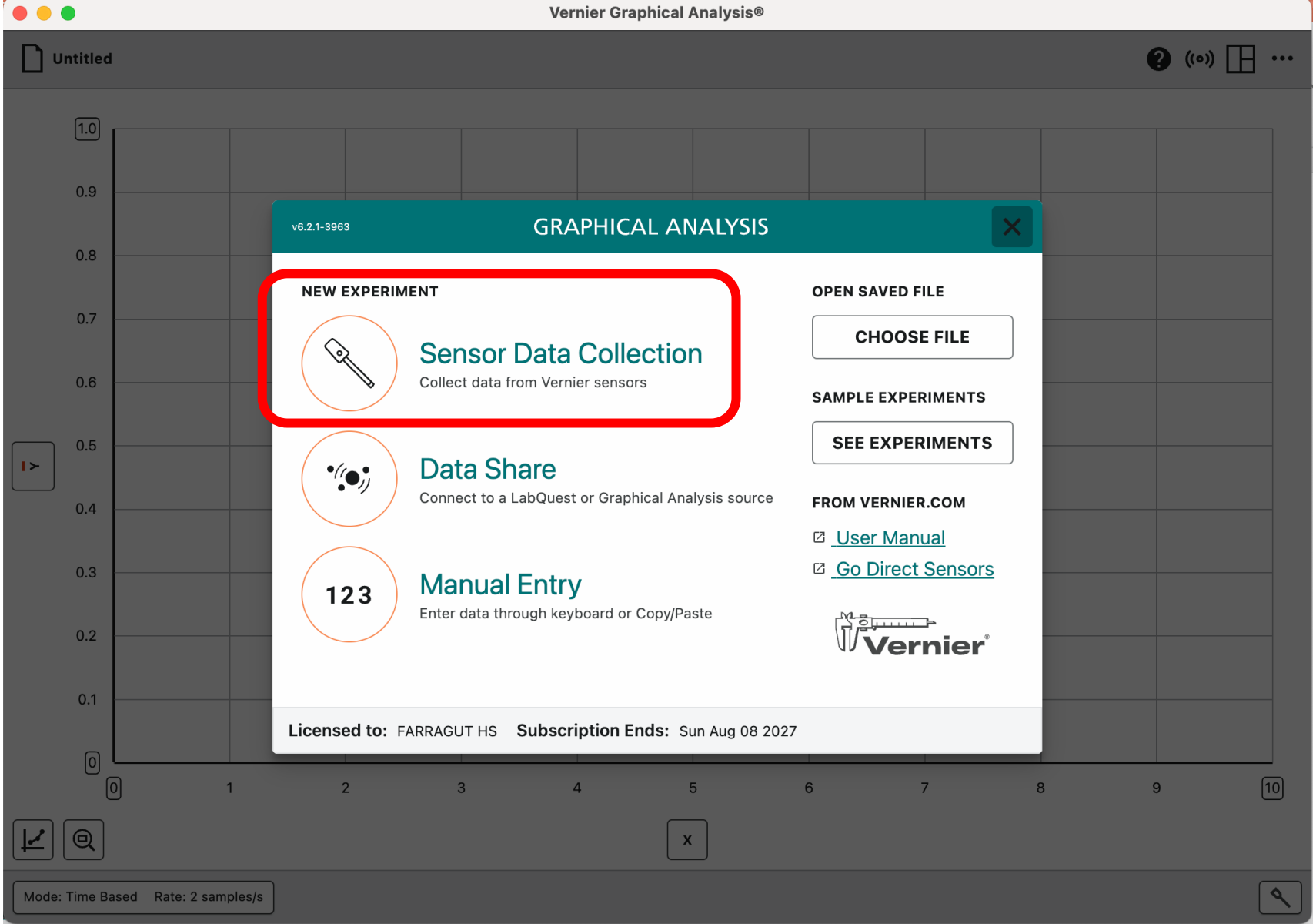
Accelerometer

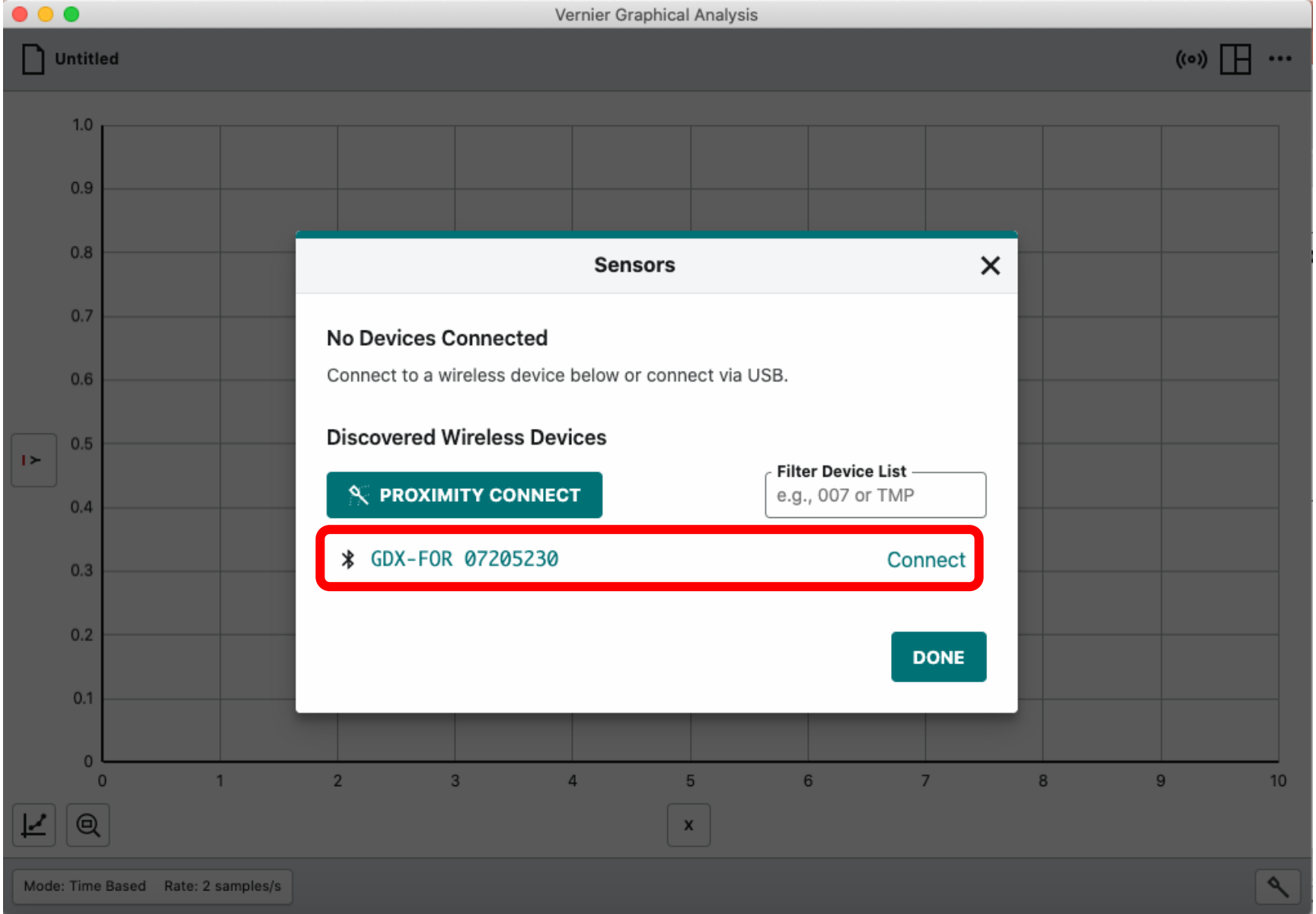
Speed of the Hand

