PACSAT Launchpad Getting Started

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**Version:** 0.1

These instructions will allow you to operate and test a PACSAT board using the TI Launchpad development board. They assume that you have a basic understanding of Windows and Linux. In addition, they are geared towards university teams which may have network restrictions or other computing issues not normally encountered in a home environment. I recommend using both a Windows and Linux machine throughout this process; the reason for this method will be explained later.

**Equipment Required**

1. PACSAT and Launchpad boards
2. Mini USB to TTL serial converter adapter (the adapter commonly used in the PACSAT team is hyperlinked [here](https://www.amazon.com/gp/product/B0BJKCSZZW/ref=ppx_od_dt_b_asin_title_s00?ie=UTF8&psc=1))
3. Female to female jumper wires (3)
4. USB Mini B Male to USB Type A 2.0 or Type A 3.0 Male (1)
5. USB Micro B Male to USB Type A 2.0 or Type A 3.0 Male (1)
6. Linux and Windows computer(s)
7. HAM radio with UHF receiving capability
8. Antenna for UHF receiver
9. Antenna for PACSAT UHF SMA transmitter

**Software Required**

1. Code Composer Studio (Linux)
2. PuTTY (Windows)
3. FTDI drivers (Windows)
4. USBDeview (recommended, Windows)
5. PacSatSW GitHub repository local copy
6. PacSatHardware GitHub repository local copy

**Loading the PACSAT Software**

To load the PACSAT software onto the board, you’ll need to download and unzip the GitHub repositories for both SW and Hardware. This process will be done on your Linux machine. I recommend simply downloading local copies instead of cloning the repositories since you’ll be moving some files around. You shouldn’t push updates from your copy that you’ll be operating the boards from. I found that Code Composer Studio will automatically update the TI drivers on Linux, but for some reason Windows had a much tougher time updating the drivers through CCS. In

addition, your Linux installation likely already has the FTDI USB to serial drivers. Windows OS will be used later when you’re ready to send commands via PuTTY. I found that it’s more difficult to send commands to ttyUSB devices on Linux than it is to identify and command USB devices via COM ports on Windows, especially if your university IT set restrictions on your Linux machine.

**The following steps will be performed on your Linux machine**

1. Downloading PACSAT Software
   1. On the Linux machine, go to <https://github/orgs/AMSAT-NA/repositories>
   2. Once in the repository, click PacSatSW
   3. On the top of the screen in the PacSatSW folder, click the green Code button, then press download ZIP
   4. Repeat 1(iii) for the PacSatHardware folder
   5. Unzip both folders you just downloaded into a repository of your choosing
2. Loading PACSAT Software onto the TI Launchpad Board
   1. Attach an antenna or a dummy load into the UHF SMA connector on the PACSAT board
   2. Plug in the three jumper wires into the appropriate leads on both the serial adapter and the PACSAT board. There’s a section on the board labeled “Serial Bus.” (Ground to ground, transmit to receive, receive to transmit).
   3. Plug in the serial adapter into your computer via the mini-USB to USB cable
   4. Connect a USB-Micro cable from the computer to the Launchpad
   5. Navigate to the folder “PacSatHardware-main/launchpad” and copy the folders “hcg” and “hcgExtras”.
   6. Navigate to the folder “PacSatSW-main” and replace the folders “hcg” and “hcgExtras” with the one you coped from the Hardware folder
   7. Launch Code Composer Studio
   8. Press Import Project
   9. Select Browse next to the Select search-directory
   10. Navigate to the PacSatSW folder that was unzipped and then press Open(Documents/PacSatSW-main)
   11. Press Finish
   12. Select the config.h file
   13. In the “define LAUNCHPAD\_HARDWARE” line, remove the comment and set the define
   14. Ctrl Find CALLSIGN, and change the CALLSIGN, DCAST\_CALLSIGN and \_CALLSIGN to whatever your callsign is
   15. Next, at the top, in the dropdown menu, press the File tab, then Save All to save the changes made
   16. Next in the dropdown menu, Press the Project tab, select Clean
   17. Resolve any errors. Some of these errors may be related to hardware which has not been implemented yet; for example, a power amplifier hasn’t been installed on the board as of Nov 2024.
   18. Clean again until there are no more errors
   19. Press Flash

At this point you can turn on any receiver operating in the UHF band and tune to the frequency that the board transmits at. Even without connecting your radio to the PACSAT ground station software, you should be able to hear the packets every 30 seconds. If you don’t hear any packets, then there might be something wrong with the code or the board itself. You could try flashing the board again or pressing the “reset” button on the Launchpad. Otherwise, continue to the next section to see how we can configure the PACSAT settings through PuTTY.

**The following steps will be performed on your Windows computer.**

1. Connect the PACSAT and Launchpad to your Windows computer similarly to how you connected to your Linux machine using both the micro and mini-USB cables
2. Open PuTTY and navigate to the serial connection type
3. Type in the correct com port and baud rate, then open
4. Type “helpall” to see the list of commands
5. Reset the board to see information like RX and TX frequency

The next iteration of this document will include recommendations for setting up the ground station software. If you want to get a head start, then navigate to [this](https://www.g0kla.com/pacsat/) website. Read through the manual. The instructions in this document will only supplement those given in the manual. It will not serve as a replacement.