

# DG8SAQ VNWA 2.x Self Installer Manual

### 1. Introduction:

This document describes the DG8SAQ Installation process using the VNWA Self Installer. The VNWA Self installer is an executable file which contains the VNWA Driver, the VNWA Application and the VNWA helpfile and assists VNWA 2.x users with easy installation option.

The Self Installer installs VNWA Application 35.x upwards.

## 2. Important Information

#### **Copyright notice**

The design of the is copyright by Thomas Baier DG8SAQ & SDR-Kits - all right reserved -

### 2.1 Caution - Safety Information:

- 1. VNWA 2.x is powered and controlled through the USB-cable supplied. The USB-cable should be connected to the USB port of a Personal Computer capable of supplying +5V DC at 500mA maximum.
- 2. The maximum safe input voltage into the TX-out and Rx-in ports is an RF Voltage of 0dBm (225mV RMS with a frequency between 1 kHz up to 1300 MHz). Exceeding this value may cause damage to the VNWA and may invalidate product warranty.
- 3. Always check the SDR-Kits Website for current Product information including Safety Information and latest Product Updates.

http://www.sdr-kits.net/VNWA/VNWA\_Documentation.html

### 2.2 **Product Documentation:**

The documentation of this product is supplied as a VNWA Application Helpfile, through the VNWA Installer or may be downloaded from the Internet from

## http://sdr-kits.net/DG8SAQ/VNWA/VNWA\_HELP.pdf

## 2.3 Requirements:

The Self Installer is available from VNWA Application 35.0 upwards. After VNWA Application 35.x is installed it is important that VNWA 2.x is firmware is **manually** upgraded to the latest firmware. The latest firmware can be found in the VNWA Application folder used by the Self Installer. **Note:** Firmware version 4.14 comes after version 4.9 and 4.10!!

### 2.4 VNWA License code:

Make sure you have the VNWA License code which was supplied with the VNWA available prior to the installation. It will be required for the upgrade.

## 3. VNWA Self Installer: Driver - Software and Helpfile Installation

Caution: Although the installation package is provided for easy installation, it is recommended that the appropriate installation procedure for your Operating System is reviewed before starting the installer. The procedure below assumes that VNWA package has NOT been installed previously on the Computer in question.

### 3.1 Windows 7 & Vista 64 bit and 32 bit Installation

This section shows installation procedure for Windows 7 (64 or 32 bits)

## Note: For Installation on Windows XP refer to section 3.4

## **IMPORTANT:** Information for Windows 7 and Vista users:

If you are installing the VNWA application for the **first time**, the VNWA Setup program will guide you to install an application Winhlp32.exe from the Microsoft website. The Winhlp32.exe program is required to display the VNWA help file. However Microsoft license conditions does not allow the Winhelp32.exe to be distributed as part of the VNWA setup program.

VNWA installation is easier and friendlier if Winhlp32.exe application is already installed beforehand. It is therefore recommend to install Winhlp32.exe from the link

http://support.microsoft.com/kb/917607 prior to starting the VNWA installation program in step 3.1.1. You can always check if Winhlp32.exe is already installed by inspecting the file size of this file in C:\windows. If file size of Winhlp32.exe is 290 KBytes then the application is already installed. If this file is present but it is only 9Kbytes in size then Winhlp32.exe should be installed first:

- 3.1.1 Download and save the Installation Package from the following location to your desktop <u>http://www.sdr-kits.net/DG8SAQ/VNWA-installer.exe</u>
- 3.1.2 Make sure the VNWA is **NOT** connected to the PC Double Click on the VNWA-installer Icon to start the VNWA installation process.

Confirm the VNWA-installer can make changes to your Computer, then screen below is shown. Press "Next"



3.1.3 If the file Winhlp32.exe is NOT installed on the Computer than the screen below is shown. Winhlp32.exe file should be installed otherwise VNWA helpfile will not be displayed. If you click the box the Web browser will be launched. Follow the instructions on the Microsoft Website to download winhlp32.exe. Note: For 64 bit Operating Systems the filename ending in -x64.msu should be downloaded and -x86.msu for 32 bit Operating Systems.

