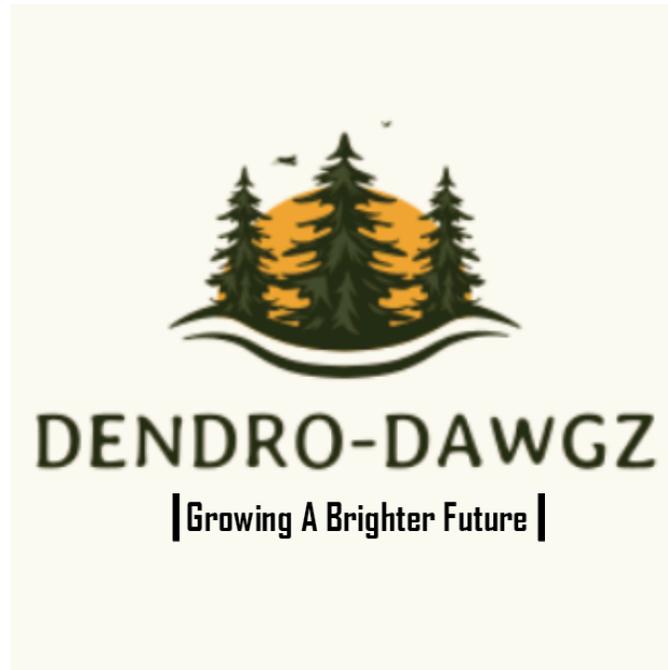


- User Manual -

Version 1
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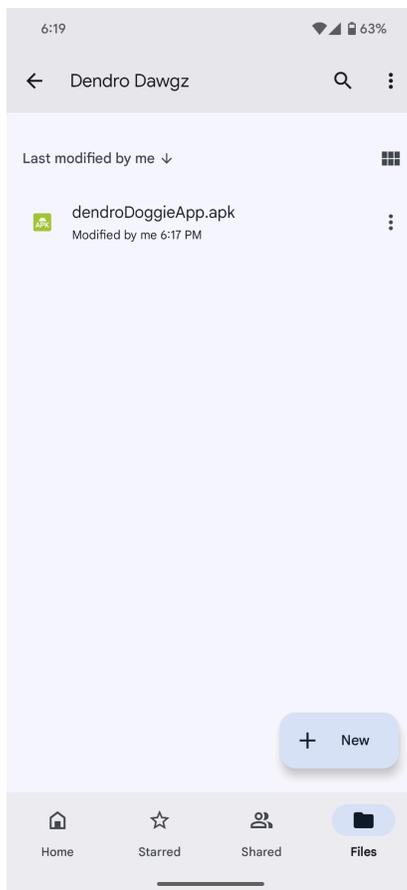
Introduction

The DendroDawgz development team thanks you for being part of the DendroDoggie community. DendroDoggie is a powerful system made to ease the organization and analysis of dendrometer and TMS-4 data. Specifically, this application has been custom-designed to optimize the processes of downloading, visualizing, merging, exporting, and storing data from these TOMST devices. We are very pleased (and hope you are too!) with these functionalities. The purpose of this user manual is to help you, our high-valued client, easily understand and utilize these features. This document covers how to successfully install, administer, and maintain the DendroDoggie application. This paper also provides step-by-step instruction on how to benefit from this application's wonderful features.

Installation

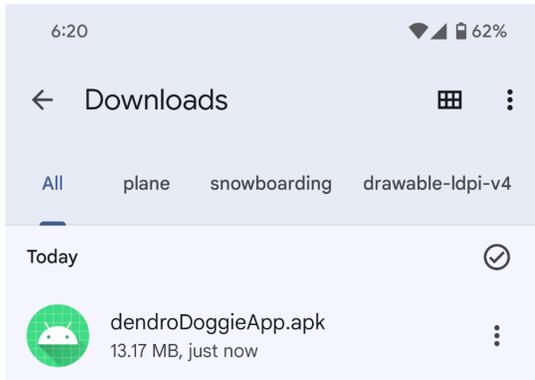
In order to download the app you will need access to the apk. This should be located within your google drive if you have been given access to the app. The following section will provide step by step instructions on how to install the app.

1. Locate the app apk within your google drive. The file name should be dendroDoggieApp.apk. The location of the file may vary.

