Foundations Lab 2: ECG and Exercise

ECG Cable Setup

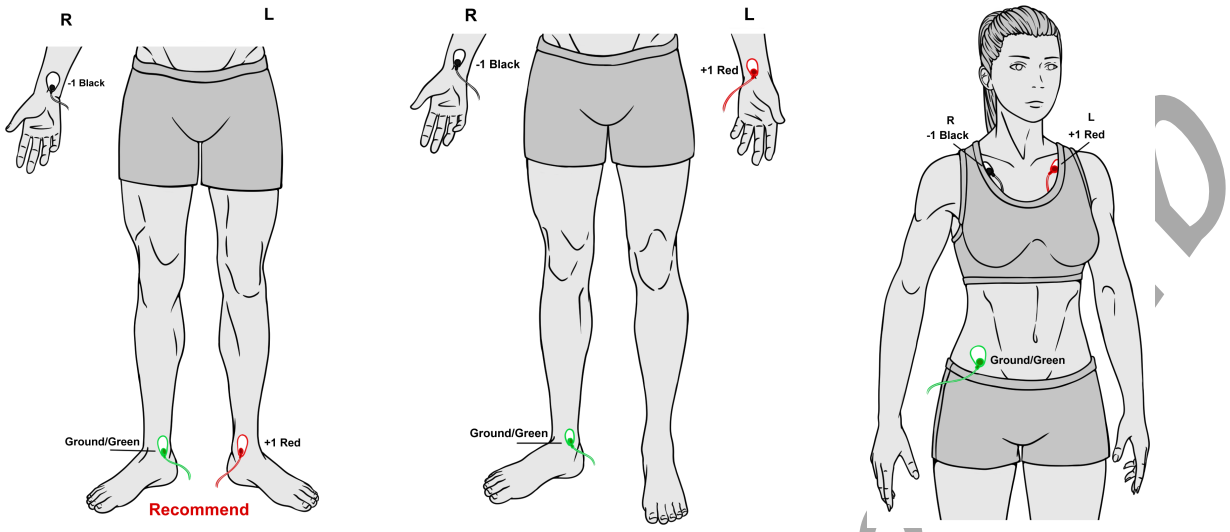
Note - Connect the iWire-B3G to the IXTA prior to turning it on.

1. Plug the iWire into the IXTA.
2. Plug the red, black and green electrodes into the iWire.

3. Snap the lead wires onto the electrodes:
    - the red (+1) lead is attached to the left ankle, left wrist or under the left clavicle,
    - the black (-1) lead is connected to the right wrist or under the right clavicle,
    - the green (C or ground) lead is connected to the right leg or on the abdomen.
    - Place these electrodes on the subject after you have snapped on the leads.
5. Make sure the subject sits still with their hands in their lap.

