Signal Hound®

VSG25
Software Manual

Signal Hound VSG25 Software Manual

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Contents

1 Overview

This document outlines the operation and functionality of the Signal Hound VSG25 vector signal generator software. This document will guide you through the setup and operation of the software. You can use this document to learn about the features of the generator and how to access them in the application.

2 Preparation

2.1 SOFTWARE INSTALLATION

The software can be found on the CD included with your purchase or on our website www.signalhound.com. The latest version of the software can always be found on our website.

Once you have located the software, run the setup.exe and follow the on-screen instructions. You must have administrator privileges to install the software. You may be asked to install the Windows Runtime Frameworks, as this must be installed for the software to run. The installer will install the device drivers for the Signal Hound products during installation as well.

It is recommended to install the application folder in the default location.

2.2 SYSTEM REQUIREMENTS

Supported operating systems:

- Windows 7 (32/64-bit)
- Windows 8 (32/64-bit)

Minimum system requirements:

- No processor requirements
- The software will average less than 1GB of memory
- USB 2.0

2.3 DRIVER INSTALLATION

Drivers are distributed with the installer for both 32 and 64 bit systems. After installation the driver files are located at **\drivers\x86** and **\drivers\x64** in the application directory.

If the drives did not successfully install during the installation process you can manually install them.

The easiest way to install the drivers post application installation is to run the correct driver installer in the application directory. Select the proper installer based on the type of PC you have (32/64-bit) and run the driver installer as administrator (right-click, run as administrator). A console will appear to let you know if the installation was successful.

If the drivers still not install correctly, contact Signal Hound.

2.4 CONNECTING YOUR SIGNAL HOUND VGS25

With the software and device drivers installed, you are ready to connect your device. The supplied USB cable should be connected into your PC first followed by your device.

The first time you connect the device to your PC, the PC may take a few seconds to recognize the device and update any drivers. Wait for this process to complete and the PC to recognize the device before launching the software. You may need to reboot your computer after driver installation.

When your device is ready, the back panel LED should show a constant green color.

2.5 RUNNING THE SOFTWARE

With the software installed and the device recognized you can run the software. You can do this through the desktop shortcut or through the VSG25.exe file found in the installation directory.

3 Getting Started

Launching the VSG25 software brings up the user interface (UI). This section describes the UI in detail and how you can use the UI to control your Signal Hound vector signal generator.

Below is a picture of the software with all major areas of interest labeled:
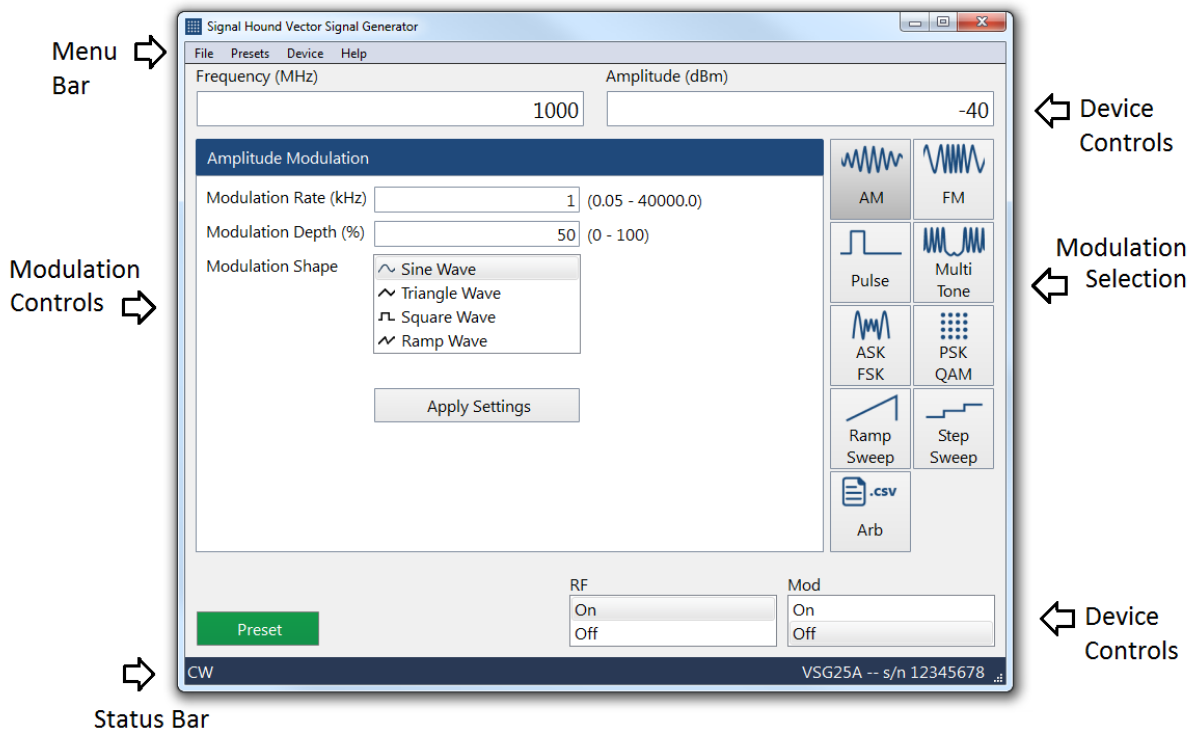
3.1 THE MENU BAR

