



# TR-DataRX™ User Manual

## Quick Start Guide

The screenshot displays the TR-DataRX software interface. On the left, a table lists recording details:

NAME	DATE	DURATION	COUNT
Recording 1	6/7/2021 11:07:00 AM	00:13.9186305	1514
Recording 2	6/7/2021 11:14:52 AM	00:15.2025167	3999
Recording 3	6/10/2021 5:45:47 PM	0:09:34.3592459	10654
Recording 4	6/11/2021 1:22:00 PM	0:14:50.3210621	16693
Recording 5	6/11/2021 1:39:33 PM	0:00:25.2556773	695
Recording 6	6/11/2021 3:00:13 PM	0:04:16.7793693	4705
Recording 7	6/11/2021 3:06:15 PM	1:25:03.37743	101514
Recording 8	6/11/2021 4:39:54 PM	0:30:46.4174921	97254
Recording 9	6/12/2021 12:39:45 PM	0:00:12.2991334	246

The central area shows a 3D rendering of the TR-DataRX hardware, including a grey carrying case and two white sensor modules. On the right, the 'Connected Sensors' section shows two DataRX-B sensors (ID: 066666) connected to the 'Right Arm' and 'Back' of the robot. The 'Initialization' status is 'Initialization completed'. Control buttons for START, PAUSE, STOP, ABOUT, and HELP are visible.

Below the hardware image, three real-time data plots are shown for Roll, Pitch, and Yaw. The Roll plot shows values between 0 and 50 degrees. The Pitch plot shows values between 0 and 10 degrees. The Yaw plot shows values between 0 and 10 degrees. The plots are labeled 'Roll', 'Pitch', and 'Yaw' respectively. Below the plots are buttons for 'EXPORT RECORDING', 'PERFORMANCE REPORT', and 'REMOVE RECORDING'. A 'MORE' button is also present.

The Tactile Robotics logo is located in the bottom right corner of the interface, with the tagline 'Feel the Intangible'.

Date: November 18, 2022

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### **Important Note:**

The TR-DataRX™ App is available on Microsoft Store for free download.

## 1. Introduction

TR-DataRX™ is software that wirelessly connects to multiple sensors, called DataRX, that measure the Euler angles (roll, pitch, and yaw angles), linear accelerations, angular velocities, and Earth's magnetic field along with X, Y and Z axes. TR-DataRX™ also:

- (i) Provides information on angular accelerations and jerk values with statistical measures for each quantity after recording the data.
- (ii) Features on-the-go monitoring of the quantities with graphics.
- (iii) Allows users to export all data in Excel or CSV formats and export the plots.
- (iv) Connects to multiple wireless sensors and simultaneously records data of all sensors.

The current version of TR-DataRX™ is compatible with Windows Operating System (OS). The future versions will include the setup file for both Windows and Mac OS.

DataRX sensors come in two versions:

- BLE-based wireless sensors
- Wi-Fi-based wireless sensors

The power management system used in the hardware can preserve the power for up to 2 hours for Wi-Fi sensors and 6 hours for BLE sensors when used continuously.

DataRX sensors can be mounted on different devices using magnets or straps based on various enclosure designs. The application of these sensors is not limited to robotics, rehabilitation, kinesiology, physiotherapy, surgery, and sports medicine.

## 2. TR-DataRX™ Installation Requirements

The following features are the requirements that a machine needs to meet to execute the TR-DataRX™ software:

- OS Type: Windows 10
- OS Version: Version 2004 (OS build 19041.985) [Minimum Tested]  
Version 20H2 (OS build 19042.1052) [Recommended]
- Installed Memory (RAM): 6 GB [Minimum Tested]  
8 GB or more [Recommended]
- Processor: Core(TM) i5-3450 CPU @ 2.10 GHz or equivalent [Minimum Tested]  
Core(TM) i5 4<sup>th</sup> Gen. CPU and higher or equivalent [Recommended]

**Important Note:** *The machine needs to have a working Bluetooth 4+ adapter installed or the TR-DataRX™ software will execute in Wi-Fi-only mode. Most laptops and newer desktop PCs have built-in Wi-Fi and Bluetooth adapters. If your system does not have a built-in Bluetooth adapter, you can utilize an external Bluetooth 4+ dongle.*

## 3. TR-DataRX™ Installation Procedure

This section provides instructions to install TR-DataRX™.

**3.1.** Go to Microsoft Store App on your device by visiting the link below:

⇒ [Microsoft App Store TR-DataRx](#)

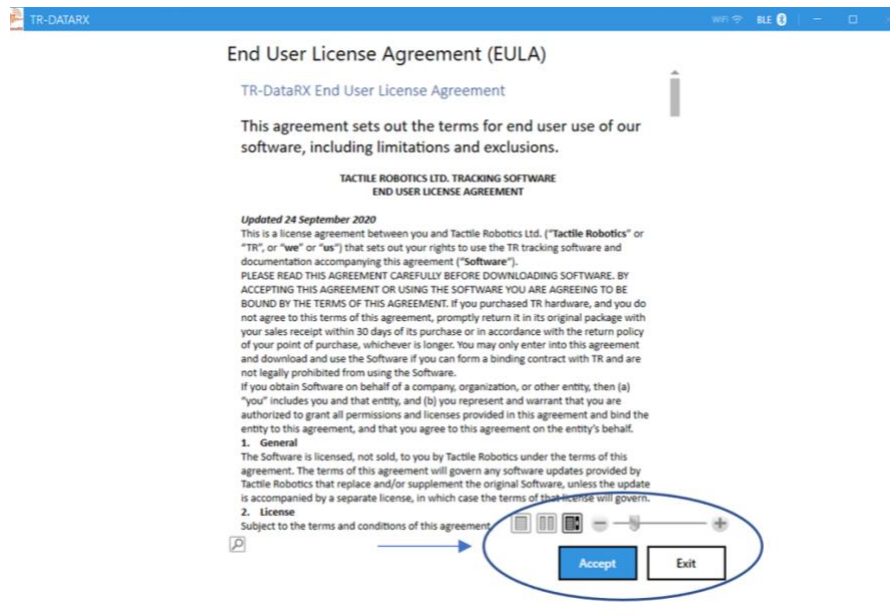
**3.2.** Search for “TR-DataRX” and click the **Get/Install** button. It will start downloading and installing the app on your machine.



**Figure 1.** Software download from Microsoft Store.

**Note:** When clicking the “Install” button, you may be asked to provide permission for the installation. Click “Yes” if you see this message generated by the OS.

**3.3.** After installation, search for the app in the “search icon” and pin it to the desktop and taskbar. When operating the app for the first time, you will see the “End User License Agreement” shown in **Figure 2**. Read the agreement and click the “Accept” button to agree with the terms and conditions.



**Figure 2.** End User License Agreement.

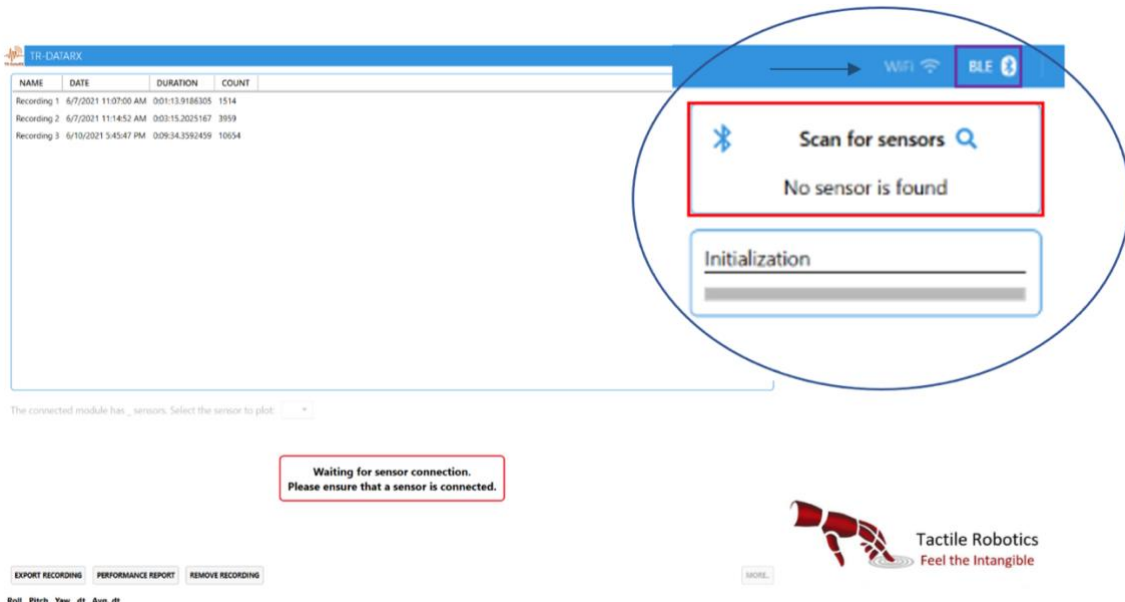
## 4. Software Usage Instruction

This section provides step-by-step instructions on how to work with the TR-DataRX™ app and Data-RX sensors.