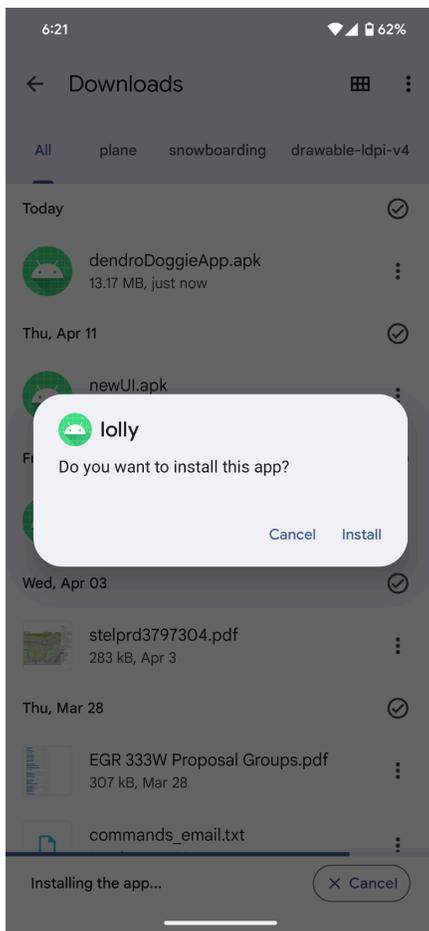


2. Once the file has been located, you can proceed to download the file.

3. Once the apk is downloaded, it will appear in the device's Downloads folder.

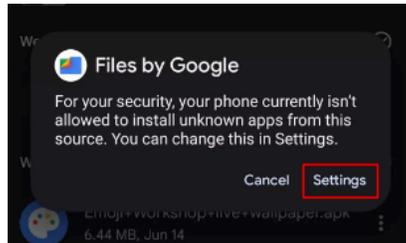


4. Once located within the device, click on the apk file, this will prompt you to install the app.

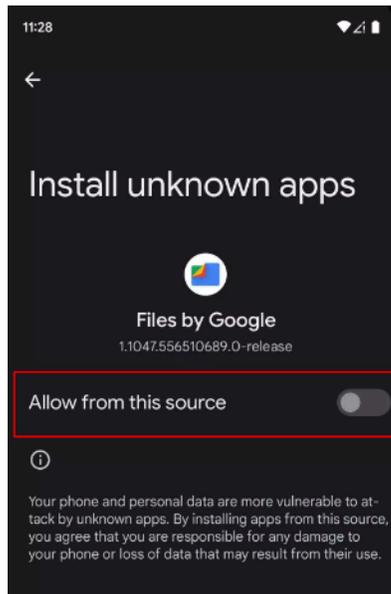


- Warning: When attempting to install the apk, you may be prompted to give the device permission to download apk files. To do so, just follow the instructions given below.

- Click the settings button on the prompt



- Check “Allow from this source” for install unknown apps



5. When the installation is complete, the app will now appear on the device and be ready to use.

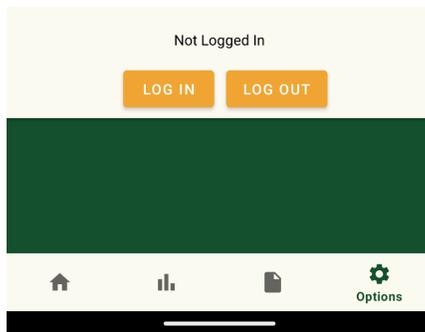
Configuration and Daily Operation

The DendroDoggie application requires very little configuration once installed; in addition, the application does not require any care to perform daily operations. Suffice to say, the application is ready to go once installed. However, depending on the user's individual needs, they will need to know where to change and how to use settings. These points will be covered in the sections below.

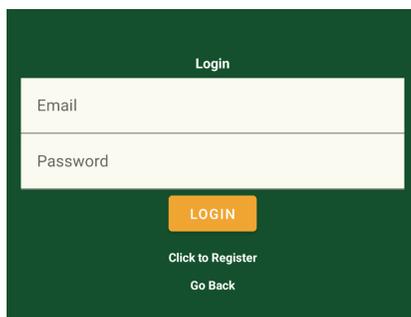
Creating Account

Creating an account will allow you to upload data to the cloud. It will also give you the ability to share any uploaded data with other users. In order to create an account, just follow the simple steps below.

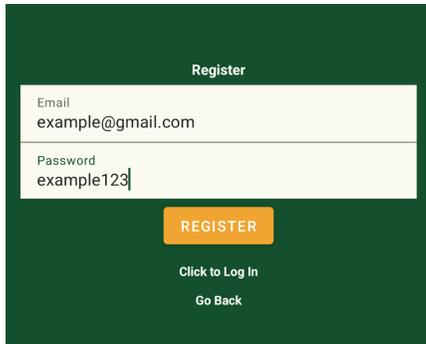
1. Navigate to the Options view, at the bottom you will see a “Log in” button. Click this button and it will bring up the login page.



2. Once on the login page, click the “Click to Register” button to go to the registration page.



- When on the registration page, input a valid email address and password, then click the “Register” button.



Register

Email
example@gmail.com

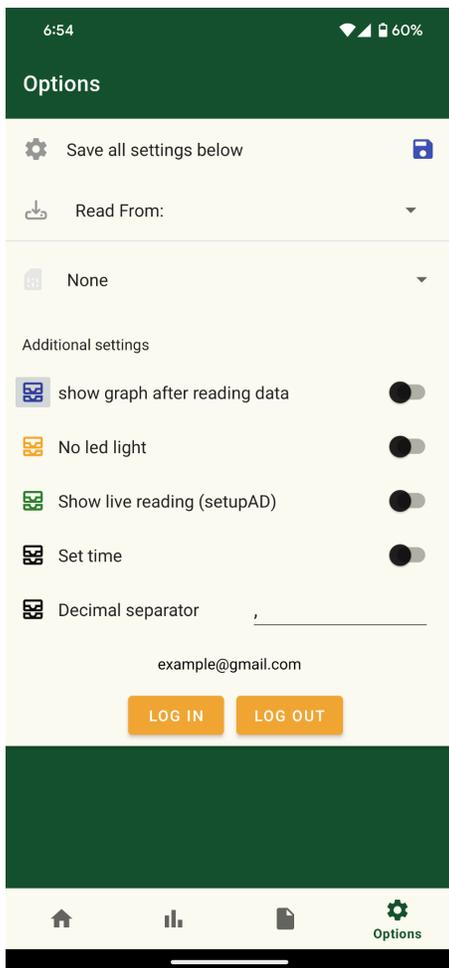
Password
example123

REGISTER

Click to Log In

Go Back

- That's it, you can now use the information you inputted to login to the app at any time. To make sure you are logged in, go to the Options view and check the email at the bottom of the page.



