

Earth Station Checklist

This document is intended to help new CubeSat developers get on the air. It is not intended to be a definitive guide to setting up an earth station. Once the basic station is on the air, you will know what parts to upgrade. As always, talk with your mentor about the process.

1 Prerequisites:

- 1.1 Get the permit process started for the antennas. Determine what type of installation will be necessary; either a small structure on the roof or a tower in the ground. Determine a way to get coax and other cables to the antennas. Two 2-inch conduits are necessary at a minimum.
- 1.2 Read the “Amateur Satellite Handbook,” published by the ARRL. It is a great resource on Amateur Radio satellites and earth stations. It is not necessary to completely understand it, but know where information is located. You may buy the book online at www.arrl.org.
- 1.3 Find an Amsat mentor nearby. Mentors can be located by asking around at a local amateur radio club meeting or on the web at www.amsat.org.
- 1.4 Determine what callsign is to be used for the effort. Club or personal callsigns may be used. Note: the person whose callsign is to be used must be involved in the project.

2 Obtain essential radio equipment:

- 2.1 Begin by obtaining a transceiver and appropriate antennas. 2 meter and 70 cm operation is recommended for the transceiver, as well as any other bands your earth station or satellite will be using. Appropriate antennas are omnidirectional, such as J-poles, ground plane, or discone. These are easy to build or obtain.
- 2.2 Azimuth/elevation rotor for the antennas is optional. When setting up the earth station, it is recommended to begin with omnidirectional antennas rather than directional antennas.
- 2.3 New transceivers are always appearing on the market. However, used radios can be quite useful. Be sure that single sideband, continuous wave, and frequency modulation modes are available for any frequencies that you might want to use.

3 Assemble components and start operating.

- 3.1 Before assembling, spray de-oxidant on all connections, and check connectors with an ohmmeter. Check for high standing wave ratio (SWR) and correct the problems. Ensure that the element lengths and spacings are correct.
- 3.2 Install antenna support structure. It is recommended to use stainless steel hardware when possible. If in a residential area, wait a few weeks before installing antennas so that any interference problems posed by neighbors will appear and be resolved before any "radiation" is emitted.
- 3.3 Install antennas and rotors, if necessary. Be sure to use ferrite beads to keep RF out of the earth station area. Hook up the transceiver to the antennas, ensuring that all coaxial cable runs are properly labeled at both ends. Install lightning protection if necessary.

4 Participate in terrestrial contacts:

- 4.1 Get on the local repeaters and ask for signal reports. This is usually done with frequency modulation (FM), but ask around, many people have single sideband (SSB) gear.
- 4.2 Get on Sideband and try to work some distance station (not in the satellite portion of the band!). There are many
- 4.3 Contests are great to find out how your station works. There are many people on the air eager to talk with you.

5 Participate in satellite contacts:

- 5.1 Start with voice satellites. They are much easier to work when you are just learning how to use the equipment. Invite your mentor to help you out on your first satellite contacts.
- 5.2 After voice, move to digital. There are many high-orbit digital satellites that have very strong downlink signals. They can be decoded with software TNCs. Make sure the doppler shift is accounted for.