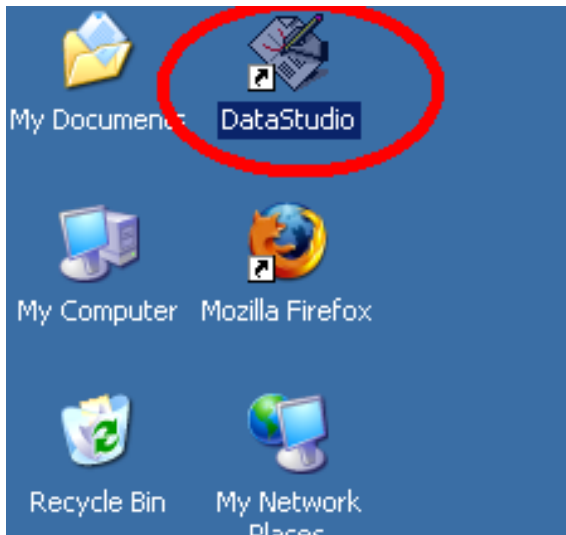


# How to use DataStudio for friction measurements

## Physics 23 Lab 03

Missouri University of Science and Technology

# DataStudio icon on desktop



# Create Experiment

The screenshot shows the DataStudio application window. At the top, there is a menu bar with 'File', 'Edit', 'Experiment', 'Window', and 'Help'. Below the menu bar are buttons for 'Summary', 'Setup', 'Start', a digital display showing 'STOP 00:00.0', and 'Calculate'. On the left side, there are two panels: 'Data' and 'Displays'. The main area is currently empty, displaying a 'Welcome to DataStudio' dialog box. The dialog box has a title bar and a close button. It contains a cartoon atom icon and the text 'How would you like to use DataStudio?'. There are four icons with labels below them: 'Open Activity' (books), 'Create Experiment' (a lightbulb and a flask, circled in red), 'Enter Data' (a clipboard with a table and a keyboard), and 'Graph Equation' (a graph with a line and the equation  $y = mx + b$ ).

Summary Setup Start STOP 00:00.0 Calculate

Data

Displays

Welcome to DataStudio

How would you like to use DataStudio?

Open Activity

Create Experiment

Enter Data

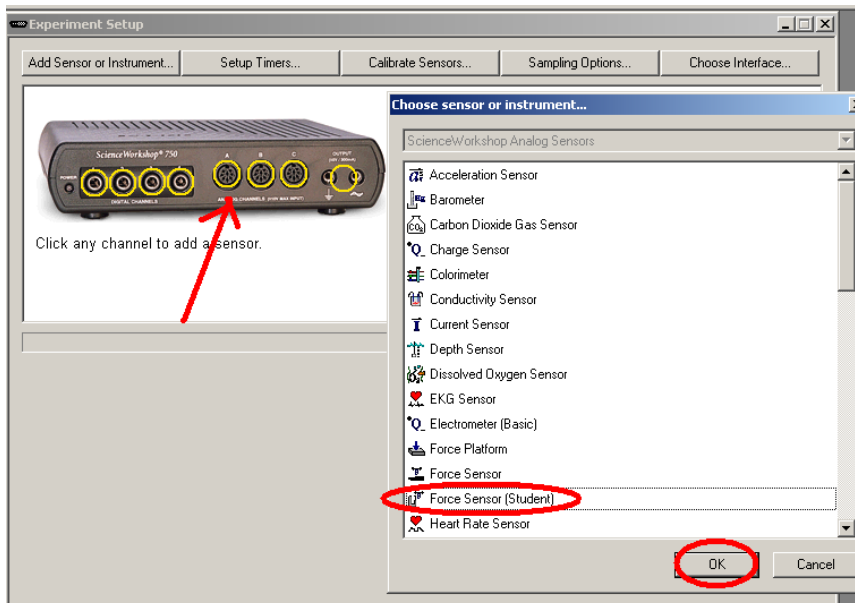
Graph Equation

$y = mx + b$

# Left-click input A; select “Force Sensor (student)”

Experiment Setup

Add Sensor or Instrument... Setup Timers... Calibrate Sensors... Sampling Options... Choose Interface...



Click any channel to add a sensor.

Choose sensor or instrument...

ScienceWorkshop Analog Sensors

- Acceleration Sensor
- Barometer
- Carbon Dioxide Gas Sensor
- Charge Sensor
- Colorimeter
- Conductivity Sensor
- Current Sensor
- Depth Sensor
- Dissolved Oxygen Sensor
- EKG Sensor
- Electrometer (Basic)
- Force Platform
- Force Sensor
- Force Sensor (Student)**
- Heart Rate Sensor

OK Cancel

The image shows the ScienceWorkshop 750 interface. On the left, a hardware device is shown with three analog channels labeled A, B, and C. A red arrow points to channel A, with the text "Click any channel to add a sensor." below it. On the right, a "Choose sensor or instrument..." dialog box is open, displaying a list of sensors. The "Force Sensor (Student)" option is highlighted with a red oval. The "OK" button at the bottom right of the dialog is also circled in red.

