<u>Using a Tablet with the AIM and VNA</u>

Dec 29, 2014

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Venue 8 Pro connected via USB to AIMuhf.
The AIMuhf is powered by a 9V battery in the case.
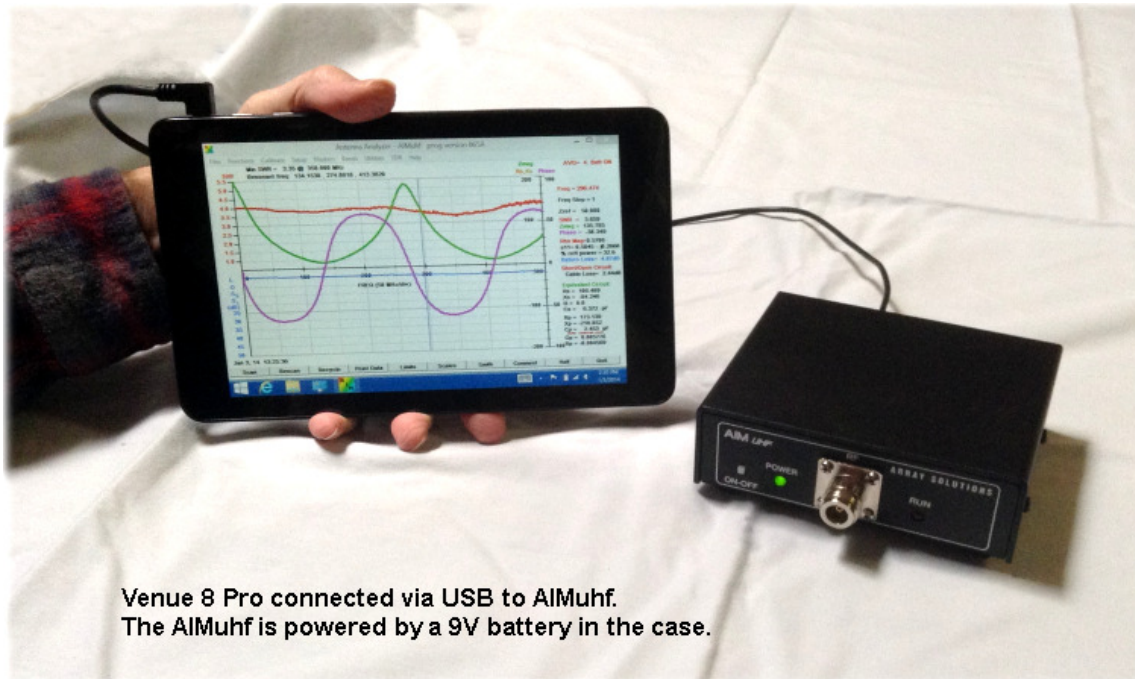
For several years we have had requests for a handheld antenna analyzer equivalent to the AIM4170. Technology for the tablet computer has now improved to the point where a full-featured handheld analyzer can be obtained at a very reasonable price. The new Windows tablets work with all members of the AIM4170 family and the VNA2180 family.

The new tablet computers running Windows 8.1 make it possible to have a handheld antenna analyzer with all the features of a desktop computer. These tablets have the complete version of **Win 8.1**, the same version that runs on desktop or laptop computers. Microsoft Office is also included with the Dell Venue 8 Pro.

When traveling light, this can take the place of a laptop. It also does everything you want a tablet for: email, Skype, entertainment, games, etc.

The same AIM or VNA program that you use on your big computer can be downloaded and the touch screen can be used without a keyboard or mouse to operate the **AIM4170, AIMuhf, PowerAIM, VNA2180** or the **VNAuhf**. A coax extension cable of two or three feet can be used to extend the RF port to a convenient point for making connection to the antenna or component under test. This cable is included in the calibration process so it's length, impedance and loss are not critical. The AIM can be carried in a backpack or totebag with tools and accessories, so it's out of the way. The tablet itself can be conveniently carried in a coat pocket or large pants pocket for easy access.

The screen of the **Dell Venue 8 Pro** tablet featured in this report has 1280x800 pixels, so the graph and data have good resolution. Scan data can be saved in files and transferred to another computer via the wifi link, email or flash drive. Screen shots can be saved with

the Snipping Tool included in Windows. Everything operates the same way that it would on a big computer.

Update May 3, 2014: **Walmart** has the Dell Venue 8 Pro (new) for **$200**.

In April of 2014 the Dell Venue 8 Pro is available for **$250 dollars** or less. The model I have has 32GB of memory. Another model has 64GB of memory.   A user of the VNA2180 has reported good results with an Acer Iconia W3 8-inch tablet.
Array Solutions does not sell tablet computers bundled with the antenna analyzers but they are available from many sources including Dell and Amazon. If you live in a area where there is a Microcenter store, their prices are often the lowest.

Note: Dell also has a model called the "Venue 8" (without the Pro) which uses the android OS. This is probably a very nice tablet but it won't run Windows programs.

Note: There is a Microsoft tablet called the "Surface RT". This has a special operating system and not the real Win 8.1, so it can't be used for the AIM.
The regular Microsoft Surface computer with Win 8 will probably work but it's much more expensive.

For the initial setup, I found a keyboard and mouse were convenient but they aren't required. These accessories can be connected to the USB port with a simple USB expander and for less than $25 in accessories, I have a **complete computer**. The keyboard, mouse and AIM can all be attached to the USB port at the same time. For portable operation in the field, only the AIM connection to the usb port is needed.

When you get the Venue 8 Pro, be sure to get a USB/OTG (On-the-Go) adapter to connect the microUSB port on the tablet to external devices. This is about $3 and can be found at a computer store or on eBay. A nice case for an 8 inch tablet with or without a keyboard can be found on eBay or Amazon for less than $25.

The initial setup of the Dell table is like setting up any computer running Windows. The Windows software is already loaded. After going though the initial setup, the connection to my wifi link was very easy. Windows found the link immediately and I just entered the password. Then I could download the AIM program.

For models of the AIM family that need a USB/RS232 adapter, you can get an adapter from Array Solutions or on eBay. If you already have an adapter that works with Win 7 or Win 8, that will be fine. Be sure to look for the **FTDI** designation. Windows installed the adapter automatically by getting the FTDI driver from the internet. The screen shots later in this report show how to find the comm port number. If you're running an AIMuhf or VNAuhf, you don't need the usb adapter but you still need the OTG cable.

When I entered the comm port number into the AIM program, the AIM worked immediately just like it does on my main computer.   The AIM graph size can be customized by the height and width parameters in the config file if you want to.

 For example, my config file settings are:
   1250 // max graph width in pixels
    750 // max graph height in pixels
      7   // Default font size
      1 // Bold Data display

The buttons and menus can be operated by the touch screen so you don't have to use a mouse or keyboard for field work. The battery in the Venue 8 Pro will last about eight hours. It recovers from the sleep mode instantly. If you want to turn the tablet off to save power, it will reboot in about ten seconds. The display is readable even in bright sunlight.

The tablet and your big computer can use the same AIM/VNA programs and the same calibration files. Scan files can also be transferred between the computers.

While in the field, it's very nice to have all the computing power you are used to for processing data and for communicating with other people through Skype, or email. The Dell tablet will connect to the internet wherever there is wifi.

I haven't tried it but you can probably connect a 3G dongle to the tablet to have wireless operation anywhere there is cell service. This allows you to communicate with clients and colleagues while in the field and sent them AIM data immediately. Here's a web page with more information:
  3G Dongle Info

Typical System Components:

For a Dell system, I suggest the following items:

1. **Dell Venue 8 Pro** with 32 GB memory. (Consider the 64 GB model is you think you'll be using this tablet like a laptop for a lot of applications.)

2. **Required - USB/OTG** adapter to convert from the microUSB connector on the Venue 8 Pro to the AIM cable or other accessories. These are around three dollars on eBay. Search for "usb otg". I like the right angle model myself. If you're using an AIM or VNA now, the same cable that you have connected to your big computer will plug into this adapter and you're ready to go.

3. Optional but highly recommended - **Stylus**. Inexpensive styluses are shown on eBay for two or three dollars for a package of ten. The stylus makes it <u>much</u> easier to select items on the screen and it even works when you're wearing gloves.

Note: the Dell stylus for about $30 has received consistently <u>bad</u> reviews through 2013. I did not get this option.

4. Optional but recommended - **Carrying case**. The Venue 8 Pro has a textured back cover and it's easy to hold but a case makes it even easier to hold and provides extra protection. Nice carrying cases can be found on Amazon.com or eBay for less than twenty-five dollars.   Some cases include a keyboard.

