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LabHub[®] User Guide

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LabHub® System User Guide

The LabHub system is an integrated laboratory tool designed to facilitate safe and accurate data acquisition. This guide presents the main features of the LabHub and shows, step-by-step, how to use it in conjunction with the LabHub app. For additional information on the LabHub system, go to www.lab-aids.com/labhub.

The LabHub System

LabHub

Key features:

- Bluetooth enabled for connections with up to seven LabHub app-enabled devices
- Built-in RGB spectrophotometer
- Automatic recognition of attached sensors and heater
- Internal rechargeable Li-ion battery
- Durable and liquid-resistant enclosure

The top display, shown in Figure 1, contains the power button and LED indicators:

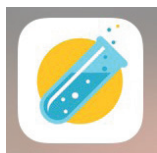
- A. Power on/off
- B. Bluetooth
- C. Setup
- D. Heater
- E. Temperature and voltage sensors
- F. RGB spectrophotometer
- G. LabHub ID (You need your LabHub's unique ID when connecting it to the app.)

LabHub peripherals (Figures 2-5)

- H. Connection ports for sensors (H1), heater (H2), and AC power cord (H3)
- I. Temperature probe (+/- 0.1 °F and °C)
- J. Voltage probe (+/- 0.1 DC V)
- K. Flameless heater with temperature adjustable up to 150°C
- L. AC power cord
- M. Distillation apparatus
- N. Desiccator crucible

LabHub app for Android, Chrome, and iOS

(To obtain the app, use the QR code on the bottom of the LabHub as shown in Figure 2.)



- Controls LabHub functions
- Sets data acquisition parameters
- Displays, graphs, and saves data
- Exports data (in csv format) to other devices via email or messages

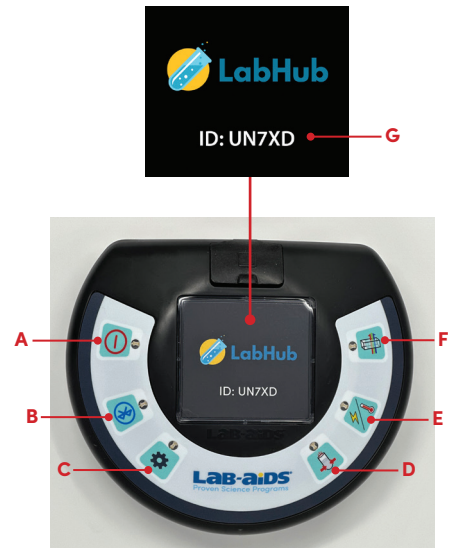


Figure 1: Top view



Figure 2: Back and bottom view

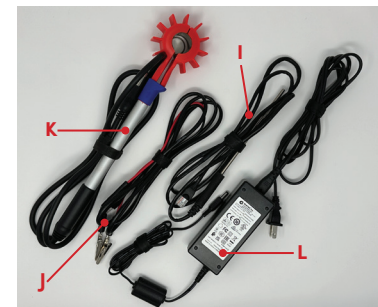


Figure 3

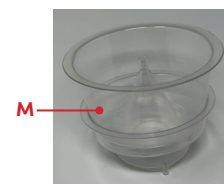


Figure 4



Figure 5

Powering on the LabHub

Safety Note: Do not power on the LabHub if the heater is connected.

Press the on/off button, shown in Figure 6 and located on the upper left of the LabHub. You should see all the lights flicker briefly and hear a sound.



Figure 6

Resetting the LabHub

If the LabHub is not responding, you can reset it by holding down the on/off button for 5 seconds.

Connecting peripherals

All connection ports are located at the rear of the LabHub, as shown in Figure 2.

- AC power cord
- Sensors (All sensors use the same port.)
- Heater (*Notes:* Do not power on the LabHub if the heater is connected. AC power is required for heater operation.)

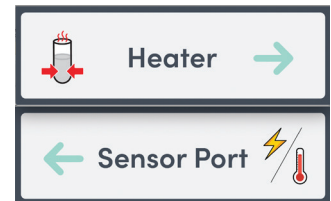



Figure 7

Using the LabHub app

The LabHub app must be downloaded to a device prior to use. Use the QR code on the bottom of the LabHub to download the app compatible with your device.

