**Dendro-Pi**

Program to take periodic pictures and retrieve data from dendrometers at Dorval and BERMS

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**Getting started**

**Setting up Raspberry Pi for ssh**

**1. Insert SD card into computer**

(delete all contents of SD card)

**2. Download Raspberry Pi Imager from Raspberry Pi Website**

**3. Open Raspberry Pi Imager**

a. Select Raspberry Pi Device (Raspberry Pi Zero)

b. Select Operating System (Raspberry Pi OS (32-BIT) (Bookworm))

c. Select Storage (Mass Storage Device USB Device)

**4. Edit OS Customization Settings**

General Tab

a. Set hostname (Dorval#) (Name of the Pi)

b. Set Username & Password (To log into the Pi)

c. Configure Wireless LAN

SSID: Wifi network name (new\_aspen\_2022)

Password: Wifi Password (Aspen2022)

d. Set Wireless LAN Country to CA

Services Tab

1. Enable SSH: Use Password Authentication

**Save**

Apply OS Customization Settings: Yes

A screenshot of a computer

Description automatically generated

*This may take server minutes to Write & Verify the installation.*

**5. When Verification Completes:**

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Remove SD from computer and insert into raspberry pi

Reboot the Raspberry Pi

**Configuring Raspberry Pi**

**1. Connect to same network on computer that the raspberry pi is configured to connect to**

**2. If on PC, open the command prompt / Windows PowerShell,**

**SSH into raspberry pi by running the following command (without braces)**

*> ssh username@{hostname}.local*

*EXAMPLE: ssh madlab@DorvalTest.local*

When prompted for password: input Password from OS Customization

*EXAMPLE: Aspen2022*

**3. Run the following command to configure the Raspberry Pi**

*> sudo raspi-config*

**5. Change the timezone in localization settings**

**6. Finish and reboot to save your changes**

**7. After rebooting ssh back into the Raspberry Pi.**

**8. Check to see if picamera2 is installed by running the following command**

*> rpicam-jpeg -o test.jpg*

*This will take a picture and saves to test.jpg*

if not run the following commands to download picamera2

*> sudo apt-get update*

*> sudo apt-get install python-picamera2 python3-picamera2*

**Installing**

**1. Download & Extract dendro-pi from Dropbox to your computer**

<https://www.dropbox.com/scl/fo/xuw8ubnp06l1cp1v416ws/ALyV71UHngTeN6_6W3n_WP4?rlkey=arwzjlyfpycmpph3arqi5iumh&st=8wq63p35&dl=0>

**2. Exit SSH, run the following command (without braces)**

*> scp -r {Path to File(s)} {Destination for copy}*

*Example:*

*> scp -r C:\Users\alanj\Documents\School\Madlab\RaspberryPi\dendro-pi-main madlab@DorvalTest.local:~/*

*Recursively copies scripts from local computer to Pi.*

**3. With PiCamera2 installed and Dropbox files copied, ssh back in, and enter the dendro-pi-main/test/ directory, and run:**

*> python test\_dendro.py*

**4. Open dendro-pi-main/main/dendro\_pictures.py in a text editor**

*> nano dendro\_pictures.py*

**and insert name of camera on this line:**

> CAMERA\_NAME = "ADD NAME HERE"

*> CAMERA\_NAME = "DorvalTest2\_"*

**5. Follow this guide to install dropbox-uploader.sh**

**\*\* TODO: Rewrite this guide myself \*\***

<https://linuxhint.com/install-use-dropbox-raspberry-pi/>

Dropbox login info:

Email: [Mad.lab.usask@gmail.com](mailto:Mad.lab.usask@gmail.com)

Password: Madlab2019!

1. WHERE? git clone <https://github.com/andreafabrizi/Dropbox-Uploader.git>

**6. In dendro-pi-main/ Run "crontab -e" and DO NOTHING. Save and close the file without editing.**

*> crontab -e*

**7. Confirm crontab -l is empty by entering:** *> crontab -l*

If its not empty, enter:

*> crontab -r*

**Run the script add\_cron.sh to schedule hourly pictures and daily file uploads by running the following command:**

*> sh add\_cron.sh*

Run crontab -l again to confirm tasks were added.

*\*Troubleshooting: crontab -l (list all tasks),*

*crontab -r (Deletes all tasks)*

*service cron status (Shows log of tasks)*

*\* Might need to change from sh … to bash \**

**8. On Dropbox, create a new folder to upload to**

**9. Open upload-to-dropbox.sh in a text editor**

*> nano upload-to-dropbox.sh*

**Insert the directory name in line 3 as shown below:**

/dropbox\_uploader.sh upload ~/dendro-pi-main/pictures/\* /Directory\_Name\_Here/ | grep "file exists with the same hash" > already\_uploaded.txt

*Example:*

*./dropbox\_uploader.sh upload ~/dendro-pi-main/pictures/\* /DorvalTestDB/ | grep "file exists with the same hash" > already\_uploaded.txt*

\*\* Need to convert to UNIX Line endings \*\* (dos2unix upload-to-dropbox.sh)

