$50 Antenna Analyzer Project
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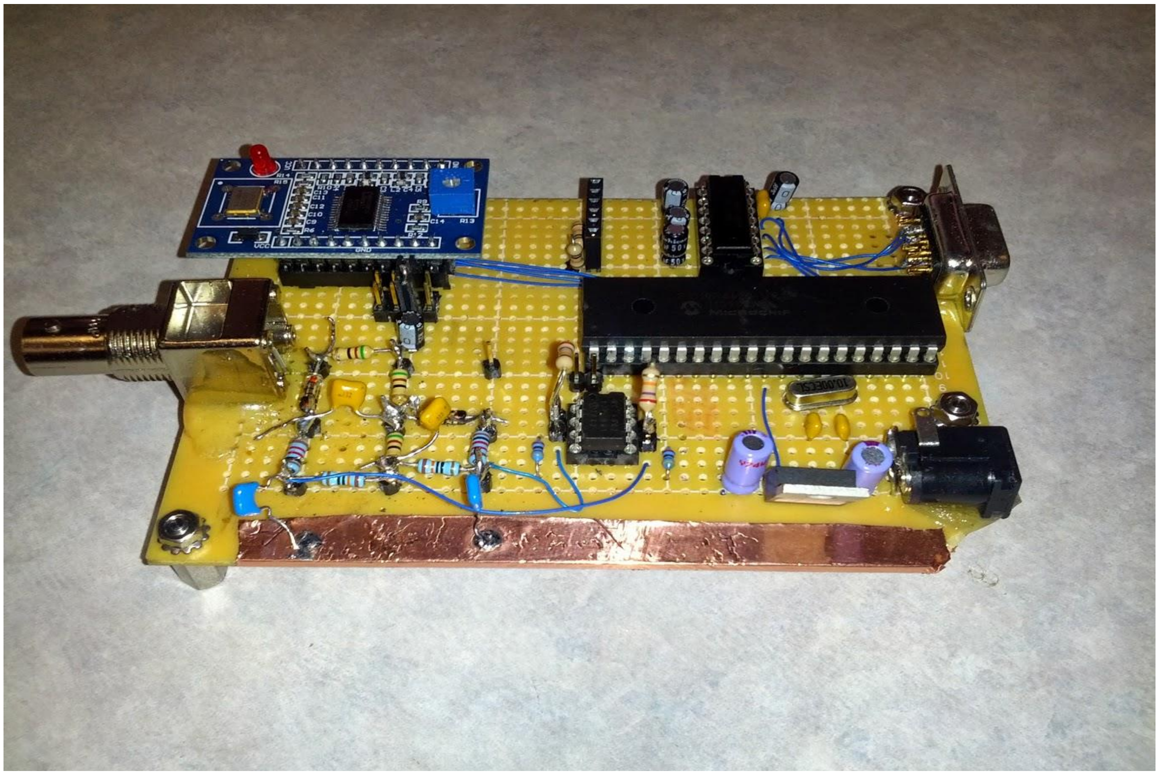