Note: The link to the microsoft winhlp32.exe support is: <u>http://support.microsoft.com/kb/917607</u>

🔂 Setup - VNWA	
Additional Files Needed Winhlp32.exe needed for correct operation	
As far as Setup can tell, you do not have Winhlp32.exe installed on program, provided by Microsoft, is needed for the VNWA help syster with Vista or Windows 7. Unfortunately Winhlp32 cannot be redistrib this package due to license restrictions, so you will need to download To download Winhlp.exe, please check the box below then select 'W browser will be started with the correct web address to download th version of WinHlp32.	your PC. This m to work correctly puted as part of d it from Microsoft. ext'. Your web he appropriate
NOTE: your browser may hide the Setup application, so close your b completing the download to proceed with installation.	orowser after
Launch web browser to download Winhlp32	
< Back Nex	t > Cancel

3.1.4 Press "Next" – The default location where VNWA will be installed will be shown: Note: Select a different Destination Location (ie C:\VNWA\_2) if you s to install a second VNWA application on the same PC to prevent overwriting the setup files of your first VNWA application.

Setup - VNWA	
Select Destination Location	
Where should VNWA be installed	
Setup will install VNWA i	nto the following folder.
To continue, click Next. If you we	ould like to select a different folder, dick Browse.
C:\VNWA35x	Browse
At least 14.9 MB of free disk space	te is required.
	< Back Next > Cancel

3.1.5 Press "Next" – Default where program shortcuts will be installed

jg Setup - VNWA	
Select Start Menu Folder Where should Setup place the	e program's shortcuts?
Setup will create the	program's shortcuts in the following Start Menu folder.
To continue, click Next. If you	i would like to select a different folder, dick Browse. Browse
	< Back Next > Cancel

3.1.6 Press "Next" – Screen to enter VNWA license key is now displayed as shown below: There are two options to enter the VNWA license key for your VNWA:

SDR-Kits – VNWA 2.x Self Installer Manual 1.2 - copyright 2011 by SDR-Kits

Directly enter the VNWA license code exactly as shown in the Manual supplied with the VNWA 2.x hardware. The VNWA license code is also specified in the VNWA shipping advice email **Note:** the last colon is the last character and must also be entered.



- Note: A Screen (not shown in this manual) is now displayed with option to create a Desktop Icon for: A) All users or B) For Current User only. Make your selection and press "Next"
- 3.1.7 Press "Next" Information on Audio Configuration is displayed



3.1.8 Press "Next" and Ready to Install screen is displayed

授 Setup - VNWA	
Ready to Install Setup is now ready to begin installing VNWA on your computer.	
Click Install to continue with the installation, or click Back if you want to rev change any settings.	riew or
Destination location: C:\VNWA34x Start Menu folder: VNWA	*
٩	
< Back Install	Cancel

3.1.9 Press "Install" – VNWA Application and helpfile are now installed and Driver Installation window is displayed. **Note:** Do **NOT** plug-in VNWA at this time



3.1.10 Press "Next" – Following screen may be displayed – Select "Install this driver software anyway"



3.1.11 Press "Next" - Driver installation will take from 10-30 seconds

Device Driver Installation Wiza	rd	
	Completing the De Installation Wizar	evice Driver d
	The drivers were successfully in	stalled on this computer.
	You can now connect your dev came with instructions, please n	ice to this computer. If your device ead them first.
	Driver Name	Status
	✓ libusb-win32 (libusb0) lib	Ready to use
	< Back	Finish Cancel

3.1.12 Press "Finish" -

3.1.13 If you have selected to view the "Show Vista/Windows 7 Audio setup help" in point 3.1.5 read the information and close the window prior to next step

3.1.14 Press "Finish" to complete installation.



### **END OF VNWA Installation**

### 3.2 Windows 7 & Vista 64 bit and 32 bit Application Configuration:

3.2.1 Plug in the VNWA USB cable into USB Port of your Computer. Note: It is recommended to connect the VNWA same Computer USB Port next time you use the VNWA.

When connecting the VNWA for the **first time** after Driver installation, the VNWA will be recognized and device driver installation should complete automatically.



3.2.2 Click "Start" "All Programs" "VNWA" and VNWA Icon to start the application or use the Shortcut created on the Desktop.



3.2.3 Overclocking Warning may be displayed when you run VNWA Application software for the first time. Select "ok" to allow overclocking of the DDS chips beyond 400 MHz. Note: VNWA performance over 500 MHz will be worse affected if overclocking of the DDS is not permitted.