### 4.1. Establish Wireless Connection

The first step is establishing a wireless connection between the sensor(s) and the software. The following sub-steps explain how to connect the sensor(s) to the software successfully:

**4.1.1.** Double-click on the software shortcut on the Desktop or other location in your device. **Figure 3** shows the first page of the software.



**Figure 3.** The first page of TR-DataRX software.

**4.1.2.** Click the “BLE” sign on the top right side. The BLE mode is enabled, and the software automatically detects a BLE adapter, as shown by a purple rectangle in **Figure 3**. Also, notice “**Scan for sensors**” by a red rectangle in **Figure 3**.

**Note:** When opening the TR-DataRX™ software for the first time, you may receive a message from Windows (see **Figure 4**). If so, check the boxes beside Private and Public networks and click the “Allow access” button.



**Figure 4. Windows security alert message.**

**4.1.3.** When the system does not detect the BLE adapter, you will see a message by hovering your mouse on the “BLE” sign (see **Figure 5**). In this case, you need to check your BLE adapter connectivity. Also, check whether it is installed on the appropriate driver.

Ensure the Bluetooth adapter is connected properly by checking if the Bluetooth tile exists in the Windows Action Center. Then, restart the software to connect to the BLE adapter successfully.

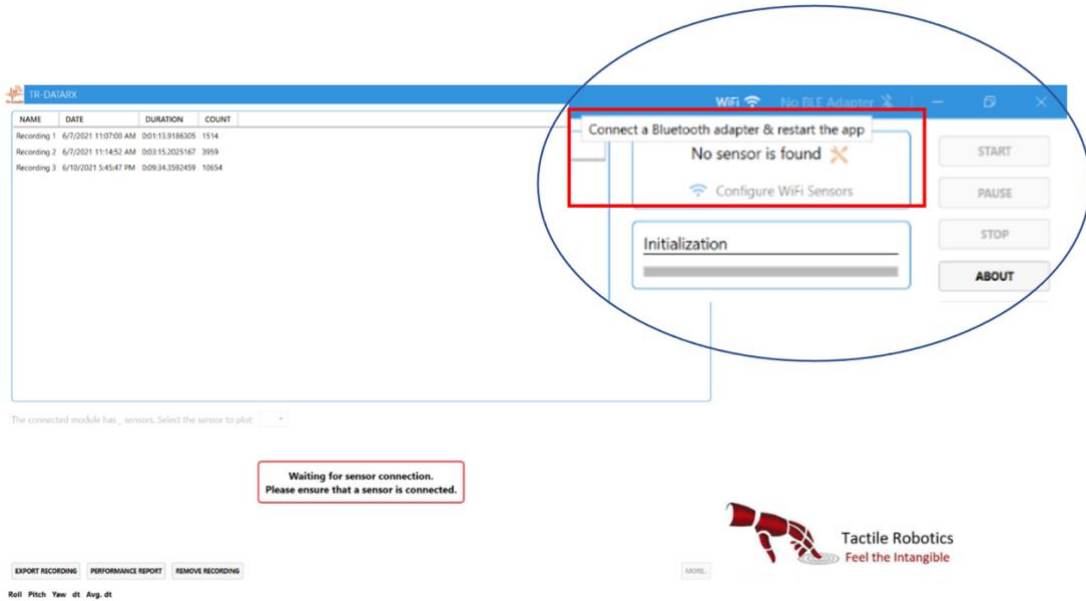


Figure 5. The Message indicating no BLE adapter is enabled or available on Windows OS.

4.1.4. If the BLE adapter is available but turned off by the system, you will see a button called “Turn on Bluetooth” in the TR-DataRX™ software (see **Figure 6**). In this case, you need to turn on the BLE connection by clicking this button.

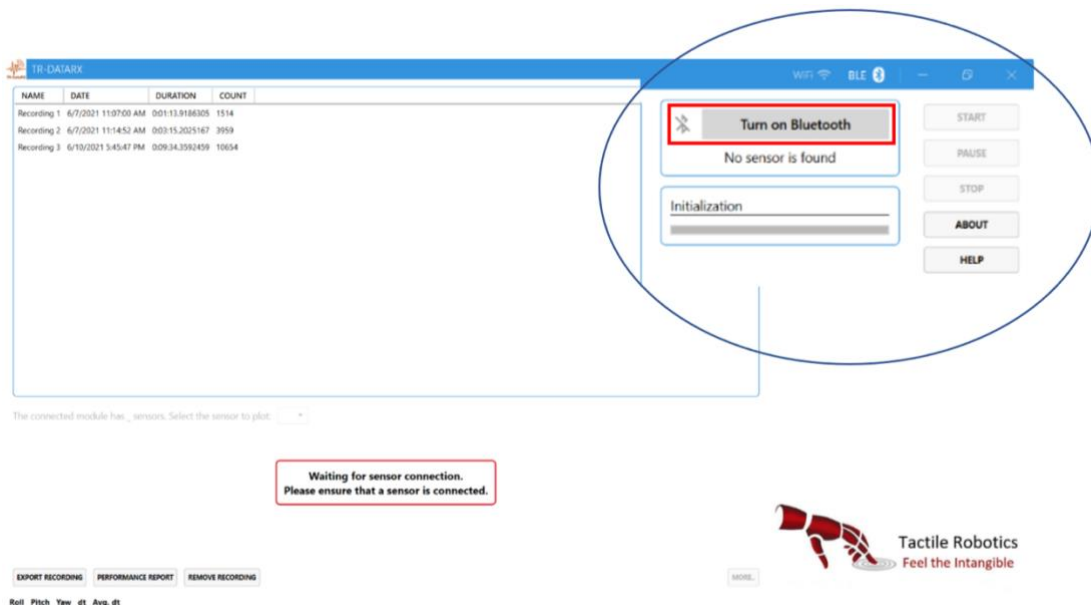


Figure 6. The icon indicating the BLE connection is turned off.



**4.1.5.** After following steps **4.1.3** and **4.1.4**, you will see the icon “**Scan for sensors.**” Now, it is time to turn the wireless sensor(s) on by pressing the black push button and waiting for the red LED to blink. Before turning the sensor(s) on, place them on the table where the device is located. It is recommended to place the sensor(s) in the direction shown in **Figure 7**, where the micro-USB side is toward the user.

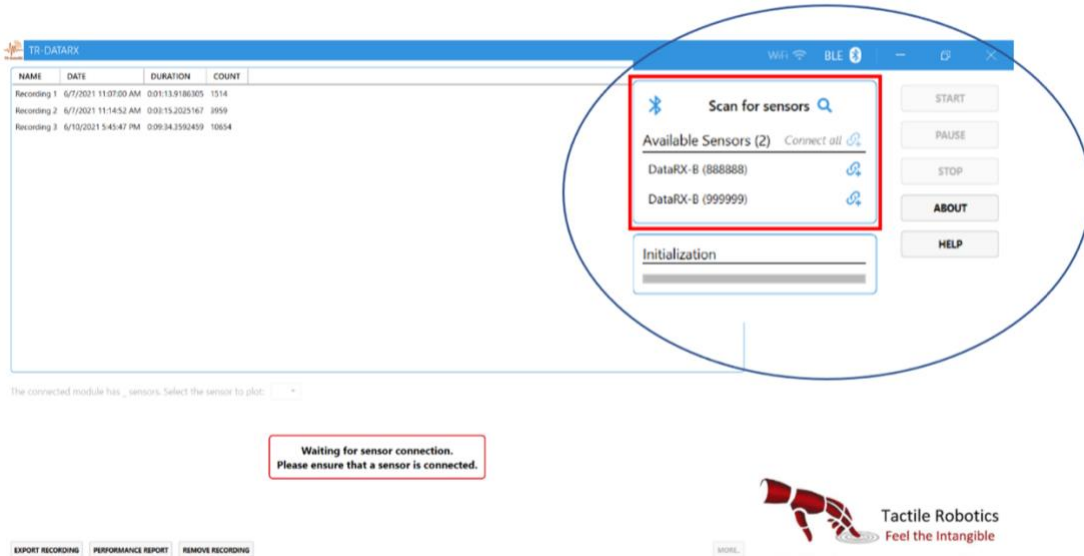
After turning the sensor(s) on, the red LED on the sensor(s) will start blinking. This means the connection between the sensor(s) and the software is yet to be established.