6:54 60%

Options

Save all settings below

Read From:

None

Additional settings

show graph after reading data

No led light

Show live reading (setupAD)

Set time

Decimal separator ,

example@gmail.com

LOG IN LOG OUT

Options

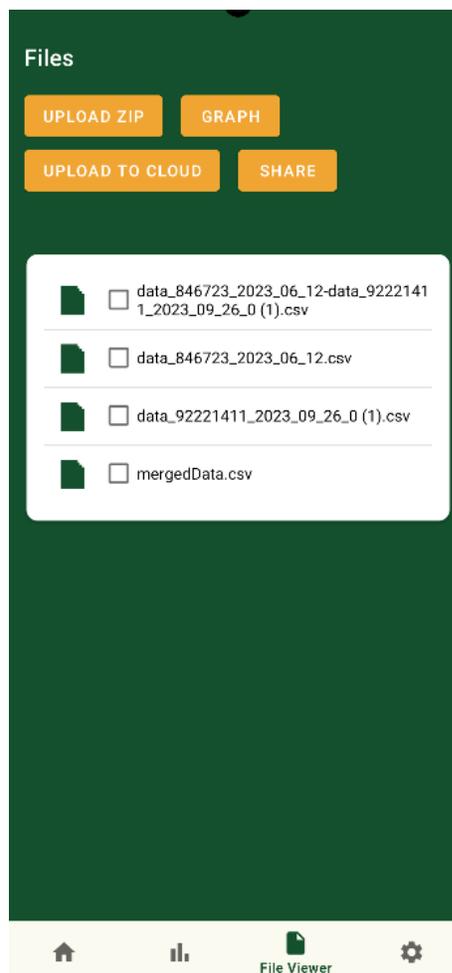
Graphing Data

Graphing data is a crucial feature in our application, and for this reason we made the process as simple as possible. Follow the steps below to convert your CSV files into a beautiful line chart.

1. Navigate to the “file viewer” tab at the bottom of the screen.

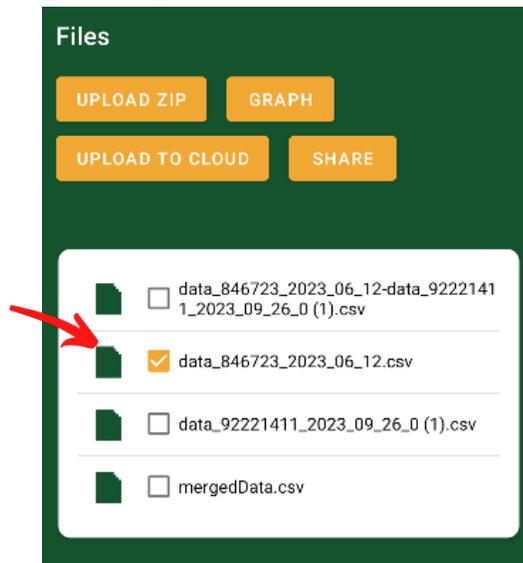


2. You are now looking at all of the CSV files inside of the “Documents folder” on your device.

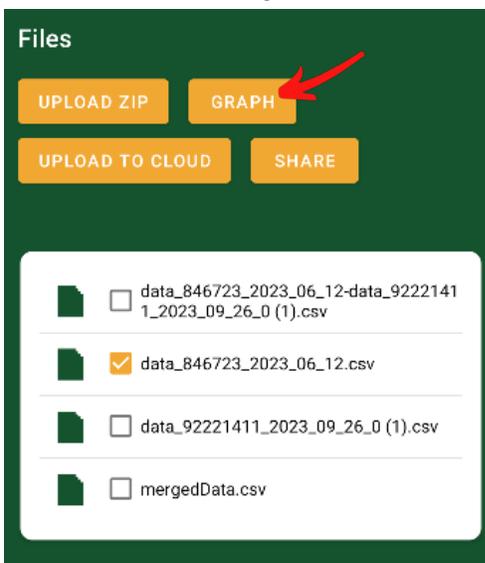


If you are unable to see your CSV files inside of the file viewer tab:
Try moving the file(s) into the “Documents” folder of your device.

3. Select a file from the list by clicking on the checkbox next to the corresponding file name.



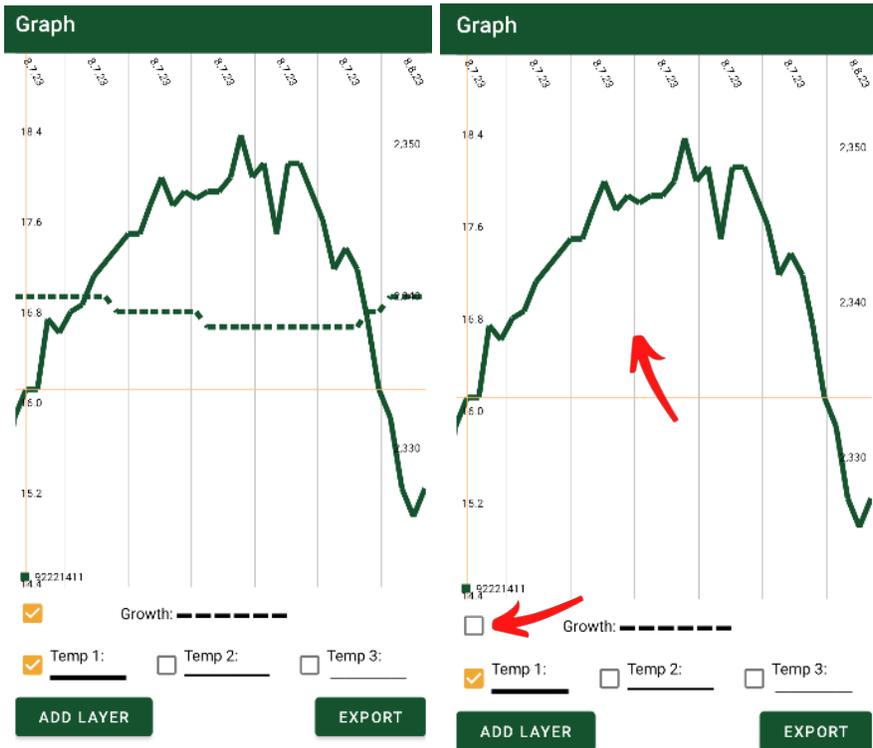
4. Select the button labeled "Graph" in the top right corner of the screen.



