

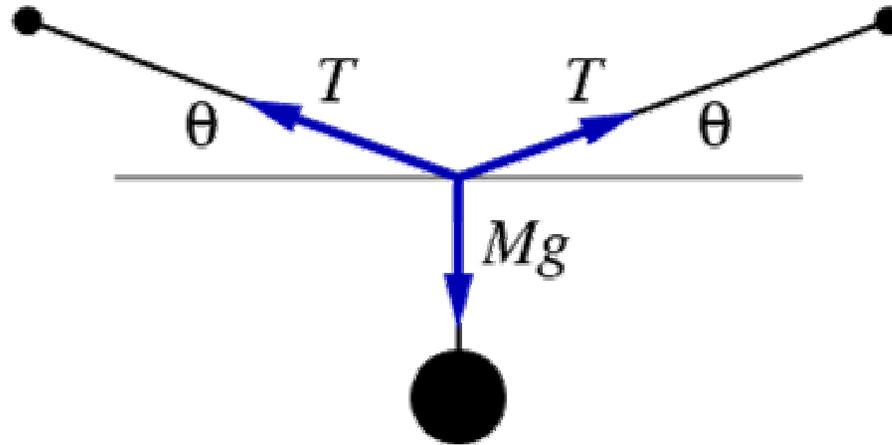


MIT

8.01T Physics I

Experiment 5A: Static Equilibrium

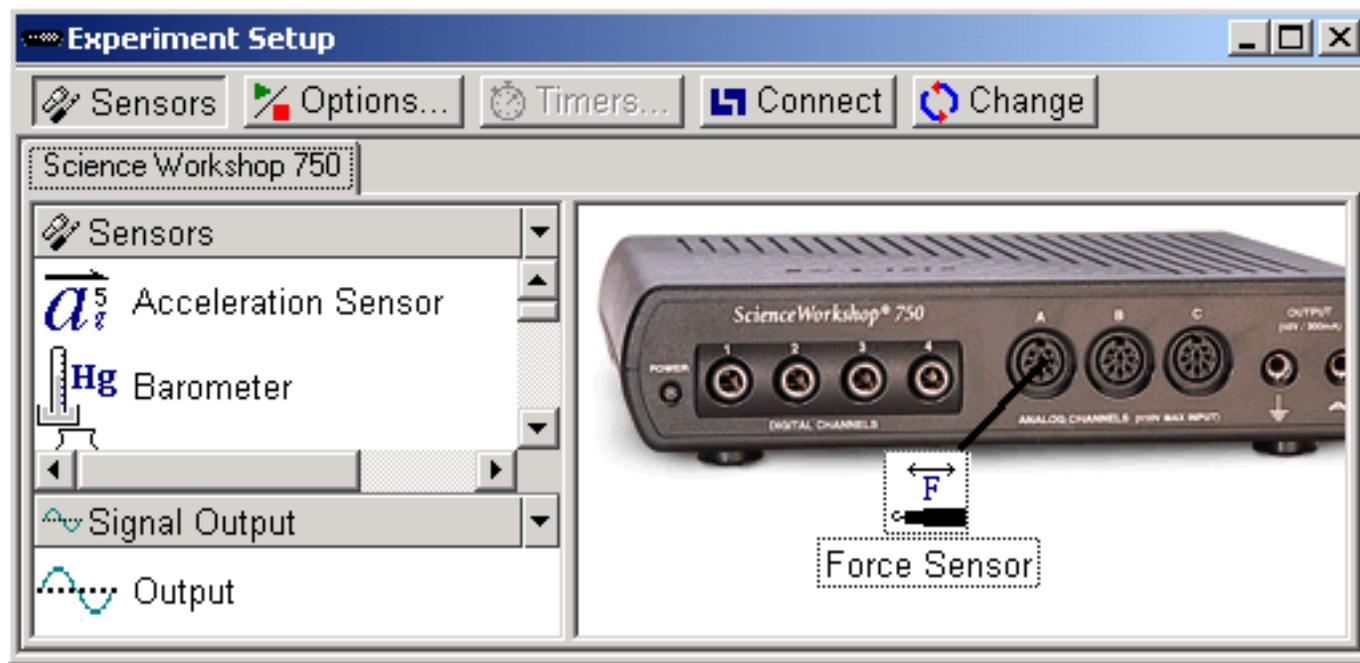
Goal



When a weight is suspended by two strings as in the diagram $T = Mg/(2\sin\theta)$. The goal is to measure T for several values of θ , to verify the equation and the diverging tension required for a taut string.

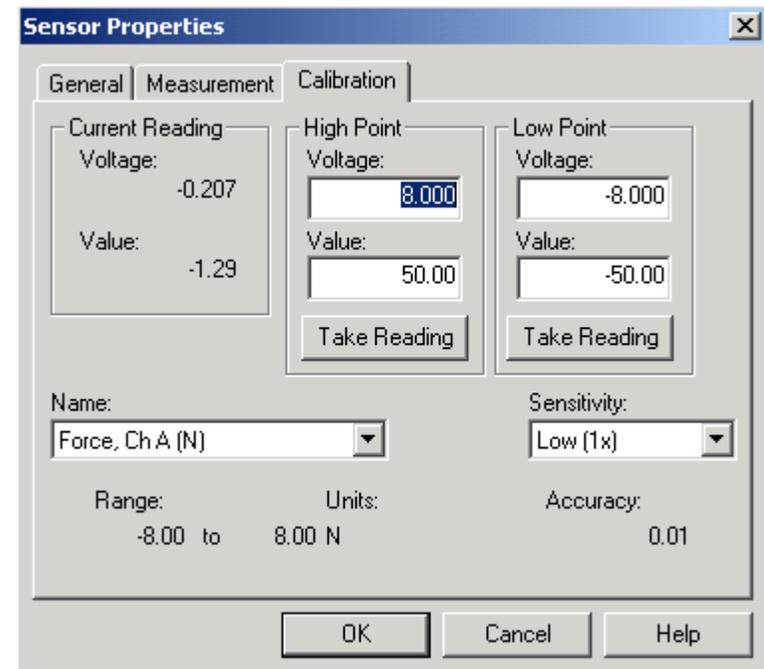
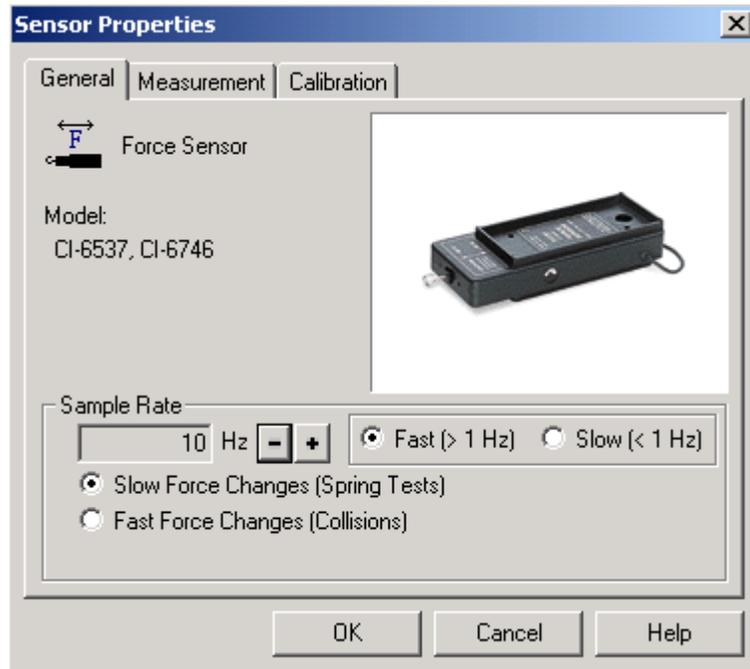
Starting *DataStudio*:

Create a new experiment. Plug a force sensor into the drag it to the input in the Setup window.