**Figure 7.** The Red LED blinks when the connection is not established.

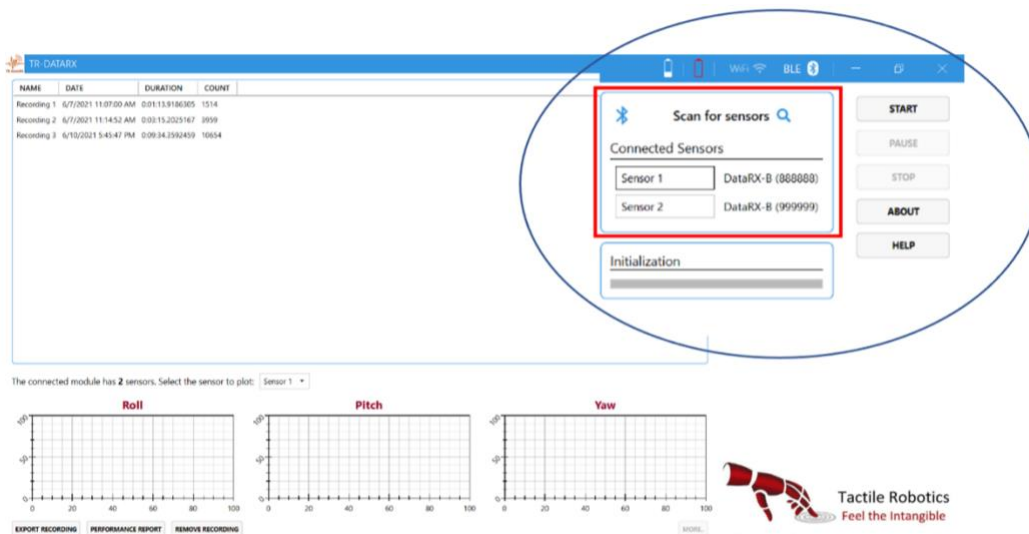
**Note:** There is a deep sleep mode for the sensor(s). If the sensor(s) are not connected to the software within 1 minute, they will go to deep sleep mode. In this case, you need to reset the sensor(s) by clicking on the black push button of the sensor(s) twice. After resetting the sensor(s), they will start blinking again and are ready to get connected.

**4.1.6.** Click the “**Scan for sensors**” button to find the available BLE sensor(s). The available BLE sensors are listed in the box shown in **Figure 8**.



**Figure 8.** Scanning for available BLE sensor(s).

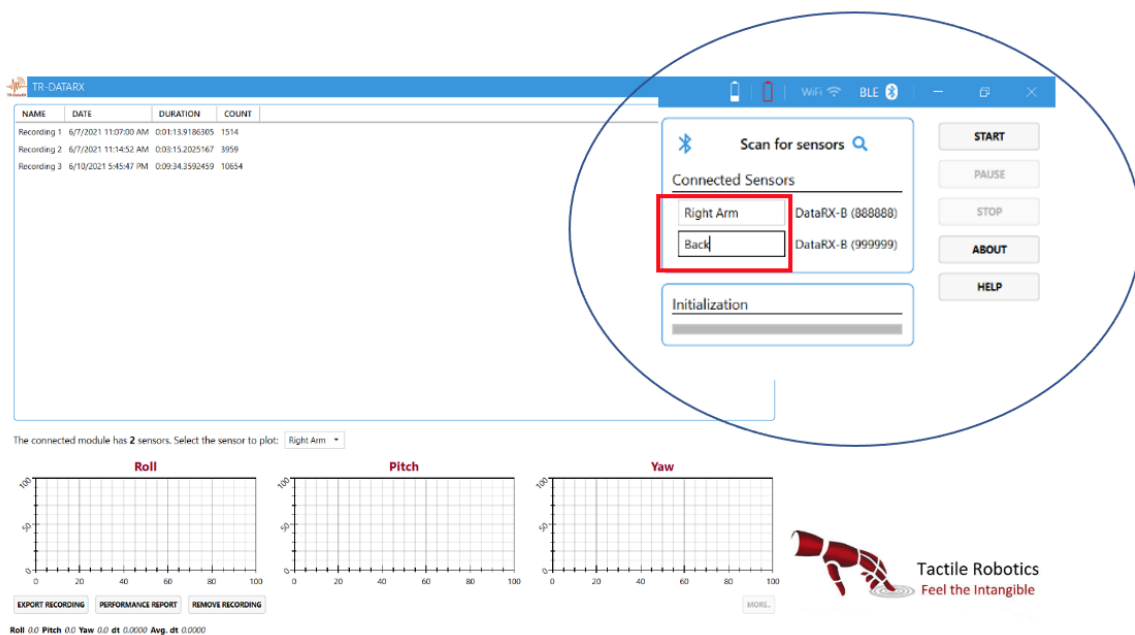
**4.1.7.** Click “*Connect all*” to establish the connection between sensors and software. Also, click on each specific sensor to connect individually.



**Figure 9.** List of BLE sensor(s) connected to the software.

After the connection is established, the red LED on the sensors turns to solid red. The status of sensors changes in the software to the one shown in **Figure 9**. Each BLE sensor has a device ID (E.g. DataRX-888888 for Sensor 1).

**4.1.8.** The software allows users to rename each sensor according to their application. **Figure 10** shows an example of how to change the sensor's name in the software.



**Figure 10. Renaming the sensors on the software.**

Once the sensor(s) are connected to the software, a battery level sign for each sensor is added to the top bar. **Figure 11** indicates that the battery level of the “Back” sensor is 25%.

After connecting the sensor(s) to the software and clicking the “**START**” button, any additionally connected sensors will not be included in the ongoing recording. All sensors need to get connected before pressing the “**START**” button.

**Note:** The red light will blink when the battery levels drop below 20%. To ensure a stable connection, charge the sensor battery if the battery level is **below 10%**.

**Caution:** Do not use the sensors when they are being charged.

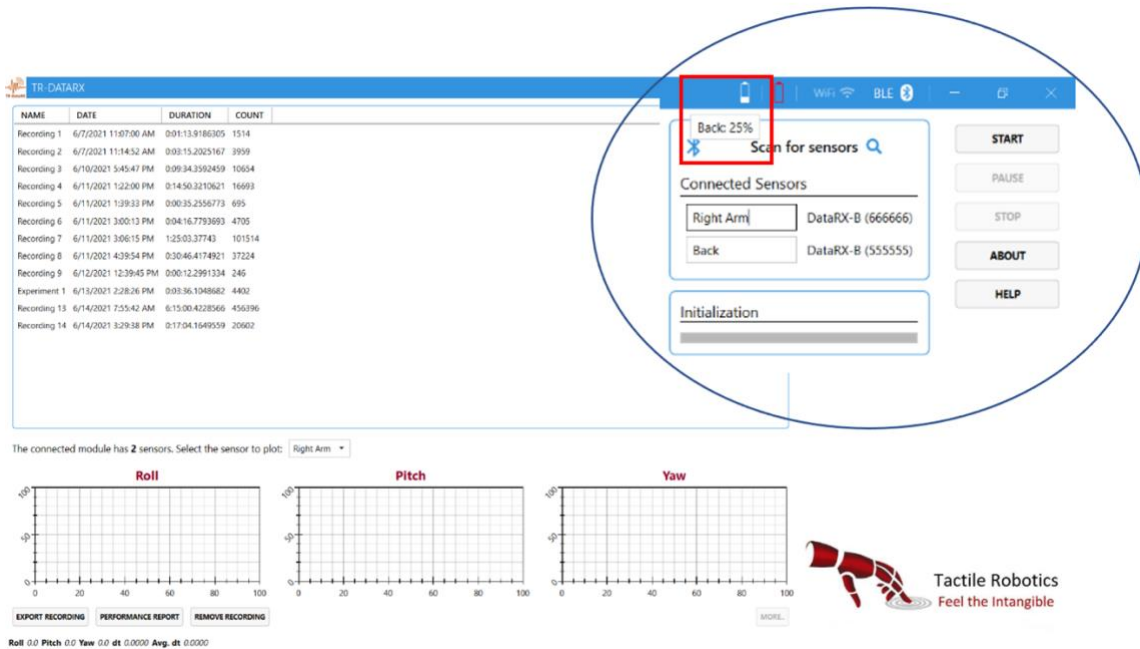


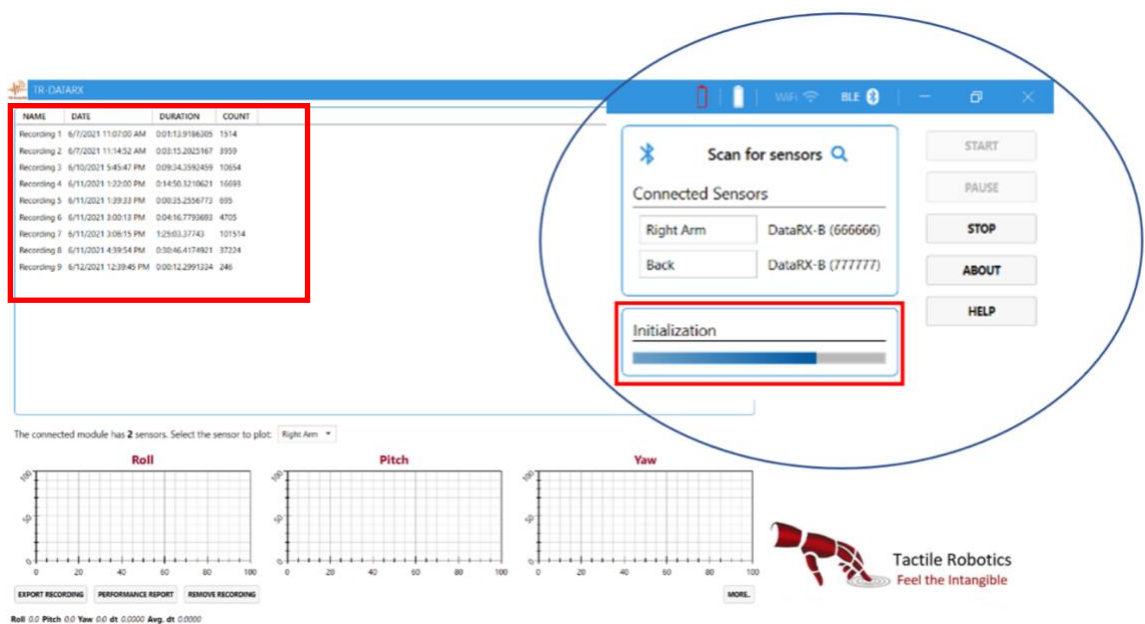
Figure 11. The Software shows the sensor's battery level after the connection is established.