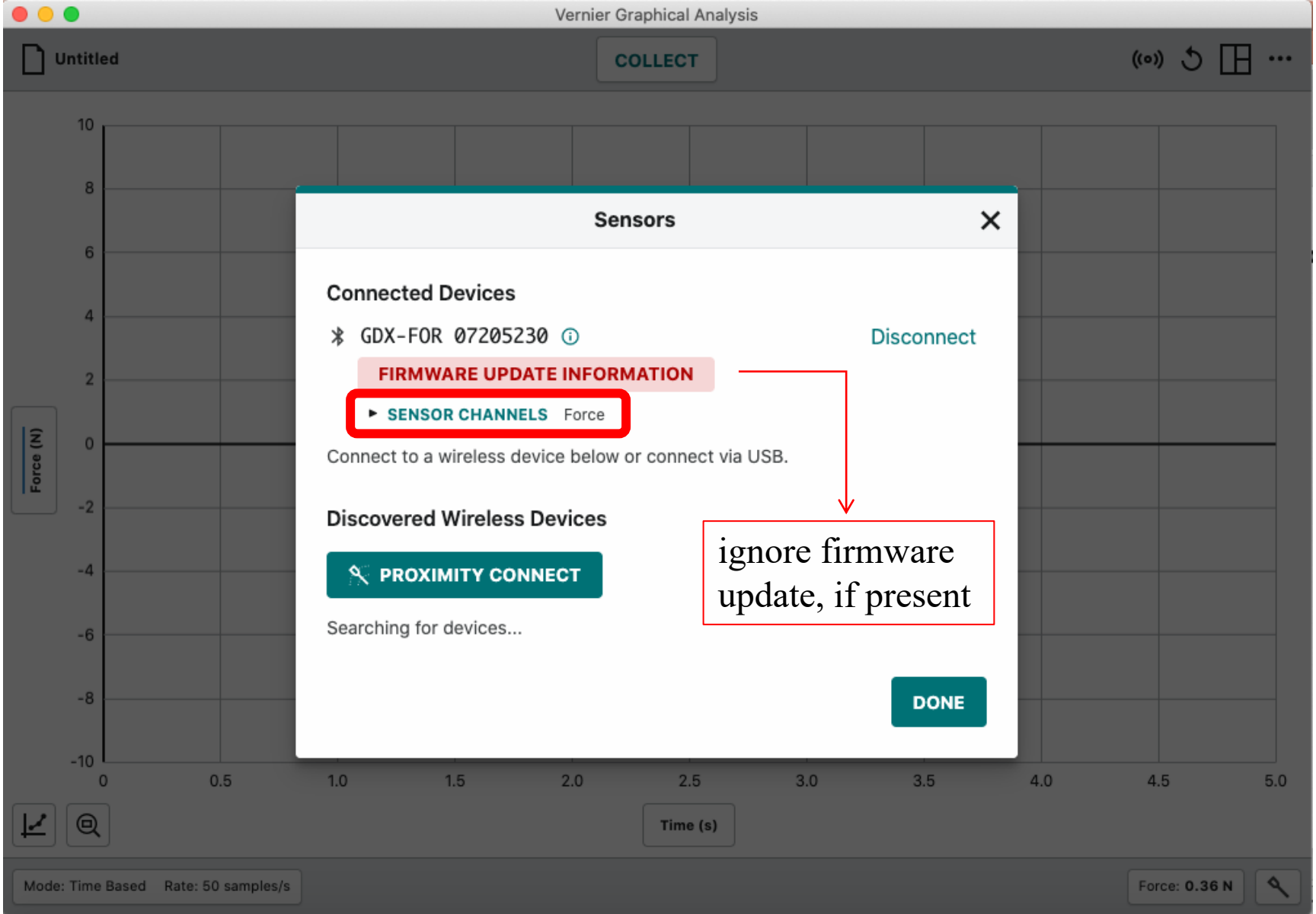
Use GoDirect Accelerometer to determine the maximum speed of a hand moving back and forth.