The menu bar provides a set of menus across the top of the application.

3.1.1 File Menu

- Exit – Disconnect the device and close the software.

3.1.2 Preset Menu

- Load/Save – Through this menu you can save the entire state of the application to restore at a future time.

3.1.3 Device Menu

- I/Q Offset Adjust – Display a dialog for control the I/Q offset adjustment.

3.1.4 Help Menu

- About – Display the software and API version.

3.2 DEVICE CONTROLS

There are a number of device controls which allow you to define and manage output characteristics.

- Frequency – Specify the output frequency in MHz. This will also function as the center frequency for any active modulation.
- Amplitude – Specify the output amplitude in dBm.
- RF – Toggles the RF output. When off, the RF output is disabled regardless of other settings.
- Mod – Toggles the current modulation. When disabled, a CW is output. When enabled, the last selected modulation will be configured again.
- Preset – Performs a software reset and loads the software defaults.

3.3 MODULATION SELECTION

The modulation selection buttons expose the controls for the various modulation outputs available for the VSG25. Each button corresponds to a new set of controls to be displayed in the modulation controls area.

3.4 MODULATION CONTROLS

The modulation controls show related controls for the currently selected modulation. The shown modulation will not be active until the *Apply Settings* button is pressed. All controls are detailed below.

3.4.1 AM Controls

- Modulation Rate – Specify the AM waveform frequency in kHz.
- Modulation Depth – Specify the AM waveform depth as a percentage of the output amplitude.
- Modulation Shape – Specify the shape of the AM waveform.

3.4.2 FM Controls

- Modulation Rate – Specify the FM waveform frequency in kHz.
- FM Deviation – Specify the FM deviation in kHz. This is the maximum frequency difference between the FM modulated wave and carrier frequency.
- Modulation Shape – Specify the shape of the FM waveform.

3.4.3 Pulse Controls

- Pulse Width – Specify the time the signal is high during one pulse cycle in microseconds.
- Pulse Period – Specify the time between rising pulse edges in milliseconds.

3.4.4 Multi-Tone Controls

- Tone Spacing – Specify the spacing in kHz between each output tone.
- Tone Count – Specify the number of generated output tones.
- Notch Width – Specify a bandwidth of a notch reject filter to be applied to the resulting output tones.
- Tone Phase – Specify how the phase of each individual tone is generated.

3.4.5 ASK/FSK Controls

- Symbol Rate - Specify the symbol rate of the resulting data signal in kHz.
- Modulation Type – Specify whether to generate an ASK or FSK signal.
- Modulation Depth – For ASK signals this is defined as $(V_{max} – V_{min}) / (V_{max} + V_{min})$. For FSK signals this is defined as peak deviation $(F_{max} – F_{min}) / 2$.
- Filter Type – Specify whether a Gaussian filter is applied to the resulting modulation waveform.
- Filter Alpha – Specify the roll-off factor of the Gaussian filter. This is disregarded if no filter is selected.
- Data – Specify a data sequence to be modulated by bringing up the symbol editor. See the Symbol Editor section.