## 4.2. Data Collection from Sensor(s)

This subsection provides helpful information on how to collect data from the sensor(s) used for different applications. The following sub-steps explain various features of the software:

**4.2.1.** When the sensor(s) are placed on the table and untouched, click the “**START**” button on the software’s top right side. Then, the sensor(s) start initializing for a few seconds. **Figure 12** shows how the software initializes the sensor(s) values.

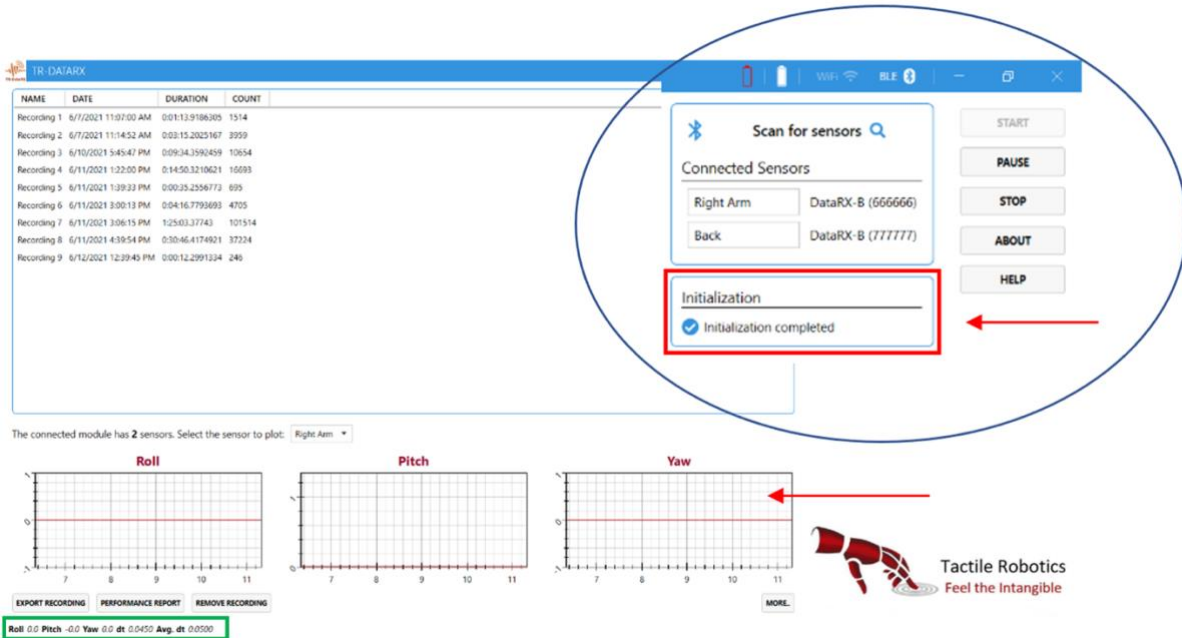
**Caution:** Do not move the sensor(s) during the initialization process.



**Figure 12.** Sensor(s) initialization by TR-DataRX software.

**Important Feature:** A list on the software’s left side includes the history of the performed experiments. This list provides a data summary, experiment duration, and the number of captured sensor(s) data points. The users can access the history by clicking on each experiment.

**4.2.2.** After initialization, a message will appear “Initialization completed.” Then, the software collects data from the sensor(s). As shown in **Figure 13**, the values of Euler angles (Roll, Pitch and Yaw) are almost zero in the plots which makes sense as the sensors have not been moved yet.



**Figure 13.** Initialization is completed and software starts collecting data from sensor(s).

**Important Note:** On the footer of the main window (see **red box in Figure 13**), notice a value in front of “**Roll**,” “**Pitch**” and “**Yaw**.” If you do see “NaN” for any of “**Roll**,” “**Pitch**” or “**Yaw**,” it means that the sensor connection is not well established. In this situation, turn off the sensor by pressing the black button. Then wait a few seconds, turn it on again, and follow **Steps 4.1.6** again.

**4.2.3.** Attach the sensor(s) to the device and collect data for your desired experiments. As can be seen in **Figure 14**, the plots are related to the “Right Arm” sensor. There is a dropdown box that allows the user to choose other connected sensors to see the results on the graph.

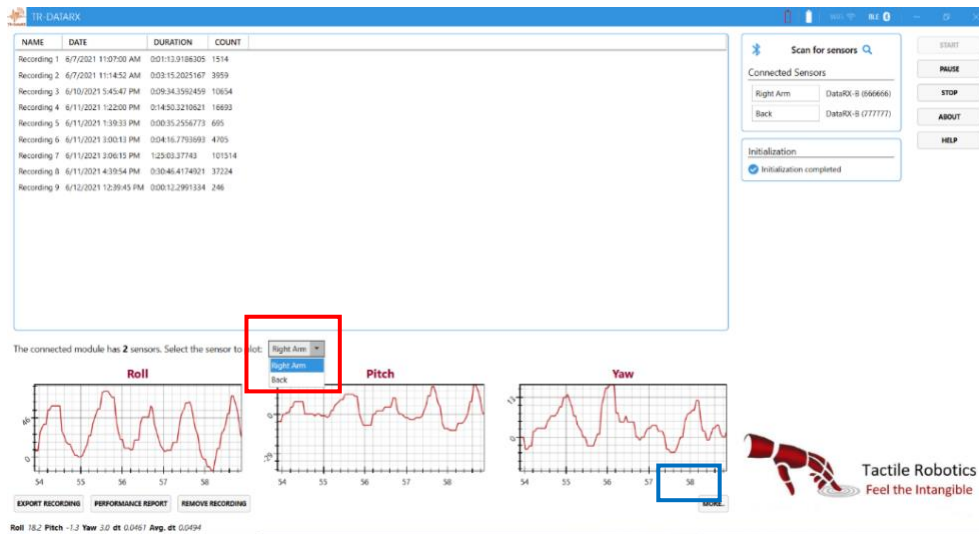


Figure 14. Example of data collection from “Right Arm” sensor.

4.2.4. There is also an option to track all other sensory data visually. To do so, click on “MORE...” button located on bottom right side of window to see all plots in Figure 15.

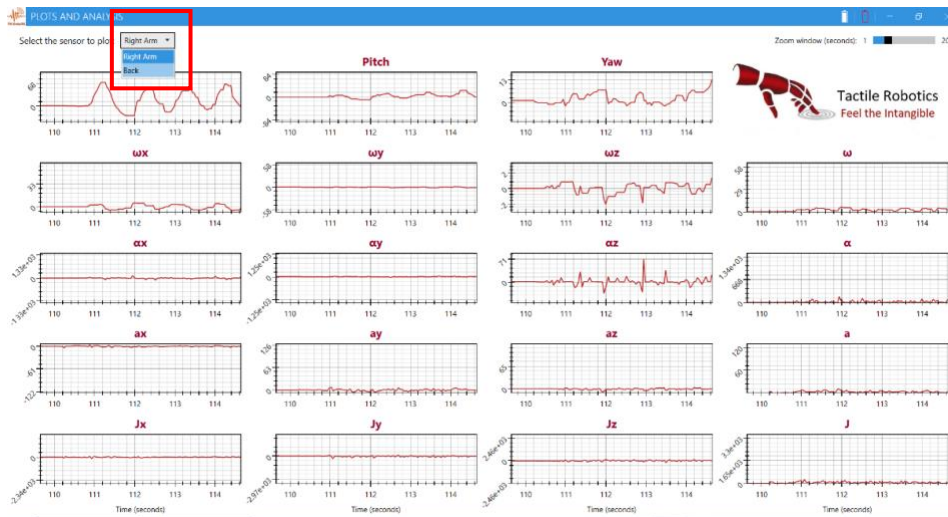


Figure 15. Real-time plots shows physical quantities measured by “Right Arm” sensor.