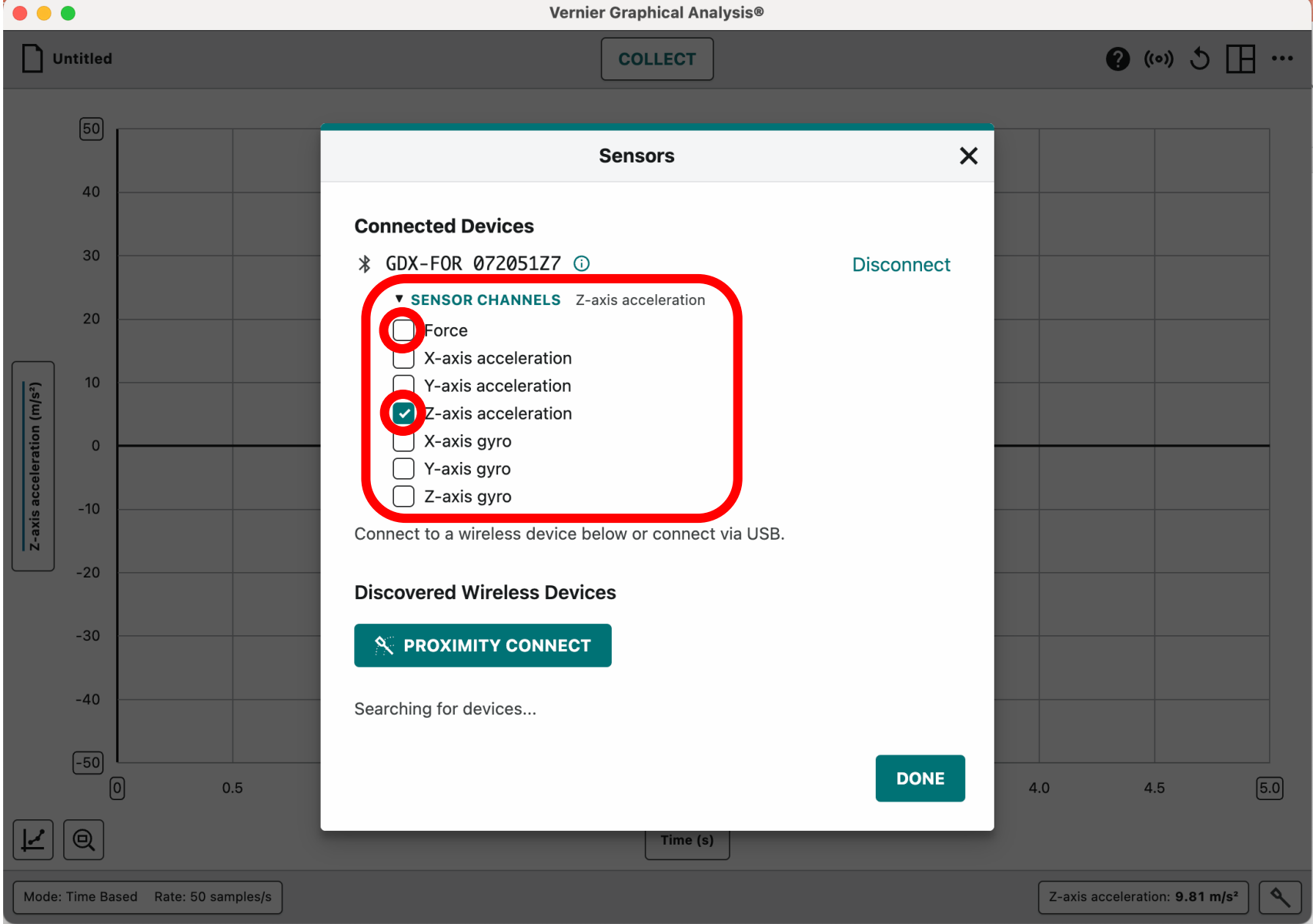
Setting up:

