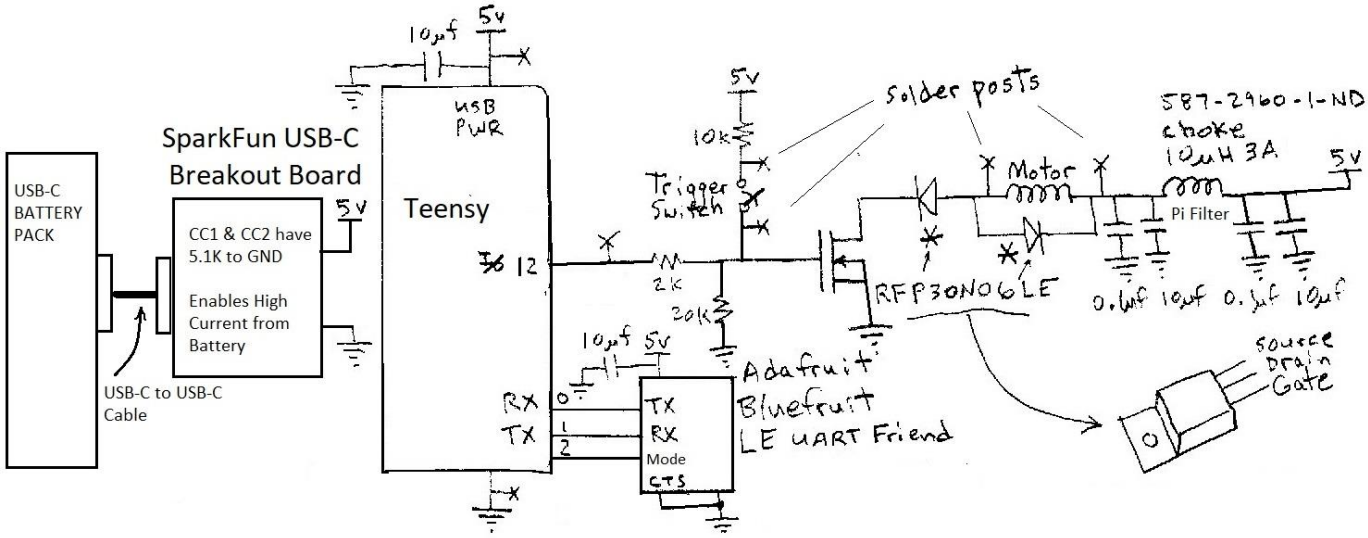
Bluetooth Water Gun

The squirrels in my friend's backyard climb the side of her house and jump over to a bird feeder to eat the seeds. The solution; a battery operated Bluetooth water gun controlled by her phone. The gun is positioned under the eaves so it's not exposed to rain and is aimed at the feeder.

The project is powered by a Power Bank with a USB-C in/out connector. The motor in the water gun draws about 750ma so USB-A will not provide enough current. The SparkFun USB-C breakout board has the required 5.1K resistors on the CC1 and CC2 pins which inform the battery to source up to 3 amps without dropping the voltage. The 5 volts from the breakout board powers a Teensy and Bluefruit LE UART Friend. I used a Teensy LC, (because I had one) but a Teensy 4.0 or Arduino will work the same. The Rx/Tx pins from the Teensy are wired to the Tx/Rx pins on the Bluefruit module. The Teensy is programmed to output a logic high when a button push is received over Bluetooth. This I/O signal turns on an N-FET that can handle the 750ma of motor current. The original gun trigger switch is also wired to control the gate of the N-FET in order to shoot the gun manually (for aiming). The original water gun put 4.2 volts on the pump motor so to make sure I didn't damage the motor with 5 volts, I dropped 0.7 volts with a diode. The motor also needs a "catch" diode across the windings to eliminate high voltage spikes that might damage the switching FET. Initial testing showed that the Teensy could be glitched by the motor noise on the 5 volt line so a Pi-filter was added. Caps were also added to the Teensy and Bluefruit for good measure.