3.4.6 PSK/QAM Controls

- Symbol Rate – Specify the symbol rate of the resulting data signal in kHz.
- Modulation – Specify the modulation of the output signal. The data specified will be encoded using the selected modulation.
- Filter – Specify which inter-symbol interference filter is to be applied to the resulting modulation waveform.
- Filter Alpha – Specify the roll-off factor. If no filter is selected this value is ignored.
- Data – Specify a data sequence to be modulated by bring up the symbol editor. See the Symbol Editor section.

3.4.7 Ramp Sweep Controls

- Span – Specify the frequency span in MHz for the device to sweep.
- Sweep Time – Specify in milliseconds how fast the device should sweep the selected span.

3.4.8 Step Sweep Controls

- Start – Specify in MHz the start frequency of the stepped sweep signal.
- Stop – Specify the stop frequency of the stepped sweep signal. Combined with the start frequency, these two values define the range of the stepped sweep.
- Step – Specify the step size in MHz of the stepped sweep. The signal starting at the specified start frequency will be stepped in increments of the step frequency until the frequency is greater than the stop frequency, at which point the process will repeat.

- Dwell – Specify how long the signal dwells at each frequency in milliseconds. The actual dwell time at each frequency will be an approximate of the specified dwell time and not exact.

3.4.9 Arb Controls

- Load File – Loads an ARB file to be used to generate a custom I/Q signal. See Arb Files for more information regarding the format of these files. If an arb file is successfully loaded, the characteristics of the signal are displayed in the control area.

3.5 STATUS BAR

The status bar displays information about the device and its current state. In the status bar you will see information about the active device such as model and serial number. You will also see the current active modulation.

The status bar also shows you warnings related to the active modulation such as if an entry you entered was limited by the device or outside the range of operation. When the symbol clock error exceeds 1ppm from the requested value, a warning is displayed in the status bar.

4 Symbol Editor

The symbol editor is a dialog window used to create custom data sequences in the software for the various digital modulations. The symbol editor makes it fast and easy to enter custom binary sequences. The symbol editor even allows you to save sequences and load them for later use.

The symbol editor consists of the current binary output on the left and a number of action buttons on the right. Above the binary output, you can see the current size of the binary sequence measured in bits and the current bit position of the cursor. Using the buttons on the right of the output sequence, you can add additional bits into
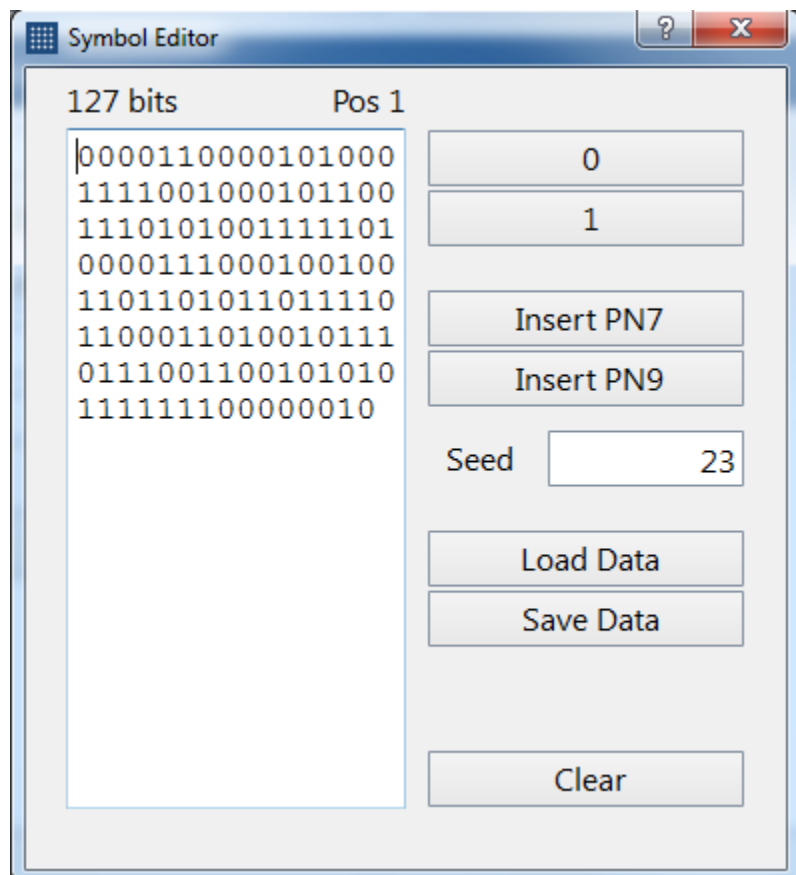
the sequence at the cursor location. You can also insert pseudo-noise sequences with the *Insert PN7* and *Insert PN9* buttons. You can manually set the seed for the pseudo random sequences to repeatability tests.