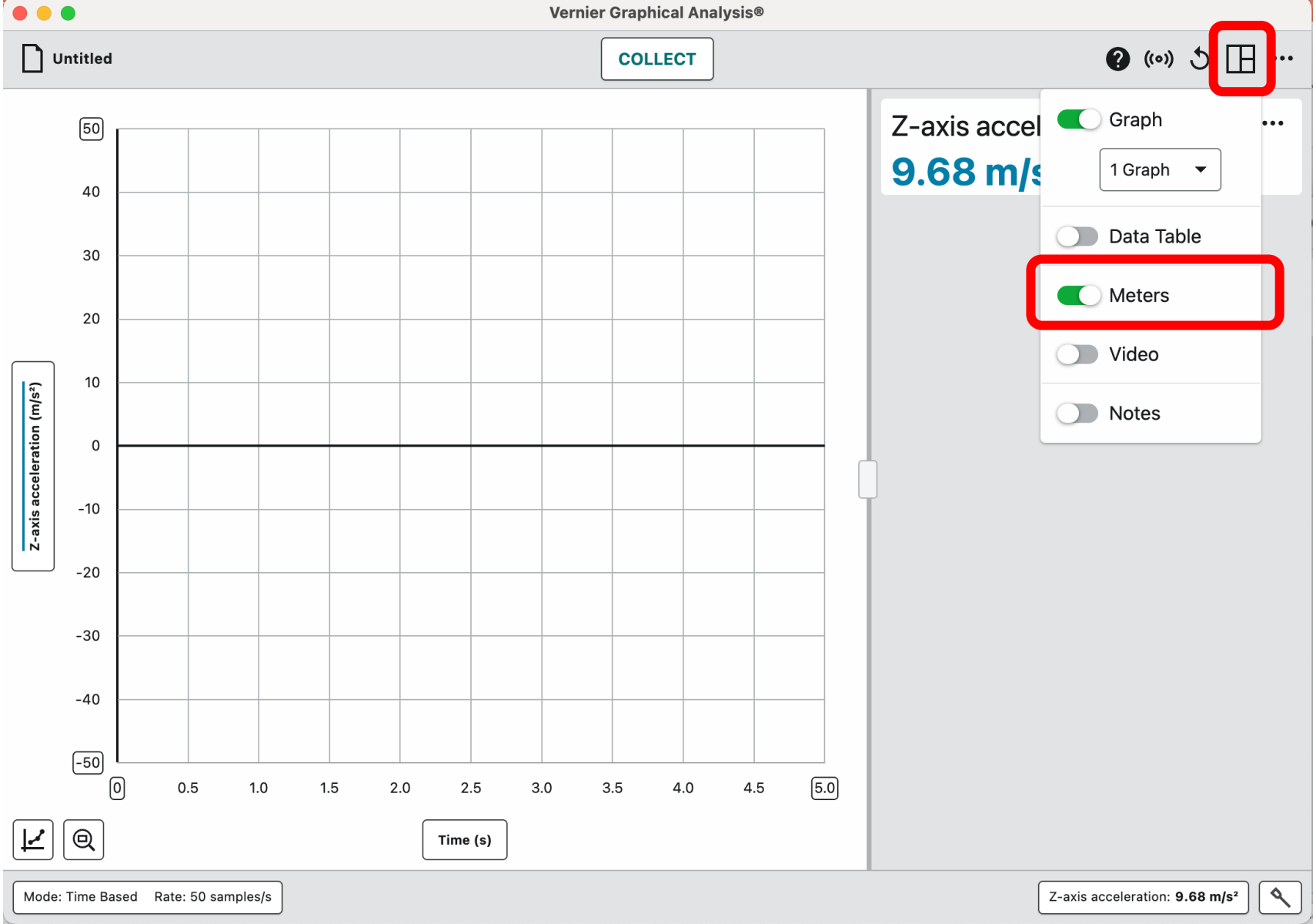
1. Open Graphical Analysis (or choose New Experiment) and choose Sensor Data Collection. Identify your sensor by its Bluetooth ID and click Connect.
2. Use *only* the *Z*-axis accelerometer channel. Deselect the Force channel. Under the View Options menu choose Meters. You should see a live readout.
3. Place the sensor at rest on the table on its side, with the *z*-axis parallel to the surface and the *y*-axis pointing to the ceiling. Then under the Sensor Actions menu choose Zero. The meter should show a value close to zero.


Vernier Graphical Analysis®
Untitled
v6.2.1-3963
GRAPHICAL ANALYSIS
NEW EXPERIMENT
Sensor Data Collection
Collect data from Vernier sensors
Data Share
Connect to a LabQuest or Graphical Analysis source
123
Manual Entry
Enter data through keyboard or Copy/Paste
OPEN SAVED FILE
CHOOSE FILE
SAMPLE EXPERIMENTS
SEE EXPERIMENTS
FROM VERNIER.COM
User Manual
Go Direct Sensors
Vernier
Licensed to: FARRAGUT HS
Subscription Ends: Sun Aug 08 2027
Mode: Time Based
Rate: 2 samples/s
X

