



Ground Station Overview

ThumbNet provides a comprehensive network of very cheap and simple satellite receiving stations that use "citizen science" to capture and consolidate images and data. While there are planned or existing, formal and informal ground station networks (e.g. GENSO, AMSAT), none are particularly well suited to the ThumbSat concept, for a number of reasons, including:

- ThumbNet gives more control for use in the ThumbSat program.
- The requirements are less, so it is easier to fund and coordinate.
- As the equipment is not technically complex, it allows a wide range of people to be involved.

The concept is simple. More ground stations in the net mean lower average distances between the closest station and the satellite, which is important as the ThumbSat transmit power is very low. The small size of the ground stations means that they can be located in any inhabited place, however remote, as long as there is basic mobile phone or internet access. Many remote islands are suitable locations for ThumbNet stations, so the oceans no longer appear to be remote to orbiting satellites.

ThumbNet has been in talks with schools and educational groups around the globe to develop contacts in diverse areas such as the Marshall Islands, Cook Islands, Tanzania, and French Guiana. Already, more than 20 groups have committed to volunteering to have students and staff members operate the ground stations as part of their science courses!

Consisting of little more than a set of software applications running on a laptop or desktop computer, a television tuner dongle, and a High Gain antenna, the ground stations will be distributed to the volunteer stations as kits to be assembled on site by the students that will be involved in the station operation. By involving the students in the construction as well as the operation of the ground station, a better understanding of the equipment and science theories are gained as well as a deeper sense of appreciation and commitment to the project.



Additionally, remote communities that are operating the ground stations will form social connections and friendships with others around the world and the new common bonds will promote an environment of unity and trust among groups with vastly different backgrounds and experiences.

Data received by each station will all be transmitted to a central computer monitored by ThumbNet via the internet, for processing and data distribution to the end user/scientist. There is every reason to believe that this could also be used to create a modest source of income for the remote communities.



Since it is well recognized that getting funding for education programs can be challenging, most of the hardware required to build the station will be donated to the school or community group by the ThumbNet team. The materials that will not be donated are almost certainly available in most maintenance sheds at the school. In particular, the school will primarily only need the materials for the antenna, which consists of little more than 3 meters of stiff wire (copper, brass aluminum, steel etc), approximately 1 meter of wood, (similar to a broom handle) and some coax cable to connect the antenna to the receiver. We will donate the receivers and USB cables, along with the software and procedures at no cost to qualifying groups.

Potential station operators

Schools are obvious potential operators. They often have internet access and a continuous population of enthusiastic and flexible people. Involving schools also means that the project can continuously encourage the next generation of scientists and engineers.

ThumbNet would not especially encourage radio amateurs or people with existing licenses. In fact, the intention would be to encourage people who have no previous experience of operating radio equipment. ThumbNet stations can be designed, built and understood by just about anyone!

Ideally, operators will be able to locate themselves away from sources in the same band, to minimize radio RF interference. It is expected that one advantage of locating a ground station on a remote island is the minimal radio noise from other sources.

Filling in the gaps

There are several ways to compensate for large gaps between stations:

- Use higher gain equipment around the larger gaps.
- Use oil rigs and other “temporary” locations.
- The schedules of cargo ships and tankers are well known some time in advance, so it may be possible to make use of them.



Potential ThumbNet ground station locations. (Islands Only)



Ground Station Technical Overview

Simplified parts breakdown of the ground station equipment:

- 70cm High Gain (YAGI) antenna
- RTL2832U +R820T USB television tuner dongle
- Power USB cable
- Laptop or desktop computer
- Software Defined Radio application (e.g. SDR# or HDSR)
- Orbital prediction software application
- Audio cable
- Digital modem software
- Image or mission specific software
- Antenna pointing hardware and software



Receiver Dongle