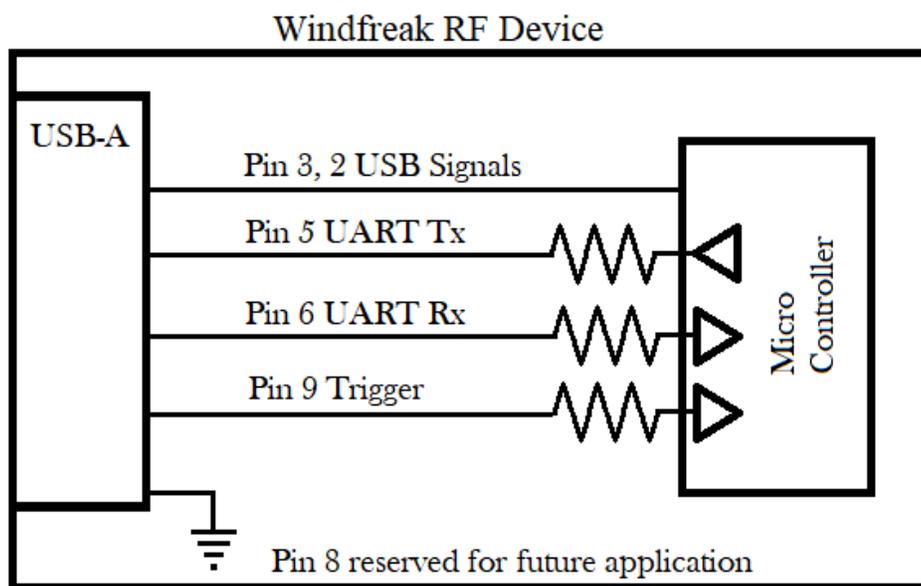


Windfreak RF Devices that have USB-A 3.0 type connector as the USB communications plug can also send and receive UART communications through two of the pins in the USB connector. A device such as the SynthUSB3 has this ability. This document describes how to hook into the UART signals from Arduino and Raspberry Pi devices.

Please note: This is an industry non-standard way of doing things, so these types of devices from Windfreak ship with a USB2 cable. When using these devices with USB only, it is important to use the USB2 cable shipped with the device. This protects the PC from any issue that might be caused by the UART signals coming through a USB3 cable to a PC USB port. Internally, there are 500 ohm resistors on the Tx and Rx lines, which should protect hardware from damage.

