Frederiksen

Passion for science

Microphone   248600

The microphone can be used for studying sound waves and for measuring the speed of sound.

The microphone is most flexible and can be used with many kinds of equipment; for this purpose a variety of connectors are used. Therefore the microphone is supplied without cable, sold separately to fit the task – please see overview below. The cable plugs into the end of the microphone with a modular connector.
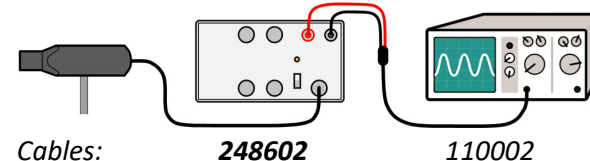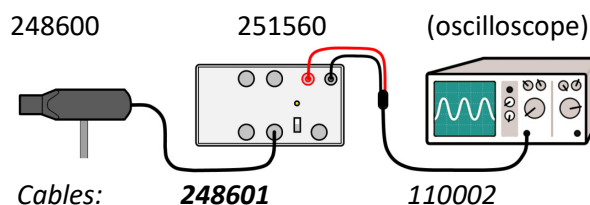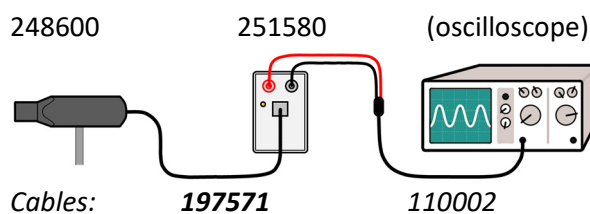
The microphone needs an external bias voltage which is provided by the equipment mentioned in the table. For instance, a battery box is required if you want to examine the waveform of sound on an oscilloscope.
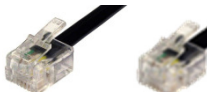
Waveforms on an oscilloscope

Use a 251580 Battery box and the 197571 cable included with the battery box.

Alternatively, use a 251560 Battery box with a 248601 DIN6/modular cable, connected to the microphone and the *Mic 2* input on the battery box *or* a 248602 DIN5/modular cable used in the *Sensor* input.

Connection to the oscilloscope is typically done with a 110002 shielded cable BNC / banana. The signal is output via the two 4 mm safety sockets on the battery box.

248600   251580   (oscilloscope)

Cables: **197571**   *110002*

248600   251560   (oscilloscope)

Cables: **248601**   *110002*

Cables: **248602**   *110002*

Connector types	Modular / modular	DIN – 6-pin / mod.	DIN – 5-pin / mod.	Jack / modular
Used with	197570 SpeedGate 251580 Battery box 663010 Interface kit	200250 Timer 200260 Student timer 251560 Battery box	251560 Battery box Misc Pasco interfaces (500, 550, 750, 850)	200250 Timer PS-2159 Pasco digital adapter
Cable no.	197571	248601	248602	512560

Speed of sound

An electronic stopwatch is started and stopped by the signal from two microphones, placed with a certain distance. The sound passed first the start microphone, next the stop microphone. Many options exist for choosing the stopwatch – see below.
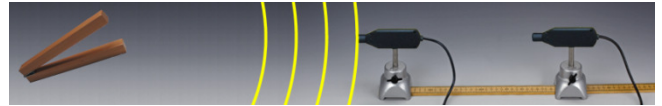
Use a 248200 Clapper board to produce a well defined sound impulse. The sound must be produced roughly on the extension of a line running through the two microphones. Keep a distance of at least one metre (or better, two) to the start microphone.

The microphones may react to unwanted noise. Therefore the measurement is repeated a couple of times.

Snap!

Timer starts

Timer stops

Timing – 197570 SpeedGate

Use two 197571 Modular/modular cable.

SpeedGate is a photogate unit with built-in timer. The timer can be used with external signals and can therefore act as a stopwatch with two microphones

When the SpeedGate turns on (push ✖) the primary function is *Front Time* (change if necessary with ❶).Set the secondary function to *Interval Before* with button ❷ .

