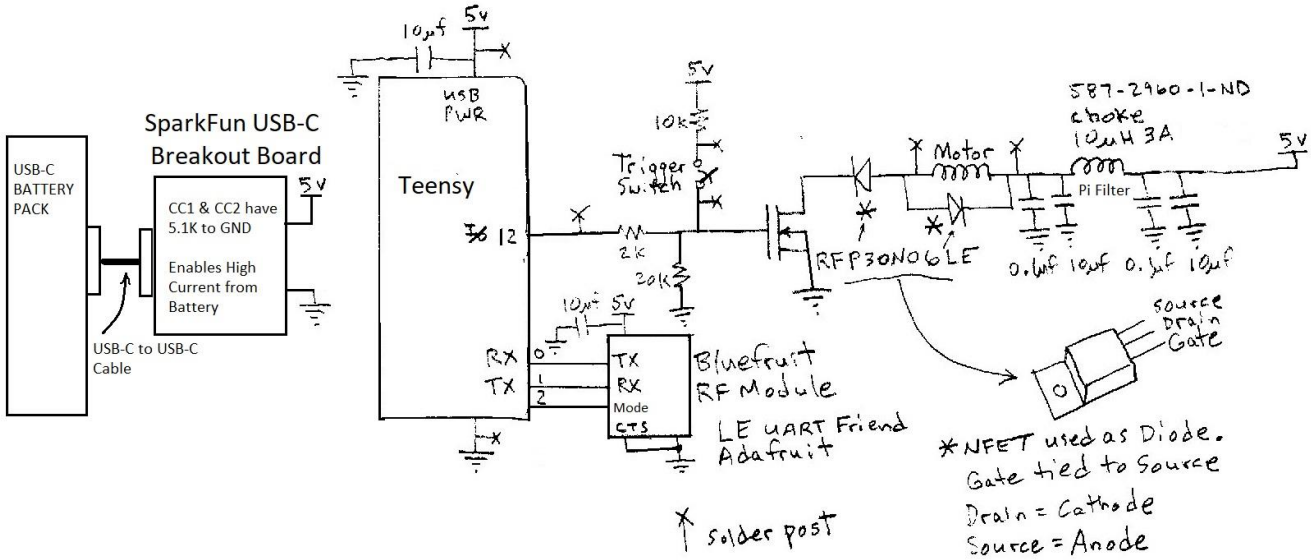
Bluetooth Water Gun

The squirrels in my friend's backyard like to eat the seeds in her bird feeder. She asked me to convert a battery operated water gun to have Bluetooth control run by her phone. The gun is positioned under the awning so it's not exposed to rain and is aimed at the bird feeder. Now she can drive the squirrels away by pushing a button on her phone while sitting on her couch. The project is powered by a Battery Pack 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 drooping 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 water gun came with a single lithium battery 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.