The LabHub app controls all functions of the LabHub other than powering it on and off. There are two types of LabHub users: one Leader and up to six Members. The Leader's app controls all the LabHub's functions. A Member can follow what the Leader is doing, view all displayed data, and save data through their own app.

Connecting your LabHub to the LabHub app

1. Make sure your device's Bluetooth is on.
2. Open the LabHub app. You should see the screen in Figure 8a (Android and iOS) or 8b (Chrome).
3. For Android and iOS users, press  (forward arrow) found in the lower right corner of the app screen as shown in Figure 8a.

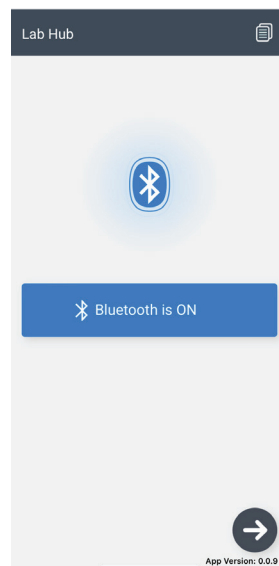


Figure 8a

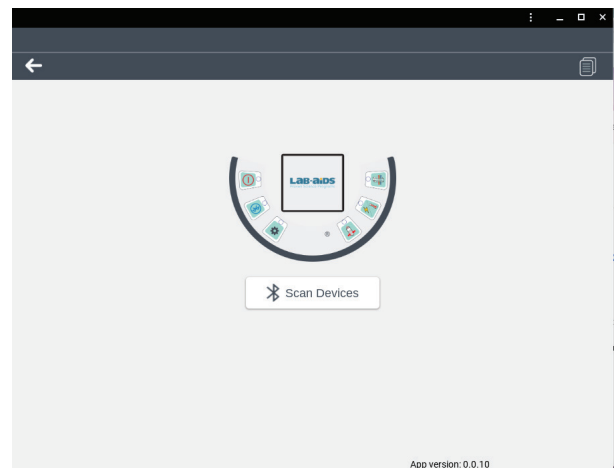


Figure 8b

4. Check the list of discoverable devices in the white box, seen in Figure 9a (for Android or iOS) or 9b (for Chrome), and select the *LabHub ID* corresponding to the one on the top of your LabHub.
5. For Android and iOS users press the **Connect** button; for Chrome users, press **Pair**. If the screen in Figure 10 appears, select **Yes** to become the *Leader* or **No** to become a *Member*. If the screen in Figure 10 doesn't appear, there is already a *Leader*, and you automatically become a *Member*.

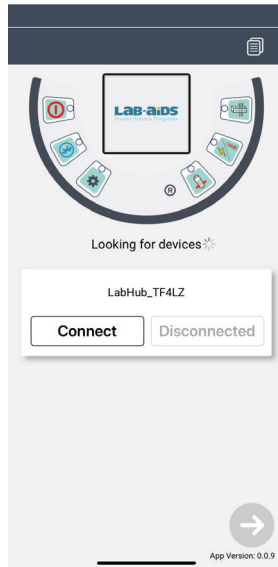


Figure 9a

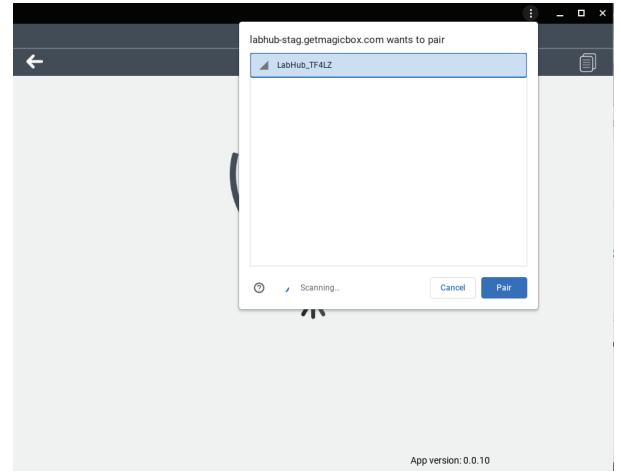


Figure 9b

6. Press → to move to the *Select Mode* screen shown in Figure 11.

In the event of losing the connection between the App and the LabHub

If only the *Leader* drops off, each *Member* will see a pop-up asking whether they want to become *Leader*. If this occurs while an experiment is in progress, if a new *Leader* is not chosen within 90 seconds, the experiment will be stopped and no more data will be acquired.

