BRAD Station Tracking Software Instructions

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If you are reading this, you likely want to track a balloon using the Montana Space Grant's BOREALIS program's ground station. This document will lay out the steps to use the software associated with the ground station to track a balloon.

To launch the GUI, double click on the file called main.exe. This will launch the tracking software.

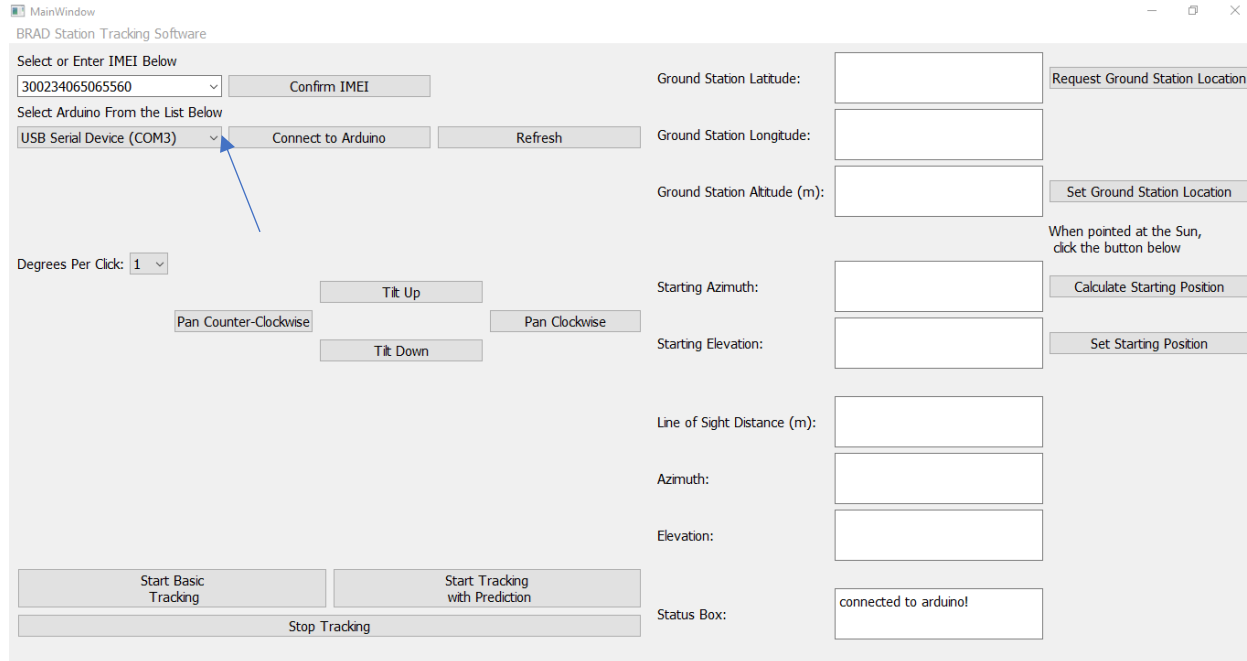1. Select or enter your Balloon IMEI in the top left corner
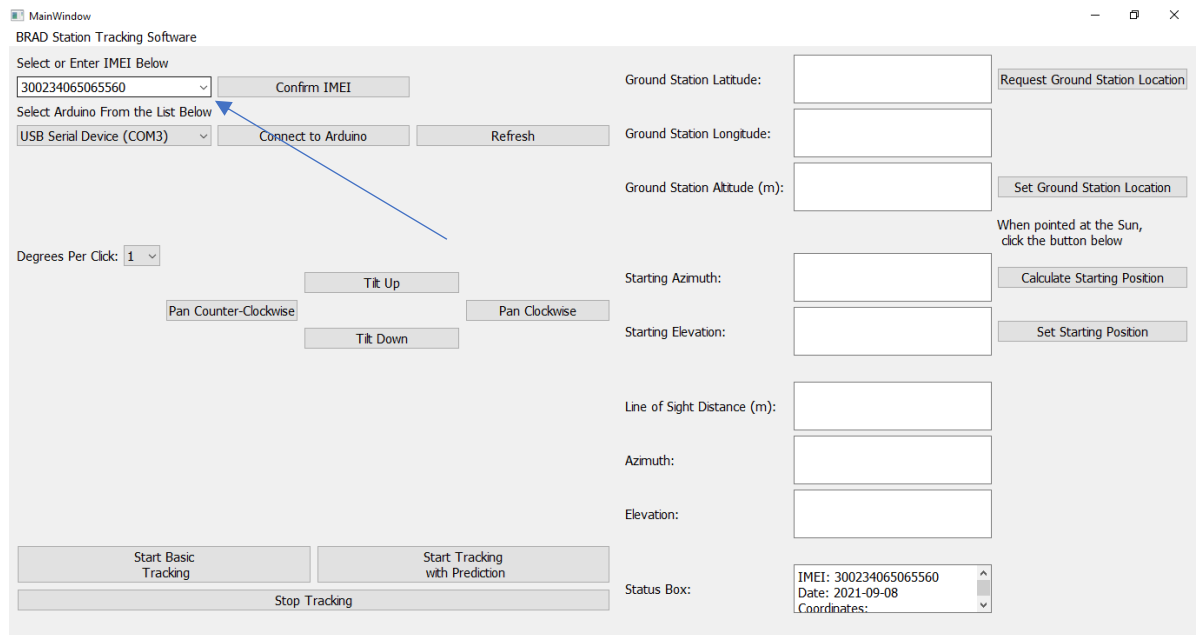
   a.