VNWA software started for the first time. If you want to use your VNWA beyond 300 MHz, you must AGREE to OVERCLOCK the DDS chips. By clicking OK, your VNWA will be switched to use auto clock multipliers which will allow overclocking. IIII You do this at your own risk IIII If you do not wish to overclock, press Cancel. You can also set VNWA to auto clock multipliers manually later on. This message will appear only once.
OK Cancel

3.2.4 VNWA Application starts: Click "OK" to enter VNWA setup information



3.2.5 The tab "USB Setting" should now displayed. If not click on the USB-Setting Tab Check whether VNWA license code is shown, In event this information is missing then enter the VNWA license code again. Now press "Rescan USB Bus" and "Test USB Interface" Check bottom line for message "Test passed without errors"

<b>PC and Instrume</b>	nt Hardware Related Setup	×
PC and Instrume Interface Type USB Settings // Rescan USB Bus Test USB Interface Verify Firmware Flash Firmware VMWA Energy Settings: Firmware Energy Settings	nt Hardware Related Setup         Audio Settings       Audio Level       Instrument Settings       Misc. Settings         bus/device       id/endor/id/Product       bus/device       id/endor/id/Product         bus/device       id/endor/id/Product       0x20A0/0x4118       0x20A0/0x4118         • Manufacturer:       sdfsAQ-VNWA       -       -         • Serial Number:       126       -       -         • Munifacturer:       18       -       -         • Serial Number:       10       -       -         • Configuration/Value:       1       -       -         • Configuration/Value:       1       -       -         • Dombatributer:       80h       -       -         • MaxPower:       150       -       -         • binterfaceRumber:       0       -       -         • binterfaceClass:       0       -       -         • binterfaceClass:       0       -       -         • binterface:       0       -       -	
OFF on power up     Image: Contrast of the set of t	Jan.Verduyn:A1652:	
Firmware V4.15 for AD9859:	Test passed without errors	1

3.2.6 Select Tab "Audio Settings" and set "Audio Capture Device" to "USB Audio Codec" Note: Variants of the USB Audio Codec" may be shown instead For Factory VNWA2.x check Reference = Right Channel has been selected. (Note: some VNWA 2.x built from a Kit may use "Left Channel" depending on wiring of the 3.5mm audio connectors) Now press "Test Audio"

<b>B</b> PC and Instrument Hardware Relate	d Setup 🛛 🗙
PC and Instrument Hardware Relate Interface Type USB Settings Audio Settings Audio Level Instrum Audio Capture Device USB Audio CODEC Capture Capture Settings Audio Code Capture Capture	d Setup ent Settings Misc. Settings Misc Audio Settings Audio Buffer Length in Samples Samples / IF Period T0 ×4 # Presamples 3 # Postsamples 3 Calibrate Sample Rate Measd. Sample Rate = 48004.6 Reference = Right Channel ▼ For VNWA 2.x with USB

3.2.7 Click on Tab "Audio Level" and check whether two sine waves are present as show below in "Reflect" mode. (100% Reflection with TX Port unterminated)
If sine waves are distorted then USB Audio Codec needs to be configured as shown in section 3.3.

*When the Audio level adjust is performed according to point 3.4 click on Tab "Calibrate Sample Rate"* 

*Note:* when the THRU Mode is active the Audio levels min and max are higher than when in *REFL Mode* 



3.2.7 Connect the TX port and RX port with SMA cable and check that the Reflect (Left Channel) sine wave has now disappeared. (TX port now sees 50 Ohms and no reflection) Next select "Thru" and check that the Left Channel "sine wave is displayed.



3.2.8 Click "Stop" cease the Audio test. Next click on Instrument Settings" and check whether clock is set to "auto" as shown below. **Note:** for VNWA 2, the clock is generally a little below 36 MHz, somewhere between 35.855 MHz and 36.000 MHz depending on Crystal fitted. When performing Audio test press ++ /+ or -- /- buttons until the sinewaves are almost stationary on the screen. If you have a frequency counter perform Calibrate DDS Clock calibration as described in the VNWA helpfile.

🛱 PC and Instrument Hardware Relate	d Setup 🛛 🔀
Interface Type USB Settings Audio Settings Audio Level Instrum	nent Settings   Misc. Settings
VNWA Type: S-Parameter Test Set:	S11 = low save profile
VNWA 2+ 💌 none 💌	load profile
RFDDS	LO DDS
AD9859, AD9951	AD9859, AD9951 👻
Clock = 35.859068078476 x auto V MHz	Clock = 35.859068078476 x auto V MHz
=> clock = auto	=> clock = auto
Calibrate Clock Frequency	
Calibrate DDS Clock Frequency	
To calibrate the DDS clock frequency, you need to measure the output	t frequency at the TX port with a frequency counter.