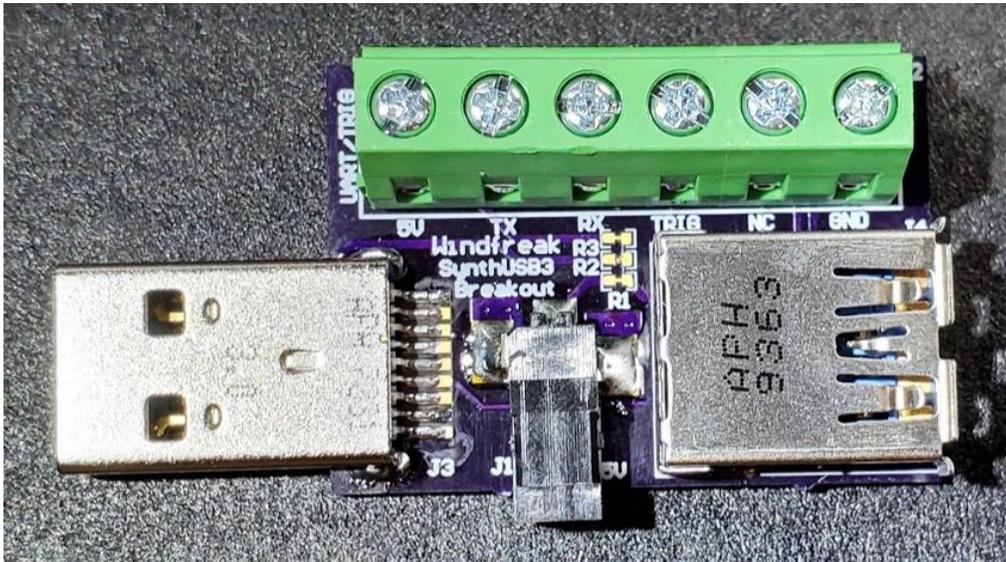


Windfreak Communication Block

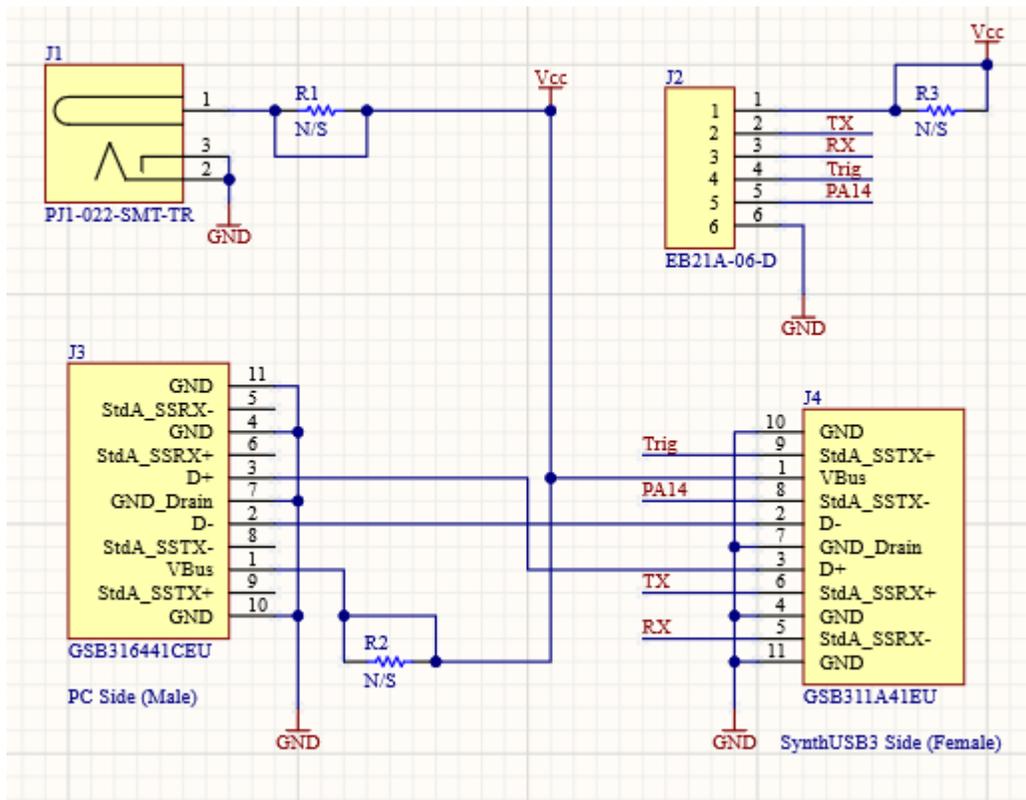
One way to connect to the Windfreak device is to cut and strip back a USB3 cable and tap into the bare wires. This takes knowledge of the cable, or some other way of knowing what the wires are. It's probably not a good idea to trust in wire colors unless getting them directly from the manufacturer of the cable.

When hooking your UART device to the Windfreak Signal Generator via a cable, Tx should hook to Rx and Rx should hook to Tx. In other words, your transmitter should transmit to the Windfreak UART receiver and your receiver should receive from the Windfreak UART transmitter.