Left ankle, right wrist and right ankle is recommended

iWorx Lab



Exercise 1: The ECG in a Resting Subject

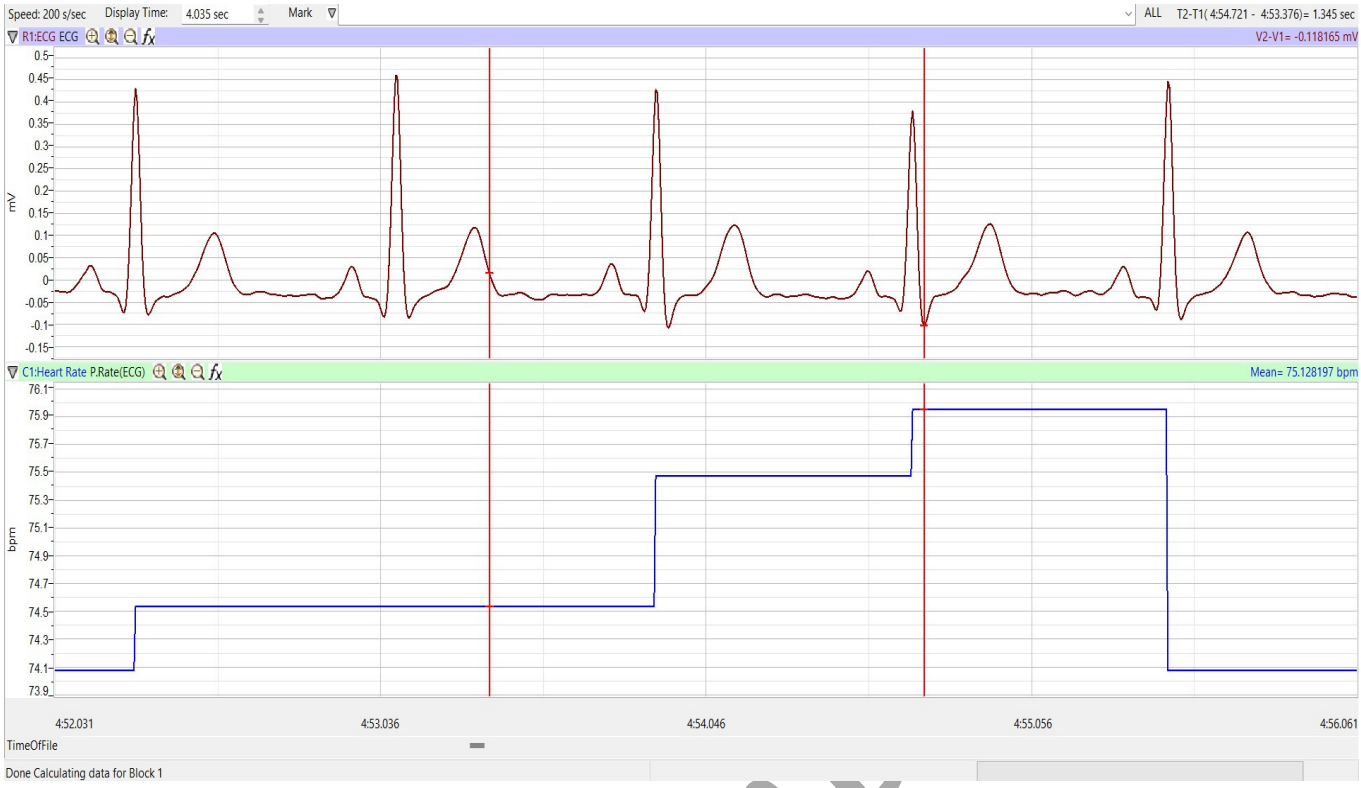
Aim: To measure ECG in a resting individual.

Procedure

1. Click on the Record button, located on the upper right side of the LabScribe Main window

2. Click on the AutoScale button on the tool bar.
    - If a larger ECG signal is required, the electrodes should be moved from the wrists to the skin below each clavicle.
3. Mark the recording by typing "Resting ECG" in the Mark box and click the Mark button.
4. Record for 5 minutes then click Stop.
5. Select Save As in the File menu and save your data to your Desktop or another folder.

IworX Sample



Exercise 2: The ECG After Leg Exercises (Running, Jumping Jacks, etc)

Aim: To measure the ECG immediately after exercise.

Approximate Time: 20 minutes

NOTE: Read the directions fully before doing this section of data collection. Making marks at the correct time is important. Use a timer or stopwatch.

Procedure

1. When the subject has completed Exercise 1, disconnect the snaps and the pulse sensor.
2. Have the subject exercise for at least three minutes. The subject should have an elevated heart rate and be breathing deeply when they are done exercising (running, jumping jacks, etc...).
3. Immediately after the exercise period is over, have the subject sit down and relax next to the recording equipment.
4. Quickly reconnect the snaps and the pulse sensor.
5. Click Record. Click AutoScale. While recording, type **0 sec** in the Mark box and click the Mark button.
6. Continue recording until the subject's heart rate has returned to normal. This may take less than 2 minutes, or longer than 10 minutes, depending on the fitness of the subject.
    - Enter marks every 60 seconds by typing **60**, **120**, **180**, etc... in the Mark box and clicking the Mark button.