Schematic



*Both diodes were constructed from the body diode in a RFP30N06LE N-FET. I didn't have any diodes in my parts bin that could handle the current so I used FETs instead. With the gate tied to the source, the FET is turned off and the instrinsic body diode is wired as Drain=cathode and Source=anode.

Parts List

Quantity	Part	Cost
1	Squirt Gun (2 pack)	$12.99
1	Teensy (4.0, 3.2, LC) or Arduino	$23.80
1	Project Box	$8.49
1	Perf Board	$9.23
1	Battery Pack	$19.99
1	USB-C to USB-C Cable 1 foot length (3 pack)	$7.99
1	USB-C Breakout board	$4.95
1	Bluefruit LE UART Friend	$20.14
3	RFP30N06LE N Channel FET (10 pack)	$8.00
1	587-2960-1-ND 10uh inductor	$0.40
4	10 uf Cap	
2	0.1uf Cap	
1	10K resistor	
1	20K resistor	
1	2K resistor	

Total cost about $120

Build

The components were assembled on a perf board cut to fit in a project box bolted to the water gun. A hole drilled thru the top of the gun provides access for the 4 wires. Solder posts were provided for easy connection to the motor, trigger, control, and power. The hole for the USB cable was drilled in the box and lid to pinch the cable in place. The box has a rubber gasket to seal the lid from moisture. All boards were covered in electrical tape so they wouldn't short to anything when stuffed inside the box.

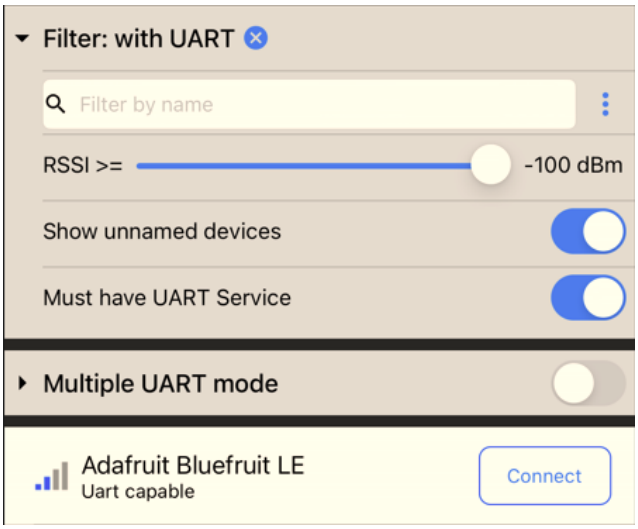
Software

My Teensy code, "Water_Gun.ino" is at my Github repo. Download the Adafruit BLE library for nRF51 based modules into your Arduino IDE. I based my code on the "Controller" example code found under Adafruit BluefruitrLE nRF51. No hardware handshaking is used which means the CTS pin on the Bluefruit must be tied low. The mode signal to the Bluefruit is driven by I/O #2 from the Teensy. I included the items from the file "BluefruitConfig.h" in my code so this file is not needed. You will need to put the "packetParser.cpp" file in the folder with the "Water_Gun.ino" file so it will compile.