If graphing multiple years of data, please be patient as this process may take many seconds.

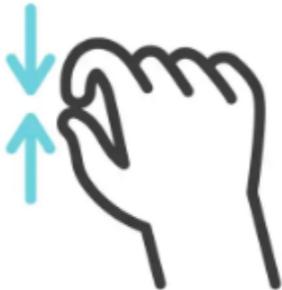
Your selected file's data is now displayed on the screen as a line graph. A dashed line represents the compression (growth) of the dataset. There are 3 temperature readings also displayed on this graph. By default, temp 2 & 3 are turned off. These temperature values are only relevant when reading from a TMS-4 device; When graphing dendrometer data, these lines can be ignored and remain toggled off. The visibility toggle feature applies to all lines on the graph.

To turn on/off the visibility of a line on a chart:
simply select/deselect the checkbox next to the corresponding line.



Use your finger to scroll anywhere on the graph view.

Zooming out:



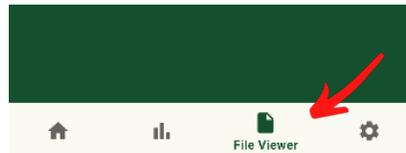
Zooming in:



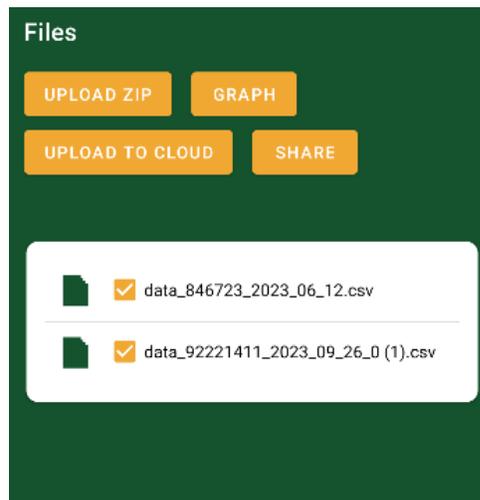
Merge Datasets

The ability to compare multiple datasets on the same graph plane is what makes our application so useful. Multiple datasets on the same graph are differentiated by color. The legend in the bottom left view shows the color associated with each data set's serial number. Our charting algorithm supports merging up to 9 datasets before the lines begin to be plotted with the same color. The following steps outline the merging process in detail:

1. Navigate to the "File Viewer" tab at the bottom of the screen.

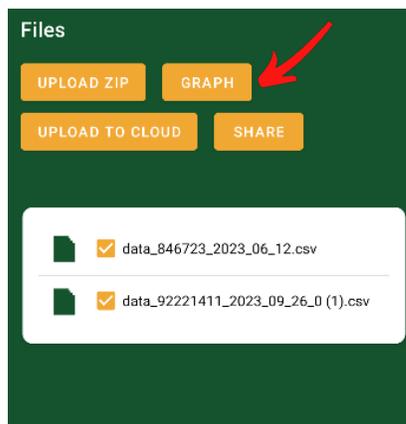


2. Select datasets to merge.



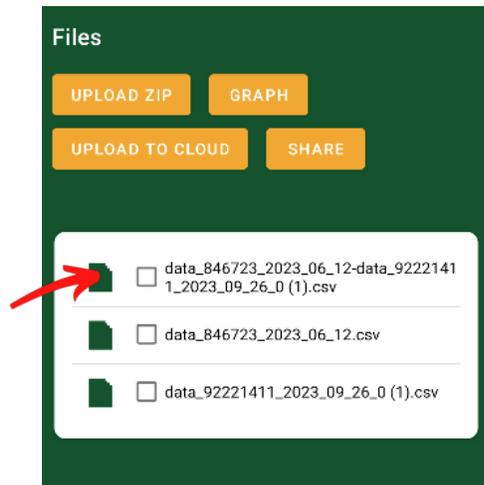
All datasets with a checkmark will be merged together into one CSV file

3. Select the "Graph" button



With the click of this button, the selected files are merged into a single CSV file, and the new file is displayed instantaneously.

4. The new merged CSV file will now be located in the Documents folder of your device with the name (<dataset1>-<dataset2>-.....-<datasetX>.csv). To be more specific, the merged file name will be a compilation of all of the selected file names, each separated by a '- '.

