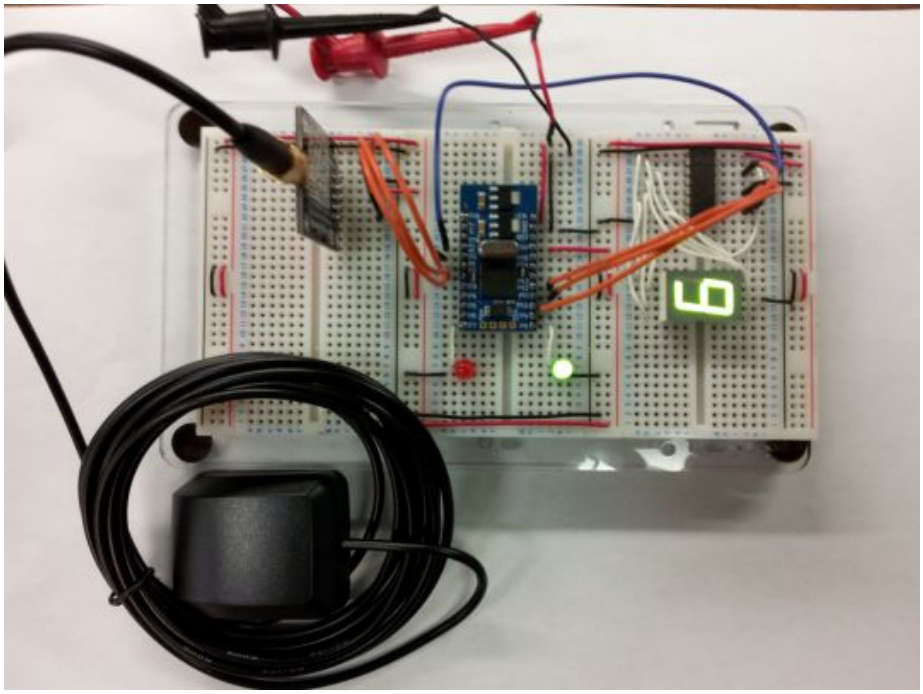
# Spin Project: GPS Status Display

**Level:** Beginner
**Hours to Complete:** 2
**Skills Required:** Schematic reading, basic wiring, and Spin programming



Have you ever wanted to know the number of satellites your GPS unit is tracking at any given time? This project teaches you how to build a device to do just that!

The Propeller Mini Board talks to the VPN1513 GPS Receiver and converts the received data to usable values that you can use in an application of your choosing. In this case, we are looking at the "Signal Validity" and the "Number of Satellites" strings from our GPS unit and converting that data into a visual representation through two LED's and a 7-Segment Display.

You do not need to be connected to a computer for this project in order to see the number of satellites being tracked, making this device highly mobile. With this mobility you are free to move about and do experiments in many locations. For example, you could investigate how buildings affect GPS signal, what types of materials reduce signal strength, or how being indoors vs. outdoors affects the GPS.

## What's Required

- (1) Propeller Board (I used a Propeller Mini #32150)
    - Alternatives include the Activity Board WX (#32912) or Propeller FLiP (#32123)
- (1) Propeller Plug (#32201, only if using a Propeller Mini)
- (2) Breadboard (#700-32023, if using a Mini or FLiP)
- (1) VPN1513 GPS Receiver w/Antenna (#28508, discontinued)
- (1) Green LED and (1) Red LED (#751-00005)
- (1) 74HC595 Serial to Parallel Shift Register (#602-00009, discontinued)
- (1) 7 Segment Green LED (#350-00027)
- Power Supply (See Display Unit Setup section)
- Set of misc. jumper wires

*Note:* Many of these parts are discontinued for sale or manufacture by Parallax, but may be found through other retailers, or have suitable replacements available through Parallax or other retailers.

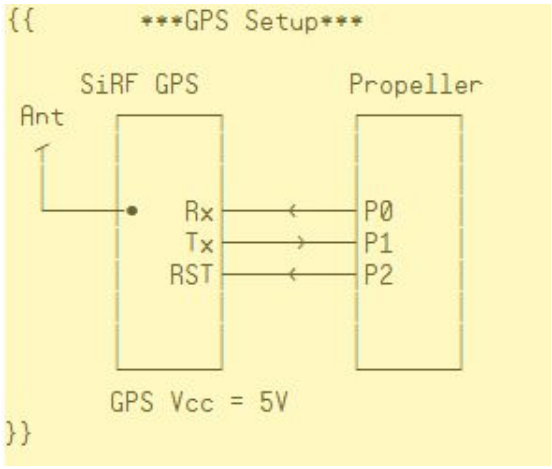
## Display Unit Setup

For the base of my project (to mount everything to), I used a Parallax Breadboard Set (#700-32305, discontinued). An alternative to this product is listed in the section above. This gave me plenty of room for all of the parts and components, and made it easy to get my fingers in between the parts to make the needed connections with the jumper wires. You can use any type of breadboard or setup that you may have available for your build, but I have found that the more space you have, the better!