3.2.9 Press the top right button to close the VNWA Setup screen. Next we test whether the VNWA helpfile is available. Press "Help" and select "Help" again. The screen below may be shown. Press "Yes" and "Browse" to select the location where the Helpfile is located. If standard VNWA installation defaults were selected then the default path will be:
 My Computer C:\VNWA\VNWA.hlp

6	Cannot find the C:\Users\J	an\Radio\VNWA3\VNWA3.	1
6	Soft&firmware\VNWA.HLF yourself?	P file. Do you want to try to	find this file
		<u>.</u>	

3.2.10 **IMPORTANT:** To save the VNWA configuration (after any changes are made) exit the Setup VNWA application. This saves the VNWA configuration files for the next time the VNWA application is started.

End of VNWA Configuration

## 3.3 Windows 7 - 64 bit and 32 bit Audio Codec Configuration

3.3.1 Windows 7 configures the USB Audio Codec as a mono application with levels set too high as shown below. This prevents VNWA application from functioning.

PC and Instrument Hardware Related Setup	🖕 Microphone Properties
Interface Type USB Settings Audio Settings Audio Le Left = Reference	General Listen Levels Advanced
	Microphone
Right = Thru/Reflect	
Stop	OK Cancel Apply
Min=-32/08 Max=32/0/ Aux Min=0 Aux Max	

3.3.2 Start the VNWA Application and select Audio Test as shown in 3.2.7 Now to configure USB Codec properties select "Start", "Control Panel"



3.3.3 Select "Hardware and Sound" and click on "Manage Audio Devices"



3.3.4 and click on tab "Recording"

yback H	Recording Sound	is Commu	nications	
elect a re	cording device b	elow to m	odify its settings:	
~	Microphone	CODEC		
~	Default Devic	e		
1	Microphone Realtek High	Definition	Audio	
-	Ready			
		ſ	Cat Data un	Deserved'
	Ire		Set Default	Properties

3.3.5 Click on "Microphone USB Audio Codec" and select "Advanced" Ensure that Default Format is set to **"2 channel, 16 bit, 48000 Hz"** 

eneral Listen Levels	Advanced
Default Format Select the sample rate in shared mode.	and bit depth to be used when running
2 channel, 16 bit, 4800	00 Hz (DVD Quality) 🔻
Exclusive Mode           Image: Allow applications           Image: Give exclusive mode	to take exclusive control of this device e applications priority
Restore Defaults	

- 3.3.6 Next select "Levels" and adjust Microphone level to value of between 3 and 5, (typically 4) and press OK
- Note: If 4 is not selectable e.g. the displayed number jumps from 3 to 5 then use the left and right arrow keys and count you way. You will find whilst **only** 5 is shown both the setting for 4 and 5 is available.

Microphone Pr	operties	Stage.		×
General Listen	Levels Advance	ced		
Microphone			4	
		ОК	Cancel	Apply

3.3.7 Check on VNWA Setup Screen that sinewave covers approx 50% to 60% as shown in step 3.3.6 and 3.3.7. If necessary adjust Microphone level until this is achieved.

### End of Audio Codec Configuration

# 3.4 Windows XP Installation

Note: For Installation on Windows 7 and Vista refer to section 3.1

This section shows installation procedure for Windows XP Operating System.

- 3.4.1 Download and save the Installation Package from the following location to your desktop <u>http://www.sdr-kits.net/DG8SAQ/VNWA-installer.exe</u>
- 3.4.2 Make sure the VNWA is **NOT** connected to the PC Double Click on the VNWA-installer Icon to start the VNWA installation process. Confirm that the VNWA-installer can make changes to your Computer



3.4.3 Press Next – The default location where VNWA will be installed will be shown: **Note:** Select a different Destination Location (ie C:\VNWA\_2) if you want to install a second VNWA application on the same PC. This prevents overwriting the setup files of your first VNWA application

🕏 Setup - VNWA 📃 🗆 🔀
Select Destination Location Where should VNWA be installed?
Setup will install VNWA into the following folder.
To continue, click Next. If you would like to select a different folder, click Browse.
C:\VNWA35 Browse
At least 14.6 MB of free disk space is required.
< Back Next > Cancel

3.4.4 Press Next – Default Location where VNWA program shortcuts will be installed

🕼 Setup - VNWA	
Select Start Menu Folder Where should Setup place the program's shortcuts?	
Setup will create the program's shortcuts in the following Start M To continue, click Next. If you would like to select a different folder, click	1enu folder. Browse.
WNWA	Browse
< Back Next >	Cancel

3.4.5 Press Next – Screen to enter VNWA license key is now displayed as shown below: There are two options to enter the VNWA license key for your VNWA:

Directly enter the VNWA license code exactly as shown in the Manual supplied with the VNWA 2.x hardware

The VNWA license code is also specified in the VNWA shipping advice email **Note:** the last colon is the last character and must also be entered.

