

## Experiment BIK-11: The Simple Pendulum and Harmonic Motion

### Equipment Required

PC or Mac Computer  
IXTA, USB cable, IXTA power supply  
FT-5K Force Transducer  
LIS-100 Laser Interrupt Sensor (optional)  
String  
Mass (pendulum bob)  
Ruler  
Protractor  
Retort stand and clamp

### Force Transducer Setup

The FT-5K utilizes load cell technology. A load cell is a force-sensing unit and is designed to measure a specific force ignoring other forces being applied.



1. Plug the FT-5K into port A5 on the TA-ROAM.
2. Flip the switch on the side of the force transducer to select your desired range (500g or 5Kg).

### Optional Laser Interrupt Sensor

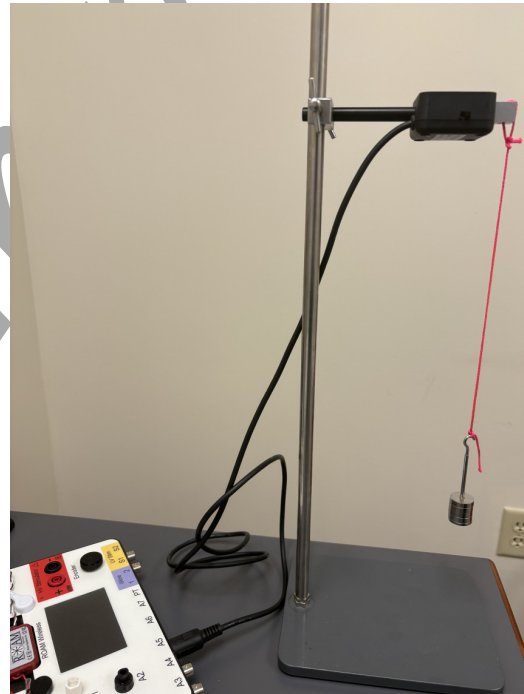
The LIS-100 light and laser sensor combines a laser and a light sensor in the same unit. Each LIS-100 will come with reflective tape, which the laser will be focused onto. The sensor can be placed up to 1 foot away from the tape. When the beam between the laser and tape is broken a corresponding signal will appear in the recording screen.

Plug the LIS-100 into port A6 on the front of the TA-ROAM.

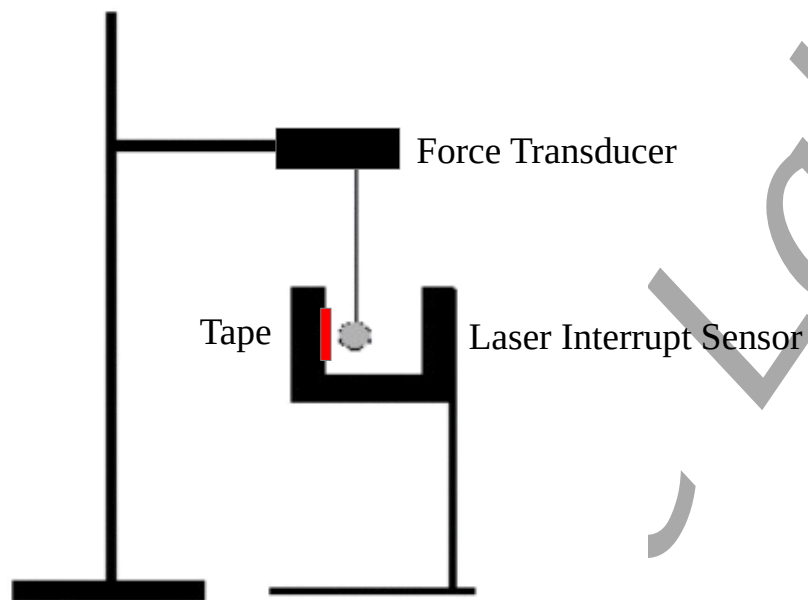


### Pendulum Setup

1. Position the force transducer with the iWorx logo facing upwards on the retort stand using a clamp.
2. Attach a mass to a string through the loophole of the force transducer.



Optional: Position the laser interrupt sensor so that it faces the mass. Place a piece of reflective tape on the other side of the sensor.



### 3. Calibrate the Force Transducer

- a) Connect the iWorx Recorder to the computer and turn it on.
- b) Plug the FT-5K into the DIN8 input of the recorder (A5 on the TA-ROAM)
- c) Open LabScribe software; select the channel that the FT-5K is plugged into.
- d) Select the force range you would like to use (500g or 5Kg). The switch is located on the side of the FT-5K.
- e) Type No Weight in the Mark box. Click Record, and click the mark button. Record for ten seconds with no weight hanging from the arm or hook of the transducer.
- f) Hang a known mass from the force transducer, Mark the record with the known weight. Record for 10 more seconds.
- g) Select Save As in the File menu, and name the file. Choose a destination on the computer in which to save the file. Click on the Save button to save the data file.

### 4. Perform a 2-point Calibration

- a) Scroll to the beginning of data when no weight was attached to the force transducer.
- b) Use the Display Time icons on the LabScribe toolbar to adjust the display time of the Main window to show the complete calibration data on the Main window.
- c) Click the Double Cursor icon. Place one cursor on the flat section of data collected when no weight was attached to the force transducer, and the second cursor on the flat section of data collected when the known weight was attached to the transducer.

- d) To convert the voltages at the positions of the cursors to pressure values, use the Simple Units Conversion dialogue window. Click V2-V1 on the force channel, then select Units, and select Simple.
- e) Put a check mark in the box next to Apply units to all blocks. Notice that the voltages from the positions of the cursors are automatically entered into the value equations.
- f) Enter “Zero” in the corresponding box to the right of the voltage recorded when no weight was attached to the transducer. Enter the known weight in the box to the right of the corresponding voltage recorded when the known weight was hung on the hook of the transducer.
- g) Enter the name of the units, grams, in the box below the weights. Click on the OK button in the lower right corner of the window to activate the units conversion.