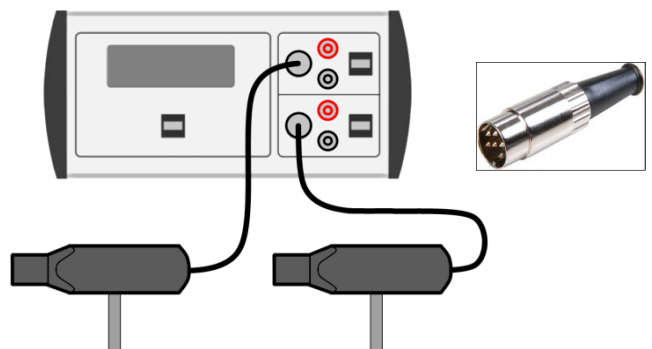The start microphone connects to *Chain IN* and the stop microphone to *Aux IN*.

The button ✖ is used for resetting and preparing for a new measurement.
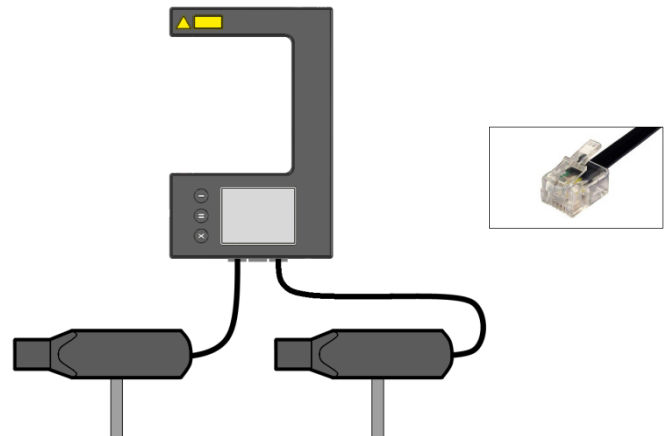
Timing – 200260 Student timer

Use two 248601 DIN6/modular cable.

The button *Reset* is used for resetting and preparing for a new measurement.
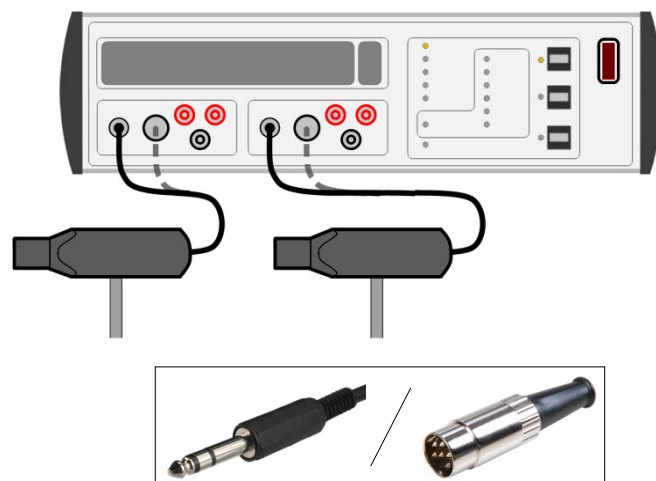
Timing – 200250 Timer / Scaler

Use two 512560 Jack/modular cable. *Alternative: two 248601 DIN6/modular cable.*

When the timer turns on, it is in Start/Stop mode (can be changed by pressing *Select* repeatedly).

Before each measurement, *Select* is pressed once for resetting and preparing for a new measurement

Datalogging applications

Any kind of datalogging equipment can in principle be used via a battery box, provided that sampling rate and sensitivity are adequate.
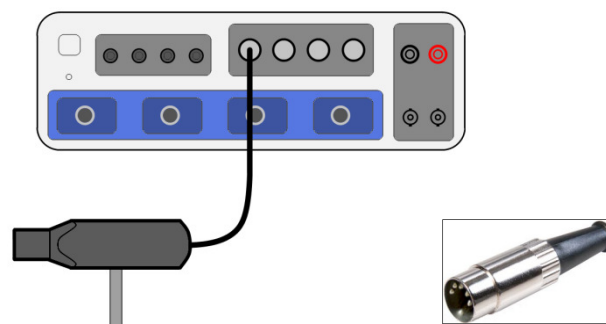
The available cable types allow the microphone to plug directly into Pasco's equipment.

Waveforms with a Pasco interface

Use a 248602 DIN5/modular cable.

Connect the cable to an analog input in a Pasco interface.