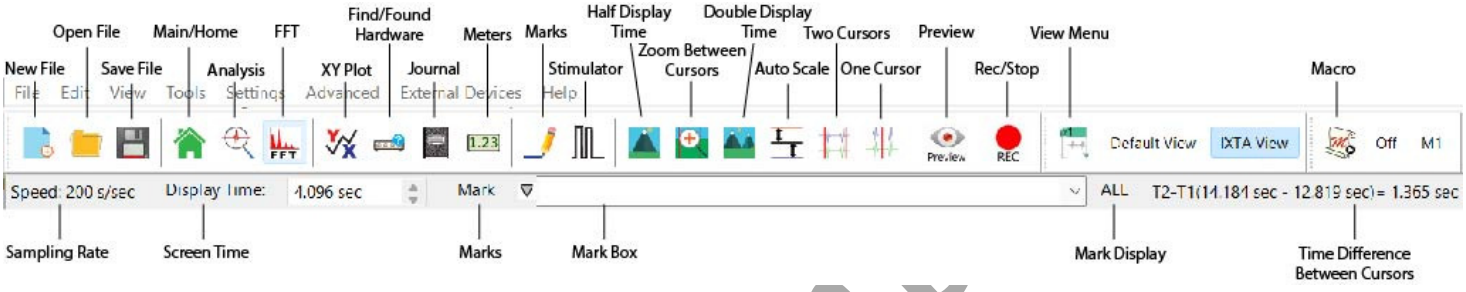
Worx Sample

7. Click Stop after 10 minutes even if the subject's heart rate has not returned to normal.
8. Click Save to save your data.

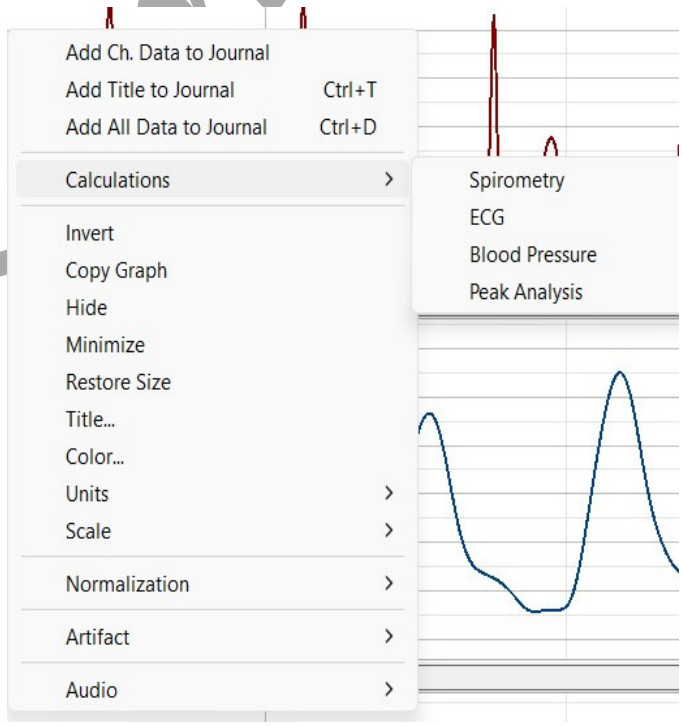
Data Analysis

Use the following techniques to analyze the data from both Exercises 1 and 2.