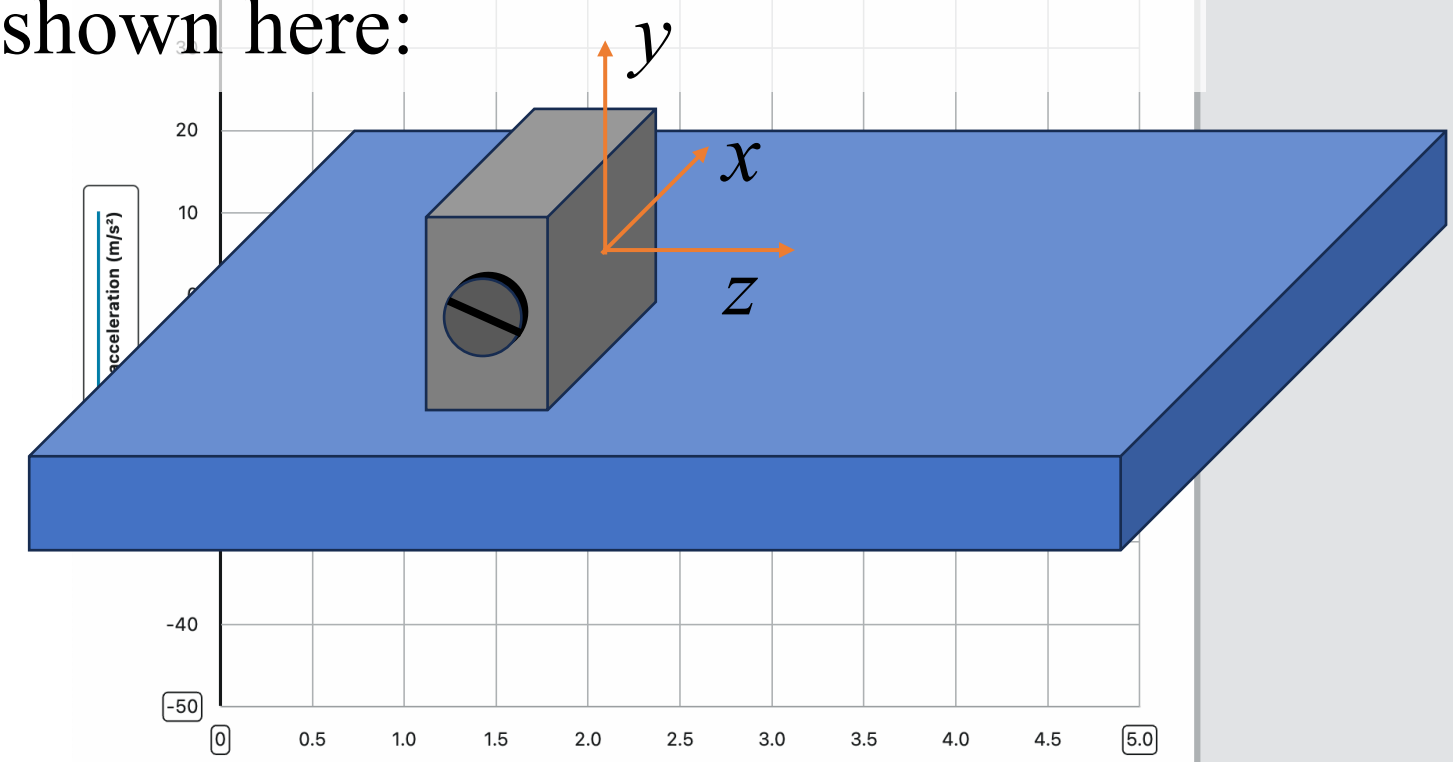

Vernier Graphical Analysis
Untitled
Sensors
No Devices Connected
Connect to a wireless device below or connect via USB.
Discovered Wireless Devices
PROXIMITY CONNECT
Filter Device List
e.g., 007 or TMP
GDX-FOR 07205230
Connect
DONE
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
1
2
3
4
5
6
7
8
9
10
x
Mode: Time Based
Rate: 2 samples/s


Vernier Graphical Analysis
Untitled
COLLECT
Sensors
Connected Devices
GDX-FOR 07205230
Disconnect
FIRMWARE UPDATE INFORMATION
SENSOR CHANNELS Force
Connect to a wireless device below or connect via USB.
Discovered Wireless Devices
PROXIMITY CONNECT
Searching for devices...
DONE
ignore firmware update, if present
Force (N)
Time (s)
Mode: Time Based Rate: 50 samples/s
Force: 0.36 N

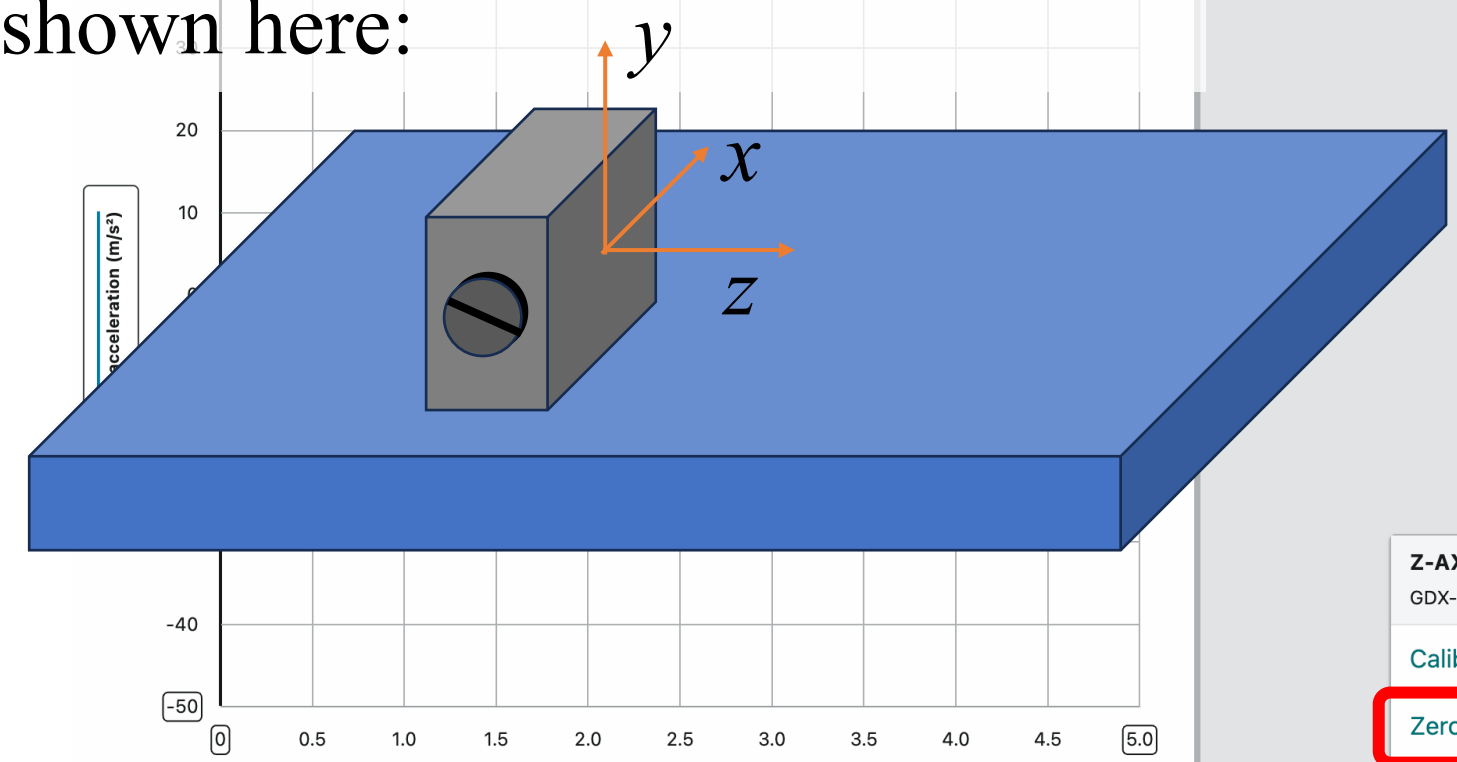

Vernier Graphical Analysis®
Untitled
COLLECT
Sensors
Connected Devices
GDX-FOR 072051Z7
Disconnect
SENSOR CHANNELS
Z-axis acceleration
Force
X-axis acceleration
Y-axis acceleration
Z-axis acceleration
X-axis gyro
Y-axis gyro
Z-axis gyro
Connect to a wireless device below or connect via USB.
Discovered Wireless Devices
PROXIMITY CONNECT
Searching for devices...
DONE
Z-axis acceleration (m/s²)
Time (s)
Mode: Time Based
Rate: 50 samples/s
Z-axis acceleration: 9.81 m/s²