Double-click the Force Sensor icon.

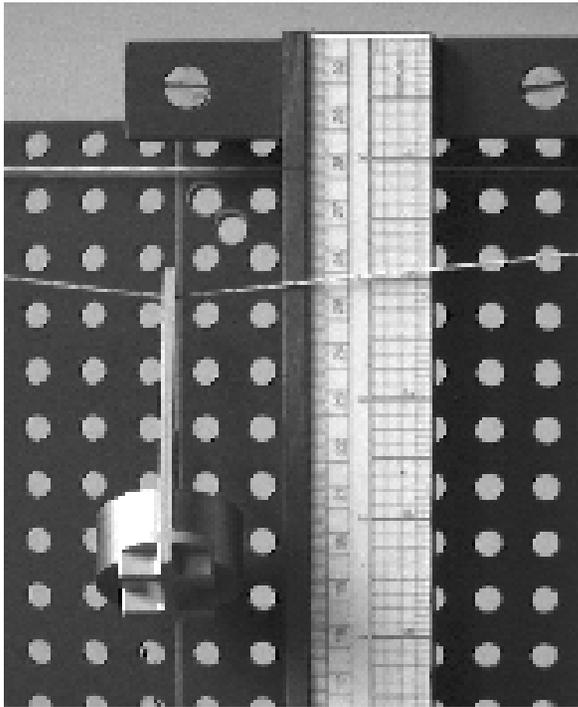
Force Sensor:



Set it for 10 samples/s and low sensitivity.

Click  Options...

Set Up T-Square:



Align right edge of ruler on center of column of holes so it avoids weight hanging in center of string.

Maintain same horizontal offset from ruler to center of pulley.

You will measure force and vertical drop of string along ruler edge.

Ensure string passes over pulley before all measurements.

Keep line of sight perpendicular to board to minimize parallax.



Sampling Options:

Sampling Options

Manual Sampling | Delayed Start | Automatic Stop

Keep data values only when commanded.
 Enter a keyboard value when data is kept.
 Prompt for a value.

Keyboard Data

Vertical Drop (inches)

Name:
Vertical Drop

Units: inches Accuracy: 1.00E-3

Edit All Properties...

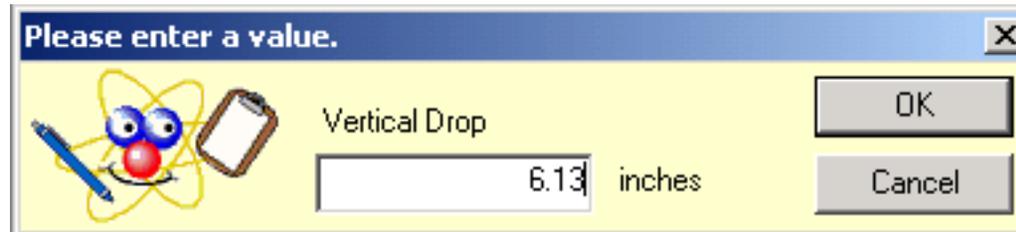
Include a list of prompt values for this keyboard data.

OK Cancel Help

Check all 3 top boxes.
New Keyboard Data
Edit All Properties

Taking Data:

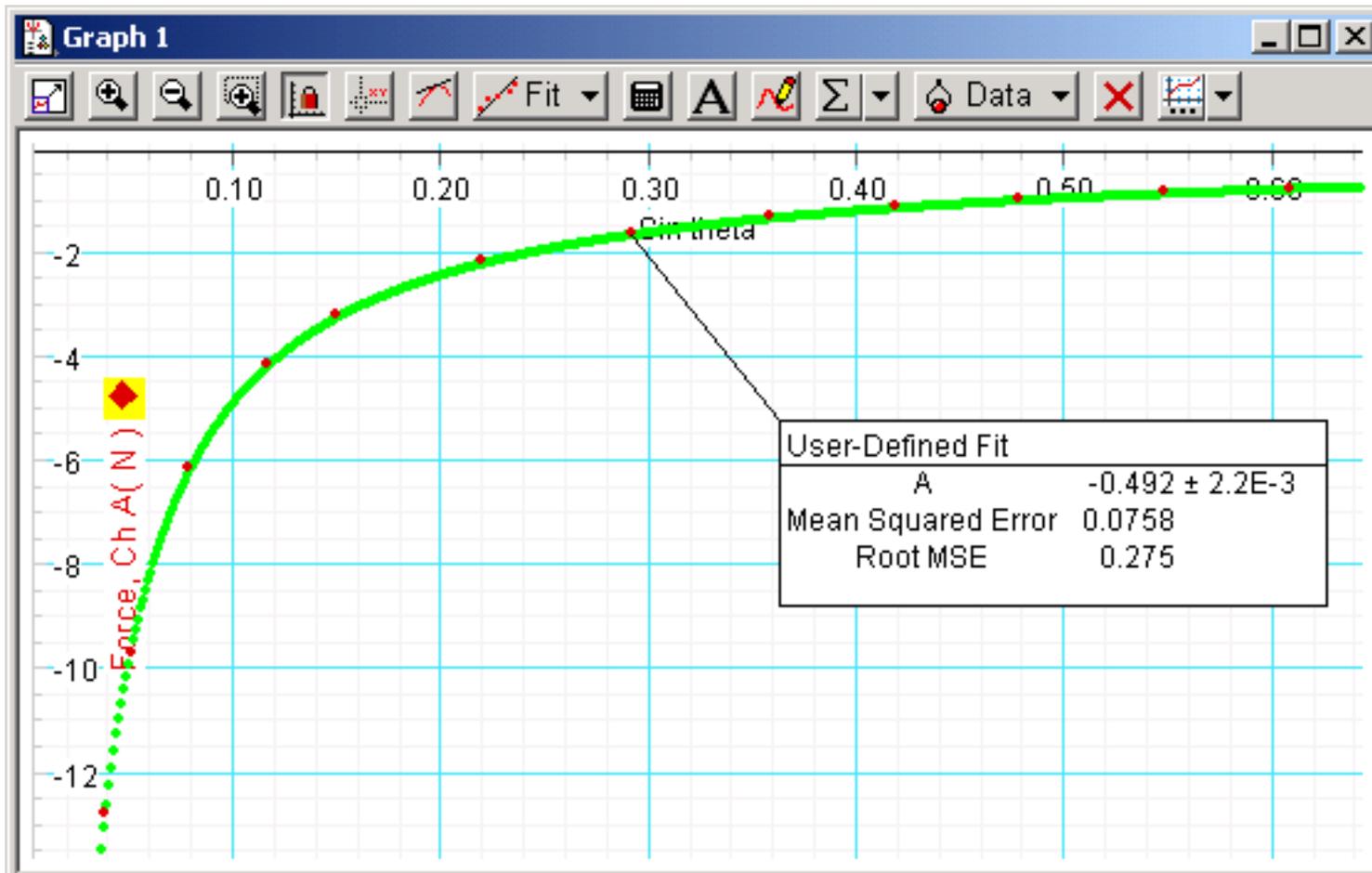
- Click “Start”; button turns to “Keep”.
- Measure vertical drop, click “Keep”.
- Enter vertical drop into window.



- Shorten string, repeat for 10 to 12 measurements.
- Ensure string passes over pulley.
- Make 2 or 3 measurements with vertical drop 1.25 in or less.
(String will be tight even without the weight.)
- Click red stop button when finished.

Analyzing Your Data:

- Calculate $\sin\theta$ from your vertical drop measurements (see write up).
- Plot force on Y axis, $\sin\theta$ on X axis.
- Fit $y = A/x$ to your data.



The Report:

Turn in one report page per group.

There is a follow-up homework problem about this experiment.