

# Sound & Waves

## Assembly Instructions

The Sound & Waves machine is a versatile system for exploring the phenomena of sound, waves, and resonance. The wiggler generates standing waves on an elastic string in a clear, visual way. Students can derive the mathematical relationship between frequency and wavelength for a given system. Attach the speakers, and students can explore sound frequency and wave-interference.

### Parts Checklist

The following items are provided with the Sound & Waves machine:

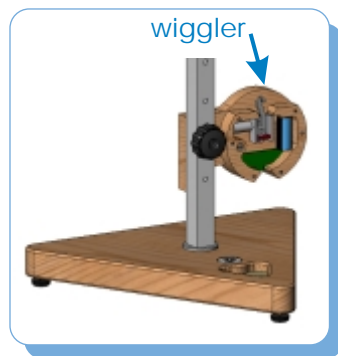
- Sound & Waves console
- fiddlehead
- wiggler
- black stereo cable (phono cable)
- elastic cord
- speakers (1 pair) with cord

In addition, you will need these items:

- Physics Stand, assembled
- timer console with power transformer
- phone cord
- black knobs (2)

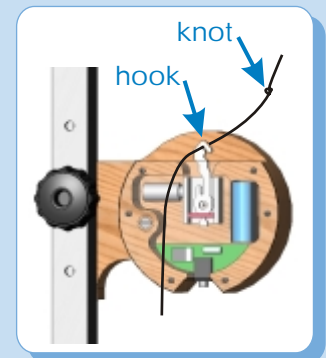
### 1. Attaching the Wiggler

Attach the wiggler by placing the threaded rod and peg through the bottom two holes of the Physics Stand. Secure the wiggler to the threaded rod with a black knob.



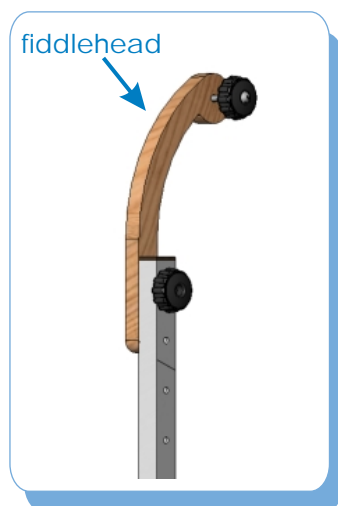
### 3. Attaching the String

The wiggler arm is a thin metal strip with a hooked end that protrudes from the wiggler about 2 cm. If the string is not already attached to the wiggler, locate the hook in the wiggler arm and thread the elastic string through it. Knot the string at the end. This knot will create a stop so that the string can be pulled tight.



### 2. Attaching the Fiddlehead

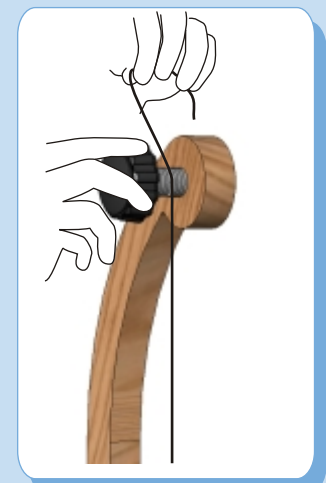
Attach the fiddlehead by placing the threaded rod and peg on the head through the top two holes on the Physics Stand. Secure with another black knob. Be sure the black knobs for the wiggler and fiddlehead are on the same side of the physics pole. The top of the fiddlehead will be higher than the Physics Stand when it is attached.



Next, attach the free end of the string to the fiddlehead by pulling it to the top knob on the fiddlehead. At this point there should be no slack in the string. Now tighten the string by stretching it a little (about 10 cm). A tighter string will resonate at higher frequencies.

Slide the string between two of the washers behind the knob. Lightly tighten the knob to secure the string.

Note: The string from the wiggler to the fiddlehead is one meter long.

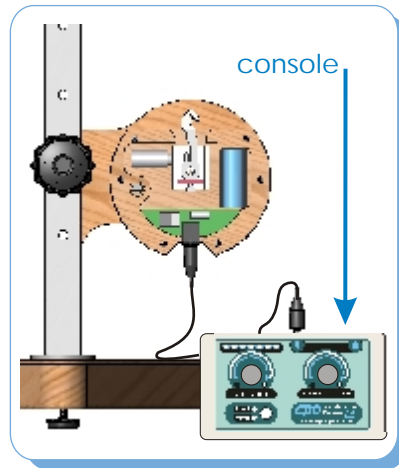


Assembly instructions continue on page 2.

# Sound & Waves

## 4. Connecting the Console

Connect the black stereo cable into the bottom of the wiggler. Connect the other end of the black stereo cable into the round jack on the Sound & Waves console.

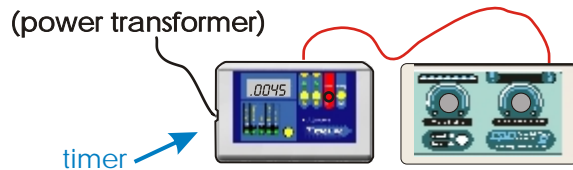


## 5. Connecting the Timer

Turn on the timer and set to frequency mode. Plug one end of the phone cord into the A slot on the timer and the other end into the square jack on the Sound & Waves console. Make sure that the A light is illuminated on the timer.

Set the Sound & Waves console to waves mode.

ALWAYS operate the CPO Timer with the power transformer for sound and wave experiments.

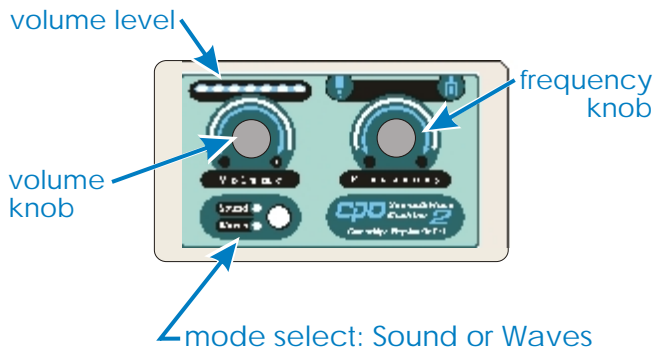


## Understanding the Console

### 1. Mode Selection

The Sound & Waves console is used to control the two different modes: Sound (speakers) and Waves (wiggler).

0.1 Hz to 20,000 Hz Frequency Range  
Accurate quartz crystal oscillator



### 2. Frequency Control

Rotate the frequency control knob clockwise to increase the frequency and counter-clockwise to decrease the frequency.

### 3. Volume

Rotate the volume control knob clockwise to increase the volume and counter-clockwise to reduce the volume. The relative volume level is indicated on the lights above the volume knob.

## Using the Sound Mode

Unplug the black stereo cable from the Sound & Waves console and connect the end of the cord from the speakers into the round jack.

Set the Sound & Waves console to sound mode by pressing the button until the sound light is illuminated.

Connect the Sound & Waves console to the timer using the square jack and set the timer to frequency mode.



For activities and detailed setup instructions, refer to the *Sound & Wave Curriculum Resource Guide* or *Teacher's Guide*.

For technical assistance, please call 866.588.6951.