   b. After selecting your balloon's IMEI, hit the confirm IMEI button.

      i. Ensure that the date in the status box in the bottom right corner is the correct date. If not, the balloon will not be tracked properly.

2. Select and connect the Arduino in the box below the IMEI selection

a.

b. Ensure that the Arduino connected to the ground station is selected and press the "Connect to Arduino" button.

    i. If you have not yet connected the Arduino on the ground station, plug in the Arduino and then git the Refresh button. This will find the Arduino.
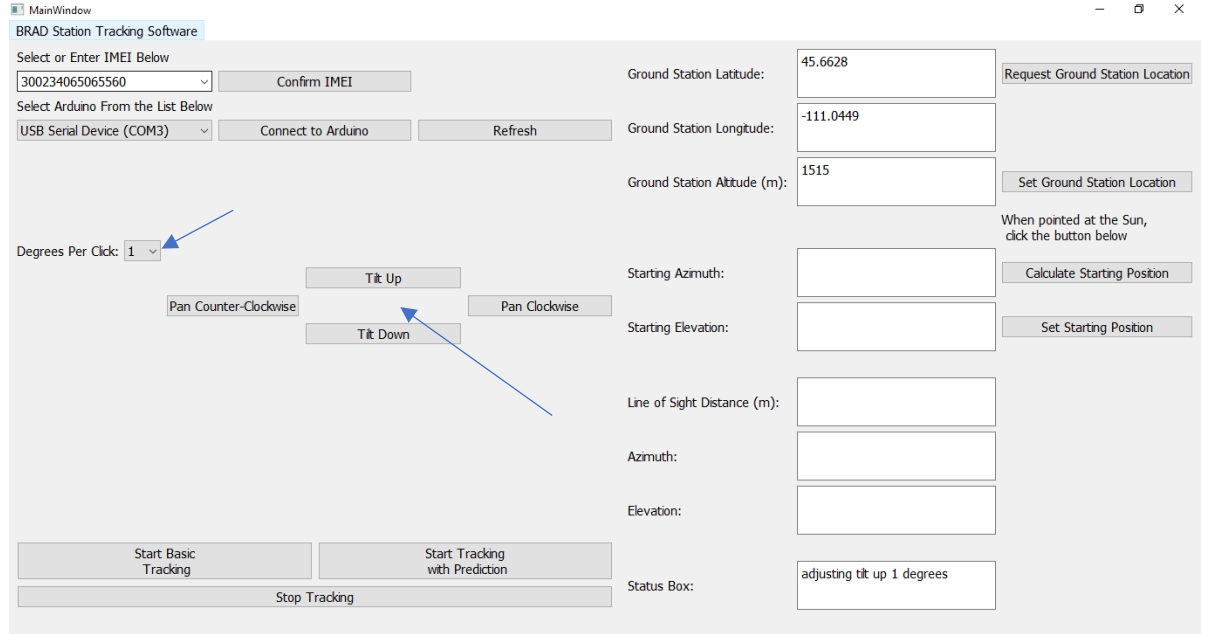
3. Obtain the GPS location of the Ground Station setup