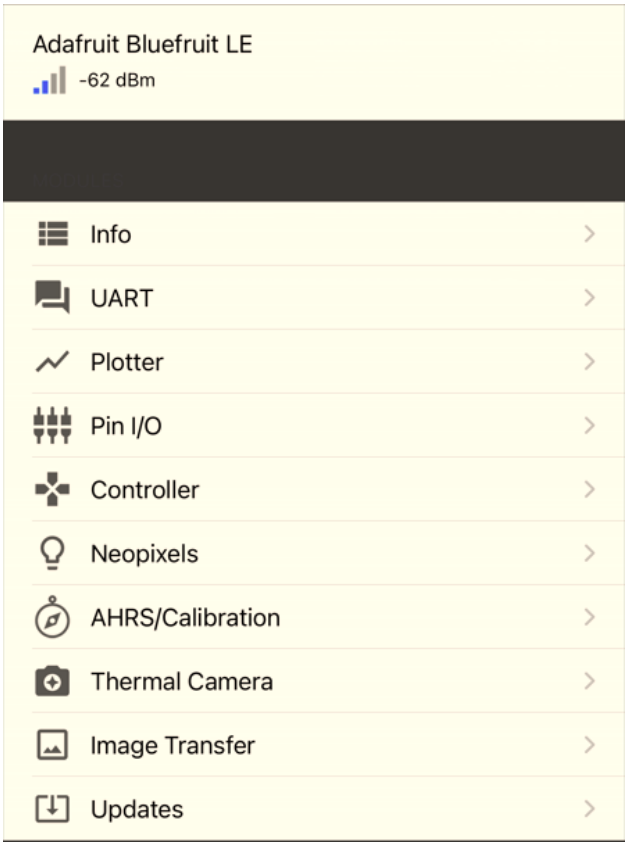
Note: When the Teensy wants to turn on the FET, it drives I/O #12 high and the 2K/20K resistor divider puts 3 volts on the gate of the switching FET. When the Teensy wants to turn off the FET, it makes I/O #12 an input which floats the pin and relies on the 20K pull down resistor to put 0 volts on the gate. This software trickery was needed so the gun trigger switch could be included with a 10K pull up resistor. The 10K/20K resistor divider puts 3.3 volts on the gate when the switch is engaged.

Phone App

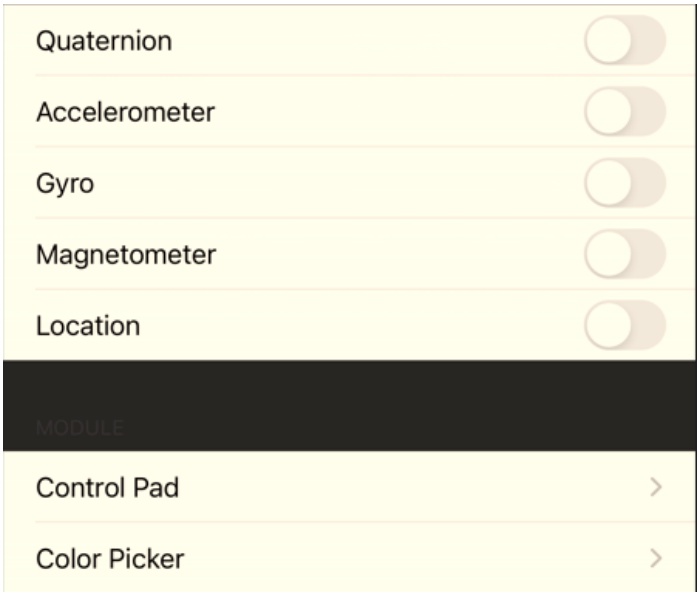
Follow the Adafruit instructions to download the Bluefruit Connect app from the iOS or Google store so your phone can control the water gun. Connect the battery to the water gun and the app should detect the Adafruit Bluefruit LE module. The following phone screen shots show how to control the water gun.



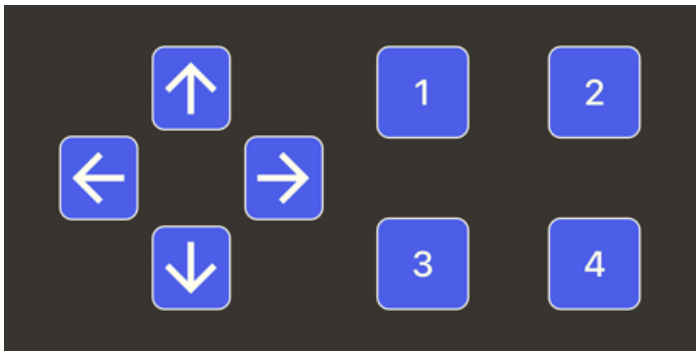
Push “Connect” next to Adafruit Bluefruit LE.



Push “Controller” to select the next screen.



Push “Control Pad” for the basic on/off buttons shown below.



Push and hold the “1” key to engage the motor, release the key to stop pumping water. If power is removed from the water gun and then reapplied, you must back out of the menus to disconnect Bluetooth and then re-connect to make it work.

A future project would be to use the arrow keys to control stepper motors for remote aiming of the water gun.