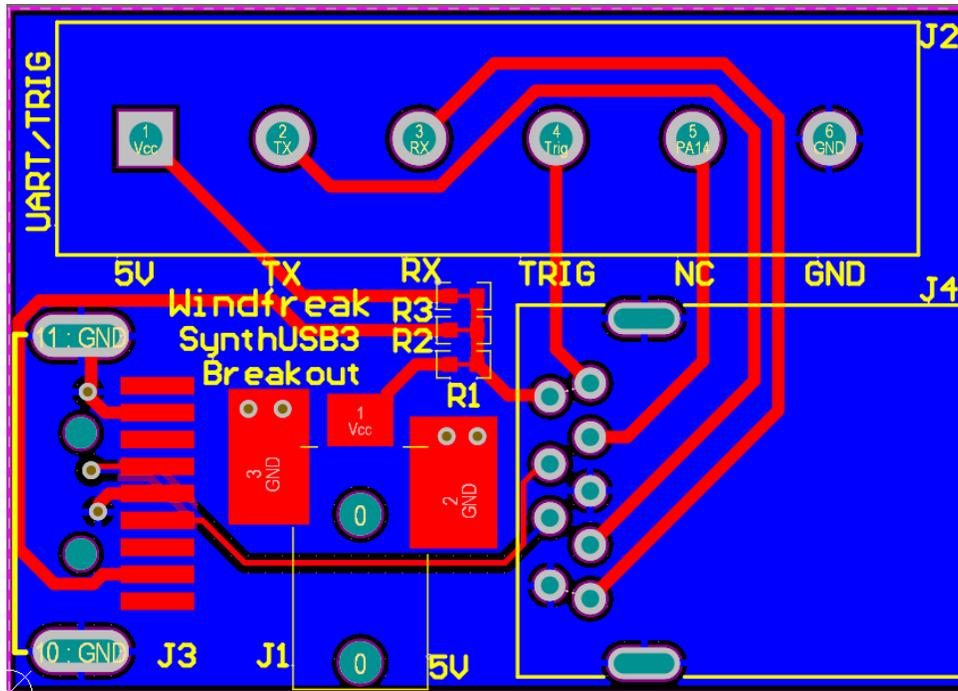
A possible solution is to purchase the SynthUSB3 breakout board from Windfreak Technologies. It is also possible to make your own.