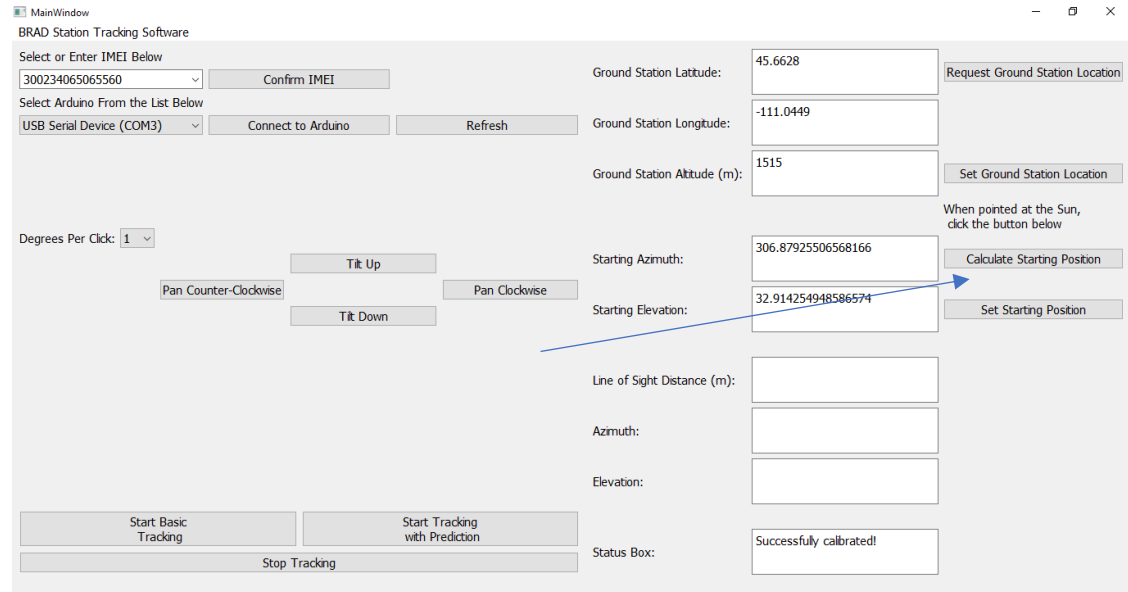   a. Enter in the ground station coordinates into the ground station location boxes.
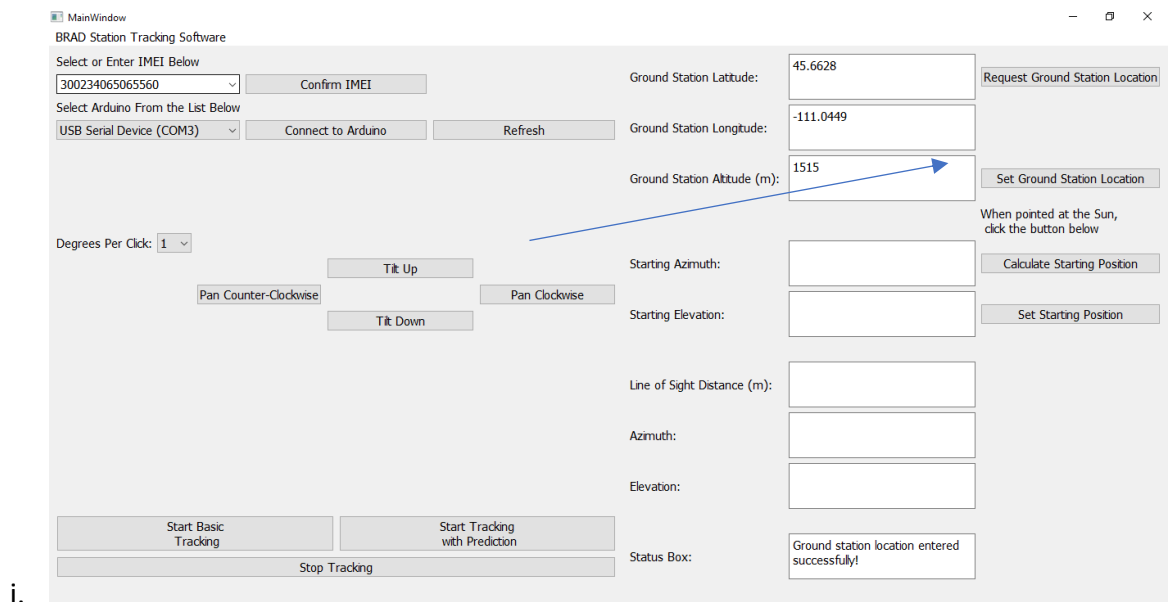
    i.

1. After obtaining/entering the location of the ground station, hit the "Set Ground Station Location" button.

4. Use the adjustment buttons to point the solar sight at the sun

a.

b. Adjust the size of the motor movement using the "Degrees Per Click" box.

   i. Ensure that the sun is centered in the solar sight.

