Installation instructions for the Windfreak SynthNV v2.5. (Please read all the way through once before beginning.)

Software:
Depending on your situation there are 3 options.

1). **If you don't have Labview:** Install Setup.exe from the installer directory. (Right click and install as administrator.) This installs the hardware drivers, Labview runtime engine and VISA. It also installs the SynthNV GUI executable which you should be able to find under Start/All Programs/WFT or the desktop. If there is an error on the driver install when using Windows 8 please install the drivers as per the help file in Extras/driver folder.

2). **If you do have Labview:** Install the hardware drivers located in the Extras/driver/ folder by right clicking on driver_install.exe and installing as administrator. If errors are encountered with Windows 8 follow the help file located in the same folder. If running Windows 10 you should not need to install drivers. Double click on SynthNV_2_5x.vi in the Extras/Source Code/ directory if you have Labview 2012 or later installed. Please contact dgoins@windfreaktech.com for older versions of labview.

3). Use PuTTY.exe which is a 3rd party stand alone program. First read the PuTTYconfiguration.pdf document since PuTTY requires setup as a serial terminal. The document is written for the SynthHD but applies to the SynthNV as well. Check out synthnvcom.pdf for serial programming commands.

When you plug in the Synthesizer for the first time, Windows should recognize a new device and finish installing the drivers. You may need to let it search for them (locally), but Windows should now find them successfully.

Hardware:
The Windfreak SynthNV is designed to work with USB power or external power or both. If using USB power only, make sure your USB port can supply 300mA of current before plugging in this device.
(Most newer PCs are capable of this). The cable is a USB mini. Windfreak Technologies assumes no responsibility for any damage the Synthesizer may cause to customer equipment. If using external power, use an isolated voltage of between 6 and 9 volts at 300mA or more. (Lower voltage gives a cooler linear regulator.) The connector has ground on the outer conductor and positive on the inner conductor. If using only the external power you will need to make sure a frequency and power level have been saved to the eeprom. It is this setting that the synthesizer goes to when powered without a USB connection. The factory setting is typically 1GHz with a power setting of -31.5dB below max power which gives about -10dBm.

It is best to operate the synthesizer output into a proper load, especially at higher powers. It is also best not to operate the synthesizer output directly into the power detector input since the detector cannot detect more than +10dBm and can also be damaged at levels of greater than +20dBm. Using a 10dB pad or more on the input to the detector is a good idea.

The reference is controlled by software under the "Extras" tab. (Note this setting is saved for power up operation if you press "Program EEPROM". If running from the internal reference the 10MHz signal is available as an output on the SMA connector J5. When set for external reference the internal 10MHz crystal oscillator is muted and allows the user to apply a more stable reference as an input at SMA connector J5. If you use something different from 10MHz please go into the software and change the reference value. This will change some of the calculations for step size and may cause unstable operation of the knob and sweep functions. If possible keep the phase detector (PFd) running at 2MHz..

When using the PCB without a case, take care to keep any conductive items away from it so nothing shorts out. Also, the RF connectors are high performance and therefore need to be treated with care. Avoid torqueing or bending the PCB via the RF connectors and this will keep the center pin solder from cracking. Of course, try to reduce the possibility of ESD when handling.

Operation of WFT Software:
Plug in at least one synthesizer to USB before starting the software. Wait for a few seconds for the device to register on the USB bus and then start the software. The “Device Under Control” box in the top right hand side of the GUI shows the serial number of the device under control. If you plug in multiple devices click “Scan USB” to go back and forth between controlling the different devices. Please leave all hardware plugged in until the software is closed out. This will avoid USB issues. In the case that you do a lot of USB communication to a device that is not plugged in, it may require a computer restart to clear out the USB buffer.

The software is mostly intuitive. A couple pointers are: To enter frequency and other values use the keypad, PC keyboard or knob. Press "Enter From Keypad" if you used the keypad. Otherwise hit enter on the PC keyboard if you typed in the value. Use the knob for fine tuning the frequency. Adjust the sensitivity of the knob with the Knob Step Size drop down box. Adjust RF Power with the slider on the right. The power slider is in dB relative to maximum power. ie. 0dB = max power, -10dB=10dB below maximum power. There are two (discontinuous) power ranges for more than 60dB of adjustment.

Using the sweep function includes two modes: 1) Basic RF frequency sweep which is output only and 2) RF sweep with simultaneous power measurement. To start a sweep first enter your desired RF power then enter frequency range, step size and step time in the Sweep tab. Click Sweep Once or Sweep Continuously on that tab for mode 1 sweep. To enter mode 2 click Start Network Analyzer. (*Important Note: The power range of the detector is +10dBm to -60dBm. Set your power so that the detector sees about 5dBm max for best linearity and dynamic range. Use a 10 dB pad if needed.*) The device will begin measuring absolute RF Power on J11 in dBm for every frequency step. To measure relative power a calibration needs to be performed. Connect a good RF cable between J6 and J11 (keeping max power below 5dBm) and click Take Cal Data. Wait for the Take Cal Data button light to go off. This could take an entire sweep. Next click Cal On. The trace should now be in relative power mode (dB) and be reading 0dB across the band. Now you may insert your DUT to measure gain vs frequency. Keep in mind that the RF generator circuit does have fairly strong harmonics and the detector measures broadband power from 100MHz to 4GHz each measurement. This can introduce errors in your measurements.

Finally, hover with your mouse over various items in the software to get hints or instructions.

Troubleshooting:
If the software GUI cannot find the device, please make sure you have installed the drivers. Go into Windows Device Manager under Ports (COM & LPT) and verify that “Teensy USB Serial” is there (worded exactly so) with an assigned COM Port #. If not re-install drivers. For Windows 8.x please follow instructions located in the driver folder. If the COM port is assigned but the GUI still cant find the device, make sure you have installed from the CD – otherwise VISA may not be installed. Also, version 1 SynthNV software will not work with version 2 SynthNV hardware and vice versa.

Take the PCB out of case and:
Vcc LED D1 doesnt light: Possible problem with PC and Vusb power. Try a different PC and or cable.
RF Lock LED D2: If Lock doesnt light it could be because settings in the "REG Cntrl" Tab are faulty. Exit out of the software and restart to make sure all default settings are loaded and try again with the default settings. Try clicking Re-init Defaults under the REG Cntrl Tab. D3 or D4 will toggle when you have started the RF Power detector. If they dont, try a different USB port and/or cable.

If you cant get it to work contact David Goins at dgoins@windfreaktech.com.

Schematics and Reference Designator Map are located on the CD shipped with the device.