**Testing**

**1. To test that the uploader is working run the following command in dendro-pi-main/main/**

> python dendro\_pictures.py

**2. Run the following command in dendro-pi-main/**

> sh upload-to-dropbox.sh

**3. Once the previous command finishes running check to see if a picture was uploaded to Dropbox**

**Updating Wifi SSID and Password**

> sudo nmtui

Edit -> Add -> ESC

Activate -> Deactivate old WiFi

*Cross fingers and hope it connects to the new WiFi*

**Copying pictures from Raspberry Pi storage via ssh**

1. Connect to same network on computer that the Raspberry Pi is connected to.

2. Run the following Secure Copy Protocol command (scp)

> scp [username@{hostname}.local:~/path/to/folder](mailto:username@%7bhostname%7d.local:~/path/to/folder) C:\destination\

*Example:*

*> scp -r madlab@DorvalTest:~/dendro-pi-main/pictures C:\Users\alanj\Desktop*

3. Enter password for Raspberry Pi when prompted

**How to Set Up Raspberry Pi Zero for an I2C Sensor**

<https://maxbotix.com/blogs/blog/setup-raspberry-pi-zero-for-i2c-sensor>

<https://www.youtube.com/watch?v=7En4tCMGMiM>

Download source code… Change paths / names

**1. Exit SSH, run the following command (without braces)**

*> scp -r {Path to File(s)} {Destination for copy}*

*Example:*

*> scp -r C:\Users\alanj\Desktop\src* [*madlab@Dorval8.local:~/*](mailto:madlab@Dorval8.local:~/)

C:\Users\alanj\Desktop\src\weatherstation\zero

*Recursively copies scripts from local computer to Pi.*

**2. Enable I2C**

> sudo raspi-config

Interface Options

**3. Check to see if sensor is detectable**

*>* sudo i2cdetect -y 1

*Expected output: port 77.*

A screenshot of a computer screen

Description automatically generated

**4. Edit /boot/config.txt:**

> sudo nano /boot/firmware/config.txt

**5. Add the following lines at the end of the file:**

dtparam=i2c\_arm=on

dtparam=i2c\_baudrate=400000

git clone https://github.com/jeffspiinthesky/weatherstation.git

cd weatherstation/zero

pip3 install -r requirements.txt \*\* Requires a venv \*\*

* Source venv/bin/activate

**Combining .csv Files**

**1. Download Files from Dropbox**

**2. Navigate to the directory containing your .csv files**

**3. Combine the .csv files while preserving the header from the first file:**

> $OutputFile = "combined.csv"

> Get-ChildItem -Filter \*.csv | Select-Object -First 1 | ForEach-Object {Get-Content $\_ | Out-File $OutputFile}

> Get-ChildItem -Filter \*.csv | Select-Object -Skip 1 | ForEach-Object {Import-Csv $\_ -Delimiter ',' | Export-Csv $OutputFile -Append -Force -NoTypeInformation -Delimiter ','}

**4. Open Excel, Data, Get Data, From File, From Text/CSV: Select combined.csv file.**

**Pi Solar Monitor**

[**https://www.youtube.com/shorts/s6DtEMxQv3A**](https://www.youtube.com/shorts/s6DtEMxQv3A)

**Activate venv:**

> cd to weather/weatherstation/zero

> source venv/bin/activate

> pip install renogymodbus

**Update upload-to-dropbox.sh script to upload .csv file  
Update command\_line.py – Found at:** [**madlab@Dorval-1:~/weather/weatherstation/zero/venv/lib/python3.11/site-packages/renogymodbus**](mailto:madlab@Dorval-1:~/weather/weatherstation/zero/venv/lib/python3.11/site-packages/renogymodbus)

**New Restore Instructions for solar monitor:**

**1. Transfer Backup Files from Local to Pi**

On your Windows machine, in PowerShell:

> scp C:\Users\alanj\Documents\School\MadLab\RaspberryPi\charge\_controller\\* madlab@<PI-IP>:/home/madlab/charge\_controller/

Might need to make the folder first if it doesn’t exist.

> mkdir -p /home/madlab/charge\_controller/

**2. On the Pi: Create Virtual Environment & Install Dependencies**

SSH into the Pi:

> ssh madlab@<PI-IP>

> cd /home/madlab/charge\_controller/

> python3 -m venv venv

> source venv/bin/activate

> pip install -r requirements.txt

**3. Overwrite the installed command\_line.py with the modified version**

> cp command\_line.py venv/lib/python3.11/site-packages/renogymodbus/command\_line.py

**4. Install the Dropbox Upload Script**

Move the script and make it executable:

> cp upload-to-dropbox\_SOLAR.sh /home/madlab/dendro-pi-main/upload-to-dropbox.sh

> chmod +x /home/madlab/dendro-pi-main/upload-to-dropbox.sh

**5. Restore the Crontab**

> crontab my\_crontab\_backup.txt

If you want to confirm:

> crontab -l

Should look like this:  
# Upload Charge Controller Data every day (3am)

3 0 \* \* \* sh /home/madlab/dendro-pi-main/upload-to-dropbox.sh

# Take Solar Charge Controller measurements every 5 minutes

\*/5 \* \* \* \* /home/madlab/charge\_controller/venv/bin/renogymodbus --device charge\_controller --portname /dev/ttyUSB0 --slaveaddress 17