Windfreak SynthUSB3 Breakout Board



SynthUSB3 Breakout Board Schematic



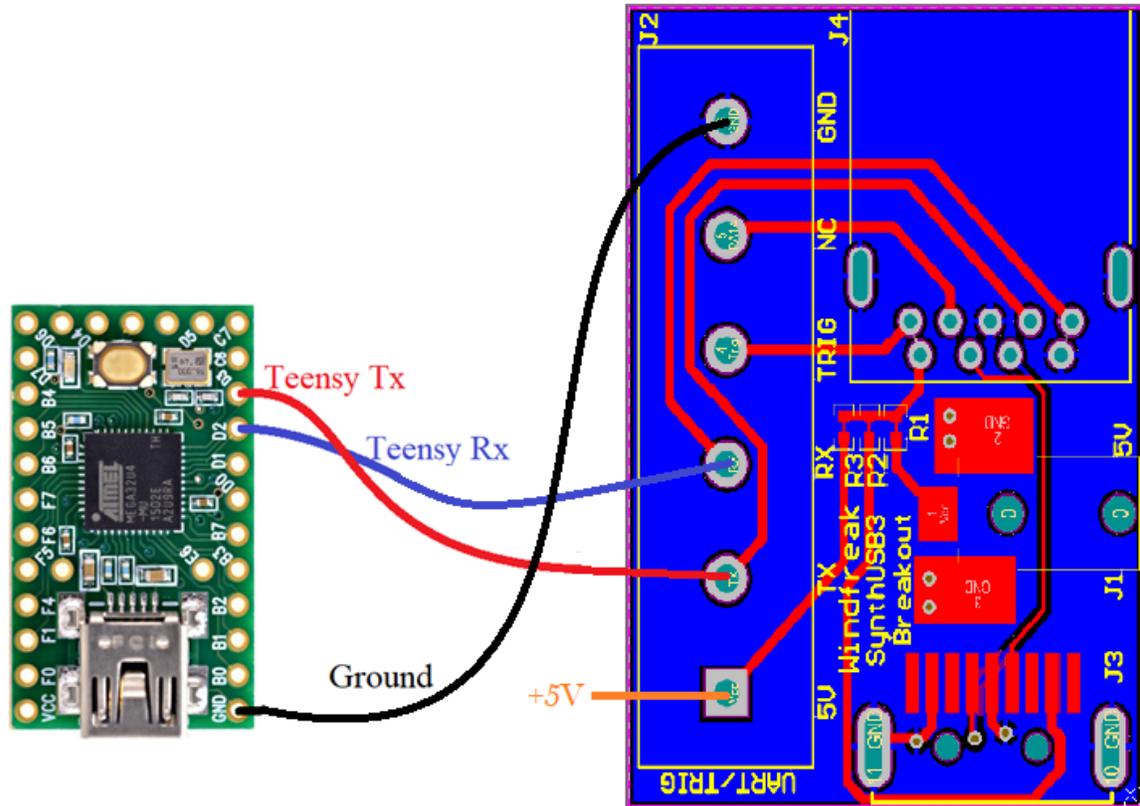
SynthUSB3 Breakout Board PCB

The PCB is labeled from the host perspective. So, connect the TX of your host processor to the TX of the breakout board, and connect the RX of your host processor to the RX of the breakout board. Also hook up ground and bring in 5V power either through the DC barrel connector, the terminal block, or through the USB connector on the left. All of the power connections are wired in parallel, so don't hook up more than 1 power source at a time. R1, R2 and R3 have shorting traces between the solder pads that can be cut if needed. Damage to your power sources is likely if you hook two or more together in parallel.

Teensy 2 Arduino Control

One example of a controller would be to use a Teensy 2 from PJRC:

<https://www.pjrc.com/store/teensy.html>



Microcontroller Hookup Diagram

The Teensy will get its power from your USB control connection.

For the Teensy Arduino application, you can use code like this:

```

void setup() {
  Serial.begin(9600); // USB baud don't care
  Serial1.begin(115200); // UART baud required for Windfreak
}

void loop() {
  if (Serial.available() > 0) Serial1.write(Serial.read()); // write to UART from USB
  if (Serial1.available() > 0) Serial.write(char(Serial1.read())); //write to USB from UART
}