If only one person is using the LabHub and they drop off, or if all connected users drop off at the same time, someone must reconnect and become *Leader* within 60 seconds to avoid stopping the experiment and the acquisition of data.

Checking battery level

The LabHub's battery level is shown to the right of the LabHub ID and Member/Leader status on the upper bar, as shown in Figure 11 and 12 below. If the battery level is less than 25%, it is advisable to plug in the power cord.

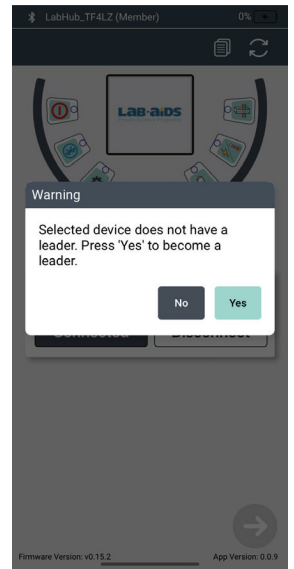






Figure 10

Preparing to collect data with the LabHub

- Only the *Leader* can control the LabHub's functions described in the next sections.
- To activate a selected function, the *Leader* must always press 
- *Members* can follow the leader by either:
 - pressing  each time that that the *Leader* does.
 - (OR)
 - pressing  (**sync icon**) in the upper bar to jump to the screen the *Leader* is on.

1. On the *Select Mode* screen, shown in Figure 11, choose **Manual Mode**, then press  to move to the *Select Function* screen, shown in Figure 12. *Note:* In the Chrome app, the buttons on the screens shown in Figures 11 and 12 might be arranged differently.

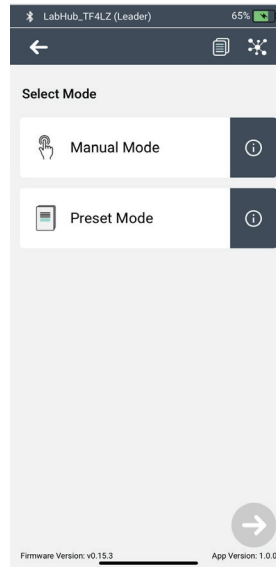


Figure 11

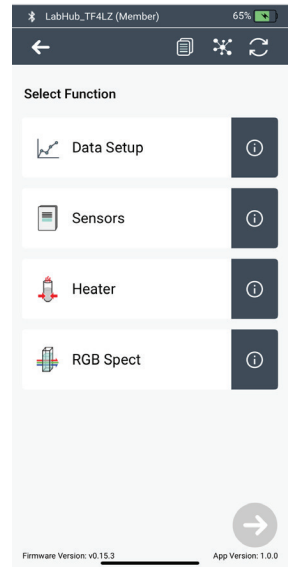




Figure 12

Data Setup: setting the parameters for data acquisition

Default Settings: *Data Rate:* 1 measurement/second
Number of Samples: Continuous

Note: *Data Setup* is only needed when you use the sensors or heater and don't want to use the default settings.

1. Select **Data Setup**, then press  to move to the *Setup* screen as shown in Figure 13.
2. The *Setup* screen allows you to use your touch screen, touch pad, or mouse to change the
 - a. **Data Rate:** Sets the interval between samples. Choosing **USER** requires the user to manually press the **Capture** button on the *Experiment* screen to make a measurement. (See Figure 13.)
 - b. **Number of Samples:** Sets the maximum number of samples the sensor will take. The experiment automatically stops when the maximum number has been reached.
3. Press  to return to the *Select Function* screen shown in Figure 12.