**Important Note:** The software and wireless sensors provides 19 measurements.

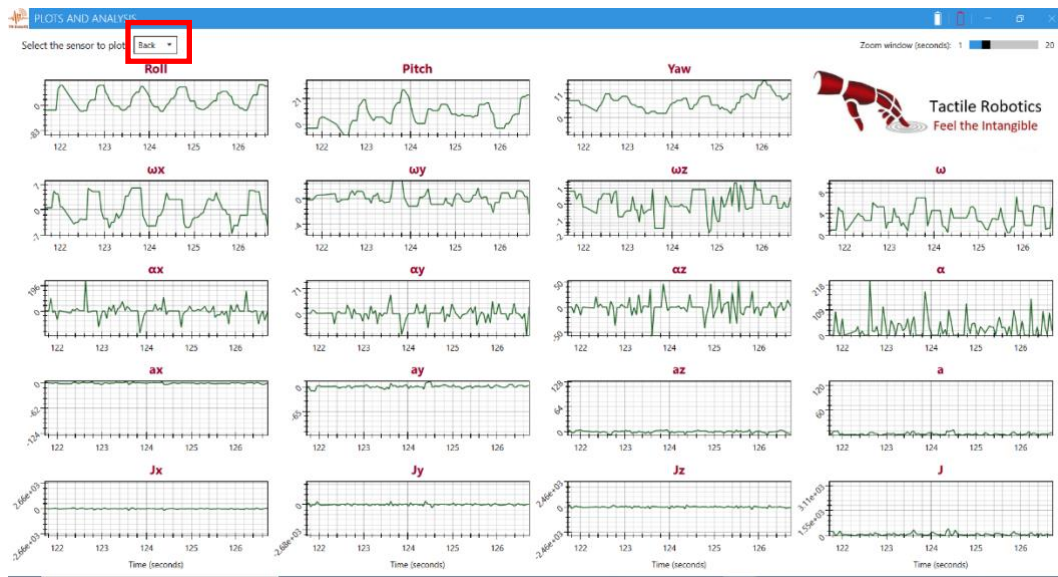
**Table 1:** Explains what each of the measurements shown in **Figure 15** means.

**Table 1. Definition of quantities measured by DataRX-W™**

Symbol	Definition	Unit
<b>Roll</b>	Rotation angle about the x-axis	degree
<b>Pitch</b>	Rotation angle about the y-axis	degree
<b>Yaw</b>	Rotation angle about the z-axis	degree
$\omega_x$	Angular velocity about the x-axis	rad/sec
$\omega_y$	Angular velocity about the y-axis	rad/sec
$\omega_z$	Angular velocity about z-axis	rad/sec
$\omega$	Angular velocity magnitude	rad/sec
$\alpha_x$	Angular acceleration about the x-axis	rad/sec <sup>2</sup>
$\alpha_y$	Angular acceleration about the y-axis	rad/sec <sup>2</sup>
$\alpha_z$	Angular acceleration about the z-axis	rad/sec <sup>2</sup>
$\alpha$	Angular acceleration magnitude	rad/sec <sup>2</sup>
$a_x$	Linear acceleration along the x-axis	m/sec <sup>2</sup>
$a_y$	Linear acceleration along the y-axis	m/sec <sup>2</sup>
$a_z$	Linear acceleration along the z-axis	m/sec <sup>2</sup>
$a$	Linear acceleration magnitude	m/sec <sup>2</sup>
$J_x$	Jerk index along the x-axis	m/sec <sup>3</sup>
$J_y$	Jerk index along the y-axis	m/sec <sup>3</sup>
$J_z$	Jerk index along the z-axis	m/sec <sup>3</sup>
$J$	Jerk index magnitude	m/sec <sup>3</sup>



**4.2.5.** Switch between sensors to see the results related to the chosen sensor, as shown in **Figure 16**.



**Figure 16.** Real-time plots showing various physical quantities measured by the “Back” sensor.

**4.2.6.** To return to the main window, the user can press the “Escape (esc)” button on the keyboard. **Figure 17** shows the software’s main window after pressing the “esc” button.

Since the “Back” sensor was chosen before, the main window demonstrates the plots of Roll, Pitch, and Yaw for the “Back” sensor. The user can always switch between sensors by following step **4.2.3**.



Figure 17. Return to the main window by pressing the “esc” button on the keyboard.

4.2.7. The software also allows the user to pause the recording by clicking the “PAUSE” button on the right side of the main window (see **Figure 18**).

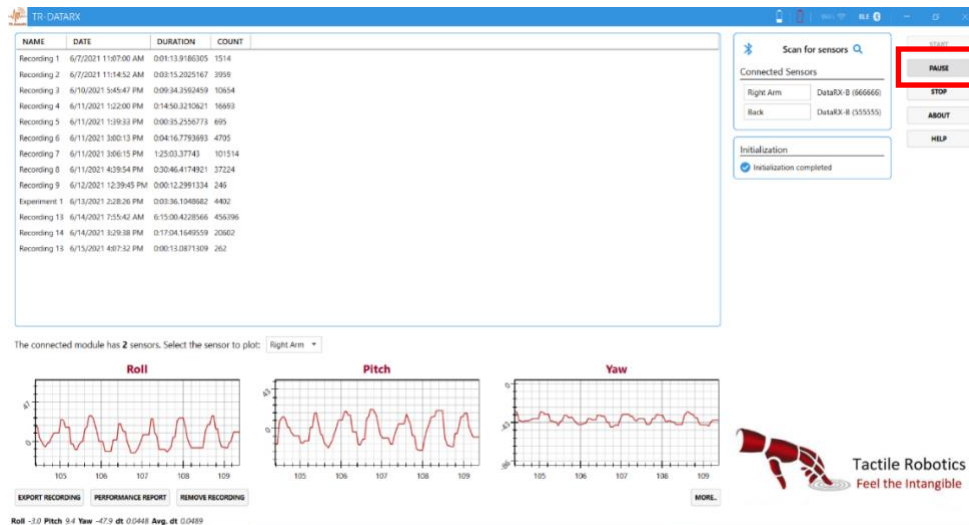
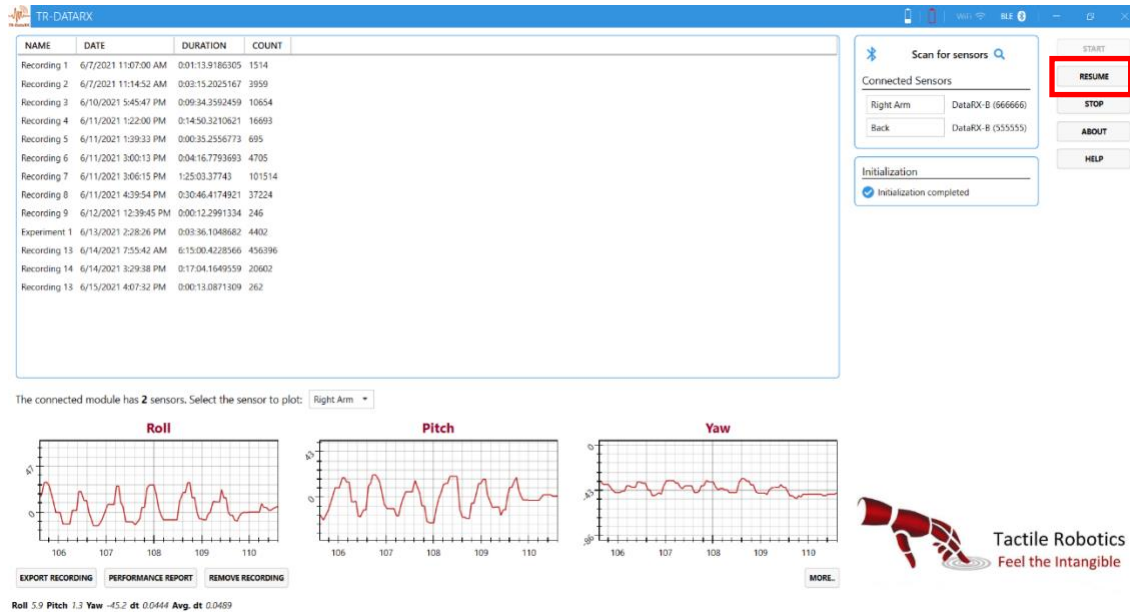


Figure 18. Pausing recording procedure by clicking the “PAUSE” button.

When the “PAUSE” button is clicked, the connection between the sensor(s) and the software remains; however, the software does not record any data. **Figure 18** shows

that the plots of Roll, Pitch and Yaw are temporarily frozen after pressing the “**PAUSE**” button. To continue data recording, click the “**RESUME**” button (See **Figure 19**).