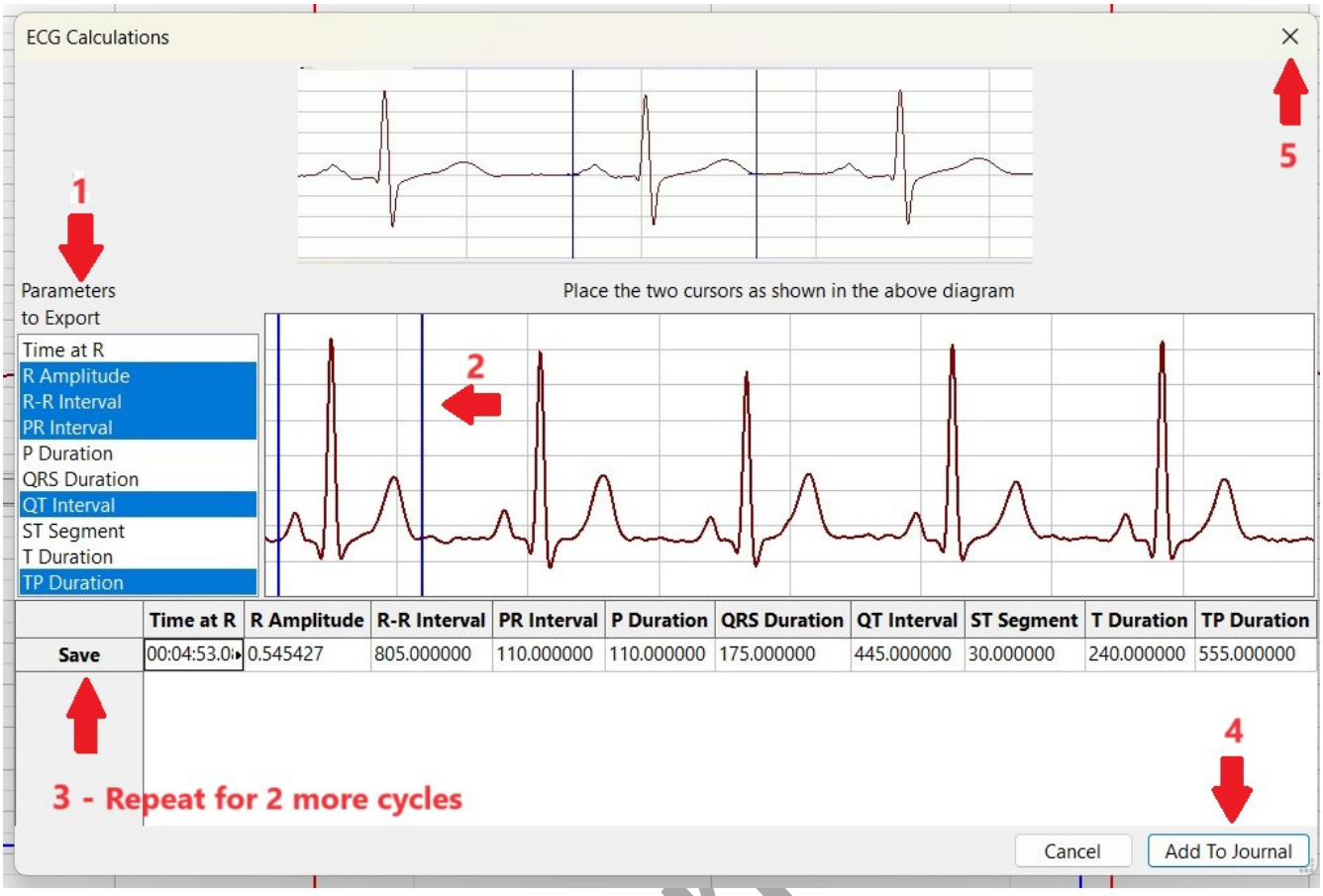
1. Go to the beginning of the recording by clicking on the down arrow next to the Mark Button and click Resting-ECG. Click AutoScale All twice.
2. Make sure to have 5 ECG cycles on screen. Double or half the display time by clicking the mountain icons or changing the display time.



3. Click the Analysis icon
4. Right click in the ECG graph
5. Click Calculations – ECG



IWorx Lab



6. Using the image above:
    1. Control Click to choose the ECG parameters to be measured
        - R Amplitude
        - R-R Interval
        - PR Interval
        - QT Interval
        - TP Duration
    2. Move the blue vertical cursors so one is just before the P wave of the first cardiac cycle and the 2nd is right after the T wave of the same cycle.
    3. Click Save on the left side of the chart.
        - Repeat Steps 2 and 3 for 2 more cardiac cycles.
    4. Click Add To Journal on the lower right of the ECG Calculations window.
    5. Click the "x" in the upper right to close the window.