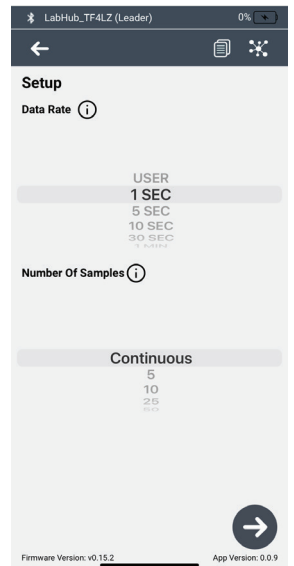



Figure 13

Sensors: using the temperature or voltage probe

Make sure to plug in the probe you want to use. When using the temperature probe, make sure its tip is fully immersed by the substance for which you want to know the temperature.

1. On the *Select Function* screen (see Figure 12), press **Sensors**. If a pop-up notifies you that your sensor has been detected, press  to proceed to the *Experiment* screen shown in Figure 14. If a pop-up tells you to connect the sensor, make sure the sensor is properly connected. Once it is, you can proceed to the *Experiment* screen.
2. When you are ready to take measurements, press the **Start** button at the bottom of the screen, as shown in Figure 14.
3. You will then be able to view real-time measurements ($^{\circ}\text{F}/^{\circ}\text{C}$ or DC V) and a graph of captured data as shown in Figure 15. At any time during the experiment you can zoom in on the graph by pinching the screen or touch pad. When using the temperature sensor, you can toggle between $^{\circ}\text{F}$ and $^{\circ}\text{C}$. Note that Figure 15 shows an experiment with the **Capture** button because the data rate had been set to **USER**.
4. When you are ready to stop taking measurements, press the **Stop** button at the bottom of the screen, as shown in Figure 15.
5. To save your data, press the **Save** button to the right of the *File Name*, as shown in Figure 15. You can rename your data file before pressing **Save**.

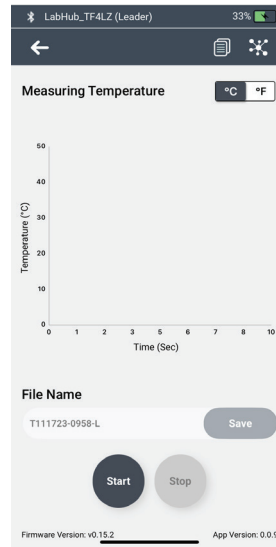


Figure 14

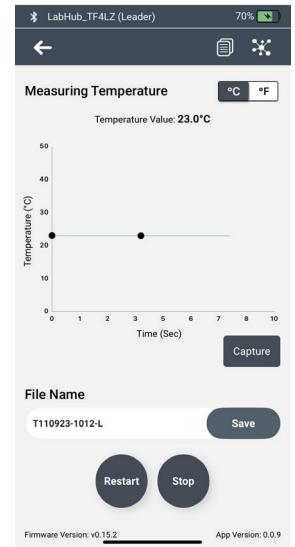





Figure 15

Heater: using the flameless heater

Make sure to plug in the AC power cord and the heater unit. If using the heater in conjunction with the temperature probe, make sure to plug in the probe and fully immerse its tip in the solution.

Temperature Probe Control

1. On the *Select Function* screen (see Figure 12), press **Heater**. If a pop-up notifies you that your heater is connected, press  to proceed to the *Control Method* screen, shown in Figure 16. If you get a pop-up telling you to connect the heater, make sure the heater is properly connected. Once it is, you can proceed to the *Control Method* screen.
2. Press **Temperature Probe** then press . If a pop-up tells you that your sensor has been detected, press . If a pop-up tells you to connect the sensor, once the sensor is connected properly you can proceed.
3. The *Set Point Temperature* is shown in a box near the top of the *Experiment* screen in Figure 17. To change this, press or click in the box to create a popup that allows you to use the up and down arrows to change the *Set Point* to your desired temperature, then press **Set**. *Note:* When heating, the water temperature will rise for several minutes after the heater shuts off.
4. Press **Start**, shown at the bottom of Figure 17 (you may have to scroll down to access it) and then press **Yes** to start heating. As shown in Figure 18, you will now be viewing real-time temperature ($^{\circ}\text{C}$), heater power consumption (W), and a graph of captured data. At any time during your experiment, you can change the *Set Point Temperature* and/or zoom in on the graph by pinching the screen or touchpad.
5. When you are ready to stop taking measurements, press the **Stop** button, shown at the bottom of Figure 17.
6. To save your data, press the **Save** button to the right of the *File Name*, as shown in Figure 17. You can rename your data file before pressing **Save**.