```

Using the Arduino Terminal, send a ? command through USB to the Teensy and you should see a response of all Windfreak variables. Here is an example from a SynthHD:

```

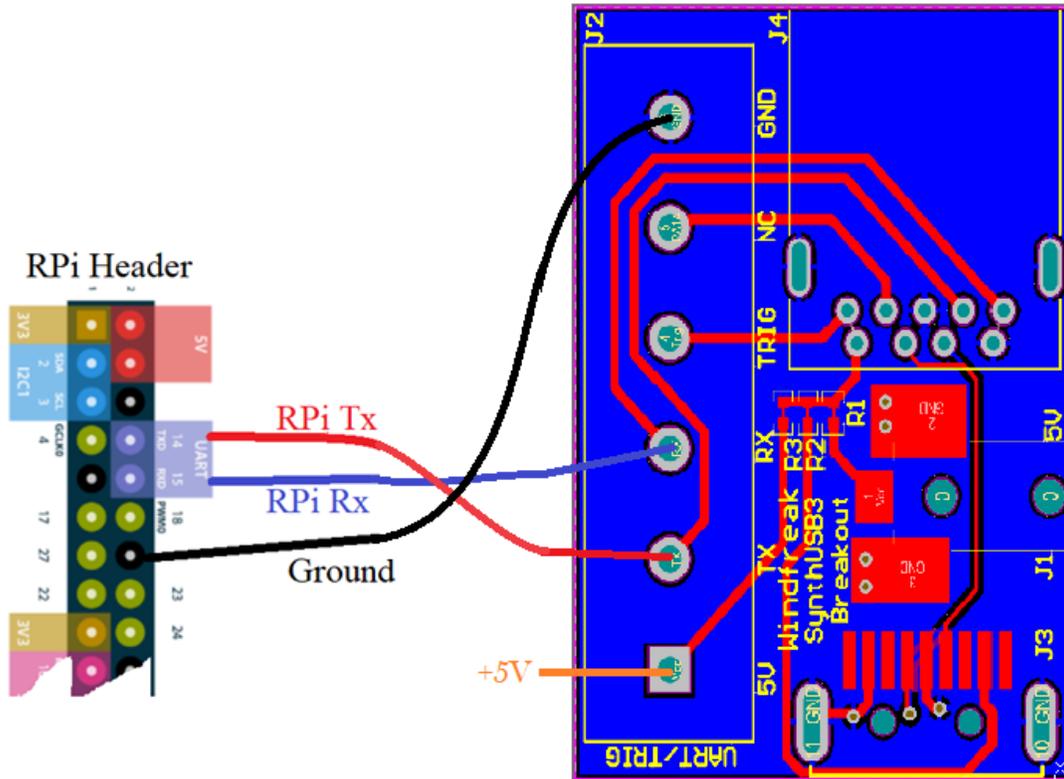
COM9
Send
C) Control Channel (A(0) or B(1)) 0
f) RF Frequency Now (MHz) 1000.00000000, 1000.00000000
W) RF Power (dBm) 0.000, 0.000
V) Amp Calibration success? 1
Z) Temperature Comp (0=none, 1=on set, 2=1sec, 3=10sec) 3, 3
a) VGA DAC Setting (0=min, 4000=max) 1270, 1270
~) RF Phase Step (0=minimum, 360.0=maximum) 0.0000, 0.0000
h) RF High(1) or Low(0) Power 1, 1
E) PLL Chip En On(1) or Off(0) 1, 0
U) PLL charge pump current 5, 5
b) REF Doubler On(1) or Off(0) 0, 0
i) Channel spacing (Hz) 100.000, 100.000
x) Reference (external=0, int 27MHz=1, int 10MHz=2) 1
*) PLL reference frequency (MHz) 27.00000000
l) Sweep lower frequency (MHz) 1000.00000000, 1000.00000000
u) Sweep upper frequency (MHz) 5000.00000000, 5000.00000000
s) Sweep step size (MHz/%) 200.00000000, 200.00000000
t) Sweep step time (mS) 1.000, 1.000
[] Sweep amplitude low (dBm) 0.000, 0.000
] Sweep amplitude high (dBm) 0.000, 0.000
^ Sweep direction (up=1 / down=0) 1, 1
k) Sweep differential separation (MHz) 1.00000000
n) Sweep differential: (0=off, 1=ChA-DiffFreq, 2=ChA+DiffFreq) 0
X) Sweep type (lin=0 / tab=1 / %=2) 0, 0
g) Sweep run (on=1 / off=0) 0
c) Sweep set continuous mode 0
w) Enable trigger: (0=software, 1=sweep, 2=step, 3=hold all) 0
F) AM step time (uS) 20
q) AM # of cycle repetitions 65
A) AM Run Continuous (on=1 / off=0) 0
P) Pulse On time (uS) 1, 1
O) Pulse Off time (uS) 10, 10
R) Pulse # of repetitions 10, 10
:) Pulse Invert signal (on=1 / off=0) 0, 0
G) Pulse Run one burst
j) Pulse continuous mode 0
<) FM Frequency (Hz) 1000, 1000
>) FM Deviation (Hz) 100000, 100000
,) FM # of repetitions 100, 100
;) FM Type (sinusoid=0 / chirp=1) 0, 0
/) FM continuous mode 0
p) Phase lock status (lock=1 / unlock=0) 1, 0
z) Temperature in degrees C 33.250
v) Show version (0=FW, 1=HW, 2=Model) 3.13, 65.54
+) Model Type
-) Serial Number 590
e) Write all settings to eeprom
?) help
 Autoscroll  Show timestamp
No line ending 9600 baud Clear output

```

Raspberry Pi4 Control

Another example of a controller would be to use a Raspberry Pi:

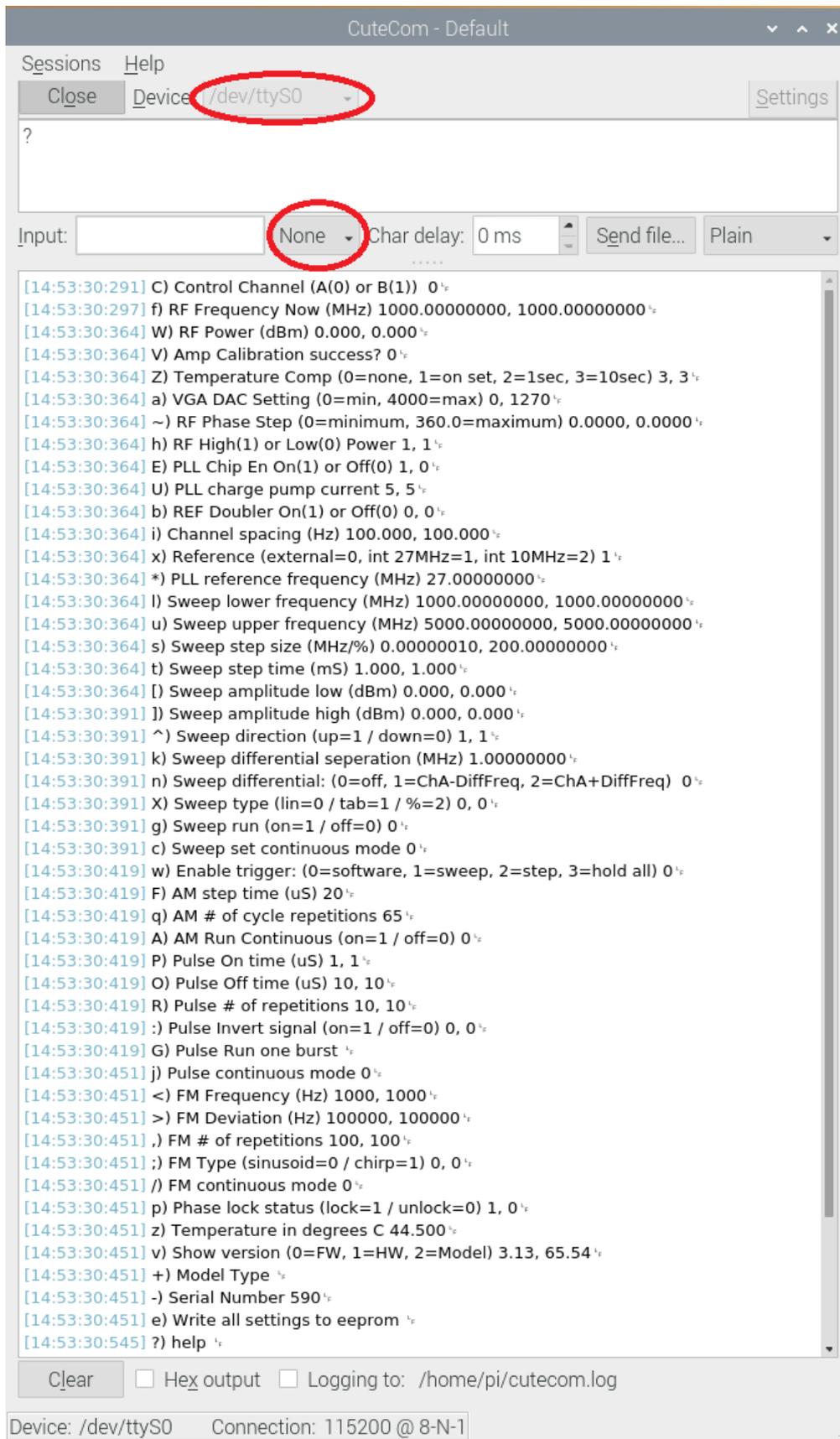
<https://www.raspberrypi.org/products/raspberry-pi-4-model-b/>



To get the RPi going you need to enable the hardware pins:

- 1) In terminal run: `sudo raspi-config`
- 2) Select Interfacing Options
- 3) Select Serial
- 4) Select NO for login shell access
- 5) Select YES to enable the serial hardware pins
- 6) Reboot
- 7) Install Cutecom

Open Cutecom. If this is the first time to run Cutecom you need to change the device to `/dev/ttyS0`. Also change the termination characters to "None" to the right of the input box. Click Open and send a `?` command and you should get a response similar to below:



For UART enabled USB-A 3.0 Windfreak RF Devices

Troubleshooting

If you don't see `/dev/ttyS0` then repeat steps 1-6 above. Windfreak devices don't like to see termination characters, so be sure and use a terminal program that allows you to turn them off. You can easily use a USB connection from the RPi since Raspbian comes with the proper hardware drivers.

Sincerely,
David Goins
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dgoins@windfreaktech.com
727-490-8812