🕼 Setup - VNWA	
License key required Enter license key or select Key File Location	
To enable your VNWA you must specify a license key. You may do this entering your license key string directly in the field below, or by specif location of the Key File supplied by SDR-Kits with your VNWA. If you a evaluating the VNWA software without VNWA hardware attached (de leave the field empty and just select 'Next'. Enter license key or location of *VNWAKey.txt: A2005:BFA-AZT-RBQ-WKP:	; either by 'ying the full are just mo mode) then Browse
< Back Next	> Cancel

- Note: A Screen (not shown in this manual) is now displayed with option to create a Desktop Icon for: A) All users or B) For Current User only. Make your selection and press "Next"
- 3.4.6 Press "Next" Read and execute the instructions displayed on the screen below:Note: The VNWA hardware must be connected in this step otherwise driver installation may fail.

🕼 Setup - VNWA 📃 🗖	×	
Information Connect VNWA hardware before proceding	B	
Please connect your VNWA to the PC before proceding. When you have connected your VNWA, or if you are just installing the software without hardware for evaluation purposes, select 'Next'.		
NOTE: If a driver installation window appears as soon as your connect your VNWA, please cancel it because the required driver installer will only start after you press 'Next' on this screen.		
< Back Next > Cancel		

3.4.7 If the screen below is displayed after plugging in VNWA then press "Cancel button on this screen



3.4.8 Press "Install" on Screen below. The Installation of VNWA Application and Driver should now start and screen below is shown.

~	
e	i 🕏 Setup - VNWA 📃 🗖 🗙
э	Ready to Install Setup is now ready to begin installing VNWA on your computer.
	Click Install to continue with the installation, or click Back if you want to review or change any settings.
	Destination location: C:\Program Files\VNWA
	Start Menu folder: VNWA
1	< Back Install Cancel

3.4.9 The Installation of VNWA Application and Driver now start and screen below is displayed. press "Next"



3.4.10 Driver installation now completes - Press "Finish"



3.4.11 Press "Finish" - to exit the VNWA installation routine.



## **END of Windows XP Installation**

## **3.5 Windows XP VNWA Application Configuration**

- 3.5.1 Ensure the VNWA USB cable into USB Port of your Computer.
- 3.5.2. Click "Start" "All Programs" "VNWA" and "VNWA" to start the VNWA application or use the Shortcut created on the Desktop.



3.5.3 VNWA Application is started. The following Notice is displayed when VNWA application is started for the first time:Note: To allow for VNWA operation above 500 MHz auto clock multipliers must be selected.

IMPORTANT NOTICE!		
VNWA software started for the first time. If you want to use your VNWA beyond 300 MHz, you must AGREE to OVERCLOCK the DDS chips.		
By clicking OK, your VNWA will be switched to use auto clock multipliers which will allow overclocking.		
!!!! You do this at your own risk !!!!		
If you do not wish to overclock, press Cancel. You can also set VNWA to auto clock multipliers manually later on.		
This message will appear only once.		
OK Cancel		

3.5.4 VNWA Application starts: Click "OK" to acknowledge that VNWA setup information needs to be entered.



### 3.5.5 Now click on Tab "USB Setting"

Check whether VNWA license code is shown, In event this information is missing then enter the VNWA license code shown on page 2, 2.4 again. Now press "Rescan USB Bus" and "Test USB Interface" Check bottom line for message "Test passed without errors"