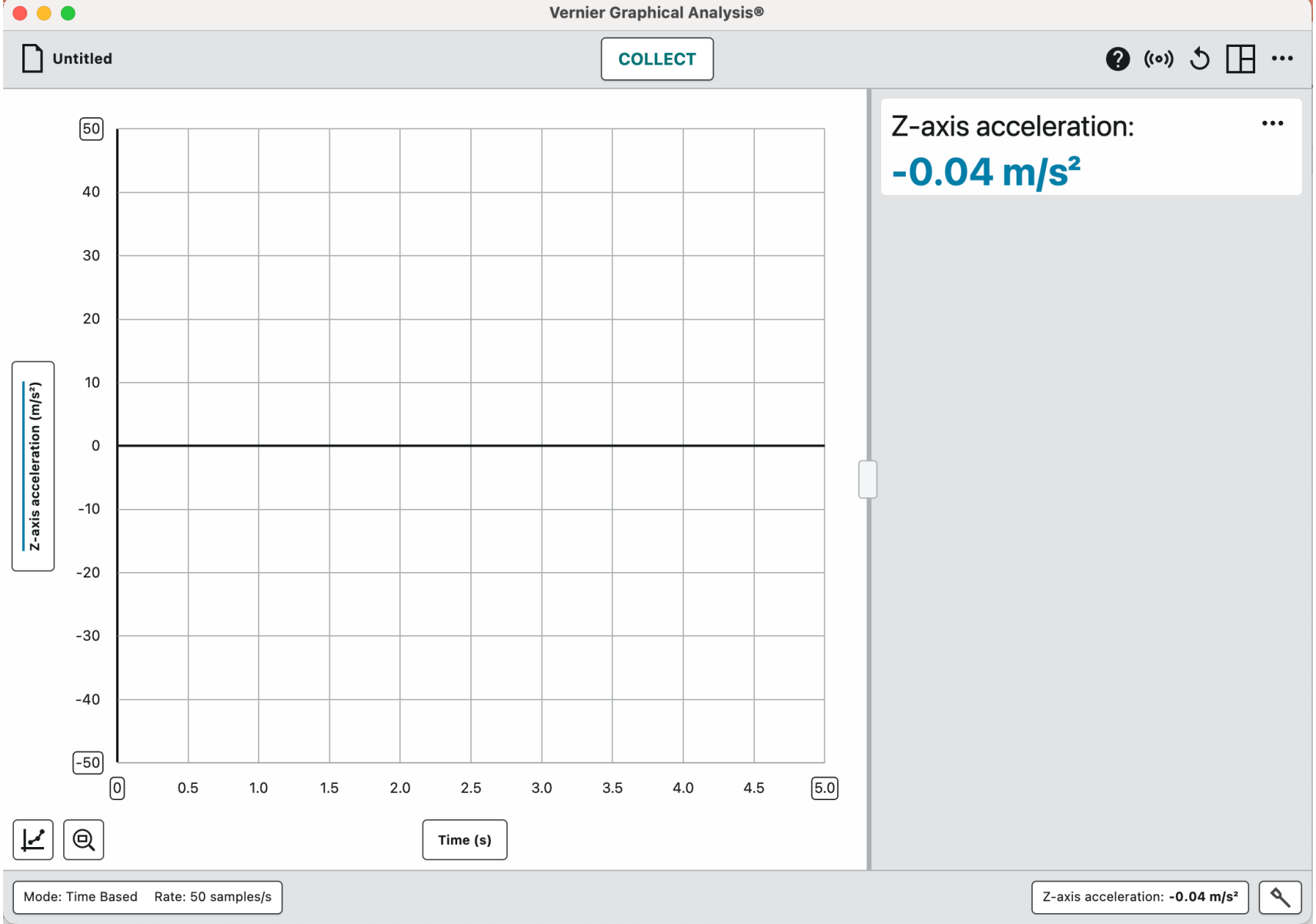

Vernier Graphical Analysis®
Untitled
COLLECT
Z-axis accel
9.68 m/s
Graph
1 Graph
Data Table
Meters
Video
Notes
50
40
30
20
10
0
-10
-20
-30
-40
-50
Z-axis acceleration (m/s²)
0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Time (s)
Mode: Time Based Rate: 50 samples/s
Z-axis acceleration: 9.68 m/s²

In order to zero the accelerometer, hold the sensor at rest on table as shown here:



In order to zero the accelerometer, hold the sensor at rest on table as shown here:



