rods on the apparatus are connected with threads.

2. Description

The heart of the apparatus is the 84cm long "vibrator" used to create the wave motion. This structure is made up of 61 individual rods (1), each 50cm long and 5mm in diameter. These rods are spaced evenly at 14mm intervals and connected by two tensioning wires. Each rod is fluorescent-tipped for good visibility. The rods are balanced on a knife-edge rail (4); a shield plate (2) is provided to brake the motion of the rods.

The tensioning wires are attached to an adjustable "balancer" (5) at one end. This component can be tipped to the right or the left to ensure that the rods remain horizontal. The other end of the wires attaches to a roller (3); wires are aligned in grooves on the roller and wound completely around it. The position of the wires may be varied. The wires attach to a mass hanger (7). A mass set (16) and stand (17) are included. Masses may be added to change the characteristics of the waves produced. A knife-edge support (6) is included for adjusting the swing of the mass hanger.

A special wave formation device (14) is also included. This device consists of a black plastic semicircle attached to a metal rod, 6mm in diameter. The rod is 92cm long. The semicircle is furnished with a fitting used to set the rods in motion. The weight (15) attached to the rod may be moved up or down in order to vary the period of the waves produced.

For automatic wave generation, an electric oscillator is included. The oscillator is powered by its own 110 VAC to 12 VDC adapter.

The damper (13) may be used for progressive wave studies. It is designed to be immersed in water, in a beaker or other container. The damper is constructed in such a manner that the buoyancy of the

portion immersed in the water is equal to the total weight. A styrofoam support (12) is included to hold the beaker.

Small pipes (18) are included for mounting on the ends of selected vibrator rods, to change their mass and vary wave production. Also supplied are a plastic fixed-end attachment (19) and a hex-head wrench (20) used for replacing broken wires. Stationary rods are supplied for steadying and supporting the vibrator after experimental use. All necessary stand material is supplied.

3. Operation

The Motorized Wave Generator can be assembled in many ways to create a great variety of waveforms. The photographs clearly demonstrate some of these variations.

Figure 2 Progressive wave with damper

Figure 3 A pipe is mounted on a vibrator rod in the center of the apparatus, and a wave is generated.

Figure 4 Standing waves, produced with both ends free. The standing wave is created manually, using the fingers to set up vibrations. The wave is composed of four sections.

Fig. 5. Manually-produced standing wave with six sections.

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Fig. 6. Period of Pendulum Swing and Standing Waves: This series of three photographs shows the relationship between the period of pendulum swing, the transmitting speed of the vibrations, and standing waves. Note the position of the weight on the wave formation device and the number of weights suspended from the mass hanger to vary the tension of the wires.

Fig. 7. Overlapping Waves: The first of these two photographs shows the overlapping effect of projected waves sent from both ends. Both ends are moved simultaneously in the same direction (upward or downward) and then returned to their original positions. In the second photograph, one end has been moved upward, the other downward. The rods are returned to their original position, and the overlapping effect is seen.

4. Maintenance

If a tension wire breaks, it may be replaced with a new one. It is necessary to remove the thread bearing parts set at the blade coupling of the vibrator rod with the hex-head wrench.

No other special maintenance is needed. If any difficulty develops with this apparatus, contact Central Scientific Company, giving all details of the problem. Do not return this apparatus without written authorization from Central Scientific Company.

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