Iona Physics Experiment

Lab: To Measure the Speed of Sound

II. Using an Oscilloscope

Background: The oscilloscope is one of the physicist's most versatile tools. It may be used to display wave shapes, measure frequency, make various electrical measurements, etc.

The controls: Locate the power switch and turn the 'scope on. Turn the Horizontal (X) and Vertical (Y) gains to the fully counter-clockwise positions. Set the horizontal and vertical position controls at about mid-range. Set the intensity control at maximum. Adjust the focus so that the spot is as small as possible. Adjust the horizontal and vertical position controls so that the spot is at the center of the screen. Set all other controls to the positions specified by the card near the 'scope.

Attach the output of the microphone amplifier to the Vertical (Y) input. By increasing the Y GAIN you will be able to observe the wave patterns.

Procedure:
Set the audio signal generator to about 2,000 cy/sec. Place the microphone, speaker, and barrier as indicated.

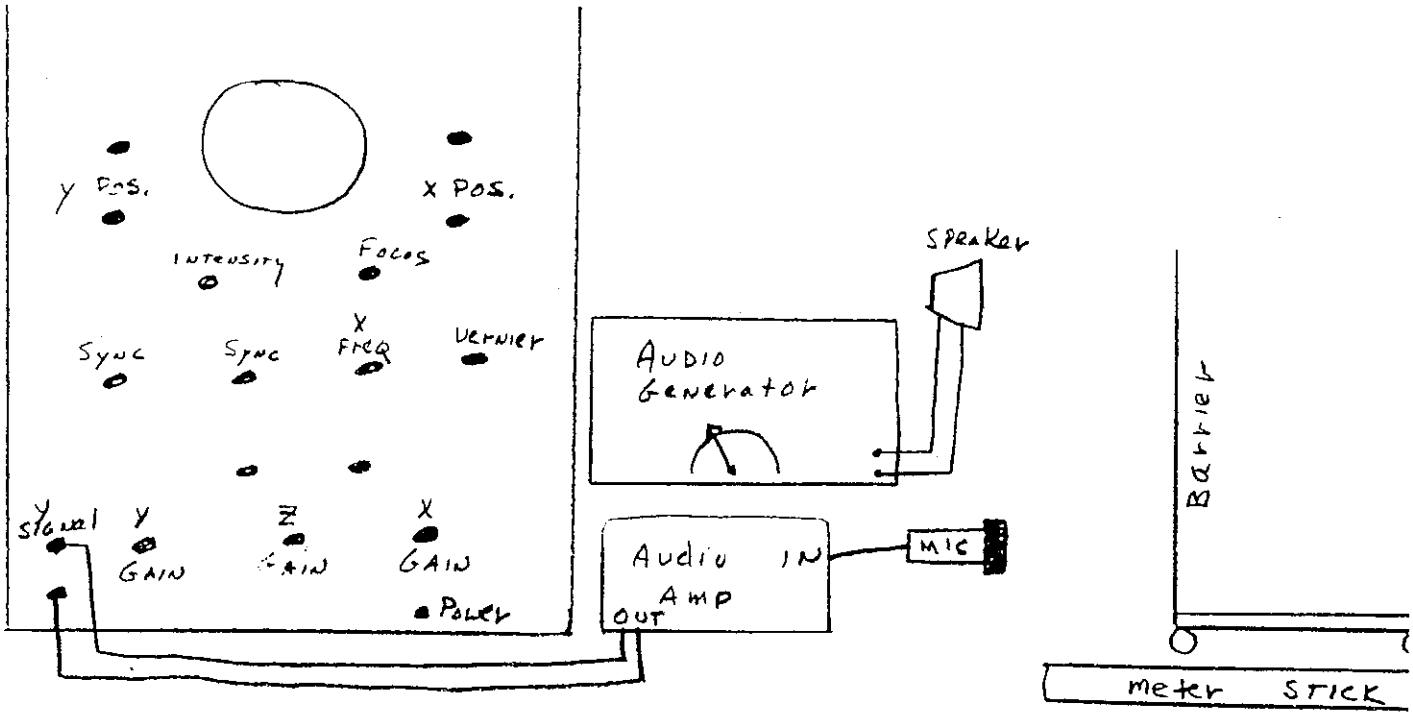
As you move the barrier toward and away from the speaker, you should observe variations in volume of the sound. This will also appear as variations in the amplitude of the pattern on the face of the oscilloscope. What you are observing is the fact that the sound waves reflected from the barrier are interfering with the sound waves leaving the speaker. When these are IN PHASE they interfere constructively, when OUT OF PHASE they tend to cancel each other.

If you locate two points of MINIMUM volume, the <u>distance between them</u> will be 1/2 wavelength of the sound.

Move the barrier until you have a minimum volume. Refer to the meter stick and record the location of the barrier to the nearest millimeter. Now without moving the meter stick, move the barrier to the next minimum volume. Refer to the meter stick and record this new location. The distance between the two locations is 1/2 of the wavelength of the sound.

Use $V = f\lambda$ to calculate the speed of sound.

DATA: FIRST LOCATION _____ M
Second Location _____ M
frequency _____ cy/sec.



III. To calculate the ACCEPTED VALUE for the speed of sound measure the temperature of the air in the room in °C.

Use the formula
$v = 332 \text{ m/sec} + (0.6 \text{ m/sec C°})\ (t)$
where t is the centigrade temperature.

Conclusion:

The accepted value of the speed of sound at _____°C was found to be _____

The speed of sound was found to be _____ using the resonance method

The speed of sound was found to be _____using the oscilloscope method.