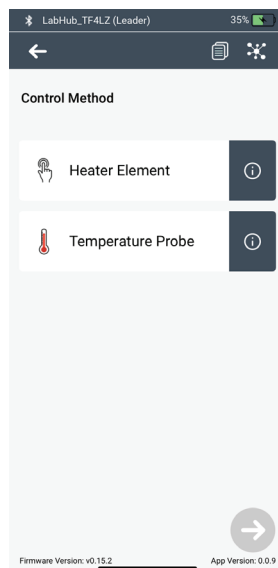


Figure 16

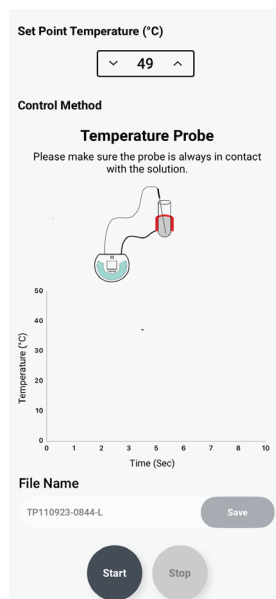


Figure 17

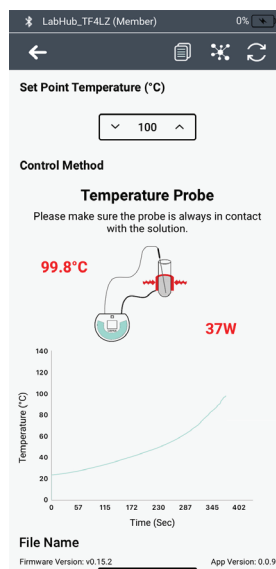




Figure 18

Heater Element Control

1. On the *Select Function* screen (see Figure 12), press **Heater**. If a pop-up notifies you that your heater is connected, press  to proceed to the *Control Method* screen (Figure 16). If a pop-up tells you to connect the heater, make sure the heater is properly connected. Once it is, you can proceed to the *Control Method* screen.
2. On the *Control Method* screen, press **Heater Element** then press . If a pop-up tells you to connect the temperature probe, connect it if you want to use the temperature probe or press **OK** if you want to proceed without using the temperature probe.
3. The *Set Point Temperature* is shown in a box near the top of the *Experiment* screen in Figure 19. To change this, press/click anywhere in the box. This creates a popup that allows you to use the up and down arrows to change the *Set Point*. Once you make your desired change, press **Set** to return to the *Experiment* screen. *Note:* When heating, the water temperature will rise for several minutes after the heater shuts off.
4. Press **Start** to start heating and recording data. If you have the temperature probe connected, you may have to scroll down to see the *Start* button and once the experiment starts, you will see a screen like the one in Figure 18. If you do not have the temperature probe plugged in, you will only see the instantaneous heater power, as shown in Figure 19.
5. When you are ready to stop taking measurements, press **Stop**.
6. To save your data, press **Save**. You can rename your data file before pressing *Save*.

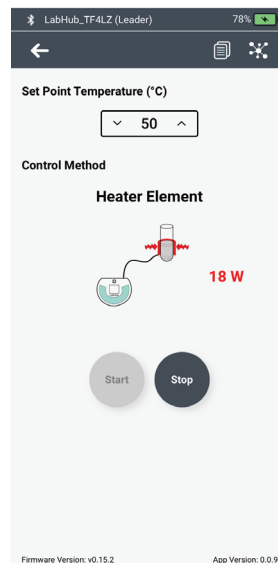





Figure 19

RGB Spectrophotometer: measuring absorbance

To obtain accurate values, each cuvette, including the reference, should contain ~3 mL of liquid. *Note:* Only the Leader can control the LabHub's functions described in this section.