An interface with sufficient sampling speed is required (a PS-2100 USB link with a PS-2158 Analog adapter is too slow).
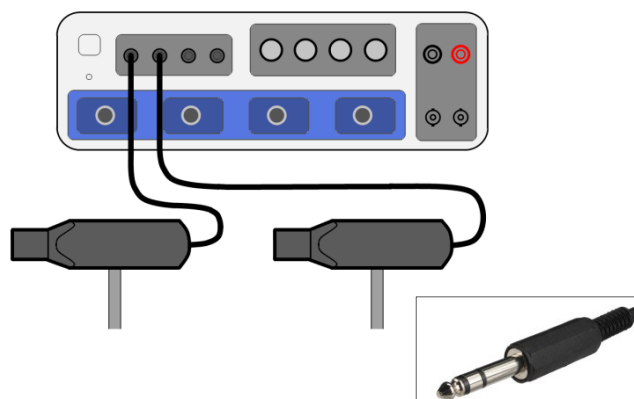
Speed of sound; timing with Pasco datalogging equipment

Use two 512560 Jack/modular cable.

With a Jack cable, the microphone acts like a digital Pasco sensor. It fits the Jack sockets on Pasco's interfaces (500, 550, 750, 850).

A PS-2159 Digital adapter can also be used (even via a PS-2100 USB link).

Software setup

Complete Workbooks for the Pasco program CapStone – containing the setup for the two experiments mentioned above – can be downloaded from www.frederiksen.eu.

Specifications

Frequency range: 100 – 20,000 Hz
Sensitivity (typical):   8 mV/Pa
Characteristic: Omnidirectional

The microphone connects to other equipment through a 6-pin modular socket. The socket provides both a normal analog signal and a digital signal that goes active when the sound pressure exceeds a certain level. The microphone is also powered through this socket. See table below which also shows the wiring of the different cables. (Cables are sold separately.)

Two of the pins in the socket are grounded via 100 Ohm resistors. The presence of these resistors ensures correct behaviour when used with 197570 SpeedGate, but has no influence on the function of the microphone itself

Warning: Modular cable 197571 is of the *crossed* variety (as shown in the table). Using the wrong type of cable can damage the equipment.
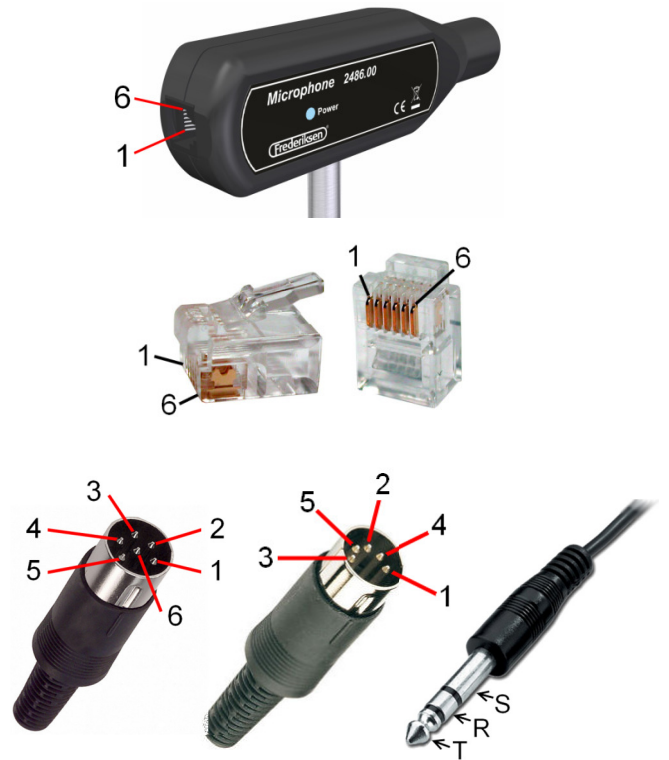
Socket on microphone		Modular cable 197571	DIN6 cable 248601	DIN5 cable 248602	Jack cable 512560
Pin	Function	Pin	Pin	Pin	Pin
6	Analog signal out	1	6	1	-
5	100 Ω to ground	2	-	-	-
4	Ground	3	1; 3	2; 5	S
3	Digital signal out	4	-	-	R
2	5-8 V Power in	5	2	4	T
1	100 Ω to ground	6	-	-	-