5. Optional - **USB or Bluetooth keyboard and mouse**. Nice for office work. Not required in the field. I got a keyboard and mouse combo package at the Microcenter computer store for $7. This is the Inland brand. The keyboard and mouse were handy for setting up the table initially since I had never used a touch screen before.

6. Optional - **USB expansion port**. This is a simple port extender, no extra power is required for most accessories. This is needed if you're using a USB keyboard and mouse. It is <u>not needed</u> for the AIM by itself.   For transfering large files between a big computer and the tablet, use a <u>flash drive</u> rather than an external hard drive. *The tablet can't power a hard drive.*

Connecting the AIM to the Tablet

Connecting the AIM or VNA to the Dell Venue 8 Pro is the same as connecting to a big computer or laptop running Windows. The touch screen makes it a little more tedious but the basic process is the same since the tablet is a complete computer running Win 8.1.

To make the touching easier, I highly recommend a stylus. These can be obtained in computer stores or on eBay. On eBay the cost is about $2 to $3 for a package of 10. The stylus speeds up data entry and it will work even if you're wearing gloves. *(Touch screens often don't work with gloves.)* If you do texting on your smart phone, the stylus makes typing a lot easier on the small virtual keyboard.

Note that touching the screen continuously for a second or two simulates a **right mouse click**. *This is referred to as a **Long-Press***.

The Dell tablet will boot up with the **Start screen** showing. Press the icon that says **Desktop**. Now you will see the conventional Windows **desktop** as shown in Figure 1 below.

Launch **Internet Explorer** and go to http://www.w5big.com/prog_update.htm to get the latest version of the AIM program (or the VNA program).   You can create a new folder for the AIM application by long-pressing in the Windows Explorer to get the option menu for a new folder. The AIM program can be put in a sub-folder if you prefer.

Go to the folder called: **This PC:\Downloads** and copy the AIM program zip file that you just downloaded into the new folder you created. Then double click on the zip file to start the unzip process. After a list of files appears, click "**decompress all**" to decompress them in the AIM folder.

Be sure the tablet is connected to the internet and connect the AIM usb adapter through the OTG cable (the little cable about 6" long).

If you have a usb expansion hub, you can have your mouse, keyboard and AIM connected at the same time.

For a brand new setup, Win 8.1 will search the internet to find the driver. This may take two or three minutes but it's automatic. For a brand new setup, the default comm port may be comm 3, so you can enter comm 3 on the AIM **Setup** menu. If that doesn't work, use the Device Manager to find the comm port. The images below show step by step how to find the Device Manager and look up the comm port value.

 Note that by default Windows does **not** display the extensions of some files. This makes finding the exe file a little tricky. The full name of the file is **AIM_nnn.exe** but the extension *.exe may not be visible in the Windows Explorer display. Look for a file with the *type* = **application** and the *length* approximately **900K to 1M** bytes. This is the AIM exe file.   You can make a shortcut for this file and drag it to the desktop like you would

for a big computer.   **Long-Press** on the name of the exe file to get the options menu to pop-up and then select **Create Shortcut**.

The lack of a file extension display can be fixed by locating the **Folder Options** menu. With the **Help** menu, you can search for "**hide extensions**".
Then under folder options click **View** and then <u>uncheck</u> the box that says **"Hide extensions for known file types."**