1. From the *Select Function* screen (Figure 12), press **RGB Spect** then press  to get to the screen shown in Figure 20.
2. Press **Calibrate Spectrophotometer**, then press .
3. Open the cover of the spectrophotometer, insert a reference cuvette containing ~3 mL liquid, then close the cover.
4. Press **Calibrate** and wait for results. If all the colored circles contain check marks, as shown in Figure 21, press . (The check marks indicate the calibration was successful.) If all the check marks aren't there, press **Calibrate** again. If it is still not successful, reset the LabHub by pressing the **on/off** button (on the top left side of the LabHub) for 5 seconds.

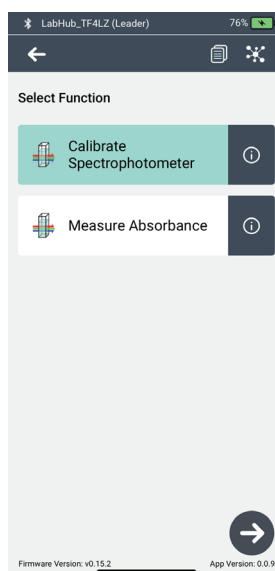


Figure 20

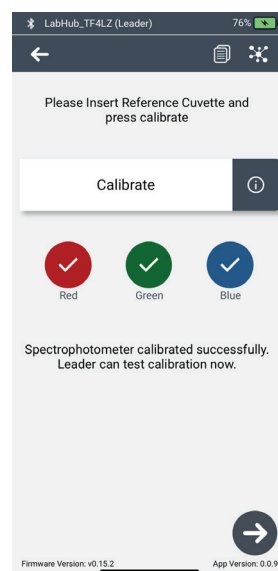


Figure 21

- With the reference cuvette still inserted, press **Test Calibrate** and wait for the results. If all readings are within the range -0.2 to 0.2 , as shown in Figure 22, press . If not, press **Test Calibrate** again. If all readings are still not within range, remove the cuvette, wipe its sides, reinsert it and try again.
- If you are ready to begin taking measurements, press **Yes** and replace the reference cuvette with a cuvette containing ~ 3 mL of a liquid you wish to measure.
- Press **Measure**. Wait for the results to appear in the colored circles, as shown in Figure 23.
- If you have additional samples to measure, insert a cuvette with a different sample and press **Measure**. You can repeat this step as many times as you need.
- When you have taken measurements of all your samples, press **Save**. You can rename your data file before pressing **Save**.

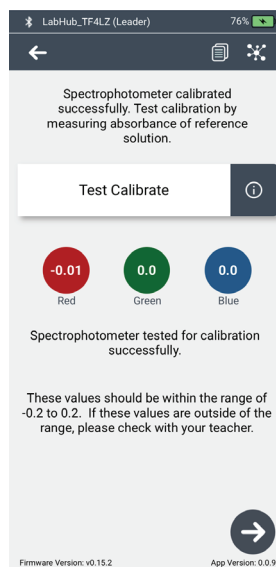


Figure 22

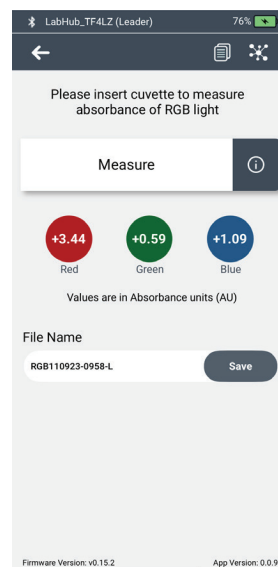


Figure 23

Reviewing, downloading, exporting, and deleting your data

- Press the **Saved Files** icon at the top of the screen.
- Near the top of the screen, as shown in Figure 24, press the button for the data type you want to view: **Temperature**, **Voltage**, or **RGB**.
- From the list of saved files, as shown in Figure 24, Press the name of the file you want to view to proceed To a screen like the one shown in Figure 25. *Note:* Chrome app users need to press to get to a screen like the one shown in Figure 25.
- Scroll through the data or press the following icons at the top of the screen to:



export the file



download the file to your device



delete the file

- To view a different file, press the in the upper left of the screen shown in Figure 25. Doing this will return you to the screen shown in Figure 24.