# Calibrate Force

The screenshot shows the 'Experiment Setup' window of the ScienceWorkshop 750 software. The 'Calibrate Sensors...' button is highlighted with a red circle. Below the hardware image, a force sensor is connected to Channel A, and the 'Force, Ch A' checkbox is also circled in red.

Experiment Setup

Add Sensor or Instrument... Setup Timers... **Calibrate Sensors...** Sampling Options... Choose...

ScienceWorkshop® 750

DIGITAL CHANNELS 1 2 3 4 ANALOG CHANNELS (10V MAX INPUT) A B C OUTPUT (5V / 500mA)

Force Sensor (Student)

Measurements

Visibility, Name Unit of Measure

Voltage, Ch A V

**Force, Ch A** N

Sample Rate 10 Hz

Low (1x)

Sensor Sampling Options

Reduce sample rate by averaging

# Calibrate with no mass

Calibrate Sensors

Sensor, Measurement, Unit  
Force Sensor (Student)  
Force, Ch A (N)

Calibrate all similar measurements simultaneously.

Previous Calibration  
Slope: 0.17500 V/N  
Offset: 00000 V

Present Sensor Measurement  
0.0031730 N  
0.041276 V

Calibration Type  
 2 Point (Adjust Slope and Offset)  
 1 Point (Adjust Offset Only)  
 1 Point (Adjust Slope Only)

Calibration Point 1  
Standard Value: 0 N  
Sensor Value: 0.041639 V  
Read From Sensor

Calibration Point 2  
Standard Value: 2.45 N  
Sensor Value: -0.23843 V  
Read From Sensor

New Calibration  
Slope: -0.11431 V/N  
Offset: 0.041639 V

OK Cancel

**NO MASS:**

# Calibrate with 250 grams

ScienceWorkshop® 750

**Calibrate Sensors**

Sensor, Measurement, Unit  
Force Sensor (Student)  
Force, Ch A (N)

Calibrate all similar measurements simultaneously.

Previous Calibration  
Slope: -0.11431 V/N      Offset: 0.041639 V

Present Sensor Measurement  
0.0020050 N      0.041410 V

Calibration Type  
 2 Point (Adjust Slope and Offset)  
 1 Point (Adjust Offset Only)  
 1 Point (Adjust Slope Only)

Calibration Point 1  
Standard Value: 0 N      Sensor Value: 0.041639 V     

Calibration Point 2  
Standard Value: 2.4500 N      Sensor Value: -0.23843 V     

New Calibration  
Slope: -0.11431 V/N      Offset: 0.041639 V

Measurements  
Visibility, Name  
 Voltage, ChA  
 Force, ChA

**MASS of 250grams**

# Graph

The screenshot shows the DataStudio software interface. At the top, there is a menu bar (File, Edit, Experiment, Window, Help) and a toolbar with buttons for Summary, Setup, Start, a digital display showing 'STOP 00:00.0', and Calculate. The main window is divided into several sections:

- Data:** A list on the left showing 'Force, Ch A (N)'.
- Experiment Setup:** A central area showing a photograph of a ScienceWorkshop 750 interface box. Below the photo is a small icon of a force sensor connected to the box. Buttons for 'Add Sensor or Instrument...', 'Setup Timers...', and 'Calibrate' are visible above the photo.
- Force Sensor (Student):** A configuration panel with a 'Measurements' tab. It includes a table for sensor settings:

Visibility	Name	Unit of Meas.
<input type="checkbox"/>	Voltage, ChA	V
<input checked="" type="checkbox"/>	Force, Ch A	N

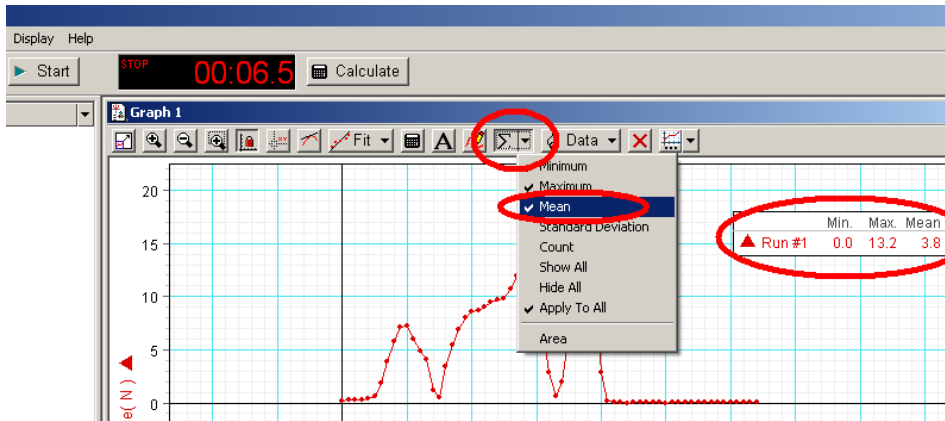
At the bottom left, there is a 'Displays' panel with a list of display types: Digits, FFT, Graph, Histogram, and Meter. The 'Graph' option is circled in red.