For a power source, note that all of the components and sensors I use will be powered off of the Propeller Mini. If you use an alternative board, you will need to use an appropriate power supply.

- ✓ To power the Propeller Mini you can use any 6-9 VDC power source. You will connect the positive lead to VIN on the Propeller Mini, and the negative lead from your source to GND.

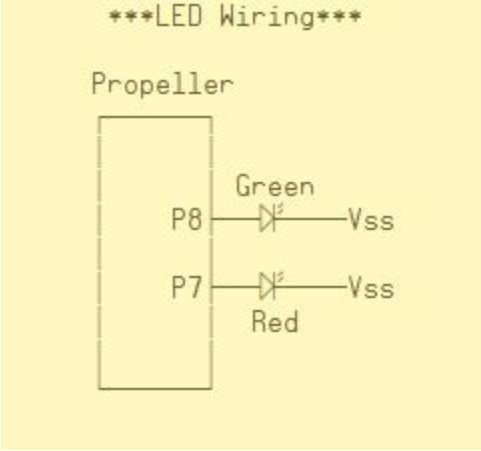
A 4-AA Battery Holder with Tinned Leads (#753-00001) is a good option.



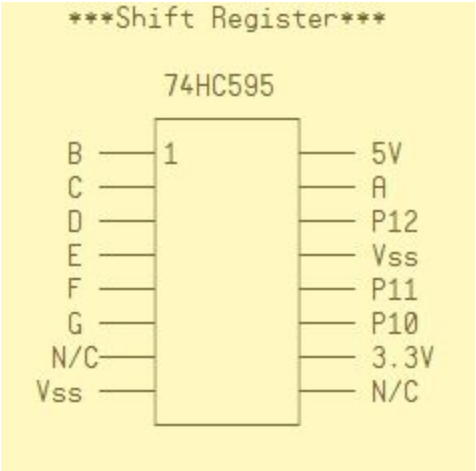

The VPN1513 can run on 3.3-5 VDC, but I recommend running it off of 5V, as the GPS unit has better performance ratings at 5V than at 3.3V. You can have current-limiting resistors in series with the signal lines, but they are not required due to the GPS unit's low current signal output.

- ✓ Once power and ground are wired in, connect the Propeller pin 0 to the Rx of the GPS, Propeller pin 1 to the Tx and Propeller pin 2 to the RST.

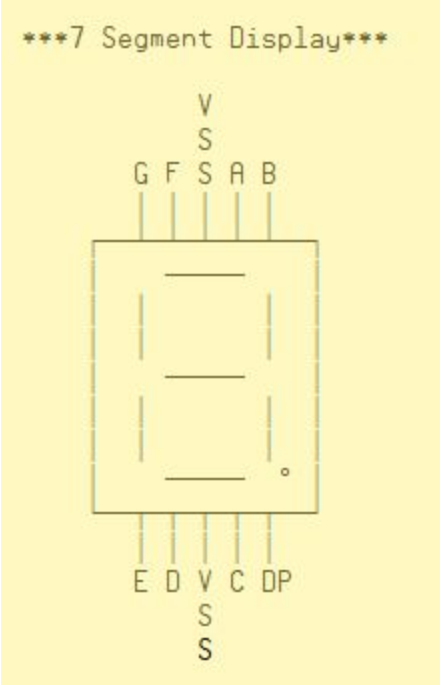
Now that your VPN1513 is ready to go, let's move on to our LED indicators.




**Note:** When connecting your LED's, ensure that the anode (positive, longer leg) is connect to the Propeller pin, and that the cathode (negative, shorter leg, or the side with the flat edge) is connected to ground.




✓ The connections labeled A-G are referring to the 7-segment display which you will connect in the next step. For this step, connect the power, ground, and I/O pins as per the diagram.




✓ Connect A through G.