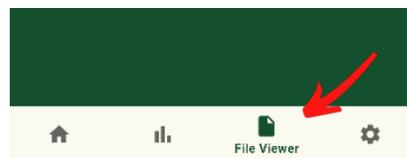


Converting Between Serial and Parallel Formats

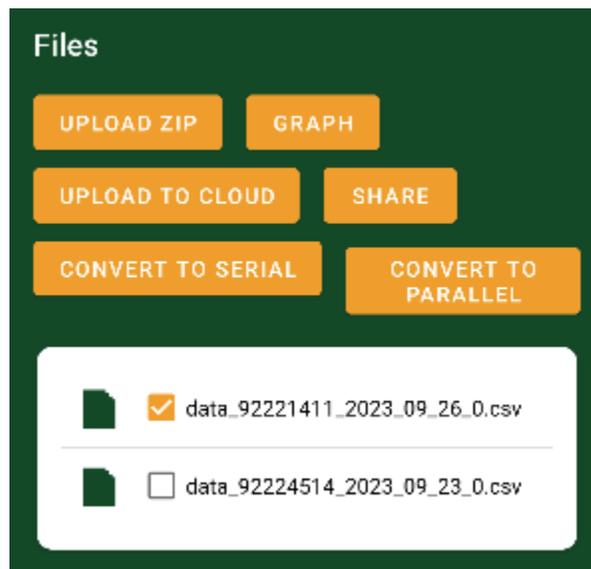
Putting data into tables can be very helpful when needing to perform statistical analysis. Because DendroDoggie uses a serial format for data which is suited to visualizing data but not suited for operating on, the application provides “Convert to Parallel” and “Convert to Serial” buttons which can be used to reformat a file.

To convert to parallel requires the following steps:

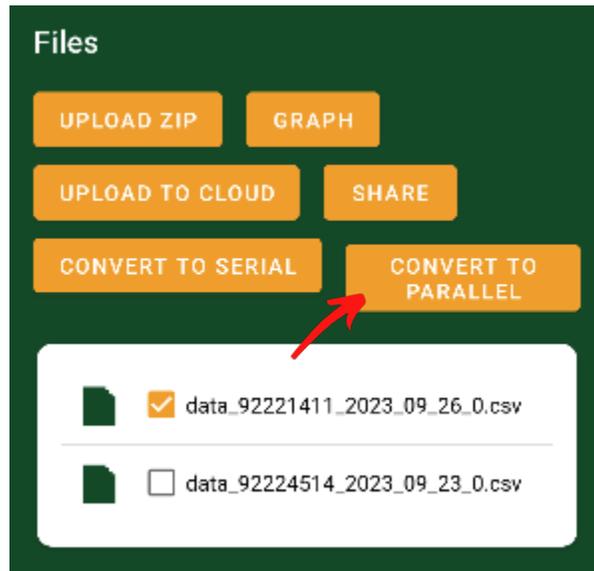
1. Navigate to the “File Viewer” tab at the bottom of the screen



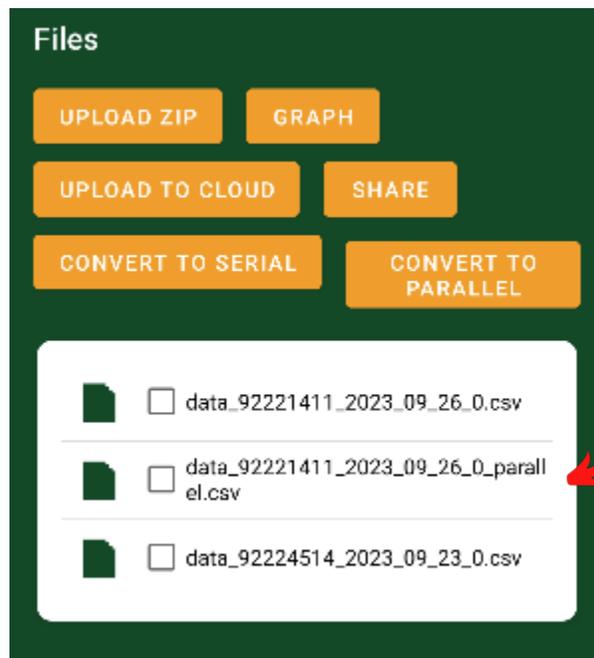
2. Select the files which need to be converted to a parallel format



3. Select the “convert to parallel” button

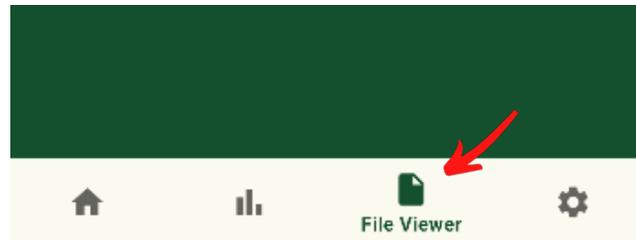


4. When the conversion is complete, a message saying “Conversion complete” will appear at the bottom of the screen
5. Reload the File Viewer by visiting another tab, and returning
6. A new file will appear with the name of the file which was converted with “parallel” appended to the end



To convert a file to the serial format, the process is much the same:

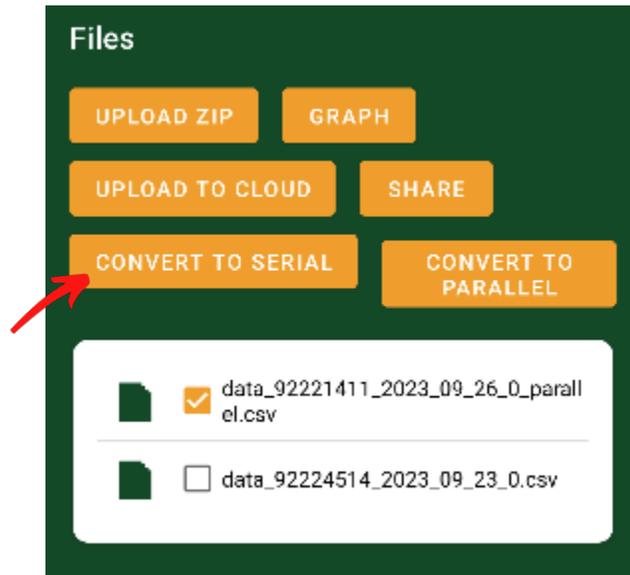
1. Navigate to the “File Viewer” tab at the bottom of the screen



