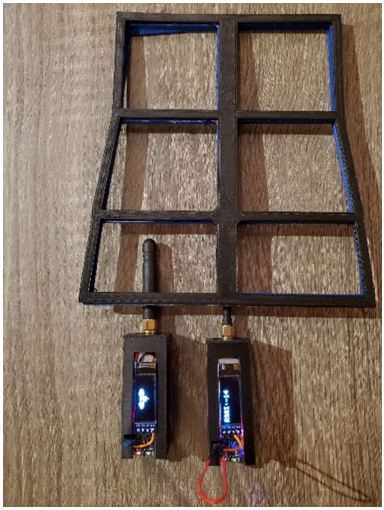
Phoenix Sub-Orbital Rocketry

Fetch User's Guide

Ver 1.0



Christopher Texler
1-12-2021

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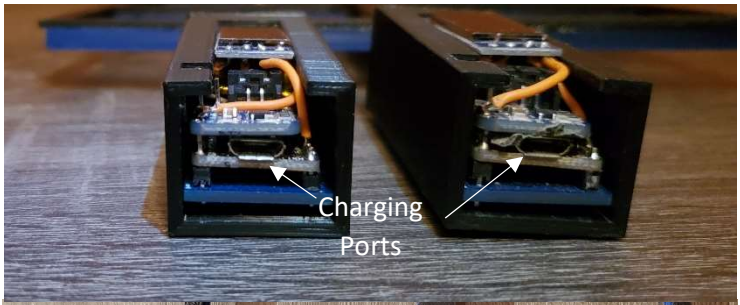

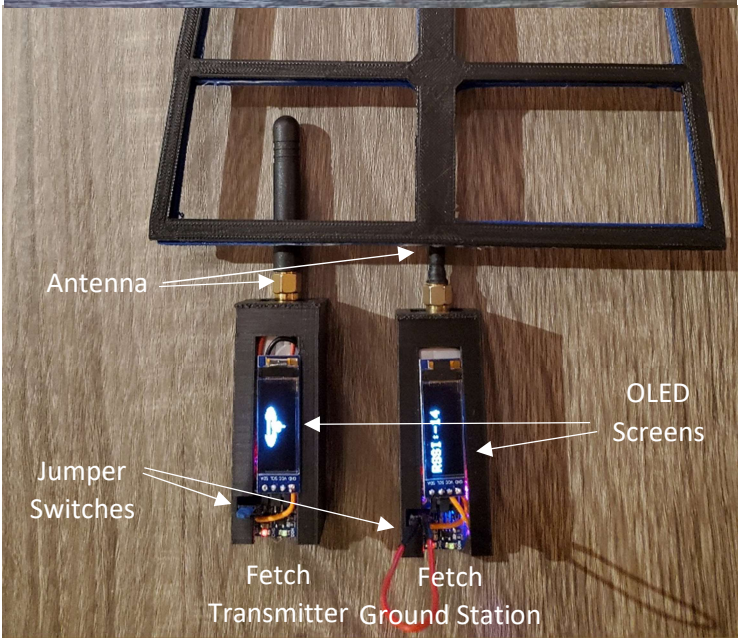

Basic Usage:

Turning the System on:

To turn the transmitter and ground station on, simply plug the jumper wires into the two prongs sticking out of the cut-out area in the case as seen in the hardware map.

Reading and Operating the Ground Station:

When the ground station and transmitter initially turn on, they will display a slash screen of the Phoenix Sub-Orbital Rocketry logo before displaying RSSI:(some number). The number on the transmitter can be ignored as the RSSI: screen on the transmitter is nonfunctional and only to be used as a power indicator. However, the RSSI: screen on the ground station is functional and is the number to read for tracking. The way to read the number is that less negative the closer and stronger of a signal you have. This means that when a directional antenna is connected to the ground station, you can tell when you're facing towards the transmitter via the number going closer to zero than when facing other directions.

The Math Behind the Magic:

Fetch works on an incredibly simple, yet ingenious concept, the transmitter sends out 915MHz “Pings” every ~0.5 seconds, the ground station receives those “pings” and then it displays the signal integrity in RSSI on the screen.

The secret behind how Fetch can use just the “pings” coming from the transmitter to track it can be boiled down to two major principles, the antenna and the signal processing capability of the human brain.

The Antenna:

First off is the black magic that is directional antenna design. For the Fetch system to work properly, the user needs to connect a directional antenna to the ground station. This is because otherwise, with an omni directional antenna, it’d show the same RSSI no matter the direction relative to the transmitter. The directional antenna works by using passive elements of wire to “reflect” and directionalize the signal and have a better signal in one direction than the other which allows it to receive a signal very well in one direction, and all but cut off in any other direction.

How to Turn Signal Strength into Directions

Since the ground station only outputs the signal integrity number, it’s up to the operator to translate that number into a direction. This is by design, though, as humans happen to be really good at playing the “Hot, Cold” game of narrowing down results which is exactly how to best operate and think about Fetch.