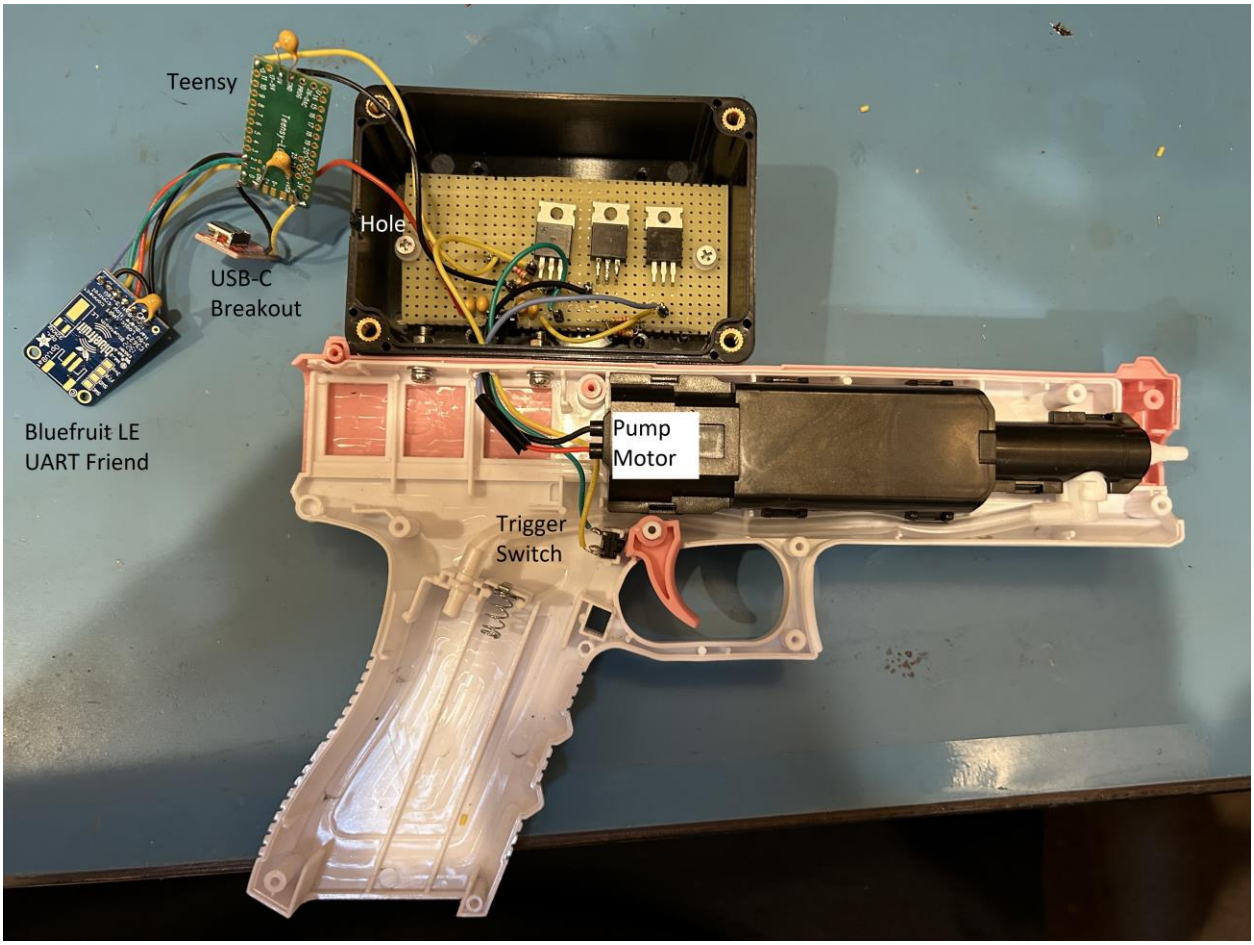
Parts List

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.

