

APC220 Radio

AIAA OC Rocketry – July 5, 2015

The CanSat shield Version 4 uses a very popular APC220 440MHz RF data transmitter and receiver. You can use this as a telemetry link to send data to your ground station. When you purchase the APC220 you will receive two units. One you can use in the CanSat and the other for your ground station. The sketches in the zip file will help set up the APC220 radio and transmit “Hello” from the CanSat to your ground station as a test.

The CanSat shield design and most of the sketches used in the CanSat project are from NAROM (Norwegian Centre for Space Related Education) and Jens Frederik Dalsgaard Nielsen from Aalborg University and we thank him for making this possible for SPARC.

IMPORTANT: The APC220 uses Amateur Radio Frequencies. You will either need to obtain an Amateur Radio License (quite easy to do), or have a licensed ham in charge of the radio transmissions

NOTES:

1. It is highly recommended that you format your SD card before use. There is a link to an SD Card Formatting program in the LINKS FOLDER
2. There are 5 jumpers on the Version 4 Shield:
 - #1 is the APC220 programming jumper. Leave off for normal use of the APC220 radio. Put the jumper ON to program the radio
 - #2 is used to connect the Arduino's RxData line to the APC220 TxData line
 - #3 is used to connect the Arduino's TxData line to the APC220 RxData line
 - #4 is used to connect the Arduino's RxData line to the OpenLog RxData line
 - #5 is used to connect the Arduino's TxData line to the OpenLog RxData line
3. Jumper Use:
 - To program the Arduino from your PC via the USB cable – Jumpers 2-4 should be OFF
 - To use the APC220 radio – Jumpers 2 and 3 should be ON; Jumpers 4 and 5 should be OFF. Power the Arduino Uno from an external supply and NOT the USB cable
 - To use the OpenLog data logger – Jumpers 4 and 5 should be ON; jumpers 2 and 3 should be OFF. Power the Arduino Uno from an external supply and NOT the USB cable
 - To configure the APC220 via the Arduino Uno and Shield, jumpers 1-3 should be ON and jumpers 4 and 5 should be OFF

This .ZIP file contains information to help get the APC220 radio running. It includes the following files and folders:

- DOCUMENTATION FOLDER – most of the documentation is on Wiki pages on the internet – see the LINKS Folder
 - Cansat_arduino_shield_ver4 (Schematic).pdf – is the schematic for the NAROM Version 4 Arduino Shield
 - APC220-43 manual.pdf – is a generic manual for the APC220

- Dfrobot-apc220-manual.pdf – is another manual for the APC220 from DFRobot.
- LIBRARIES FOLDER (Empty – no libraries required)
- LINKS FOLDER
 - “Aalborg University Shield V4 Web Page” will take you to a web page on the CanSats and the Shield. This appears to be an early description of the V4 shield – the modifications described will already be done on the final V4 shield
 - “Arduino Software Tools Web Page” will take you to the main Arduino web site where you can download the IDE (Integrated Development Environment) for writing and compiling Arduino code for your CanSat project. And there is a lot of great information elsewhere on that site
 - “NAROM 2013 CanSat Book (Uses Older Shield)” will let you download the NAROM CanSat Book with a lot of good information about the project. Again, this references an older Shield
 - APC220 Drivers – SciLabs is a link to the drivers for your PC to use the USB adapter with the APC220
 - Termite (Terminal Emulator) is a terminal emulator program that will allow you to see the data sent from the APC220 on your CanSat to an APC220 plugged into your PC’s USB port
 - DFRobot wiki – APC220 are wiki pages on the APC220 from DFRobot
 - DFRobot – APC220 is the purchase page for the APC220 from DFRobot
 - Fritzg – APC220 is an informational site for the APC220
 - APC220 Configuration video – Video from Jens at NAROM/Aalborg University showing how to configure the APC220
- SKETCHES FOLDER

The sketch was provided by Jens at NAROM/Aalborg university and modified by AIAA OC Section Rocketry and will allow you to make certain your APC220 radio works

 - APC220Cfg contains the APC220cfg.ino program used to set the frequency, baud rates, and parity of the radio
 - APC220test contains the APC220test.ino program used to test the APC220 radio.

Instructions

1. Configure

- a. Watch the APC220 Configuration Video in the links section
- b. Remember to remove power to the Arduino Uno and Shield by unplugging the USB cable or disconnecting power whenever changing boards
- c. Remove the CanSat shield and plug one of the APC220 radios into pins 8-13 + ground. This is shown in the video and described in the header of the APC220cfg.ino sketch
- d. Compile and download the APC220cfg.ino sketch
- e. Open the serial monitor. Once prompted, you can type h<enter> for help which will give you a list of valid commands. R<enter> will read the current configuration
- f. You can keep the default configuration for now (434MHz, 9600 BAUD data for radio and interface, no parity). But when you launch your CanSat, each payload must have a different frequency

- g. Repeat for each radio – they must be configured identically

2. Start the Arduino

- a. Remove the APC220 radio from the Arduino Uno
- b. Plug the CanSat shield into the Arduino Uno
- c. Plug one APC220 radio into the shield
- d. Put jumpers on jumper positions 2 and 3
- e. Apply power to the Arduino Uno from a separate power source (not the USB cable)

3. Set up the Ground Station

- a. Download and install the SciLabs drivers (see links folder)
- b. Download and install the Termite terminal emulator program
- c. Plug the APC220 into the USB adapter that came with it, and plug that into your PC's USB ports and wait for the drivers to install
- d. Start the Termite Terminal Emulator
- e. Make certain that the Termite program is on the correct Virtual Com port and set to the same BAUD rate as the APC220
- f. You should see "Hello" every one second on the Termite. It might appear to stop after a few lines, but it is just scrolling and appears not to change.