7. Click the Journal icon and click Table. All your values will be shown in a table except the R-Pulse Interval.

8. After entering all the data in the Journal, calculate the following values:

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- The average R-wave amplitude.
- The average beat period (R-R interval), in seconds/beat.
- The average PR interval.
- The average QT interval.
- The average TP duration.
- The heart rate, which is expressed in beats per minute and calculated from the average beat period by using the following equation:

$$\text{Heart Rate (beats/minute)} = \frac{60 \text{ seconds/minute}}{\#\text{ seconds/beat}}$$

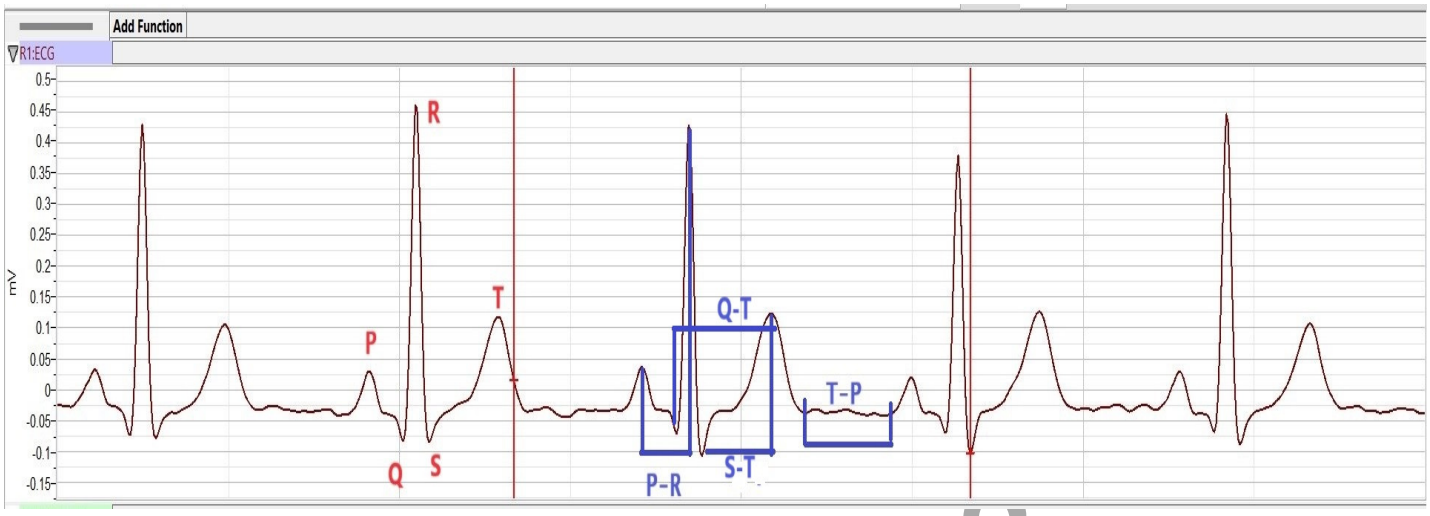
Note: Heart Rate can also be determined by looking at the Mean function on the Heart Rate Channel. The more data on screen, the more accurate the Mean heart rate.

9. Click the down arrow to the right of the Mark button and click "0 sec" to bring you to right when the subject sat down after exercising. Click AutoScale All twice.
10. Repeat Step 6 for this section of data. Measuring the same parameters as above for "0" seconds after exercise.
11. Move to the next section of recovery data by clicking the down arrow by the Mark button and choosing the next mark. Repeat steps for each 60 second interval until subject's heart rate has returned to normal. Measure the same parameters for all the 60 second intervals throughout the recovery period.
12. Stop when the subject's heart rate has returned to normal.