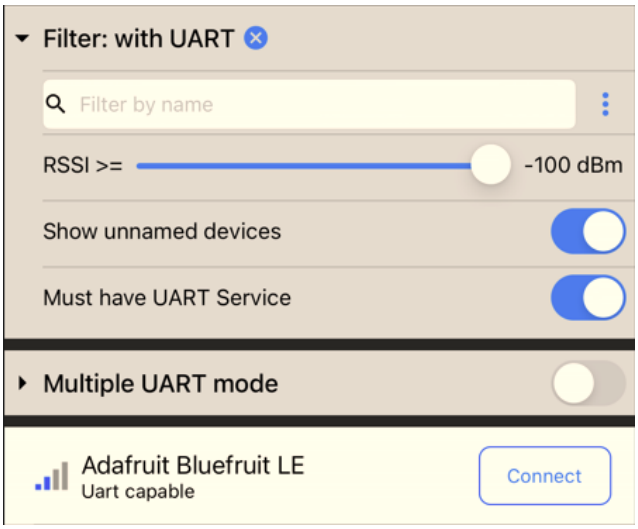


Software

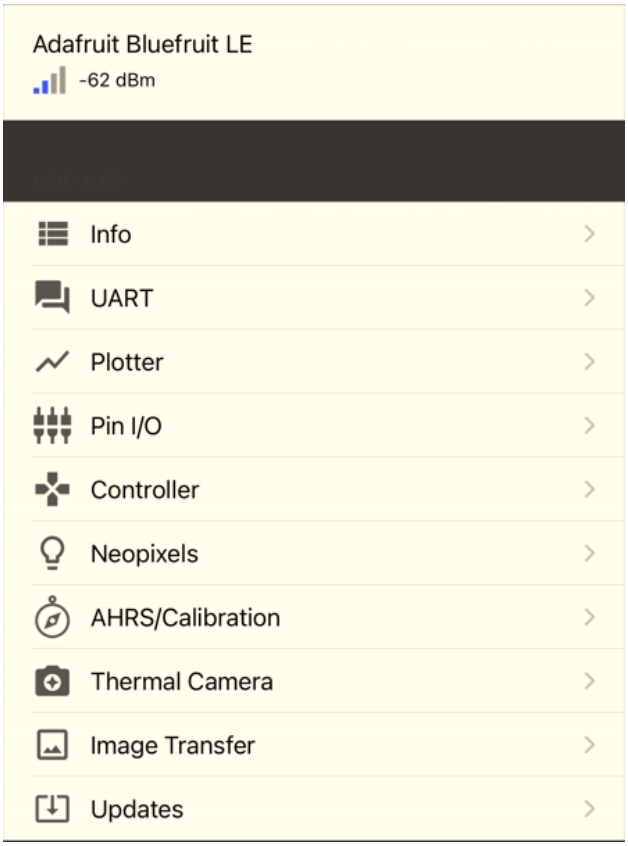
My Teensy code, "Water_Gun.ino" is at my Github repo. Download the Adafruit BLE library for nRF51 based modules into your Arduino IDE. I based my code on the "Controller" example code found under Adafruit BluefruitrLE nRF51. No hardware handshaking is used which means the CTS pin on the Bluefruit must 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 they will compile.

Phone App

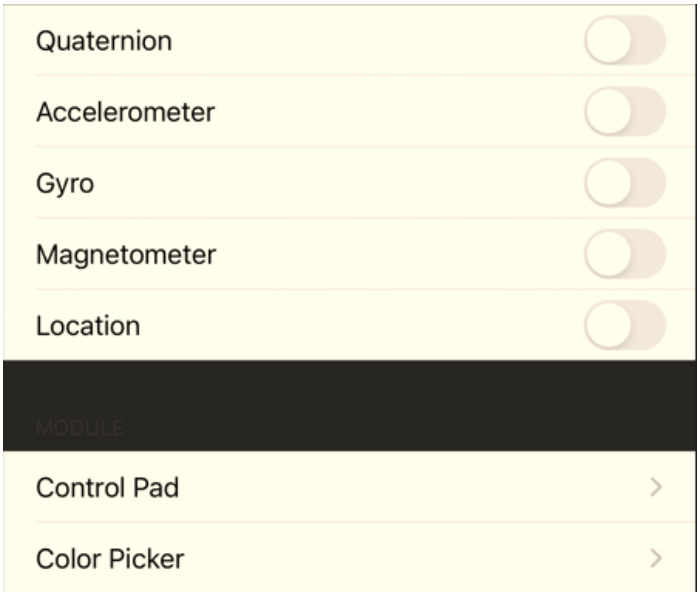
Follow the Adafruit instructions to download the Bluefruit Connect app from the iOS or Google store so your phone can control the water gun. Connect the battery to the water gun and the app should detect the Adafruit Bluefruit LE module. The following phone screen shots show how to control the water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



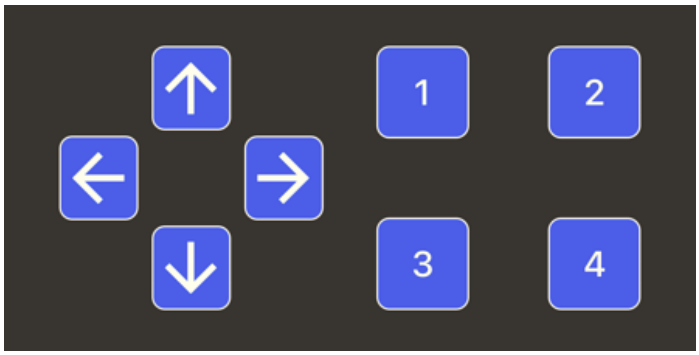
Push “Connect” next to Adafruit Bluefruit LE.



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. The other keys could be added to the Teensy code to control functions such as X – Y movement to aim the water gun. 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.