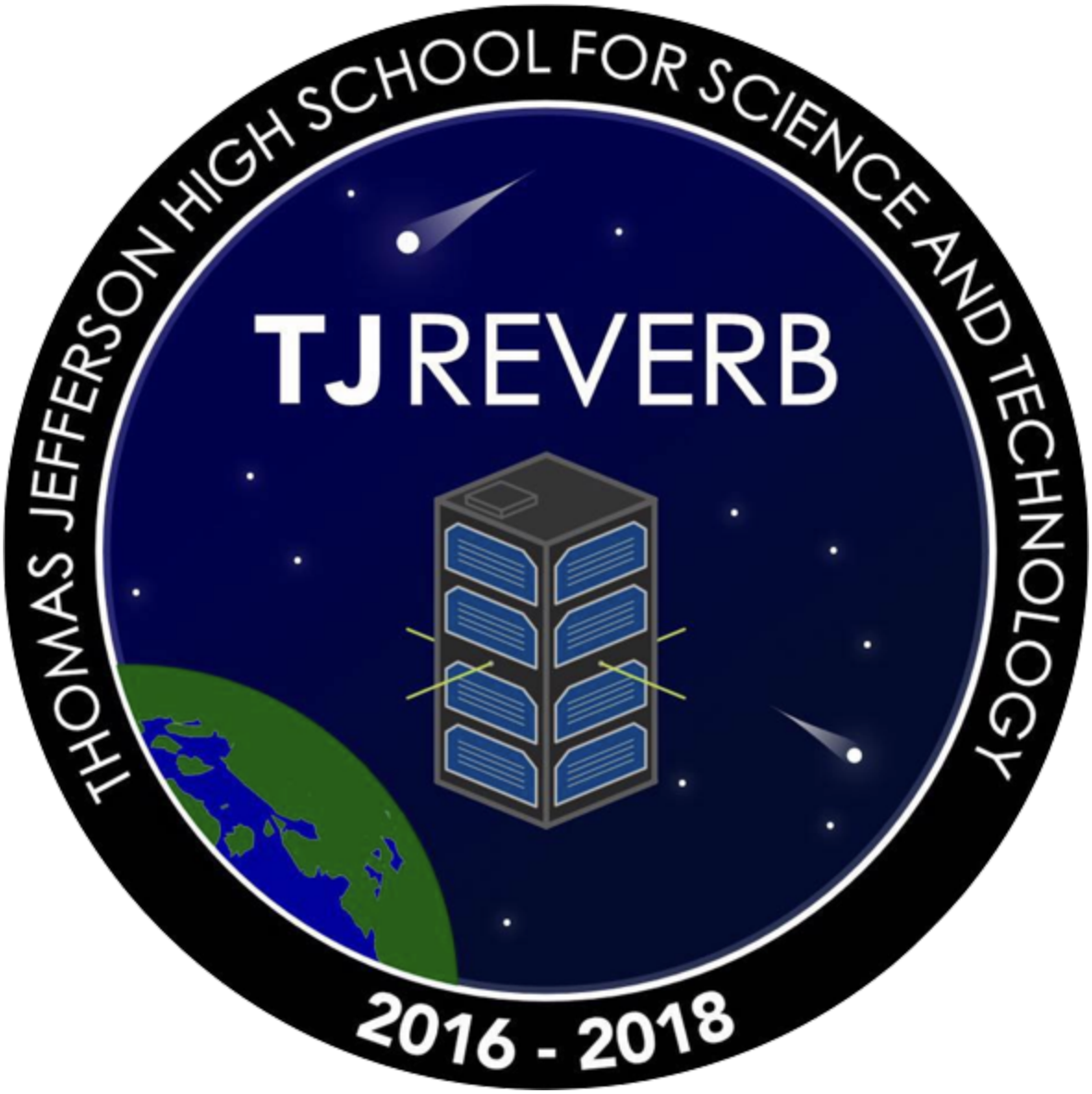
APRS Radio Guide



TJ REVERB

By: Rishabh Misra

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Contact Us

If you have any questions with regards to anything present in this guide, or the CubeSat in general, please contact us at tjreverb@gmail.com

Step 1: Parts

Below is a list of the parts needed to set up the basic APRS radio

- 2 power supplies (we used a BK Precision 1550 DC Power Supply and a BK Precision 1680 Power Supply)
- Attenuators
- 2 Byonics MTT4B Radios
- Power supply cables to connect power supply to radios (come with radio)

Before the rest of this guide begins, here is the link to the user manual for the MTT4B radio: https://www.byonics.com/downloads/MTT4B_Manual_v1.0.pdf