The 7-segment display does not require a power source, as the individual segments will be powered and lit by the shift register. Only one of the Vss pins needs to be connected to ground, but you can connect both if you prefer. When making the connections between the 7 segment and the shift register, ensure that you connect A to A, B to B and so on, otherwise you will get

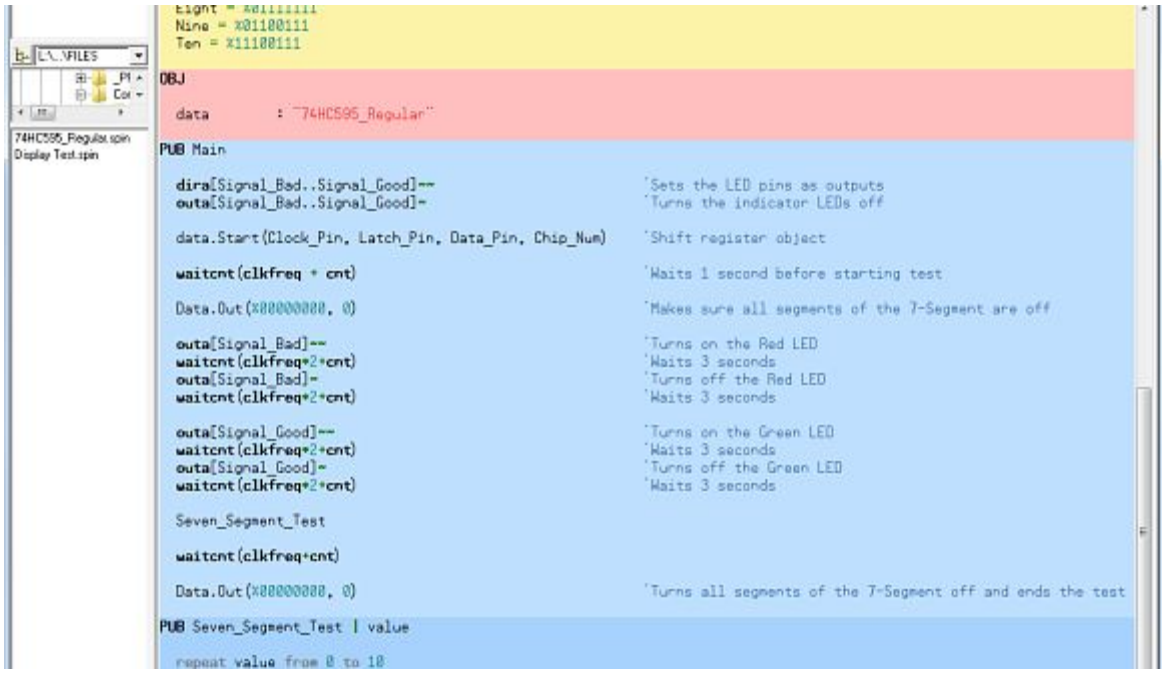
something that does not look like what you would expect as an output.  You might get an "L" instead of a "7", or something along those lines!

Once you are finished wiring the 7-segment display and have double checked to ensure that everything is connected properly, you are ready to move on to the next step....testing!!!

## Test with LEDs

- ✓ Now that you have all of the components wired together, we can run "Display Test.spin" located in the Demo Code folder.

This code will test the Green LEDs, Red LEDs, and the 7-segment to ensure that you get the proper outputs to make the digits 0-9 and decimal point light up.




After you load and run the Display Test program, the red LED should come on for two seconds, then go off for two seconds.  Then the green LED will come on for two seconds, and then go off for two seconds.  Next, the 7-segment will count up from 0 to 9, and then light the decimal point. If this is the exact sequence you get, you are good to move on to the Track Some Satellites section.

- ✓ If these are not the results you get, e.g. the green LED comes on first, or you get illegible numbers being displayed from the 7-segment, go back to the Display Unit Setup section and check your wiring again.

## Track Some Satellites

Now you are ready to see how many satellites your GPS is locked onto!  Load the "GPS Status Display.spin" program into your board which is located in the Demo Code folder you downloaded.  These are the outputs that you should observe from your project:

- Red LED Illuminated: no valid signal is being received
- Green LED Illuminated: you have a valid signal from at least one satellite
- 7 segment: displays the number of satellites your GPS receiver has locked onto from 0-9.  When the number of satellites is greater than 9, the decimal point (DP) of the 7-segment display will illuminate.

Your finished project should look similar to mine below!