Questions

1. How does the heart rate from the subject at rest and at 0, 30, 60, 90, and 120 (or more) seconds after exercise (recovery) compare? Is there any variation between the rates for each time period? Is there a trend and what is it?
2. How does the average P-R interval from rest and each time period in recovery compare? Do you see any variation or trend?
3. How does the average Q-T interval from rest and each time period in recovery compare? Do you see any variation or trend?
4. How does the average T-P interval from rest and each time period in recovery compare? Do you see any variation or trend?
5. How does the average R-wave ECG amplitude from rest and each time period in recovery compare? Do you see any variation or trend?

IWorx Sample Lab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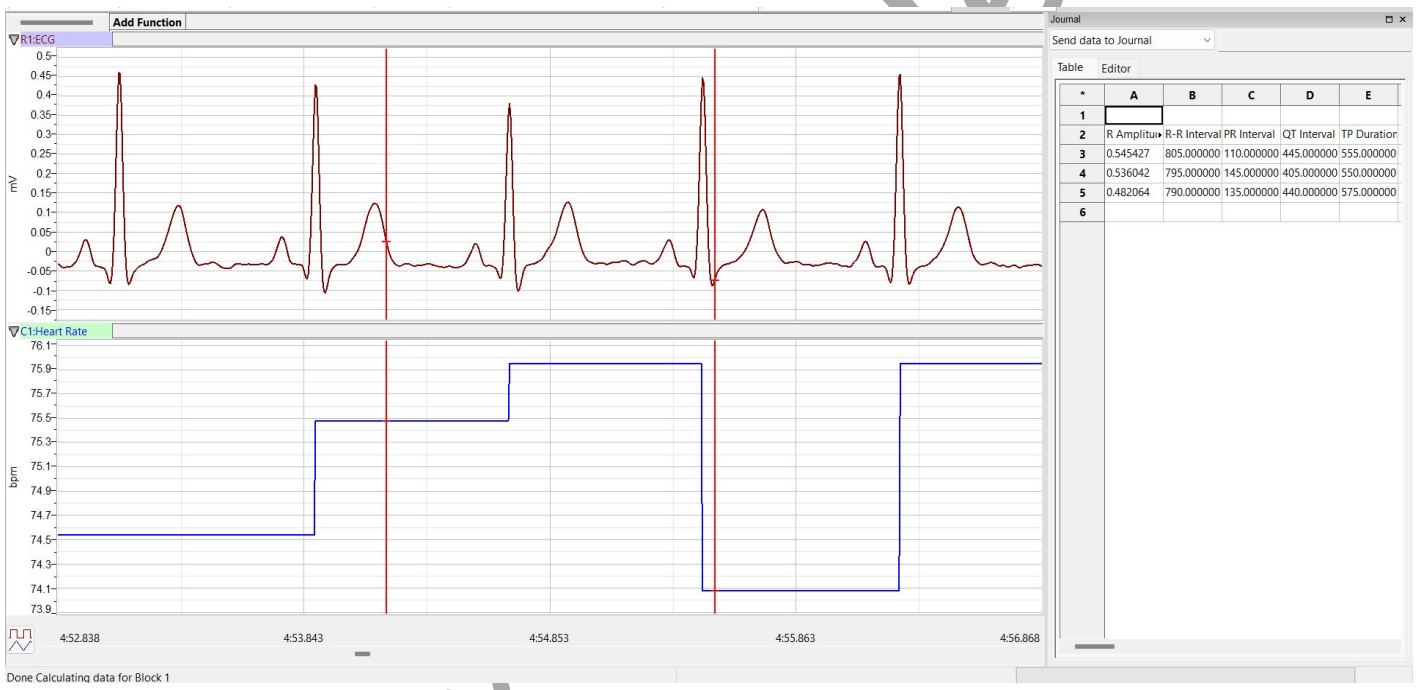
R1:ECG
mV
R
T
P
Q
S
Q-T
T-P
P-R
S-T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C1:Heart Rate
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4:55.863
4:56.868
Done Calculating data for Block 1
Journal
Send data to Journal
Table
Editor
A
B
C
D
E
R Amplitu
R-R Interval
PR Interval
QT Interval
TP Duration
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