This manual contains a lot of information regarding the radios we used for our project, such as the commands needed to operate it in the Options menu

Step 2: Setup (off computer)

After obtaining the parts, here are the steps necessary to set up the radio to start transmitting:

1. Plug both power sources into the wall
2. Connect transmitter and receiver to different power sources
3. Plug in Radio transmitter to USB port on computer
4. See figure 2.1 to see what a correctly set up transmitter attached to the computer should look like
5. Follow Step 3 (on computer transmitter directions) for directions on how to get the transmitter to transmit signal
6. Obtain another computer, and plug in Radio receiver to USB port on computer
7. See figure 2.2 to see what a correctly set up receiver attached to the computer should look like (same computer used as figure 2.1, but you should use different computers)
8. Follow Step 4 (on computer receiver directions) for directions on how to get the receiver to receive signal

Figure 2.1

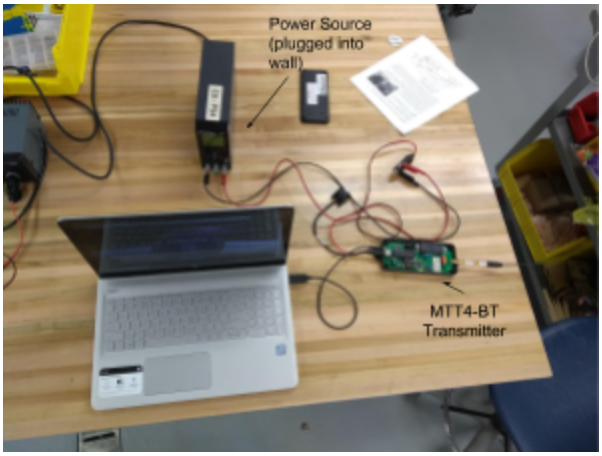
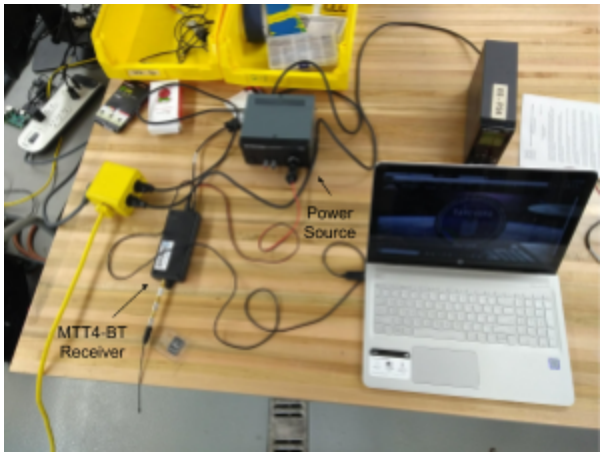


Figure 2.2



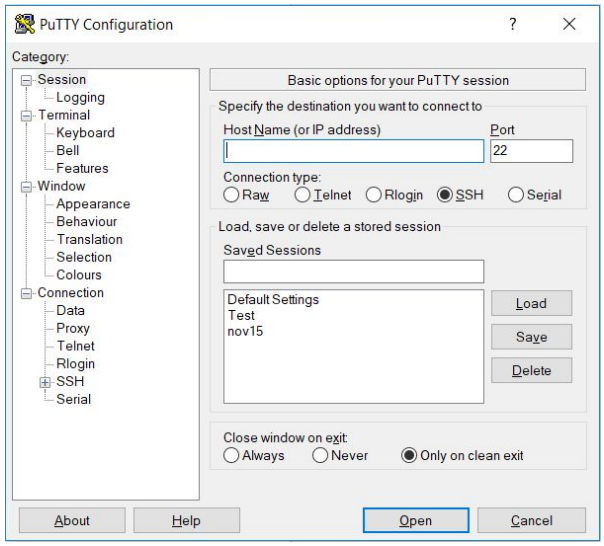
Step 3: Transmitter Setup (on Computer)

Note: This guide is made for a Windows Computer (specifically Windows 10)

1. Make sure Radio transmitter is plugged into USB port of computer
2. Download and install PuTTY at https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html
3. Open PuTTY after installation, and you should see the screen in Figure 3.1
4. Open Device Manager on your computer, and click on the dropdown titled Ports
5. You should see 1 or more listings of ports called “COM#” where # is a integer number
6. Change the mode in PuTTY to Serial, and set the baud rate to 19200
7. Type in the first “COM#” into the Serial Line field on PuTTY and click ‘Open’ at the bottom
8. If you do not see a new terminal window pop up **with** a question mark and then a prompt of ‘Press esc 3 times to enter Options Menu’ then exit any terminal windows that popped up, turn off the power source and then turn it back on, and repeat step 7 with the next “COM#” listed under the Ports dropdown in Device Manager