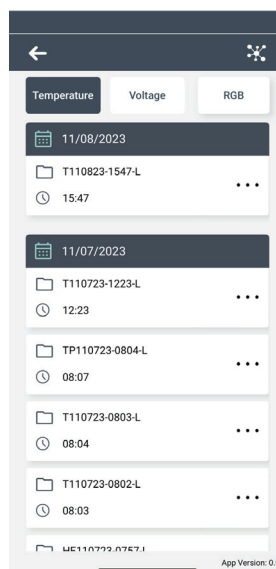


Figure 24



Figure 25

Software and firmware versions

The versions currently installed on your device are displayed at the bottom of your app screen, as shown in Figures 11-23.

Bluetooth

The LabHub is enabled with Bluetooth version 5 technology and supports earlier version Bluetooth enabled devices with versions 4.2 or higher.

Device operating system requirements

| Supporting OS version for Android, iOS, and Chromebook | | |
|--|--|-----------------|
| Device | Minimum Operating System | Recommended RAM |
| iPad | iOS12 | 2GB |
| iPhone | iOS12 | 2GB |
| Android Tablet | Android 8 | 2GB |
| Android SmartPhone | Android 8 | 2GB |
| Chromebook | <ul style="list-style-type: none">• Architecture: Intel or AMD x86-64-bit compatible device• Internal storage: 16 GB• Bootable from a USB drive• BIOS: Full administrator access• Processor and graphics: Components made after 2010• Minimum supported Google Chrome version: 113 and above | 4GB |


For further updates and more information about recommended systems, please visit www.lab-aids.com/labhub.


Software updates

When available, Android and iOS app updates will be downloaded automatically if you have activated automatic updates on your device. Otherwise, you will have to periodically check the App store, Google Play store, or go to <https://www.lab-aids.com/labhub> to find out if updates are available and/or upgrade your app to the latest version. *Note:* If/when you update the software, saved data files may be erased.

Firmware Updates

(only available through Android and iOS apps)

Firmware updates are available when  (DFU icon) appears in the upper bar, as shown in Figure 26.

Press  to install the firmware update.

Note: An Android or Apple device is needed to update the firmware.

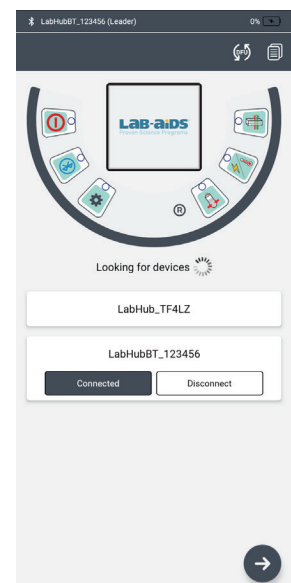


Figure 26

Key to Icons

Navigation

These icons are in the upper bar.



sync with *Leader*



go to *Connections* Screen



go to *Saved Files*

This icon is in the lower right corner of the screen



Forward Arrow

Data files

These icons are found in the upper bar of the *Saved Files* screen.



export



download



delete

Technical specifications

Spectrophotometer: measures wavelengths from 380 to 750 nm

Heater: Heats 25 mL H₂O from 23 to 100°C in ~9 minutes at the maximum set point of 150°C

Temperature sensor measurement range: -20 to 160°C

Voltage sensor measurement range: 1.5V to 9V DC

Battery 3.7V Li-ion, 3000mAh. *Note:* The battery should not be accessed by the user.

Troubleshooting

| Problem | Recommended Action(s) |
|-----------------------------|--|
| LabHub won't power on | Check that the power cord is properly connected and/or the outlet is functional. |
| App won't connect to LabHub | Check that the LabHub is turned on. Check that your device has Bluetooth turned on and is within 6' of the LabHub. |
| LabHub is not responding | Reset the LabHub by holding down the on/off button for 5 seconds. |