You can double click the exe file and the AIM program will execute. Initially, the comm port will not be correct and the program will say the AIM was not found. That's ok. Go to the **Setup** menu and select **Enter Comm Port**. Then enter the comm port number. Then close the AIM program and restart it. This time it will run ok but it will say that calibration is necessary. Now you are ready to operate the AIM just like you would with a big computer. Refer to the AIM manual for calibration information. If you are using a coax extension cable with the AIM you may need to use Custom Cal with a frequency step size of about 0.1MHz.   If you already have some cal files, you can copy them to your tablet computer with a flash drive. They do not depend on the computer but only on the AIM itself.
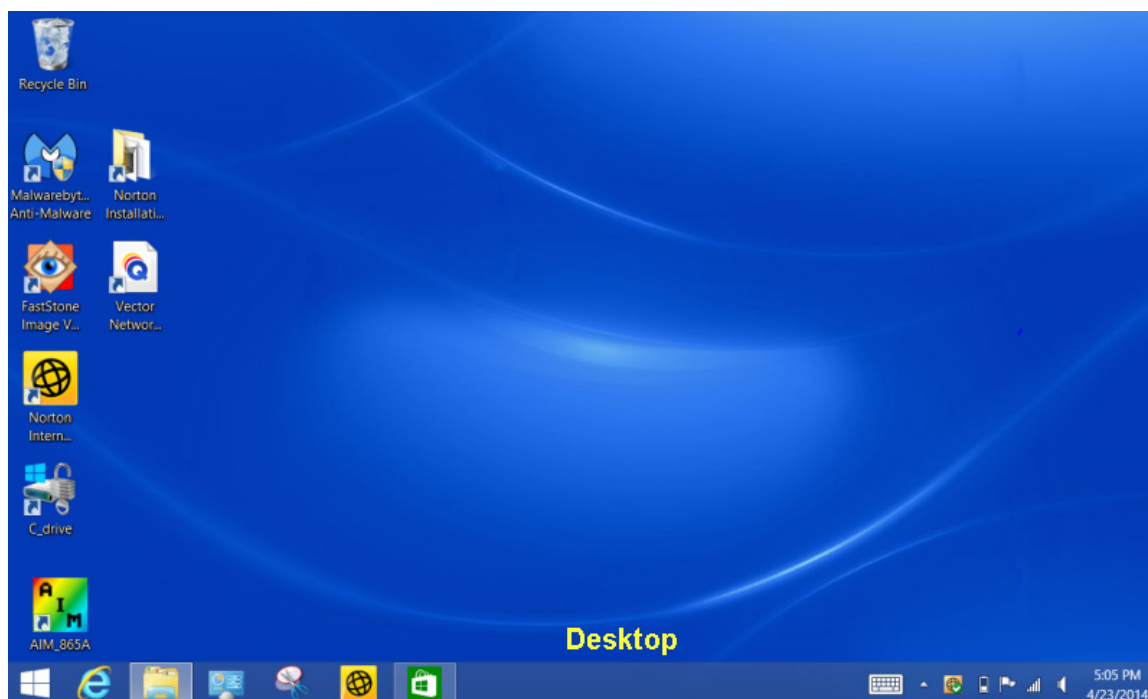
The icons that appear on your screen will vary but the one of interest is the white **Windows icon** in the lower left corner in this screen shot.
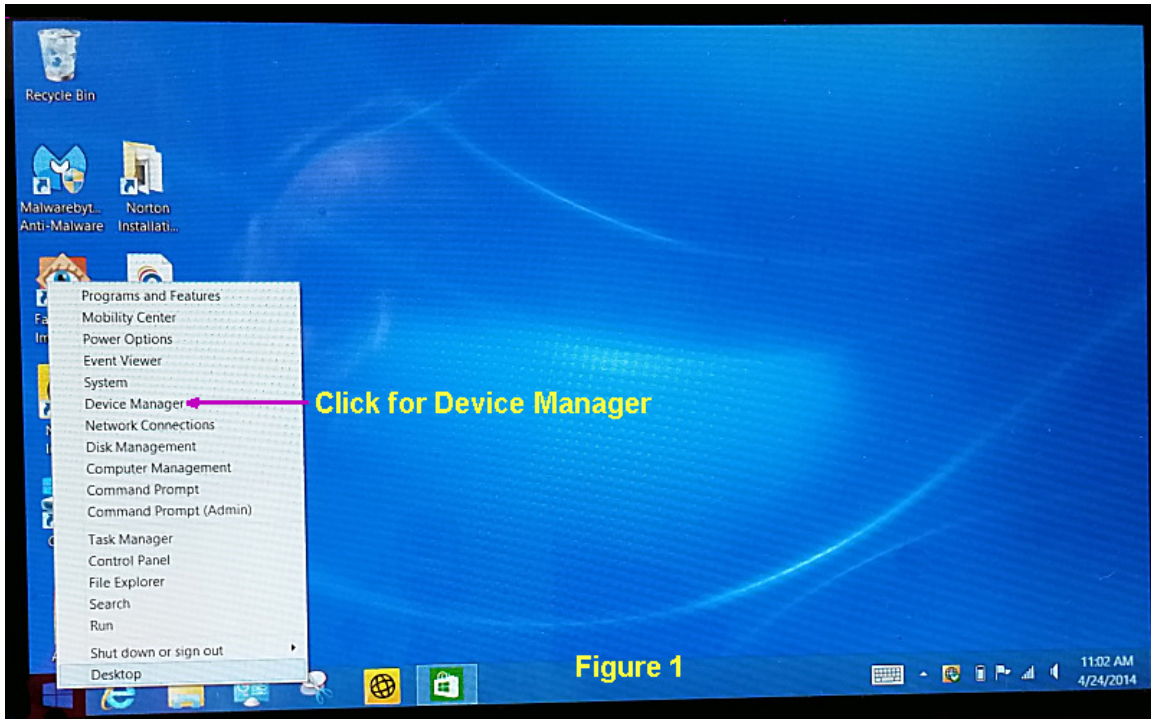
Figure 1