9. If you do see ‘Press esc 3 times to enter Options Menu’, then press the esc key on the computer 3 times, and you will enter the options menu
10. To change the text transmitted, type “BTEXT [text]” into the command line and press enter, replacing [text] with whatever you would like transmitted. See the MTT4B user manual to see more commands that you can perform in the Options menu on the radio
11. After changing the beacon text (text transmitted), type “QUIT” and press enter to quit out of the Options Menu, and the radio should be transmitting! To be sure that this is in fact occurring, you should hear a clicking sound every few seconds
12. ***Note: If any of the commands do not work (throw a command not found exception), and you are sure you typed the command in right, just retype the command and press enter until the command registers (sometimes the options menu of the MTT4B radio can be buggy)

Figure 3.1:


PuTTY Configuration
Category:
Session
Logging
Terminal
Keyboard
Bell
Features
Window
Appearance
Behaviour
Translation
Selection
Colours
Connection
Data
Proxy
Telnet
Rlogin
SSH
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Basic options for your PuTTY session
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Port
22
Connection type:
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Telnet
Rlogin
SSH
Serial
Load, save or delete a stored session
Saved Sessions
Default Settings
Test
nov15
Load
Save
Delete
Close window on exit:
Always
Never
Only on clean exit
About
Help
Open
Cancel

Step 4: Receiver Setup (on Computer)

1. Make sure Radio receiver is plugged into USB port of computer
2. Follow instructions #2-8 of Step 3, until a window remains popped up, and says ‘Press esc 3 times to enter Options Menu’
3. Don’t press the esc key 3 times, because we don’t need to enter the options menu
4. If both the transmitter and receiver were set up correctly, every few seconds the beacon text that you set in step 3 should be printing on the screen of the computer with the receiver plugged in - you have successfully transmitted and received text in APRS! Now, it is time to move on to connecting to the radios wirelessly via a Linux Virtual Machine.

Step 5: Linux Virtual Machine Setup

1. Go to https://www.virtualbox.org/ and install Oracle VM VirtualBox
2. Open VirtualBox and click ‘Create Virtual Machine’
3. Name the VM ‘ubuntu-desktop’ *Note: You do not have to name it this, but if you do, VirtualBox will automatically change the Type to Linux and Version to Ubuntu (64-bit)
4. Follow the steps, clicking ‘Next’ when necessary, and using memory and other parameter limits which you think are sufficient dependent on your computer - at the end, click ‘Create’
5. Now that the VM is set up, we will proceed to install Ubuntu onto the VM - Download an Ubuntu 64-bit ISO file from https://www.ubuntu.com/download
6. Click your VM in VirtualBox and click Settings > Storage > ‘CD/DVD’ Icon and select the Ubuntu ISO file to mount
7. Click ‘Ok’ to save settings and exit to the main VirtualBox manager, and then select the VM and click ‘Start’
8. The VM should be up and working - then follow the on-screen instructions to set up Ubuntu on the actual VM
9. Now you have a Virtual Machine set up!

Step 6: Cloning the TJ REVERB Github Repository

1. Open up Terminal on the Linux VM
2. Change the working directory to the location where you would like the repository to be cloned (If you don't know Linux and basic terminal commands, see https://maker.pro/education/basic-linux-commands-for-beginners to learn some basic Linux)
3. Type into the terminal:

   git clone https://github.com/Shasty88/TJREVERB.git
4. Press enter, and a local clone of the TJ REVERB Github Repository will be created

Step 7: Editing the C code of TJ REVERB

1. First, you will need to create a new branch from the master branch, so type into the terminal:

   git branch checkout -b [name]

   replacing [name] with whatever you would like your branch to be called. Now, you are ready to edit.
2. Into the terminal, type:

   gedit main.c

   and press Enter. A file should open up with the TJ REVERB code, where you can edit it to your liking (Visit https://www.learn-c.org/ to learn how to program in C if you do not know how to already) *Note: Because this is a local copy, and on your own branch, you will not edit the code of the actual TJ REVERB Github repository*
3. Once you are finished editing, press ctrl+s to save your work, and then in the terminal type ctrl+c to close the editing window.
4. Now, you are ready to run the TJ REVERB code, using the two radios!

*Note: We kindly request that you do not push code to the TJ REVERB Repository on Github, so that all who are using this guide can use the correct code