Using the *Load Data* and *Save Data* buttons you can export and import text files containing binary sequences. The file format for the binary sequences is simply a text file (.txt extension) and text zeros and ones defining the sequence. There should be no other characters or whitespace (tabs, spaces, and newlines) in the file.

4.1 INTERPRETING THE BINARY SEQUENCE

The binary sequence will be interpreted differently depending on modulation type selected. The sequence will be split according to how many bits per symbol are required for the selected modulation. The sequence is zero-padded at the end of the sequence if needed to create a sequence of an integer number of symbols.

5 Arb Files

The software allows you to load custom I/Q arb files which fully define the device output. The files follow a standard format which is described below.

The file should have the extension .csv. It can be easily edited in a spreadsheet application such as Microsoft Excel or any basic text editor. The format is as follows:

```
Center frequency in Hz,
Amplitude in dBm,
Sample Rate in S/s,
Samples Count,
Period Count
I0, Q0,
I1, Q1,
…
Icount-1, Qcount-1
```

An example of this format is as follows:

```
1000000000,
-20,
200000,
2,
8,
1, 0,
0, 0,
```

The example shown above describes a signal output at 1GHz at -20dBm, and a pulse modulated signal with a duty cycle of 1/8. The pulse width is 5 microseconds and pulse period is 40 microseconds.

5.1 NOTES ON THE FORMAT

Each numeric value defined in the format can be separated by a comma or any whitespace (spaces, tabs, and new lines). The example above shows values separated by commas and white spaces. The file would still be valid if all values were on one line as shown below.

```
1000000000 -20 200000 2 8 1 0 0 0
```

Comments can be inserted into the file and will be ignored as long as there is whitespace or a comma separating them from the numeric values. An example of this is below.

```
1000000000    One GHz
-20           Maximum output power allowed
200000        Two hundred kHz sample rate
2             Two samples
8             Period of eight
1 0 0 0       Pulse waveform
```

If you choose to make comments in the arb files, use words instead of numbers in the comments, as numbers in the comments will be parsed as the next input value.

6 I/Q Offset Adjustment Dialog

This applies only to notched multi-tone signals. You will need a spectrum analyzer to make this adjustment. To null the LO feed-through for notched multi-tone signals, place a marker on the LO feed-through signal, and then adjust I and Q offsets until a minimum amplitude is observed in the center of the notch. You may need to alternate between I and Q offsets a few times.
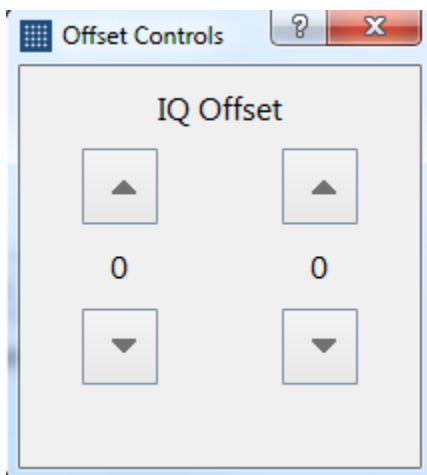
7 Troubleshooting

If the software does not communicate with the VSG25A after the driver has been installed, unplug the VSG25A and then reboot your computer. Once it has finished rebooting, plug in the VSG25A, wait up to a minute for updated drivers to load, and then launch the software.

If it still does not work, contact Signal Hound.

8 Calibration and Adjustment

For more information regarding calibration and adjustment see the VSG25 manual on our website or shipped with our software, or contact Signal Hound.

9 Warranty and Disclaimer

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