5. Set the starting position that the antenna is pointing at.

   a. Ensure that the ground station location is set and the solar sight is pointing at the sun.

      i. In the event that the sun is not visible, do your best to estimate the azimuth and elevation that the ground station is pointed. It is recommended to use a compass to obtain the azimuth, and a level to set the elevation to 0. If using a compass, ensure that you are using true north, and not magnetic north. Many phone compasses will automatically calculate the declination for you, and give the reported position in terms of true north.

   b. Click the "Calculate Starting Position" button on the right side of the screen. (unless calibrating using compass and level)

MainWindow

BRAD Station Tracking Software

Select or Enter IMEI Below

[300234065065560 ▾] [Confirm IMEI]

Select Arduino From the List Below

[USB Serial Device (COM3) ▾] [Connect to Arduino] [Refresh]

Degrees Per Click: [1 ▾]

[Tilt Up]

[Pan Counter-Clockwise] [Pan Clockwise]

[Tilt Down]

[Start Basic Tracking] [Start Tracking with Prediction]

[Stop Tracking]

Ground Station Latitude: [45.6628] [Request Ground Station Location]

Ground Station Longitude: [-111.0449]

Ground Station Altitude (m): [1515] [Set Ground Station Location]

When pointed at the Sun, click the button below

Starting Azimuth: [306.87925506568166] [Calculate Starting Position]

Starting Elevation: [32.914254948586574] [Set Starting Position]

Line of Sight Distance (m): [ ]

Azimuth: [ ]

Elevation: [ ]

Status Box: [Successfully calibrated!]

    i.

    ii. Once the starting position is calculated, hit the "Set Starting Position" button.

6. Hit the "Start Tracking" button in the bottom left to begin tracking the balloon!

    a. Basic tracking will simply point the antenna at the last position reported by the Iridium. Tracking with prediction will attempt a more precise tracking by extrapolating the change in position between previous Iridium pings, to continue adjusting the pointing of the antenna between pings of the Iridium.

    b. The "Stop Tracking" button will end the tracking

        i. The E-stop button will immediately stop the tracking, not allowing the ground station to finish it's last commanded location.

ii.
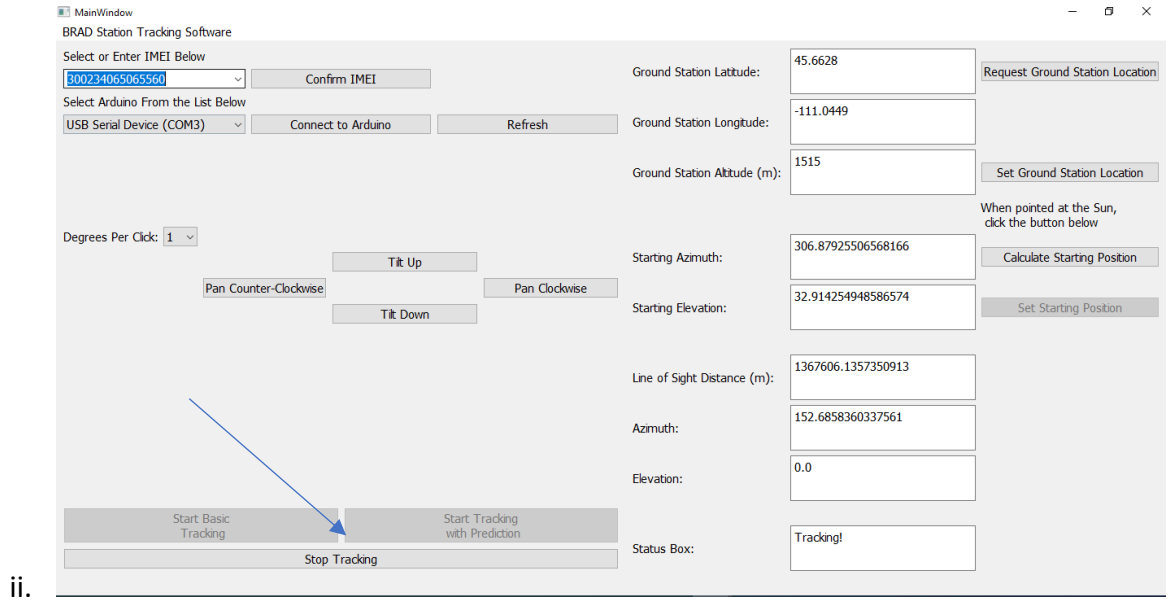
Other items to note:

- Internet connection is required to run the ground station tracker.
  - This is due to the balloon position coming from the web server.
- Ensure that your Iridium is on and actively pinging the server before starting tracking.
  - https://borealis.rci.montana.edu/tracking
- Additional information and error messages will appear in the bottom right corner in the status box. If something is not working, this may help you to debug what the issue is.
- The tracker is designed to work with Windows. If you have the desire to play with serial ports, and potentially other issues, it shouldn't be too hard to port to OSX or Linux if you so desire.
  - The python source code is provided, and will function (on Windows), assuming you install all of the dependencies needed.
- If you have two monitors connected when running the tracker, you may need to resize the window to get it to scale correctly.
- This software is still being developed, so it is very likely that there are bugs that have not yet been found. Please inform me if you have any problems using this software!

- If you have any other questions or concerns, contact me at:

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