Kundt's Apparatus

with Speaker & Microphone

SW1996-001

Description:

This apparatus is used to reproduce Kundt's experiments to study wave motion inside a tube by using sound and by creating 'standing waves'.

Advanced Features of the 'IEC' Unit:

- The 2x holes provided in the tube can be covered by sliding covers.
- The scale can be read when either on the upper side of the tube or the lower side of the tube (for measuring the microphone position). Twist the tube to move the scale.
- The parts remove easily from the tube to be re-packed for storage in the classroom.
- The speaker is fitted with protection circuit to avoid damage to the speaker if too much power is applied from the signal source. NOTE:: small speakers can easily be destroyed by too much power, so this feature is very important.
- The microphone is sensitive and strong. The microphone support blade is fibreglass.
- The strong piston is a good fit in the tube and the piston support rod is fibreglass.
- The Microphone buffer with standard 9V battery with very long life (several years) and the circuit is turned ON as the microphone plug is inserted. If the LED is on when plug is inserted, the battery is OK. Removing the plug, turns OFF the circuit

Component Parts:

1x Transparent tube, 50mm dia.x 820mm long with transparent scale fitted. Tube is complete with 2 holes and sliding covers for work on resonance.

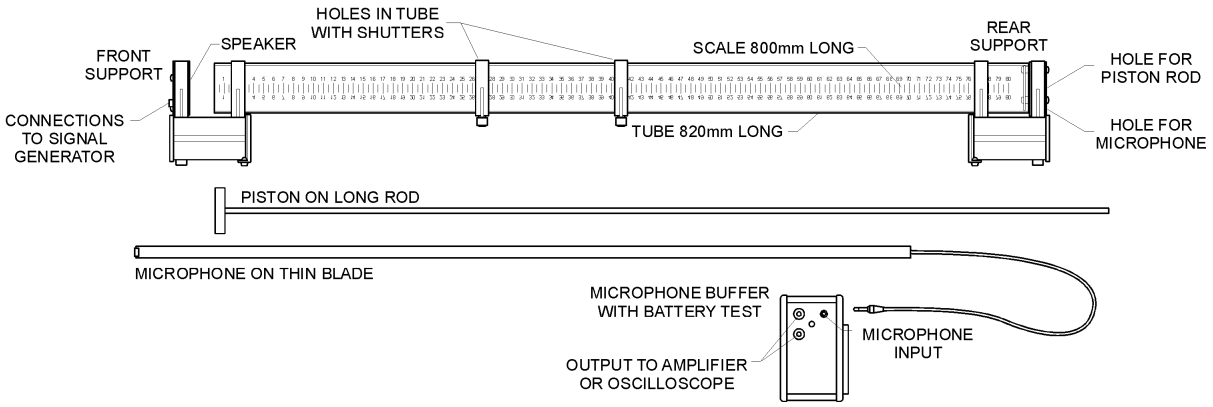
2x Support blocks to hold the tube horizontally up from the work bench. One support grips the tube and holds the speaker, the other support grips the tube and contains a guide for the piston and microphone as it slides inside the tube.

1x Piston on a long rod to create various length closed tubes.

1x Microphone and cable on long blade to pass through a slot in the piston and to place the microphone to any position along the tube.

1x Buffer unit to interface the microphone to an amplifier or oscilloscope.

PARTS IDENTIFICATION



How It Works:

Look at the drawing above to see the various parts of the Kundt's Apparatus. Variable length air column with loud speaker to create the sound waves and miniature microphone to detect the nodes and antinodes inside the tube.

Assembly for an Experiment:

- Take the piston on the long rod and take the miniature microphone on the long blade. Slide the microphone support blade into the slot in the piston so the microphone is in front of the piston face. See pictures on front page. Slide the piston and microphone together up the tube from the 800mm end until it is about half way along the tube.
- At the 'zero' end of the tube, take the 'speaker' and stretch the clip over the tube. Slide it forward until the speaker disc is touching the end of the tube.
- Take the plain support block (without the 2 sockets) and, with the spring clip facing the 800mm end of the tube, insert the piston rod through the central hole and thread the microphone cable and blade through the notch provided. Stretch the clip over the tube and slide the system forward until the piston rod guide disc enters the tube.
- Place both support blocks on the table and gently press down so the rubber feet rest nicely on the table.
- Now slide support block until the speaker is about 10mm away from the end of the tube. For normal experiments, the end of the tube must NOT touch against the speaker. REASON: The experiments are performed on either an open tube (open.both ends) or on a closed tube (tube closed at the end opposite the speaker). When the piston is slid inside the tube, the piston forms the closed end at any position along the tube. Connect the 2 sockets on the speaker housing to a sine wave signal source (oscillator or similar) with standard 4mm banana plug cables.

Signal Source:

Set your oscillator to about 500Hz and check that the speaker performs properly. The speaker is protected against too much power from the signal source, but the sine wave signal should be about 1 to 2 volts peak. If your oscillator cannot provide enough power, an amplifier may be required to drive the speaker. Or use one of the IEC Signal Generators: LB3754-001 or the famous TriMode LB3758-001 or the advanced 'WaveLab' LB3756-101.

Important Notes:

- If the voltage to the speaker is too high, the wave will be distorted and will no longer be a sine wave shape. If this occurs, the sound from the speaker will be distorted and will not sound 'clean'.
- During an experiment, the speaker does not need to be loud. The sound wave will be detected by the icrophone. Gently slide the mini microphone through the slot in the piston so that it moves inside the tube. The tube can be rotated in the clips so the scale is at the bottom and close to the microphone for accurate measurements.
- The piston can be slid along the tube to make the closed tube any length desired.
- During certain experiments, the two spring shutters can be slid from covering the holes in the tube to open the tube at these places.

Microphone Buffer:

Insert the microphone plug into the socket provided on the 'Microphone Buffer' and, using standard 4mm banana plug cables, connect the buffer to an oscilloscope to see the microphone signal or into an amplifier to hear the microphone signal.

Note that the IEC 'TriMode' LB3758-001 includes an audio amplifier. The battery is always tested if the LED is ON when the microphone plug is inserted.

Battery:

To replace the standard 9V battery, open the compartment on the side of the buffer. The battery has a very long life and will last several years providing the microphone is disconnected from the buffer when storing the instrument.

Wavelength and Frequency Conversion:

To convert Frequency to Wavelength or to convert Wavelength to Frequency, the following formula must be used:

$V = \lambda f$

where

V is speed of sound in air in metres/sec,

λ is wavelength in metres and f is frequency in Hz.

For school experiments, the speed of sound can be considered to be close to 342 metres per second.

Designed and manufactured in Australia