*Mission Operations Overview*

Saint Louis University

Rascal



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# The Ground Station

The ground station serves as the means to verify the completion of each mission goal. It will also serve to troubleshoot any problems that arise during the mission. The command to power on and off the visual aids will originate from the ground station as well.

## Ground Station Hardware

The hardware of the ground station consists of a radio, an antenna, an external TNC, and a means to control the antennas. They are described in detail below:

* **Radio:** It is a Kenwood TS-2000 radio. The radio operates on the VHF 144 MHz band and the UHF 430-440 MHz band. The transmit power is 50 W.
* **Antenna:** The antenna is a dual band Yagi antenna. There is a 70 cm antenna and a 2 m antenna.
* **External TNC:** The external TNC is a Kantronics 9612+. It is capable of handling GMSK and FSK modulated signals on the AX.25 protocol.
* **Rotor Control:** A G-5500 Yaesu controller controls the antenna azimuth and elevation motors. It is capable of traveling 180° in the elevation direction and 450° in the azimuth direction.
* **Computer Controller:** The computer interfaces with the rotor controller via the Yaesu GS-232B Computer Controller.

## Ground Station Software

There are three programs used for the ground station to track and command a satellite. They are described in detail below:

* **Orbitron:** Orbitron tracks the spacecraft and determines its azimuth and elevation. It also calculates the Doppler Shift necessary to maintain contact with the spacecraft.
* **WispDDE:** WispDDE sends the commands to the rotor control to move the antenna and to the radio to account for Doppler Shift.
* **Ground Station Software:** The ground station software was written in house and it is responsible for sending commands to the spacecraft.

# Operator Interface

The Ground Station software serves as the primary interface between the ground station and the satellite. It is where commands originate and telemetry data is decoded. It was designed to be user friendly where commands could be sent with the click of a button, beacon packets are automatically decoded as they are received, and the beacon data is displayed. If it is required, commands can be sent manually sent through it. The software can be quickly reconfigured to account for changes in the hardware setup.

C:\Users\MR LEO\Desktop\Ground Station.tif

**9**

**8**

**7**

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**4**

**3**

**2**

**1**

**Figure 1:** Ground Station Software

# Payload Troubleshooting

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