Speed of Sound

MATERIALS LIST

- cardboard tube
- LabPro® or CBL 2™ interface
- masking tape
- meterstick
- stainless-steel temperature probe
- support stand with clamp
- TI graphing calculator with link cable
- Vernier microphone

In this lab, you will determine the speed of sound. You will place a microphone directly above the opening of a large tube, where the microphone will record a short, sharp noise. After the sound travels down the tube and reflects back, the microphone will record the sound again. You can use the time between recordings and the distance that the sound traveled to determine the speed of sound in air.

SAFETY

- **Put on goggles before you install clamps at eye level.**

PREPARATION

Follow Preparation steps 1–2 for the Skills Practice Lab "Speed of Sound" in the chapter "Sound," but for the data table, label the first through fourth columns *Trial, Temperature (°C), Distance from microphone to bottom of tube (m)*, and *Time interval(s)*.

PROCEDURE

Finding the Speed of Sound

3. Connect the LabPro or CBL 2 interface to the calculator with the unit-to-unit link cable. Connect the microphone to the CH1 port on the interface. Connect the temperature probe to the CH2 port on the interface.

4. Turn on the calculator, and start the DataMate® program. Observe the temperature readings displayed on the calculator. When the readings are stable, record the displayed temperature in your data table. Unplug the temperature probe, and press CLEAR to reset the program.

5. Set up the microphone, ring stand, and tube as shown in **Figure 1.** Tape or clamp the tube securely in place. Clamp the microphone to the edge of the table or to a ring stand so that the microphone points down and is directly above the open end of the tube.

6. Set up the calculator for data collection.

- **a.** Select SETUP from the main screen.
- **b.** Press the up arrow key once to select MODE and press ENTER.
- **c.** Select TIME GRAPH from the SELECT MODE screen.
- **d.** Select ADVANCED from TIME GRAPH SETTINGS.
- **e.** Select CHANGE TRIGGERING from ADV. TIME GRAPH SETTINGS.
- **f.** Select CH1-MICROPHONE from SELECT TRIGGERING.
- **g.** Select INCREASING from TRIGGER TYPE.
- **h.** Enter "0.1" for a trigger threshold.
- **i.** Enter "0" for the pre-store.
- **j.** Select OK three times to return to the main screen.

7. Select START to prepare for data collection. Make a loud, short noise—such as a snap of the fingers—directly above the tube. This noise will trigger the interface to collect the sound data.

8. Use the meterstick to measure the length from the bottom of the microphone to the bottom of the tube. Record this length to the nearest millimeter in the data table.