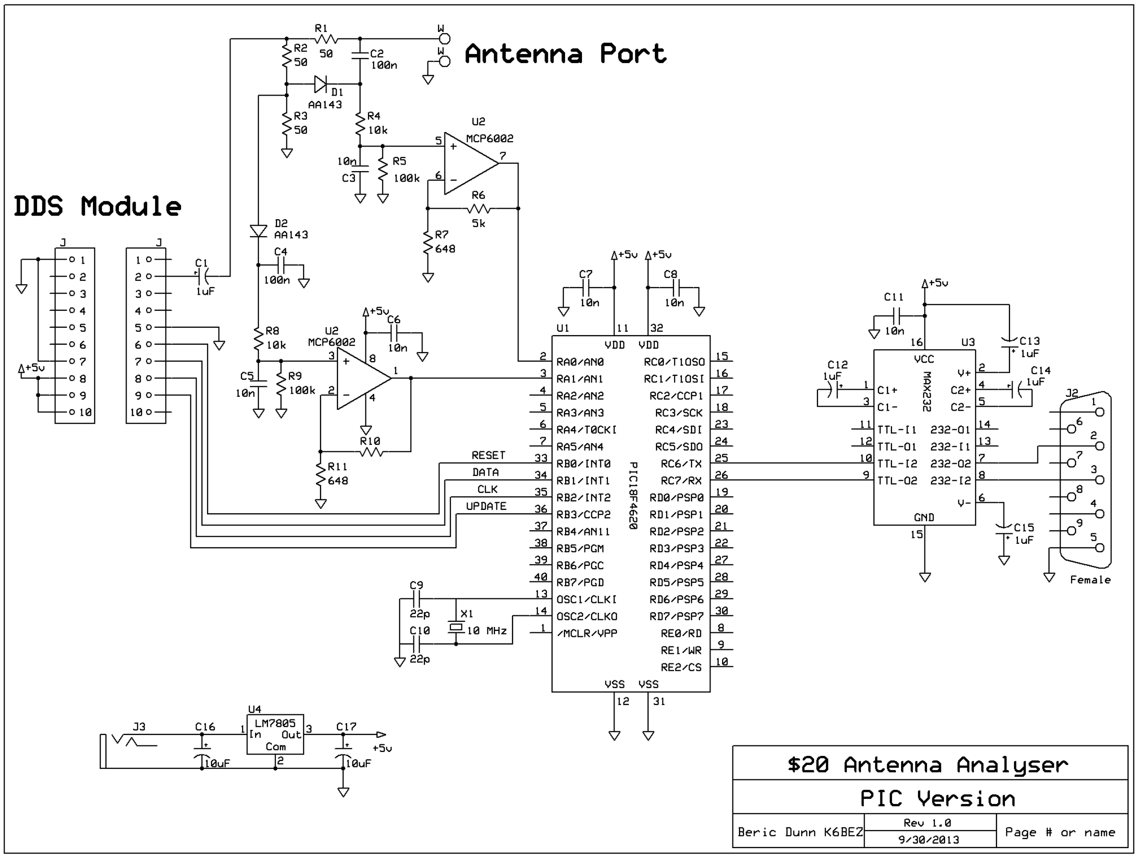
These materials were presented at Pacificon 2013.