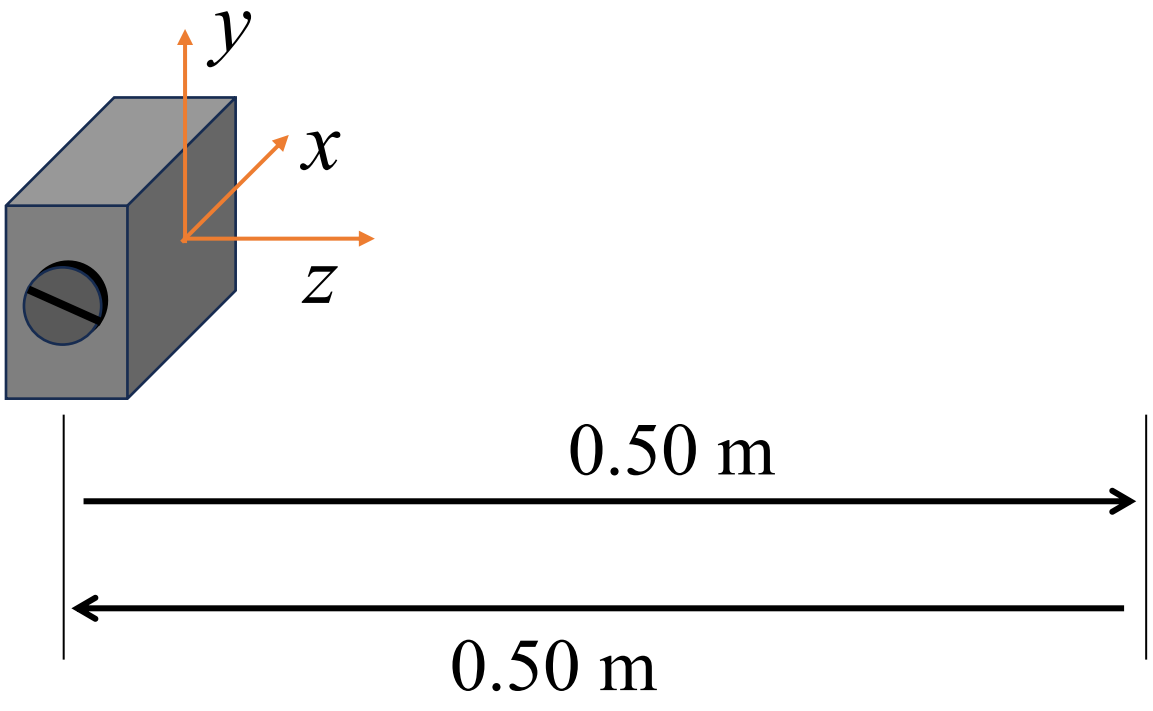

Vernier Graphical Analysis®
Untitled
COLLECT
Z-axis acceleration:
-0.04 m/s²
50
40
30
20
10
0
-10
-20
-30
-40
-50
Z-axis acceleration (m/s²)
0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Time (s)
Mode: Time Based Rate: 50 samples/s
Z-axis acceleration: -0.04 m/s²

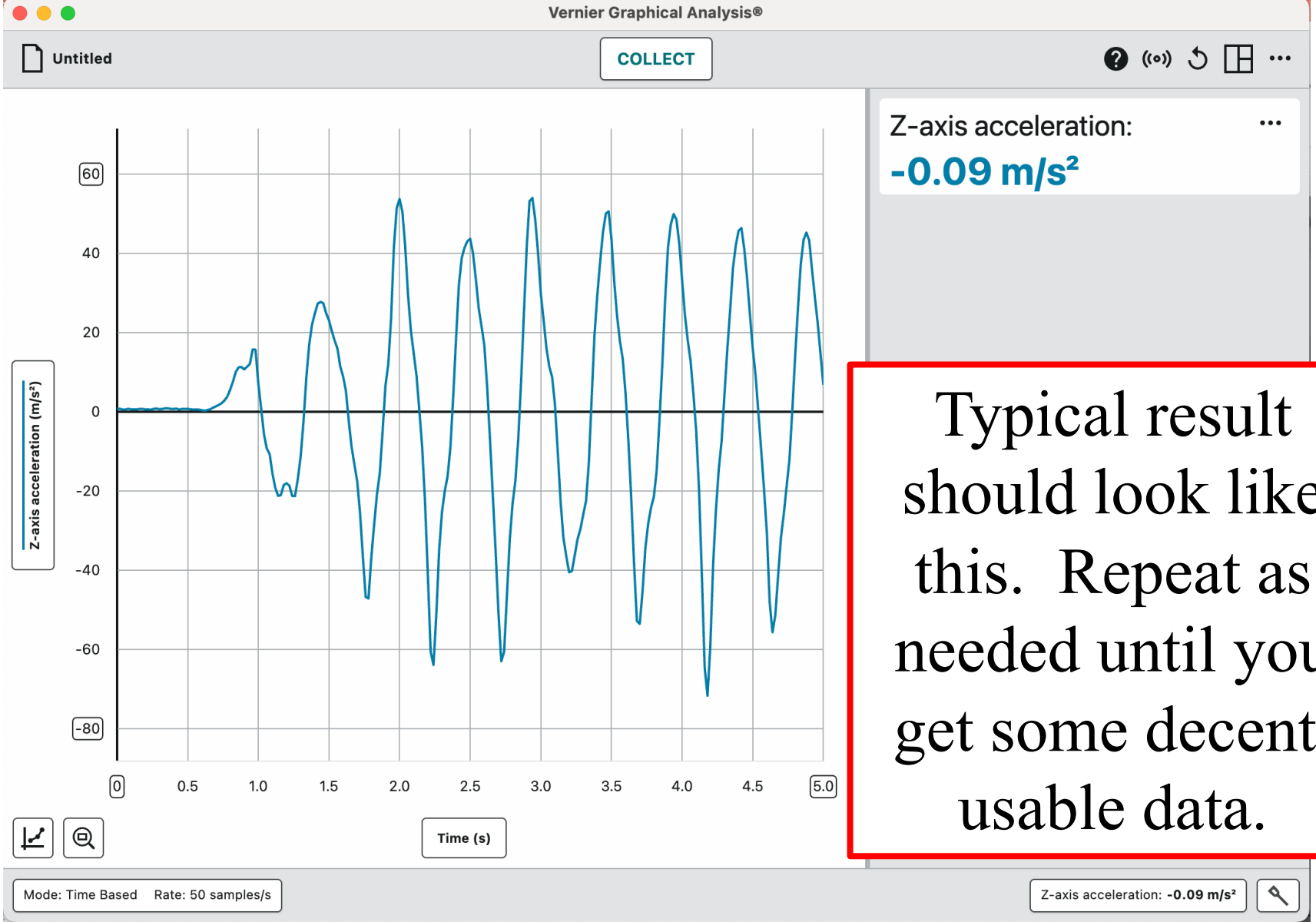
Use GoDirect Accelerometer to determine the maximum speed of a hand moving back and forth.

