Student Timer 200285

Description

The Student Timer will measure time intervals in connection with photocells, microphones, free fall equipment and other electrical switches.

The timer can also be started and stopped manually.

Connections can be combined arbitrarily, e.g. by starting the timer with a photocell and stopping with a microphone.

Batteries are included with the Student Timer.

Accessories

Photocell 197550 (+ cable 197574)
SpeedGate 197570 (+ cable 197571)
Microphone 248600 (+ cable 197571)
Free fall apparatus 198010.
launch mechanism 195200 / 195210 for air track, combined with switch box 198510 / 198515.

Power adapter 355050.

Connection of external equipment

Modular connectors

The modular connectors on the back panel are used for connection to a range of Frederiksen Scientific products like photogates, microphones, or Geiger sensors.

The modular connector features a 5 V power output for the external equipment, an analog input, a digital input and a digital “external reset” input.

Digital signal levels are 0 and 5 V.

The analog input is AC coupled and is optimised for sharp, pulse-like signals. It has its maximum gain (x 100) around 5 kHz and is primarily aimed at microphone signals.

The modular connector inputs are only protected against minor overloads.

4 mm safety sockets

The 4 mm safety sockets establish the rugged connection to any equipment that can deliver a logic signal with 0 to 5 V levels.

The red sockets are the signal inputs to the two channels. The black sockets are ground / neutral / 0 V.

There is an internal pull-up resistor to 5 V, meaning that a simple switch can function as a signal source. (Like in our 198010 Free Fall Apparatus.)

These inputs tolerate sustained overloads up to ±50 V DC or 50 V AC.

Logic levels for digital inputs

At start up and when X (Reset) is pressed, the logic level on the Start input (A) is read: High (5 V) or low (0 V).
The timer starts when this level *changes*.

Immediately after start, the logic level of the Stop (B) input is read.
The timer stops when this level *changes*.

These rules allows the timer to be used with a wide range of accessories – and makes it possible to measure passage times – see overleaf.

Start/Stop measurements

The instrument is turned on by pressing On/Off. After about a second, it is ready – indicated by the text “Ready” in the display.

The timer starts by activating an external sensor (photocell, microphone etc.) connected to the Start (A) input or by pressing the button ► in the start section.

The timer runs until an external sensor connected to Stop (B) is activated or by pressing the ■ in the stop section.

The timer is prepared for the next measurement by pressing **X** (Reset).

Measuring passage times

The timer can also measure the time a photocell is blocked (the passage time). Connect the photocell to either of the modular inputs and connect the two red sockets with a lab lead.

Displaying logic levels

Keep Start and Stop pressed and press Reset - this will show two icons for the logic levels of the inputs (before activation) or the reason for activation (after).

Contrast setting

Keep Stop pressed while turning on the unit - then the display contrast can be adjusted. (Start makes the contrast stronger, Stop makes it weaker. (Press Reset when the contrast is as you like it.)

Battery saving

A measurement lasting longer than 2 minutes will dim the display slightly. At the 10 minutes mark, the intensity goes down even further. The measurement goes on and can be followed in the display.

The display returns to normal illumination when one of the buttons is pressed or when the timer stops.

Battery saving is only active when the instrument is powered by batteries. Using a power adapter will keep the display at full intensity always.

Automatic shut down

The instrument shuts itself down after an hour of inactivity when powered by batteries. The timer will save the value in the display and will show it again after turning on next time.
If the timer is running, it will not shut off by itself.

Low battery warning

When batteries are nearly spent, the display will shortly show the message ”Low battery”.

Specifications

Precision, internal clock:	0.2 ppm (0.00002 %)
Absolute resolution:	0.01 ms
Relative resolution:	5 digits, floating point
Min. pulse width:	1 µs
Min. time interval (shown as 0):	1 µs
Max time:	99999 s
Sensitivity, analog in (5 kHz)	ca. 30 mV RMS

Spare parts

Batteries: 351005 (6 stk.).

Experiments

Lab manuals can be downloaded on our web site (search for the manual number):

131410-EN	Speed of sound in air
131420-EN	Speed of sound in steel
134510-EN	Free fall – Measuring g
134570-EN	Conservation of energy in the gravitational Field