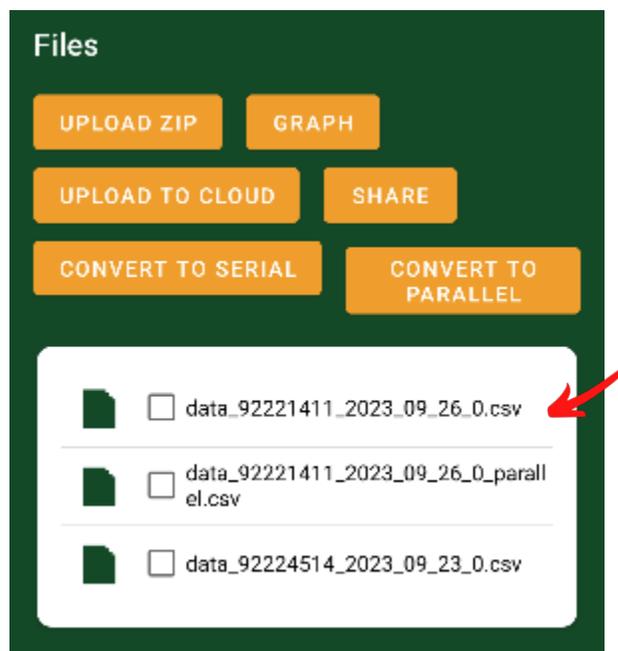
2. Select the files which need to be converted to serial format – these files should end in “parallel”



3. Select the “convert to serial” button



4. When the conversion is complete, a message saying “Conversion complete” will appear at the bottom of the screen
5. Reload the File Viewer by visiting another tab, and returning
6. A new file will appear with the name of the file which was converted



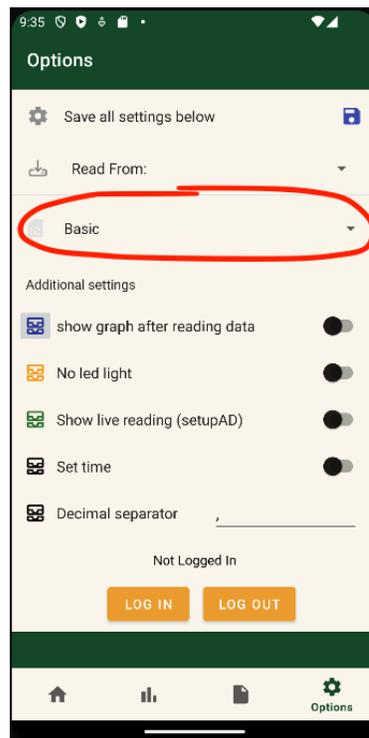
Changing Time Intervals

TOMST devices take readings at regular intervals. Changing this is agnostic across measuring instruments, and the application provides a succinct interface through which to change this setting.

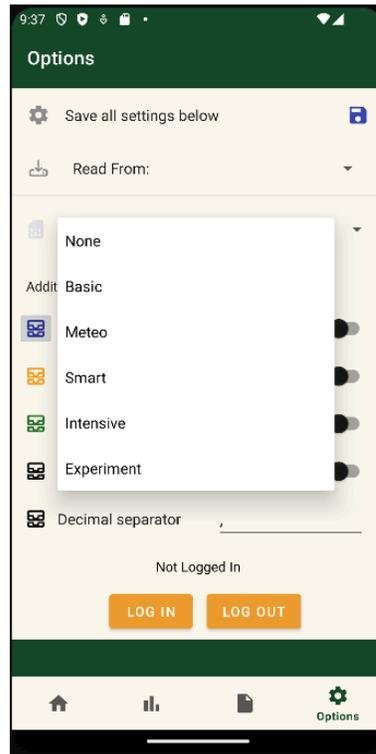
1. Navigate to the “Options” screen by pressing the gear button in the navigation bar at the bottom of the screen



2. On the Options screen, locate the second drop-down menu and tap to reveal the different intervals



3. Choose any of the options listed to change the interval



Reading From All, a Bookmark, or Date

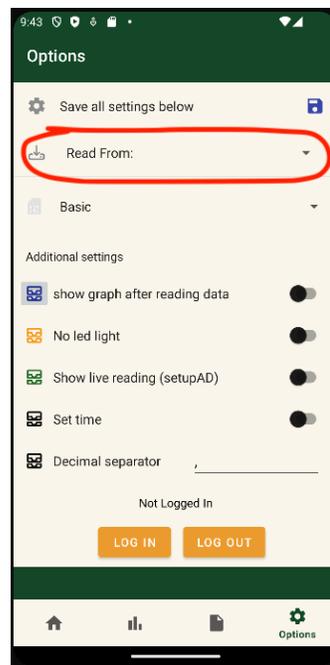
The “Read From” dropdown menu allows the user to select which method they would like to read data from the device with. Starting with “Read All”, the application will read all available data on the device.

Next, the “Bookmark” option allows the user to set a date to read from up to the current data, or a number of days from the current day from which to start reading. The following details how to achieve this.