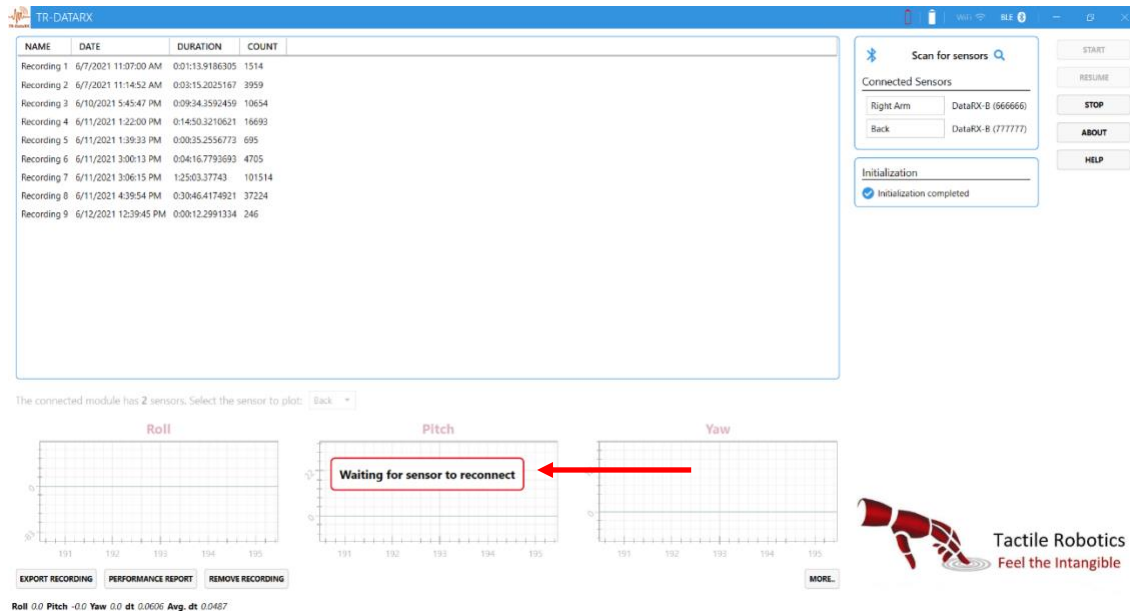


**Figure 19.** Resuming recording procedure by clicking the “Resume” button.

**4.2.8.** If the connection between the sensor(s) and the software is lost, a message will appear, and the software will wait to be reconnected to the sensor(s). This may happen if (i) the user touches the black push button of the sensor(s) by mistake, or (ii) when the sensor(s) exceeds the accessible range of the system's Bluetooth adapter, or (iii) connection fluctuations are resulted by the interferences originating from the working environment (such as devices that generate electromagnetic radiation).

As shown in **Figure 20**, a message appears when the connection is lost. In this case, the user needs to wait until the sensor(s) reconnects to the software again by considering the following points.

**Note:** If the second scenario occurs (distance issue), the sensor(s) must be taken back close to the station where the PC/ laptop running the software is located.



**Figure 20.** Message showing the connection between one or more sensors and the software is lost

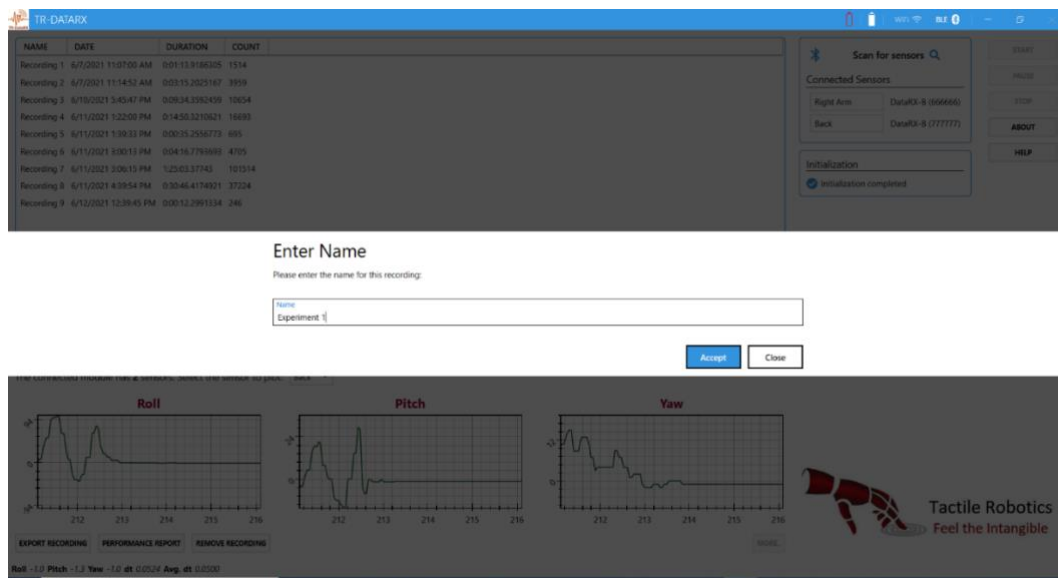
We have conducted several experiments on the distance between the sensors and the software. There are two ranges that need attention when working with DataRX-W™:

- **Discovery range:** Before scanning for available sensors, the sensors should be a maximum of 10 m away from the PC/ laptop running the software.
- **Data transmission range:** After the sensors are connected, the sensors can be up to 30 m away from the software for reliable data transfer. If the sensors go further than 30 m, the data might not be reliable, and the connection will likely be lost.

**Note:** If more than one sensor is used for the recording, the software will pause recording the data from all sensors, even if the connection with only one sensor is lost. This feature causes the synchronization between the data of all sensors to be maintained.

**4.2.9.** After completing each experiment, the user can stop recording the data by clicking the “**STOP**” button. Then, a new window will pop up requesting the user to enter a name for the experiment (see **Figure 21**). You can enter your desired name for the experiment and click on the “**Accept**” button.

**Note:** After pressing the “**STOP**” button, it is recommended to turn the sensor(s) off by pressing the black push button on the sensor(s). This helps to preserve their battery



**Figure 21.** A new window pops up after pressing the “**STOP**” button, requesting to enter a name for the folder containing experimental data.

**4.2.10.** After clicking the “**Accept**” button, the software will open a pop-up containing a set of statistical measures for each quantity. This window (called “*Performance Report*”) is designed to provide a quick overview of the experimental data. The user can close this window and export all data and plots then.

As shown in **Figure 22**, the window containing the statistical measures. This window is also accessible later by going to the list on the left side of the main window and double-clicking on the related experiment (see **Figure 23**).



NAME	MIN	MAX	RANGE	SUM	AVERAGE	STANDARD DEVIATION
Roll	-4.554493e+001	1.011643e+002	1.467093e+002	3.393690e+004	7.709428412334618	1.862450e+001
Pitch	-91.0452	91.0452	182.0904	-3.451084e+003	-7.841173e-001	1.361985e+001
Yaw	-1.092597e+001	1.921583e+001	3.014180e+001	5.494865e+003	1.248265626935484	3.014744510379208
Angular Velocity X	-7.55	63.79	71.34	2.257600e+002	5.128578e-002	2.2804779683895546
Angular Velocity Y	-63.76	61.98	125.74	5.348000e+001	1.214902e-002	2.1815928280055927
Angular Velocity Z	-3.03	3.28	6.31	-2.281000e+001	-5.181736e-003	4.156668e-001
Angular Velocity	0	6.379019e+001	6.379019e+001	3.910304e+003	8.883016e-001	3.057193290884154
Angular Acceleration X	-1.424485e+003	1.437635e+003	2.862122e+003	2.048864e+002	4.656666e-002	4.507920e+001
Angular Acceleration Y	-1.414640e+003	1.281199e+003	2.695847e+003	-6.234838e+001	-1.416365e-002	3.822849e+001
Angular Acceleration Z	-6.486362e+001	8.861859e+001	1.534821e+002	2.250358e+001	5.112127e-003	6.730602252391956
Angular Acceleration	0	1.437640e+003	1.437640e+003	3.593614e+004	8.16259296942539	5.692547e+001
Linear Acceleration X	-125.26	6.19	1.314500e+002	-3.653600e+002	-8.299864e-002	2.044064979326028
Linear Acceleration Y	-13.26	129.04	1.423000e+002	1.311450e+003	2.979214e-001	5.9216496014969815
Linear Acceleration Z	-12.14	127.99	140.13	1.350990e+003	3.069037e-001	8.267666932973176
Linear Acceleration	0	1.290645e+002	1.290645e+002	7.803471e+003	1.772710455264334	1.022965e+001
Jerk X	-2.709885e+003	2.324957e+003	5.034842e+003	-8.823133e+002	-2.004346e-001	5.809104e+001
Jerk Y	-3.551011e+003	2.839405e+003	6.390417e+003	-6.674832e+002	-1.516318e-001	1.554166e+002
Jerk Z	-3.555801e+003	2.850483e+003	6.406284e+003	1.133660e+002	2.575328e-002	1.728397e+002
Jerk	0	3.555802e+003	3.555802e+003	1.825304e+005	4.146534e+001	2.359728e+002
Magnetic Field X	-49.25	2042.93	2.092180e+003	3.188380e+003	7.243026e-001	1.235399e+002
Magnetic Field Y	-43.37	2033.12	2076.49	-3.556656e+004	-8.079636528885034	7.049557e+001
Magnetic Field Z	-2018.62	57.12	2075.74	1.429859e+005	3.248204e+001	1.658825e+002
Magnetic Field	4.012865e+001	2.043535e+003	2.039407e+003	3.239397e+005	7.358921e+001	2.084568e+002

Figure 22. Performance report containing a set of statistical measures for each quantity.