Long-Press the Windows icon in the lower left corner of the screen and the menu shown in Figure 1 will pop up after you lift your finger (or stylus).

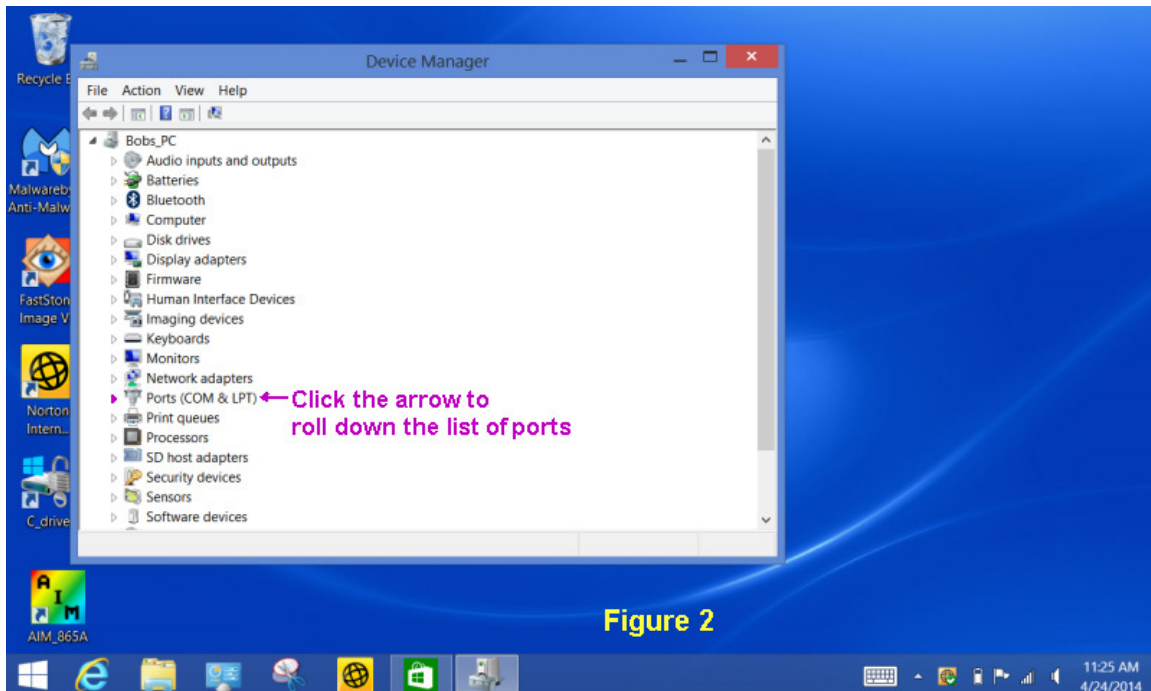Click the line that says "**Device Manager**" to get the screen shown below in Figure 2.