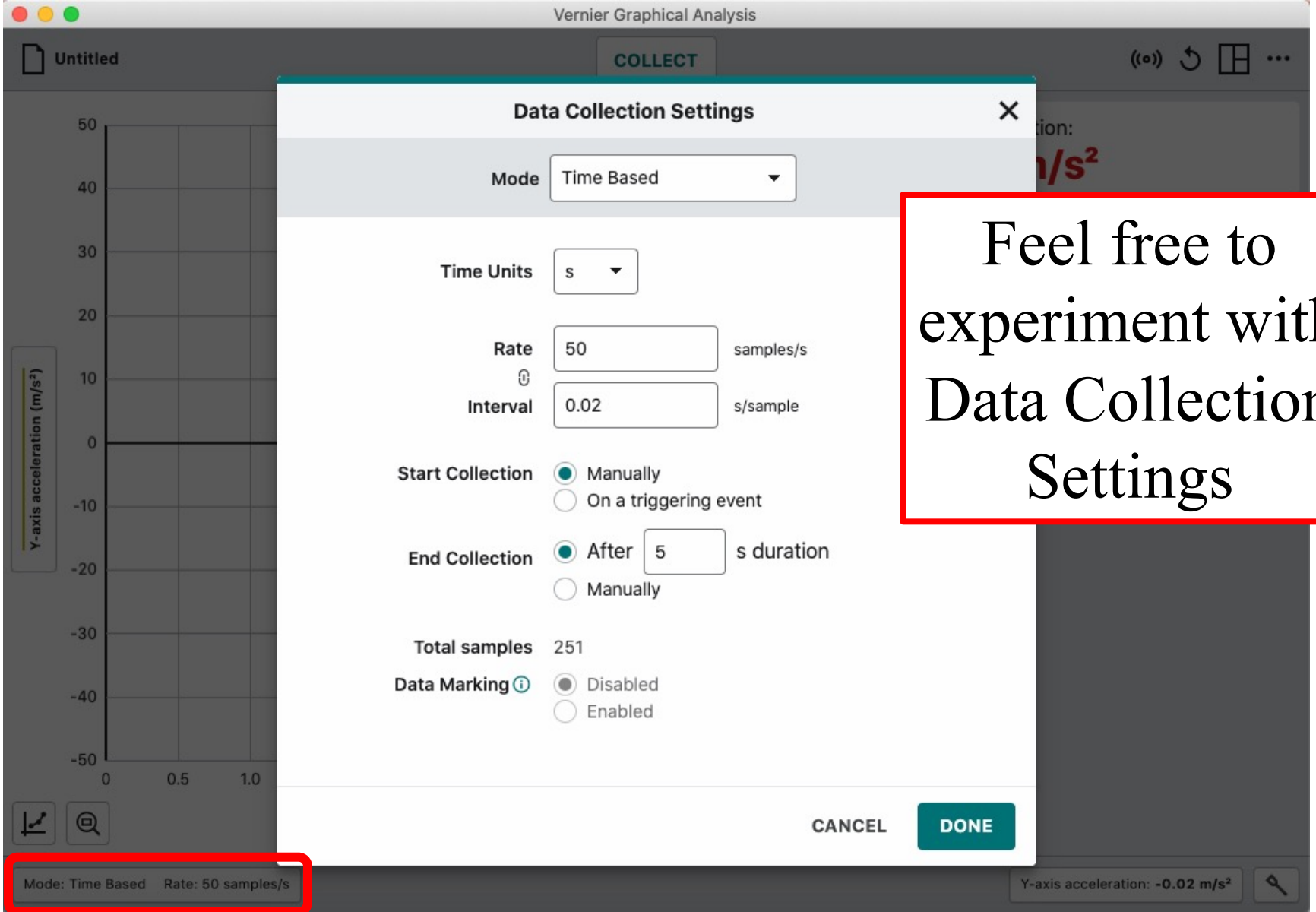
Doing the experiment:

1. Collect data and move hand quickly back and forth a *distance* of precisely 1.00 m (0.5 m each way). You can move hand back and forth multiple times in one trial.
2. Using the graph and analysis tools determine the *maximum* speed of the hand.
3. Use data from the graph and the *measured distance* to determine the *average* speed of the hand.
4. Based on all available information sketch a graph of velocity vs. time consistent with observations and values.

Click the Collect button and then move the sensor and your hand back and forth several times as shown:




Vernier Graphical Analysis®
Untitled
COLLECT
Z-axis acceleration:
-0.09 m/s²
60
40
20
0
-20
-40
-60
-80
Z-axis acceleration (m/s²)
0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Time (s)
Mode: Time Based Rate: 50 samples/s
Z-axis acceleration: -0.09 m/s²
Typical result should look like this. Repeat as needed until you get some decent, usable data.


Vernier Graphical Analysis
Untitled
COLLECT
Data Collection Settings
Mode
Time Based
Time Units
s
Rate
50
samples/s
Interval
0.02
s/sample
Start Collection
Manually
On a triggering event
End Collection
After
5
s duration
Manually
Total samples
251
Data Marking
Disabled
Enabled
CANCEL
DONE
Feel free to experiment with Data Collection Settings
Y-axis acceleration (m/s²)
Mode: Time Based Rate: 50 samples/s
Y-axis acceleration: -0.02 m/s²