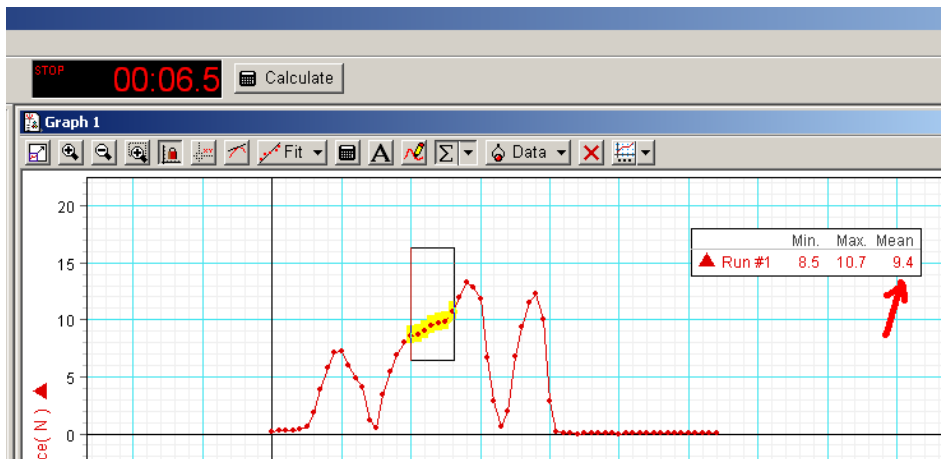
# Start

The screenshot displays the DataStudio software interface. At the top, the title bar reads "DataStudio". Below it is a menu bar with "File", "Edit", "Experiment", "Window", "Display", and "Help". A toolbar contains three buttons: "Summary", "Setup", and "Start". The "Start" button, which features a play icon, is circled in red. To the right of the toolbar is a digital display showing "STOP" in red and "00:00.0" in large red digits. Further right is a "Calc" button with a calculator icon. Below the toolbar, the "Data" panel on the left lists "Force, Ch A (N)". The "Graph 1" panel on the right shows a coordinate system with a vertical axis labeled "orce(N) •" and a horizontal axis. A tooltip "Align matching X Scale" is visible over the graph area. The graph grid shows major ticks at 0, 10, and 20 on the vertical axis.

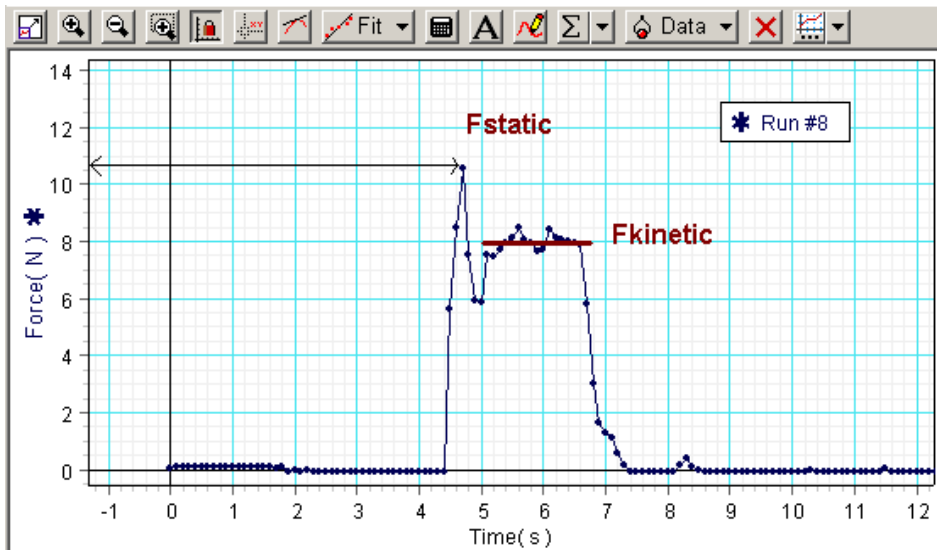
# Display "mean"



# Select data points to get mean



# $F_{static}$ and $F_{kinetic}$ : good data



# Example of useless data