Figure 2

Click the small arrow at the left end of the **Ports (COM & LPT)** line to see the comm port assignments.
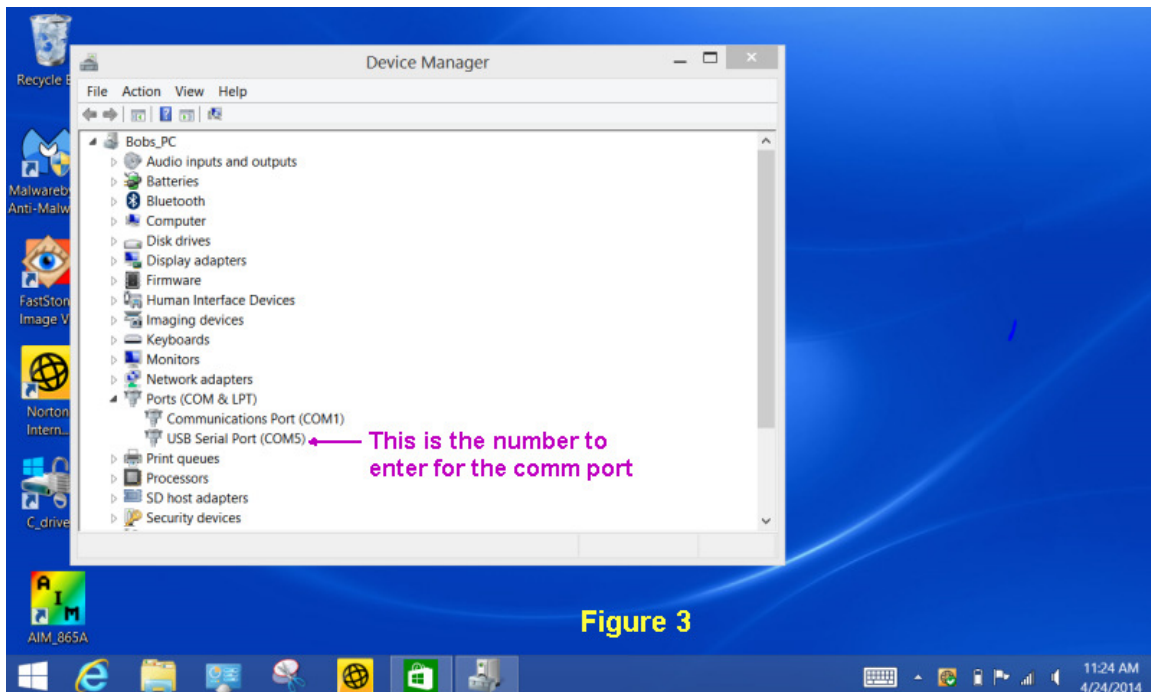

Figure 3

The line that says **USB Serial Port (COM x)** shows the port assigned to the AIM. This is the number to enter in the **AIM Setup** menu box for **Enter Comm Port**. After entering the comm port number, close the AIM program and restart it. You do not have to reboot the computer. *When entering the comm port in the AIM Setup dialog box, you don't have to type "comm", just enter the number*.