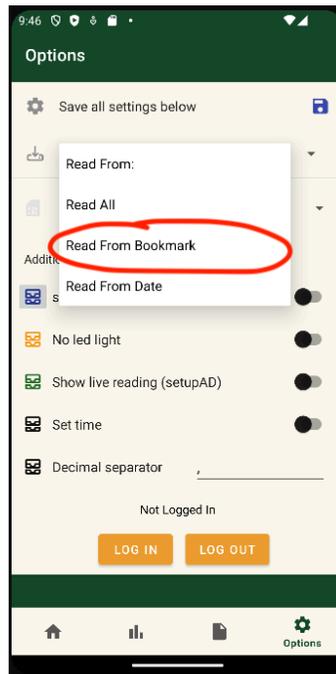
1. Navigate to the “Options” screen by pressing the home button in the navigation bar at the bottom of the screen



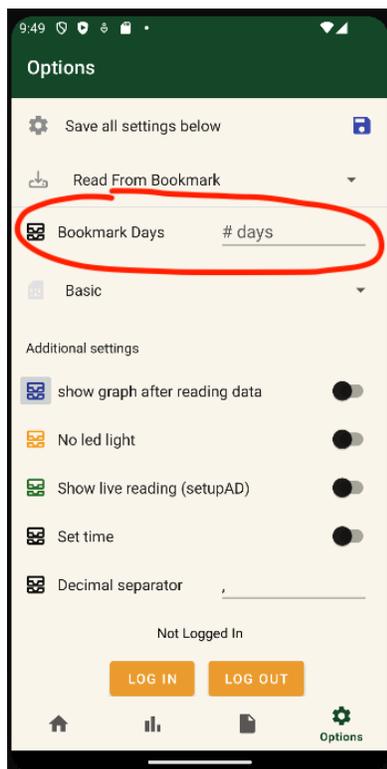
2. On the Options screen, locate the first drop-down menu and tap to reveal the different bookmarking options



3. To specify a number of days from which to read up to the current day, select the option “Read from Bookmark”



4. This will reveal a new field into which you can enter a number of days before the current day the instrument will give data from. After inputting this, save the options.

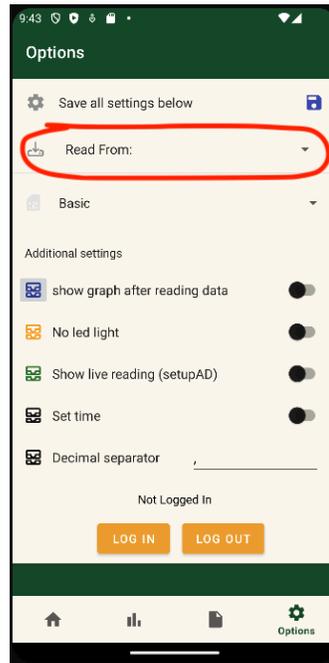


Finally, “Read From Date” allows the user to input a date in *YYYY-MM-DD* format that will read data starting at 00:00 on the given date, and read all data since then. The following details how to achieve this.

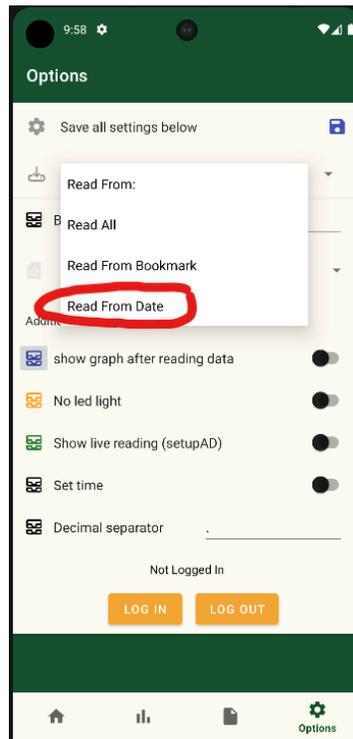
1. Navigate to the “Options” screen by pressing the home button in the navigation bar at the bottom of the screen



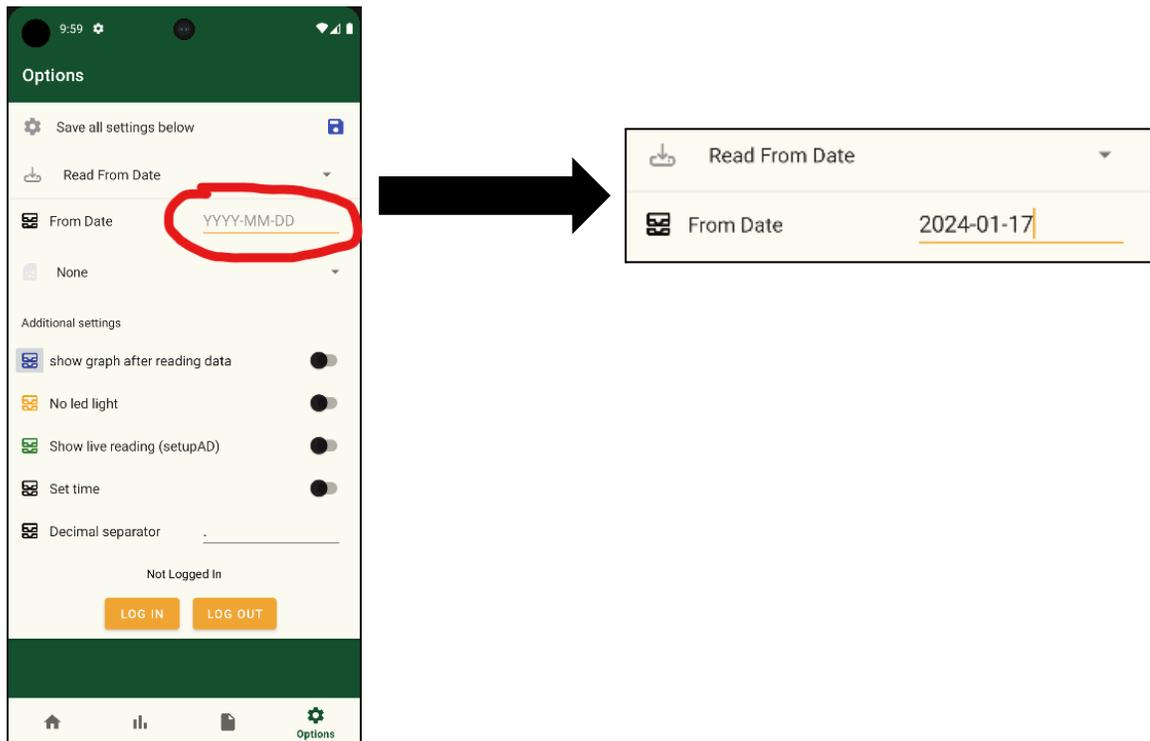
2. On the Options screen, locate the first drop-down menu and tap to reveal the different bookmarking options