The PIC is used to sweep an AD9850 DDS board ($4 on ebay) and measure the forward and reverse detector voltages from an SWR bridge at each frequency and return the values to a PC for plotting on the screen.

$20 Version:



Schematic:



Control is done by serial comunications. The default Baud-rate is 57600, 8 bit, 1 stop bit, no handshake.

Syntax:

"1000000C" sets the DDS output to 1 MHz

"1000000A" sets the start frequency to 1 MHz

"30000000B" sets the stop frequency to 30 MHz

"100N" sets the number of sweep steps to 100

"S" Starts the sweep.

This will return a list of frequencies, VSWR (*1000) and detector voltages. The example shown is for a 10 point sweep between 1 MHz and 2 MHz. The first line shows 1000000 Hz with a VSWR of 31.165, the forward detector voltage of 505 and reverse of 592.

```
1000000,0,31165,505,592
1100000,0,31451,503,590
1200000,0,32624,501,589
1300000,0,32157,504,592
1400000,0,31307,504,591
1500000,0,32624,501,589
1600000,0,31709,507,595
1700000,0,31564,508,596
```

```
1800000,0,32157,504,592
1900000,0,31307,504,591
2000000,0,31165,505,592
End
```

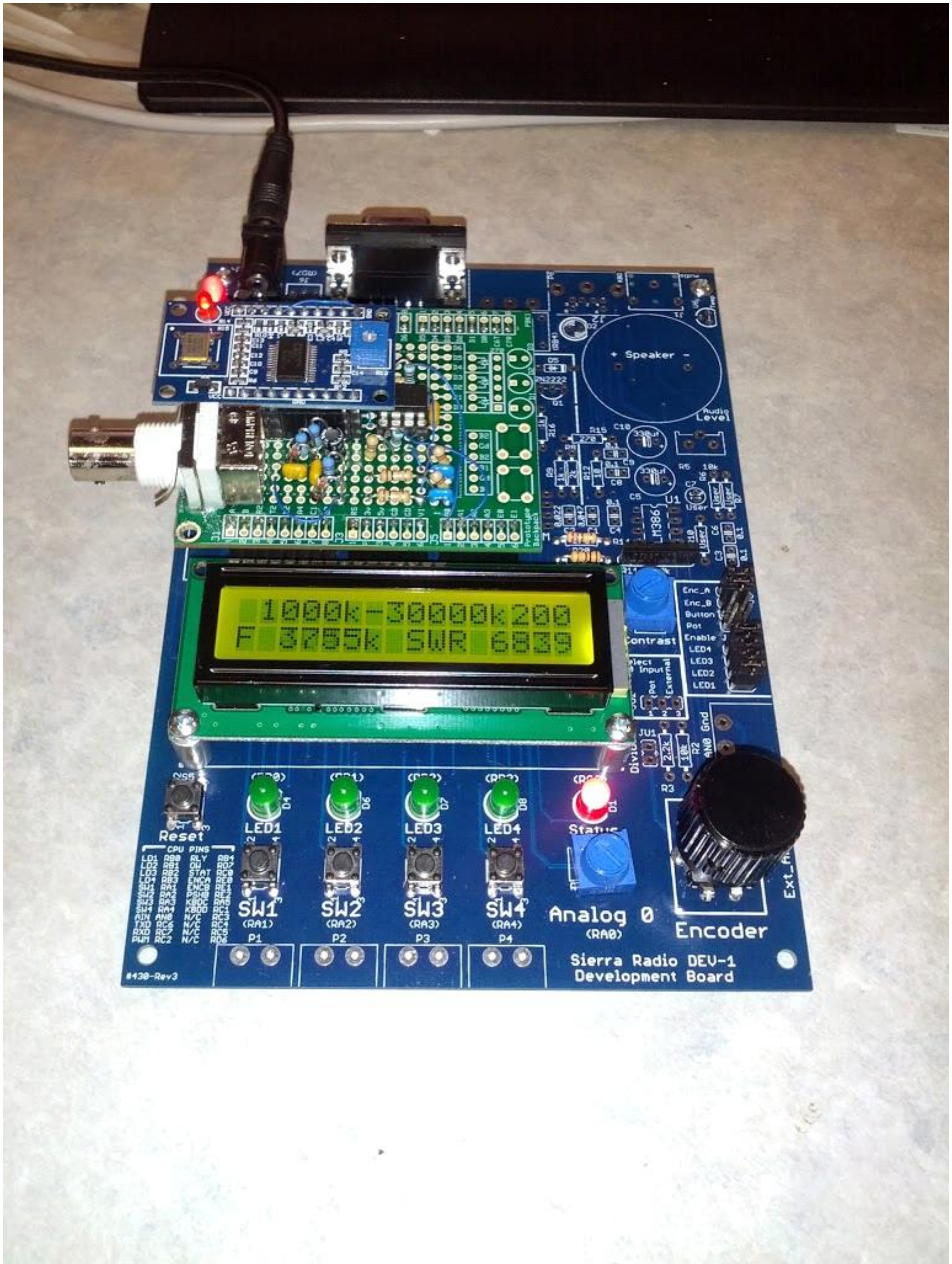
"?"   Returns a list of the sweep parameters:

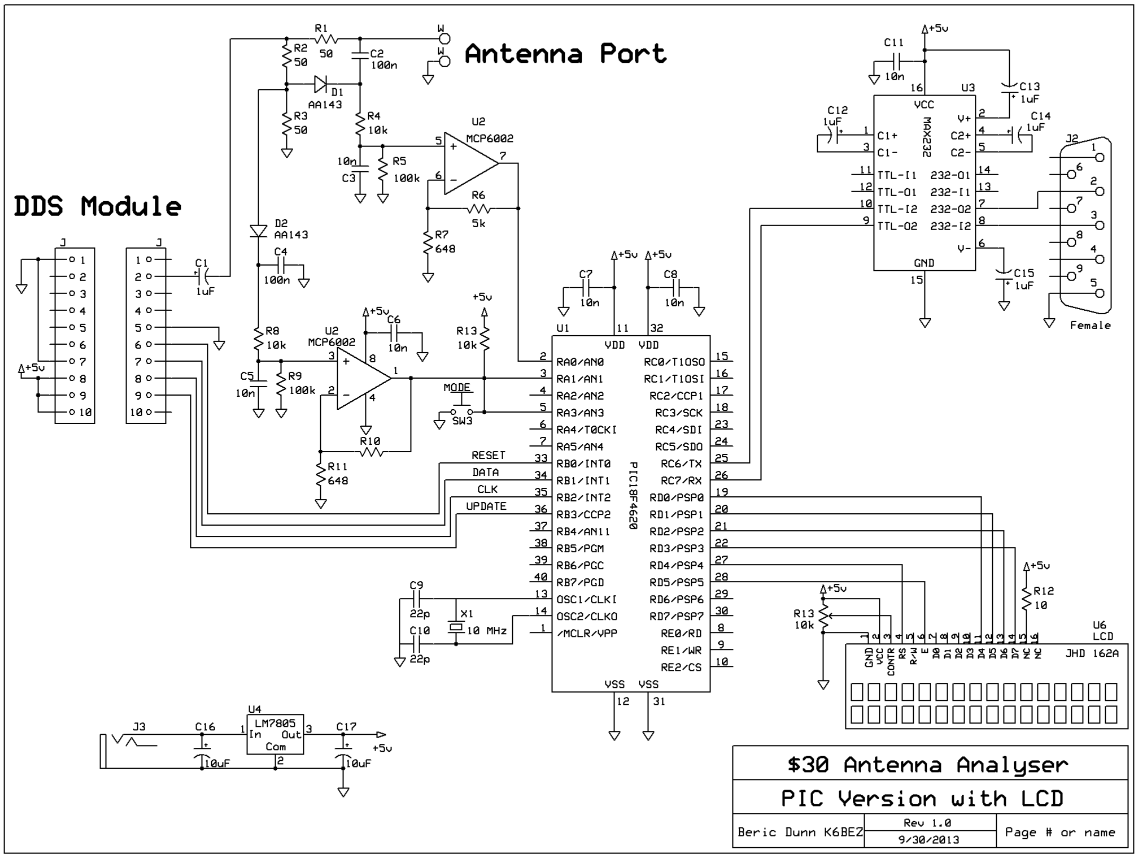
```
        Start Freq:1000000
        Stop Freq :30000000
        Num Steps :100
```

The PIC source code for Swordfish Basic is available here: **Sweeper_lite.BAS**

Stand Alone Version

A stand alone version that uses the LCD on the Dev-1 Hamstack board is also available:


1000k-30000k200
F 3755k SWR 6839
+ Speaker -
Audio Level
Contrast
Enc_A
Enc_B
Button
Pot
Enable
LED4
LED3
LED2
LED1
Reset
LED1
LED2
LED3
LED4
Status
SW1
(RA1)
SW2
(RA2)
SW3
(RA3)
SW4
(RA4)
P1
P2
P3
P4
Analog 0
(RA0)
Encoder
Sierra Radio DEV-1
Development Board
#430-Rev3
LM386