The screenshot shows the TR-DataRX main window. At the top, there's a header with the logo and 'TR-DataRX'. Below it is a table of recorded experiments with columns for NAME, DATE, DURATION, and COUNT. The 'Experiment 1' row is highlighted in blue, and a red arrow points to it from the right. To the right of the table is a control panel with a 'Scan for sensors' button, a list of 'Connected Sensors' (Sensor 1: DataRX-B (666666), Sensor 2: DataRX-B (777777)), and buttons for START, PAUSE, STOP, ABOUT, and HELP. Below the table, there's a dropdown menu for 'The connected module has 2 sensors. Select the sensor to plot: Sensor 1'. At the bottom, there are three empty graphs for 'Roll', 'Pitch', and 'Yaw', each with a y-axis from -10 to 10 and an x-axis from 0 to 100. At the bottom left, there are buttons for 'EXPORT RECORDING', 'PERFORMANCE REPORT', and 'REMOVE RECORDING'. At the bottom right, there's a 'MORE' button and the Tactile Robotics logo.

Figure 23. Main window containing performance reports of all recorded experiments along with the experiment date.

4.2.11. Access to the performance reports is also available by choosing the experiment in the list and clicking the **“PERFORMANCE REPORT”** button on the bottom left side



of the main window (see **Figure 24**). There is an option to delete the report by choosing the related experiment in the list and clicking the **“REMOVE RECORDING”** button, as shown in **Figure 25**.

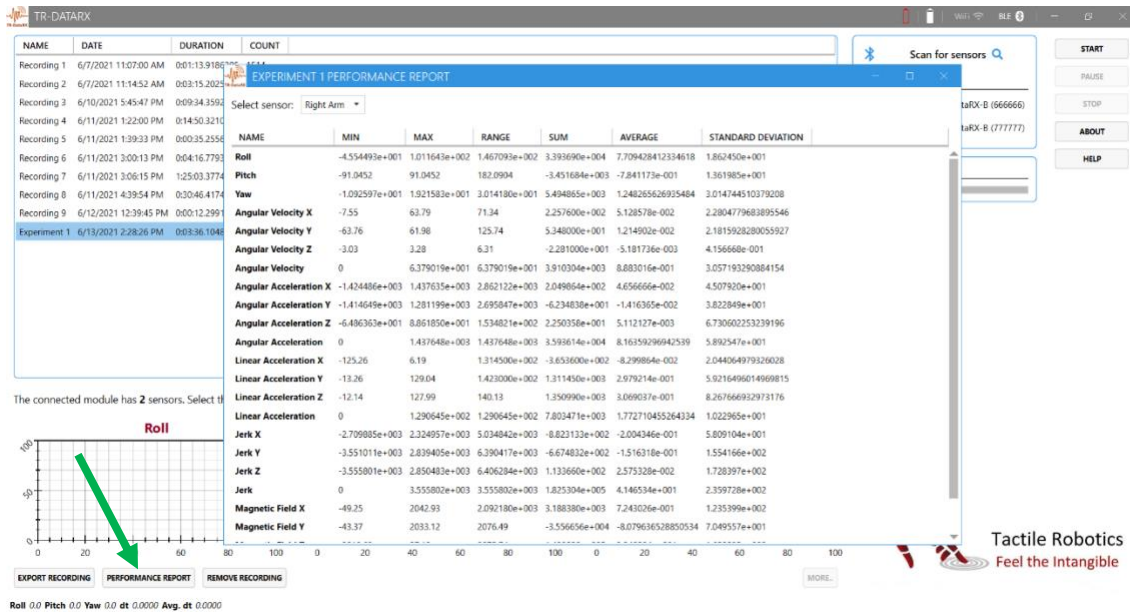


Figure 24. Option of retrieving experimental reports from the history list.

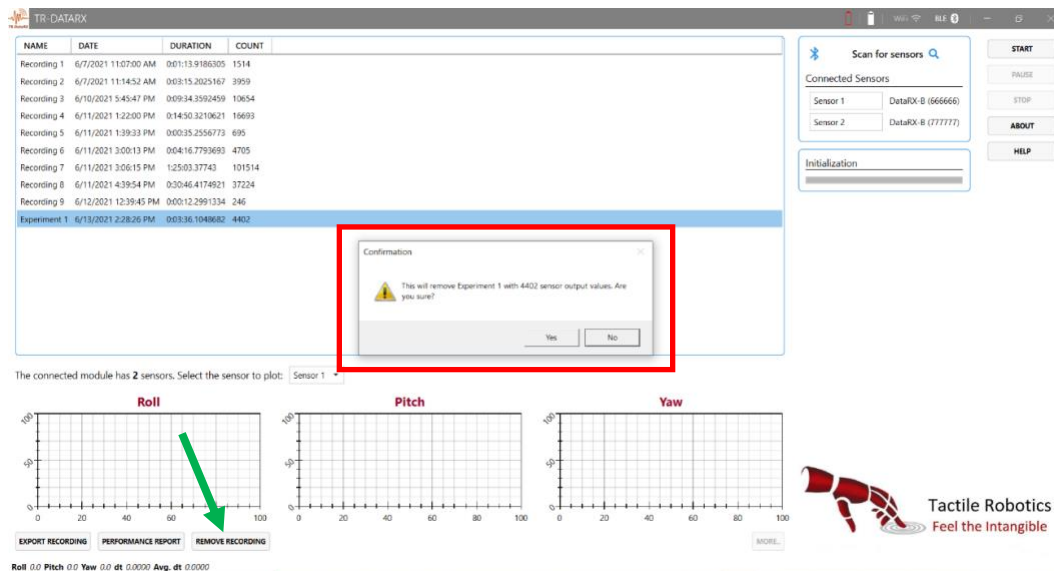


Figure 25. Option of removing reports from the history list.

## 4.3. Export Experiment Data

**4.3.1.** Finally, the software allows the user to export all experimental data and plots of a specific experiment by choosing it inside the list of recordings and then clicking on the “**EXPORT RECORDING**” button on the bottom left side of the main window. By clicking on this button, a new window will pop up containing various options for exporting the data and plots. According to **Figure 26**:

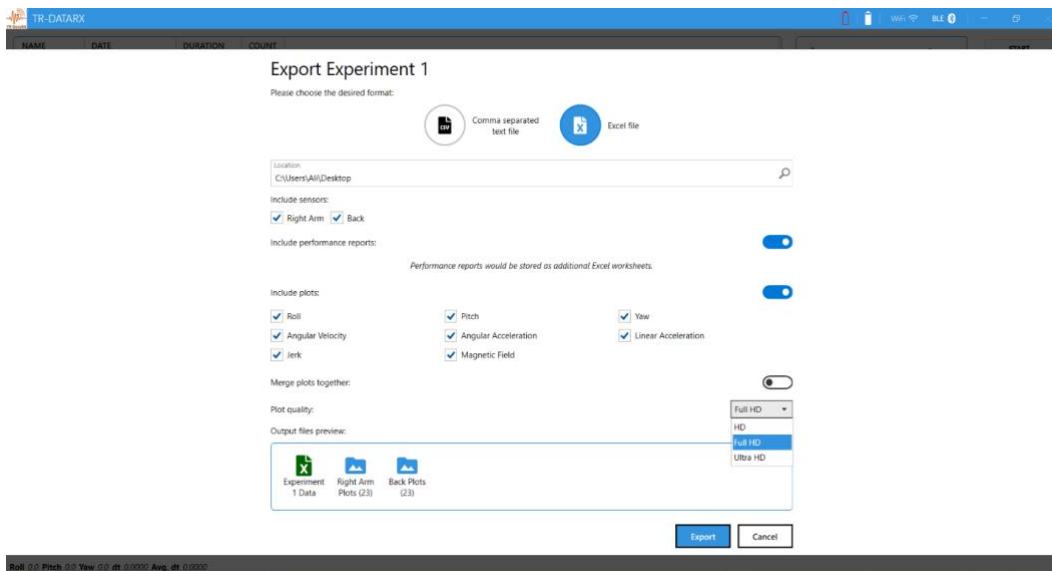


Figure 26. Export window.

- (i) The user can export the experimental data in either CSV or Excel formats.
- (ii) The user can also determine where the export files will be located.
- (iii) There is also an option to export data from all sensors or choose the ones that are of interest by checking or unchecking the box beside each sensor name.
- (iv) The export folder will contain all original data along with the performance report (containing the statistical measures for each sensor); if the user does not need to



export the performance reports, they can turn off this option by toggling the indicator to the left.