Operating Tips
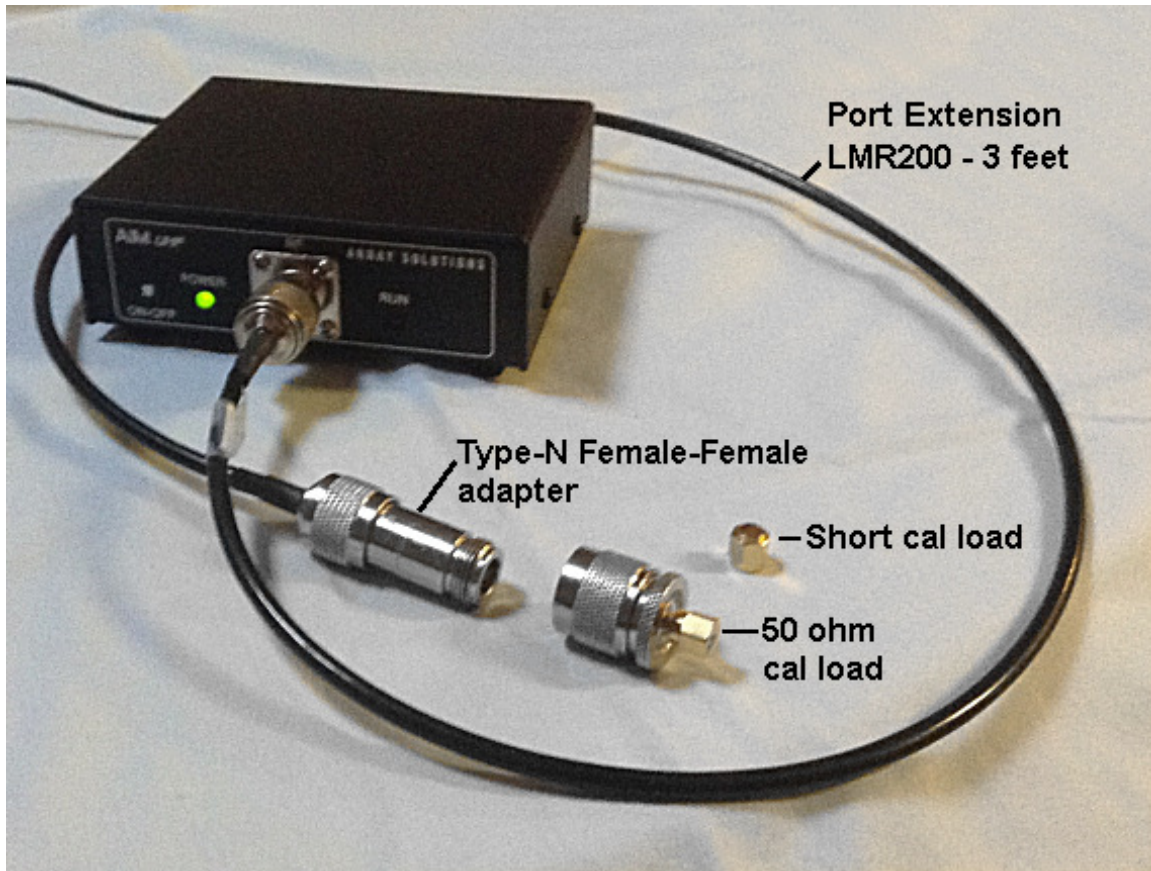
For convenience, I calibrated the AIMuhf with an LMR200 cable three feet long. This extends the RF test port a few feet so it is easily accessible when the AIMuhf black box is tucked away in my tote bag. The cable does not have to be a low loss type, since the calibration takes care of imperfections in the cable and connectors. For these examples, I put a 9V alkaline battery inside the AIMuhf case. This will run for a few hours. For extended work, a rechargeable battery is nice. Some people have mounted the battery on the outside of the AIM case for convenience. Then it plugs into the same socket where the wall power supply is usually connected. The DC voltage required is 7V to 14V. The current is less than 400 ma while scanning and about 40 ma while idle. If the battery operation mode is selected, the power will turn off automatically after being idle for ten minutes.

This picture shows the LMR200 extension cable. The cable has male connectors on each end so a female-female adapter is used to make the extension cable compatible with the RF connector on the front panel of the AIMuhf. The type-N cal loads normally used for the AIMuhf are shown.

The same principle can be used for the AIM4170 and the PowerAIM with BNC or UHF cal loads.

<u>Accessories</u>

The OTG (On-the-Go) cable converts from the microUSB port on the tablet to a standard female USB connector. This makes it easy to connect accessories to the tablet. These adapters are available with a right angle connection too. *This is the only essential item that is not in the box with the Dell Venue 8 Pro.*

The conductive stylus makes it much easier to use the touch screen. This is very handy when text messaging since the virtual keyboard on a cell phone is so small. The stylus can also be used while wearing gloves.

These are available at computer stores for $4 or $5 each. On eBay they are about $2 to $3 for a package of 10. There is an elastic loop on some tablet cases for storing the stylus.

**USB Hub
approx $5**

A hub like this allows several USB accessories to be connected to the tablet at the same time, along with the AIM. A mouse and keyboard are nice for the initial setup of the tablet. They are also good when doing serious editing, e-mailing or spread sheets. With these accessories, the tablet is equivalent to a laptop with an 8 inch screen.

In the field, the AIM can be easily controlled with just the touch screen.

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Tablet case with keyboard approx $15

This case features a keyboard that connects to the USB port of the tablet. With the USB hub, it can be connected at the same time that the AIM is connected. Bluetooth keyboards can also be used for a wireless connection.

If you don't want a keyboard, a more compact case designed specifically for the **Dell Venue 8 Pro** can be found on ebay for less than $15. This will have all the cutouts in the right places for this tablet. *(Be sure the word "Pro" is included in the name. The case for the android tablet is different.)*

<u>Remote Control</u>

For some applications it may be desirable to leave the AIM in the shack and take a tablet to the outdoor work site to make adjustments on an antenna or tuner.

G3NRW has an example of how to use the AIM with a tablet for remote control:
http://homepage.ntlworld.com/wadei/Remote AIM Control HOWTO - 090106.pdf

Another popular remote control program is called **Teamviewer:**
http://downloadus2.teamviewer.com/docs/en/TeamViewer-Remote-Control-Brochure-en.pdf