- To select the date you wish to read from, select “Read From Date”



- This will reveal a new field into which you can input the date you wish to read from, in YYYY-MM-DD format. After inputting this, save the options.



Maintenance

The DendroDoggie application takes very little to maintain. The critical libraries for the application to function are built prior to installation, and are automatically fetched when installing the APK.

In order to fetch the libraries for LibFTDI and LibUSB however, these must be added to the project beforehand. These libraries exist as submodules of the repository, and must be initialized before work can be done on the code. To do this, open a git bash terminal and navigate anywhere into the project. Run the following commands in the terminal:

```
git submodule init
```

```
git submodule update --remote
```

Removing Data Sets

The DendroDoggie application automatically saves files downloaded from dendrometers to the device's internal storage. While even a large file does not take up very much space, once files build up, this could cause many problems. Therefore, it is recommended to check the size of the Documents directory periodically to ensure there is enough space for merged files, as well as for future files.

Given large data sets are not expected to exceed a couple of megabytes, it is reasonable to remove any files every six months to a year, or in accordance with how many times data is collected from meters along with the magnitude of those files. For some users, it may take two years for the amount of data to be significant.

To accomplish deleting files, please ensure all the files you wish to save have been saved elsewhere, then please follow these steps to remove files:

1. Navigate to the "My Files" application on your device – please reference online resources to get more information on how to search for your "My Files" application on your specific Android distribution and version
2. In the application, locate the "Categories" section, and select the icon labeled "Documents"
3. Depending on how your Android device is used, you may see two folders, "Download" and "Documents", or you may see your files
 - a. If you see the application files, go to step "d"
 - b. Otherwise, select the "Download" folder, if you see the application's files, go to step "d"
 - c. Otherwise, select the "Documents" folder, if you see the application's files, go to step "d"
 - d. Once you have found the application's files:
 - i. Tap and hold on a file and select the files you wish to delete; or
 - ii. Tap and hold on a file and use the "All" check circle – located at the top left of the screen – to select all the files and select the icon labeled "Delete" at the bottom right of the screen (the icon should be a trash can)
4. Now the size of your Documents folder should be reduced and you can download or merge more data

Accessing the DendroDoggie Source Code

To maintain and add features, or to explore the applications source code, please visit the fork of the “lola” repository owned and maintained by the “DendroDoggie” organization on GitHub. For easy access from this document, please follow this link:

<https://github.com/DendroDoggie>

Another library which is crucial for the application to work, and these forks also under the DendroDoggie organization. At the time of writing the official FTDI library, written in the C programming language, is necessary for communicating housed within the go-between device to communicate with the dendrometer. That is the “libftdi” repository:

<https://github.com/DendroDoggie/libftdi>

Please note the DendroDoggie application may depend on more libraries as development continues and the application gains a larger feature set. Please refer to the DendroDoggie organization on GitHub to peruse forks of other repositories through which those libraries are maintained.

Troubleshooting

- If the adapter is plugged in and a dendrometer or other device is connected, and the application does not seem to change or register the event:
 - Unplug the adapter, wait 30 seconds, and plug it back in. This should refresh the application and the adapter's buffers.

Unable to locate CSV file in application

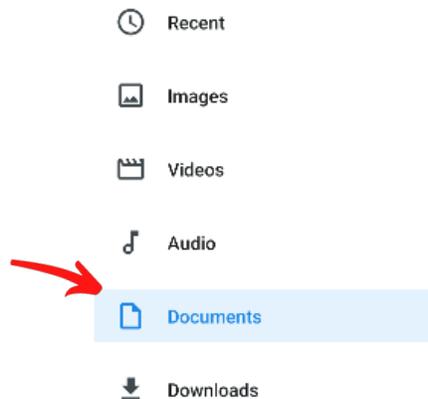
The fileViewer tab:



Lists all files of type .csv inside of the device's Documents folder.

If a file is failing to show up in the File Viewer tab, make sure

- 1. The file is of type .csv.**
- 2. The file is located on your device's 'Documents' folder, and/or the device's 'Internal Storage/Documents' folder.**



Conclusion

The Dendro Dawgz are happy to present our clients in ECOSS at NAU with the DendroDoggie application for Android mobile devices. The team is joyful we could create an application which makes the process of gathering data easier and safer, as well as to have a hand in developing a tool which will help us combat climate change. Though the team is moving into the next chapter of our lives, we would be happy to answer short questions to help deploy and keep the application operational. You can contact any of us via the information below:

Zachariah Derrick - zachariahderrick@gmail.com

Asa Henry - ajh728@nau.edu

Niklas Kariniemi - niklaskariniemi@gmail.com

Nile Roth -

With best wishes from the Dendro Dawgz, we happily pass this application on to you Andrew Richardson, Mariah Carbone, George Koch, and Austin Simonpietri.