The Sowrdfish Basic code is available here: **Sweeper.BAS**

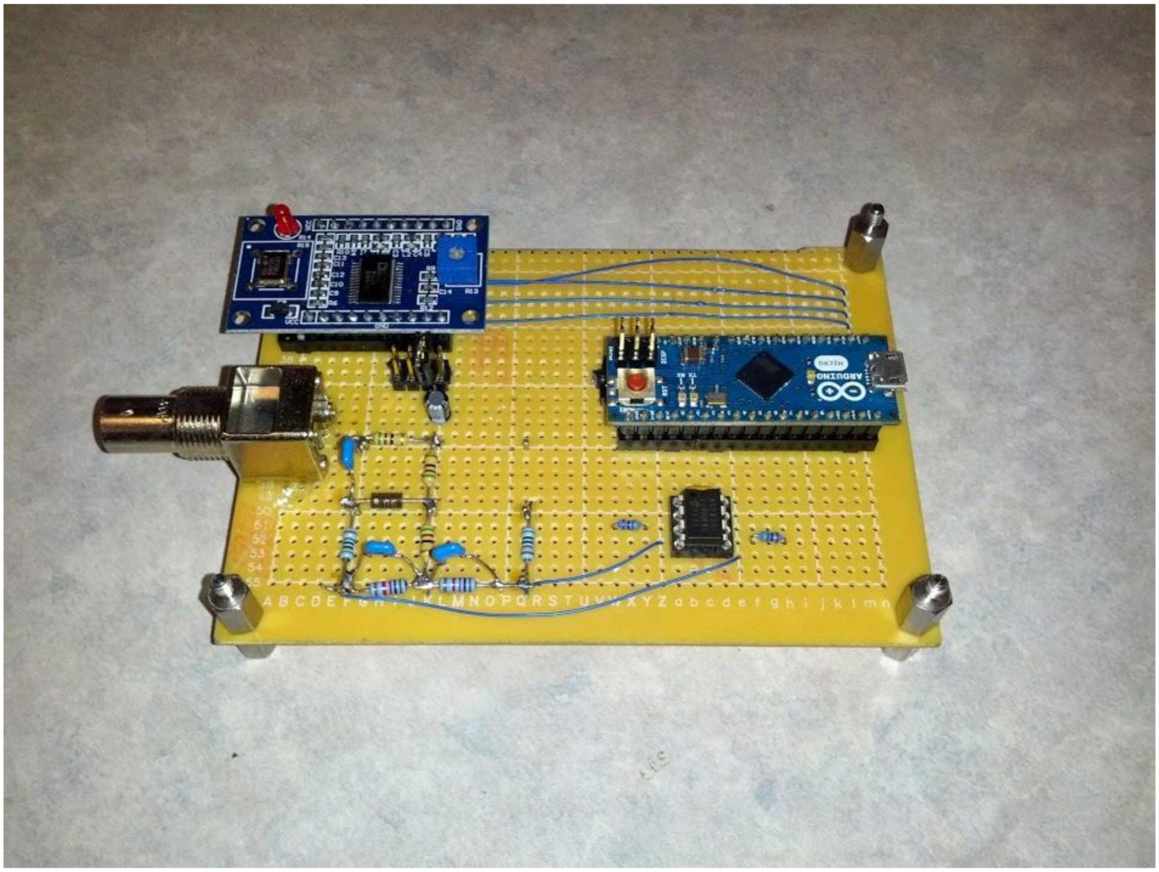
At start-up the device will start sweeping from 1 MHz to 30 MHz and display the frequency and VSWR of the best match point. To keep the code usable on the free version of Swordfish the VSWR is displayed *100 as the floattostr() call seems to use a lot of memory which easily exceeds the variable byte limit of the free compiler.

