15490 Wave Generator, Variable Phase

Purpose:
The Variable Phase Wave Generator is used to generate a number of different wave patterns in a ripple tank. By simple adjustments it can be made to produce circular waves from a single point source, as well as interference patterns from two point sources in any phase relationship, continuously adjustable, while the unit is running.

Additional Required Materials:

One (1)	Complete Ripple Tank Setup
One (1)	Variable low voltage power supply
	0-3 volt DC, 0-1 amp, or:
	1.5 volt Hobby Battery & rheostat.

Assembly:

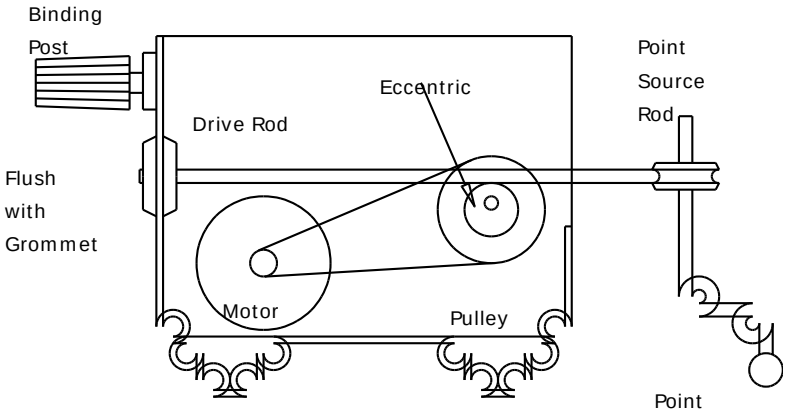
Refer to figure #1. Push each drive rod assembly through the rear grommet so that the end of the rod is flush with the rear side of the grommet. Place the generator on the glass bottom of the ripple tank filled to the depth of water specified by your instructor or laboratory guide. Adjust the vertical point source rods so that the bottom grommets depress but do not break the surface of the water in the ripple tank.

Connect the leads from a power supply to the binding posts. Turn on the power supply and adjust the voltage control so that the point sources move up and down at the slowest rate. Check to see that the point sources are moving in unison (in phase) when the pointer on the knob is straight up. If necessary, improve the alignment of the dots on the cams as follows:

1) Turn the phase control knob until the pointer is straight up.

2) Compress one of the cams against its spring enough to let the cams turn free of the gear and then rotate both cams until both dots are lined up with the knob pointer.

Turn the voltage control of the power supply to increase the speed of the motor and hence the frequency and amplitude of the waves being generated, until the nodal lines are clearly discernable as part of the interference pattern projected on the screen. Adjusting the position of the light source may improve the focus of the image projected. By rotating the vertical point source rods you may bring the point sources closer together



or farther apart.

When the pointer of the phase control knob is aligned with the dots, the two point sources are said to be moving in phase. The phase relationship may be continuously varied by turning the pointer knob, even while the unit is running.

Operation:

The variable phase wave generator allows one to investigate wave patterns produced by two point sources in and out of phase. Assuming the sources are in phase, what will happen when the resultant waves overlap? Using the principle of superposition (adding the displacements of the individual waves) predict the resulting pattern. Using the generator, test your prediction. Sketch the pattern seen on the screen. How do the waves in the pattern move? Follow a "double wave crest" (where two crests cross each other, a "double crest" will be formed. Such double crests will produce bright regions on the screen of a ripple tank). Are there regions where the waves from the two sources cancel each other at all times? These regions are the nodal lines. What happens to the nodal lines when the frequency of the motor is changed? Change the phase of the two point sources slowly, from zero to one (one whole revolution of the knob). Using the in phase pattern as a reference, how does the position of the first nodal line change as you change the phase delay from zero to one? How does the position of the second nodal line change?

The variable phase wave generator can also be used to produce circular wave patterns from a single source. The study of these and other waves is covered in the instruction sheet accompanying the Ripple Tank (#15401, #15415).

Experiments using the wave generator can be found in all additions of the PSSC laboratory guide as well as other lab manuals featuring the use of a ripple tank.

Maintenance:

A drop of oil placed on each plastic eccentric at the point of contact with the drive rod will facilitate smoother operation. Do not get oil on the drive belt or the drive pulleys. Using excess voltage (above 3 VDC) for a prolonged period of time may result in motor failure. If any difficulty develops, contact your science material distributor or Science First directly. Do not return this apparatus without the authorization of your supplier or the manufacturer.

Time Allocation:

To prepare this product for an experimental trial should take less than ten minutes. Actual experiments will vary with needs of students and the method of instruction, but are easily concluded within 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.