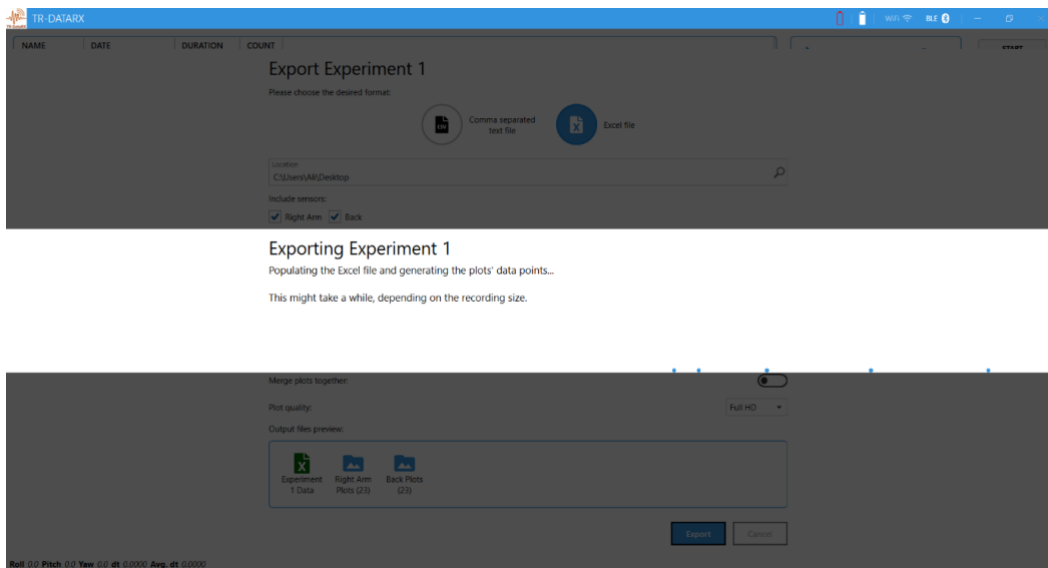
(v) The same option is also available for including or not including the plots in the export folder.

(vi) All quantities are exported to the CSV or Excel file by default. If required, users can unselect other quantities by unchecking the related boxes.

(vii) When there exists more than one sensor, the users can merge the plots of all sensors for each quantity by toggling the indicator to the right.

(viii) There is also an option to choose the quality of the plots (HD, Full HD and Ultra HD) when exporting.

**4.3.2.** After the settings are done, the user can click the **“Export”** button to export the data and plots. By clicking the **“Export”** button, a new window will pop up showing that the results are being exported (See **Figure 27**).



**Figure 27.** The window shows that the export is in progress.



# TR-DataRX™ User Manual

## 5. Technical Specifications

### Overall Characteristics

Parameter	Min	Typical	Max	Unit
Supply voltage (only sensor)	2.4		3.6	V
Operating temperature	-25	+25	+45	°C
Battery charging time		~ 5		hr
Software sampling rate (Considering data communication delay)		~ 22		Hz

### Linear Acceleration Characteristics

Parameter	Min	Typical	Max	Unit
Range (FS)	+/-2	+/-8	+/-16	g
Sensitivity (@ FS=+/-2g)		1		LSB/mg
Sensitivity tolerance (@ FS=+/-2g and typical temp.)	-4	+/-1	+4	%
Sensitivity Temperature Drift (@ FS=+/-2g)		+/-0.03		%/K
Sensitivity supply voltage drift (@ FS=+/-2g and typical temp.)		0.065	0.2	%/V



<b>Zero-g offset</b> <b>(@ typical temp. and nominal supply voltage and FS=+/-2g)</b>	-150	+/-80	+150	mg
<b>Zero-g offset temperature drift</b> <b>(@ FS=+/-2g)</b>	-3.5	+/-1	+3.5	mg/K
<b>Zero-g offset supply voltage drift</b> <b>(@ FS=+/-2g and typical temp.)</b>		1.5	2.5	mg/V
<b>Nonlinearity</b>		0.5	2	% FS
<b>Output noise density</b> <b>(@ FS=+/-2g and typical temp.)</b>		150	190	$\mu\text{g}/\sqrt{\text{Hz}}$
<b>Cross axis sensitivity</b>		1	2	%
<b>Alignment error</b> <b>(relative to package outline)</b>		0.5	2	°

### Euler Angles Characteristics

<b>Parameter</b>	<b>Min</b>	<b>Typical</b>	<b>Max</b>	<b>Unit</b>
<b>Roll/Pitch/Yaw range</b>	-180		+180	°
<b>Roll accuracy (relative to main electronic circuit and considering alignment error)</b>		+/-0.5	+/-2	°
<b>Pitch accuracy (relative to main electronic circuit and considering alignment error)</b>		+/-1	+/-2.5	°
<b>Yaw accuracy (relative to main electronic circuit and considering alignment error)</b>		+/-1	+/-2.5	°

## Angular Velocity (Gyro) Characteristics

Parameter	Min	Typical	Max	Unit
Range (FS)	125		2000	°/sec
Sensitivity via register map (@ typical temp.)		16 900		LSB/°/sec Rad/sec
Sensitivity tolerance (@ FS=2000 and typical temp.)	-3	+/-1	+3	%
Sensitivity changes over temperature (@ nominal voltage)	-0.07	+/-0.03	+0.07	%/K
Sensitivity supply voltage drift (@ typical temp.)		<0.4		%/V
Zero-rate offset (@ typical temp. and slow and fast offset cancellation off)	-3	+/-1	+3	°/sec
Zero-omega offset changes over temperature (@ FS=+2000 and nominal voltage)	-0.03	+/-0.015	+0.03	°/sec/K
Zero-omega offset supply voltage drift (@ typical temp.)		0.1		°/sec/V
Nonlinearity	-0.2	+/-0.05	+0.2	%FS
Cross axis sensitivity	-3	+/-1	+3	%

## 6. Hardware

The TR-DataRX™ software comes with wireless BLE- or Wi-Fi-based sensors. There are a couple of points that need to be considered when working with wireless sensors:

- If the battery level is below 10%, please put the sensors in charge.
- When the sensors are being charged, using them for data recording is not recommended.
- To charge the battery, use a reliable cable with a male micro-USB port at one end.



**WARNING:** Use a USB charging system with output voltage of **5V** and output current of minimum **1Amp** only. If you use a battery charger with output voltage of more than 5 V, it will burn the sensor.

- When the sensor's battery is fully charged, you will see that the green LED becomes solid. You will need to unplug the charging cable when you see a green LED.

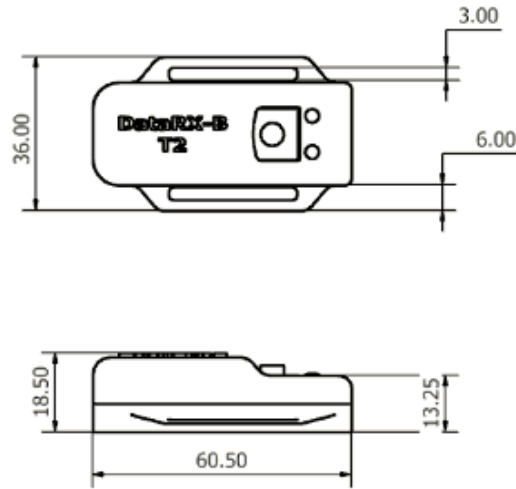
**IMPORTANT:** The sensors need to be charged at least once every two weeks, even if they are not used for two weeks. Leaving the sensor battery uncharged for over two weeks may damage the battery.

The sensor enclosure is currently in two shapes:

- Strap version
- Magnet version

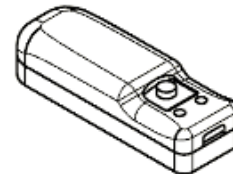
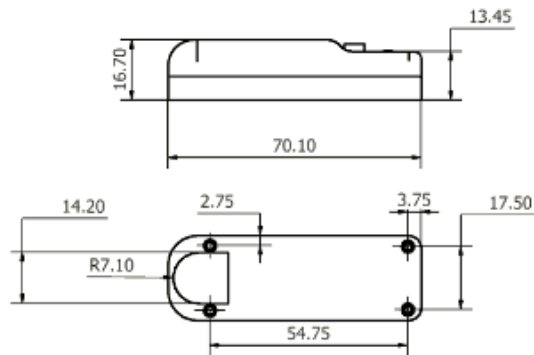
One is designed to be used by straps, and the other version has magnets to attach to the metal devices. In case of specific needs, Tactile Robotics can custom design your desired enclosures for wireless sensors.

The overall dimension of each design is shown in **Figure 28**.



REFERENCE VIEW

### Strap version



REFERENCE VIEW

### Magnet version

Figure 28. The 3D overall dimension of sensor enclosures.



**Tactile Robotics**  
Feel The Intangible

## TR-DataRX™ User Manual

For technical support, please contact our support staff:



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