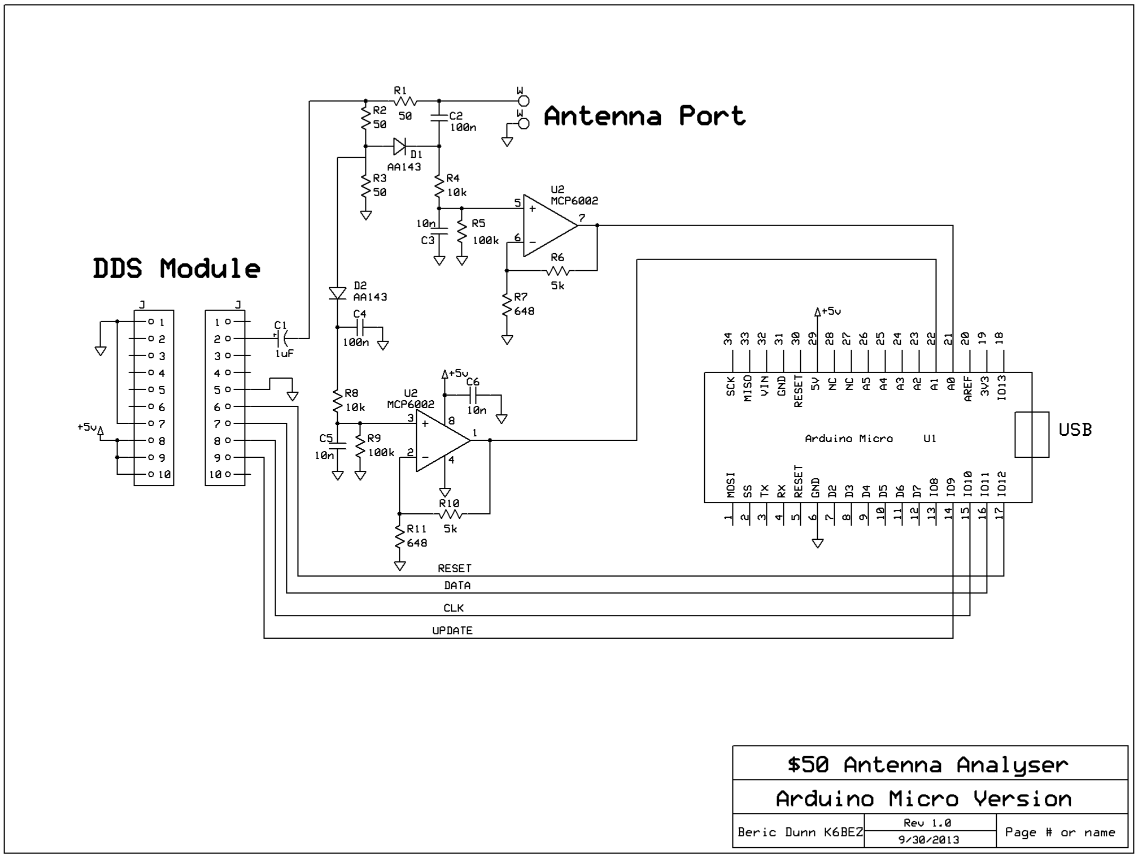
Pressing the mode button (SW3 on the Dev-1 board)will cycle through the frequency bands Full, 160m, 80m, 60m, 40m, 30m, 20m, 17m, 15m, 12m, 10m.

If data is received by the PIC, the mode is changed to give control of the sweep to the PC, at which point it starts behaving like the $20 version above.

Arduino Version

For the PIC challenged, I have also produced a version based on the Arduino Micro:


ARDUINO
MICRO



Arduino source code is available here : **DDS_sweeper.ino**

Functionality is the same as the $20 version above. No automatic sweeping or display is implemented.

PC Client Software

The User interface on the PC is written in Visual Basic .NET
The Free "Express" edition of Visual Basic is available for download from Microsoft:
www.microsoft.com/visualstudio/eng/downloads#d-express-windows-desktop

The source code for the client is available here: **Sweeper_PC_Software.zip**

There is also a Stand-alone .exe file in the zip which can be used without the Visual Basic environment being installed on your computer.

Once started, the COMM port that the sweeper hardware is connected to needs to be selected from the COM dropdown list. Then press the Connect button, and all going well, the program will perform a sweep. After which the frequency of lowest VSWR along with the VSWR will be displayed, along with a red marker on the trace.
The Sweep button will trigger a sweep. Checking the Continous box will force consecutive sweeps to be made.
The Start Freq and Stop Freq can be changed manually, and also by selecting a frequency band in the band drop-down.

Pressing the "Zoom In" button will narrow the span around the point of lowest VSWR and trigger another sweep.
The "Marker (MHz)" box can be used to set a single marker (black dotted line) which can be used as a visual target for tuning an antenna. Clicking in the plot window will also set the frequency in the Marker box and set the visual marker.

The Rescan button can be used to re-detect serial ports if for instance you start the program up and then remember to plug in your USB-RS232 cable.