PC and Instrument Hardware Related Setup 🛛 🛛 🔀
terface Type USB Settings   Audio Settings   Audio Level   Instrument Settings   Misc. Settings
Rescan USB Bus bus/device idVendor/idProduct
est USB Interface     for the state of
Verify Firmware wTotalLength: 18 bNumInterfaces: 1
Flash Firmware     bConfiguration/Value: 1       iConfiguration:     0       bmAtributes:     80h       MaxPower:     150       bInterfaceNumber:     0       bAlternateSetting:     0       bInterfaceSubClass:     0       bInterfaceSubClass:     0       bInterfaceSubClass:     0       bInterfaceSubClass:     0       bInterfaceSubClass:     0       bInterfaceSubClass:     0
FF on power up
Intware Energy Settings
zense Code: Jan. Verduyn: A1652:
mware V4.15 for AD9859: Test passed without errors 🧹 🗕 📈

3.5.6 Select "Audio Settings" and set "Audio Capture Device" to "USB Audio Codec" Set Recording Mode to "Capture" and Recoding Device to "Microphone" For Factory assembled VNWA 2.x check Reference = Right Channel has been selected. (Note: Older VNWA 2.x built from a Kit may use "Left Channel" depending on wiring of the 3.5mm audio connectors) Now press "Test Audio"

BPC and Instrument Hardware Relate	d Setup	×
Interface Type USB Settings Audio Settings Audio Level Instru Audio Capture Device USB Audio CODEC Capture Microphone Test Audio Max= Min=	ment Settings   Misc. Settings   Misc Audio Settings Audio Buffer Length in Samples Samples / IF Period 10 ×4 # Presamples 3 # Postsamples 3 Calibrate Sample Rate Measd. Sample Rate = 48004.6 Reference = Right Channel •	Image: 10000         => IF = 1200.11 Hz         => Minimum Sampling Time = 0.96 ms         ignore overload         Ignore overload         Ignore overload         Image: 100 minimum on the synce         JWA 2.x with USB

3.5.7 Select "Audio Level" and ensure whether Reflect Mode is selected. The sinewave levels should be as displayed below (100% Reflection as TX port is not terminated)Note: If screen display is different from shown below (for instance when Volume Sliders are shown) then return to previous step 2.6.5 and change Recording Mode and Recording Device.



- 3.5.8 Connect the TX port and RX port with an SMA cable and check that Left Channel sinewave has disappeared (No signal reflected). Now select "Thru" (by pressing on softbutton "Reflect" and check that the Left Channel sinewave is displayed as shown in screenshot below.
- **Note:** when the THRU Mode is active the Audio levels min and max are a little higher than when in REFL Mode



3.5.9 Click "Stop" cease the Audio test. Next click on "Instrument Settings" and check whether clock is set to "auto". Note that for VNWA 2, the clock is generally a little below 36 MHz, somewhere between 35.855 MHz and 36.000 MHz depending on Crystal fitted. When performing Audio test press ++ /+ or -- /- buttons until the sinewaves are almost stationary on the screen. If you have a frequency counter perform Calibrate DDS Clock calibration as described in the VNWA helpfile

nterface Type USB Settings Audio Settings Audio Level	Instrument Settings   Misc. 9	Settings	
NWA Type: S-Parameter Test Set:		S11 = low	save profile
/NWA 2+ none			load profile
RF DDS	LUDDS		
AD 9859, AD 9951	AD 9859, AD 9951	<u>•</u>	
Clock = 35.859068078476 x auto 💌 MHz	Clock = 35.85906	68078476 x auto 🕶 M	۹Hz
=> clock = auto	=> clock = auto		
Calibrate Clock Frequency			
Calibrate DDS Clock Frequency			
To calibrate the DDS clock frequency, you need to measure I	the output frequency at the TX	port with a frequency count	er.

3.5.10 Press the top right button to close the VNWA Setup screen. Next we test whether the VNWA helpfile is available. Press "Help" and select "Help" again. The screen below may be shown. Press "Yes" and "Browse" to select the location where the Helpfile is located. If standard VNWA installation defaults were selected then the default path will be: My Computer C:\VNWA\VNWA.hlp

3.5.11 **IMPORTANT:** To save the VNWA configuration (after any changes are made) exit the VNWA Application. This saves the VNWA setup for the next time the VNWA application is started.

### End of VNWA Configuration for Windows XP

## 4. VNWA Master Calibration

Prior to taking VNWA measurements the VNWA needs to be calibrated - Calibration uses SOLT -<u>Short - Open - Load and Through Method</u>. Ideal Calibration standards are used by default. For High precision measurements in VHF and UHF range you need to specify more precise model of the calibration standards used - please consult the VNWA helpfile

To calibrate the TX port (One Port) you need an SMA Short connector and and a SMA 50 Ohm Termination. For RX port (Two Port) calibration a short SMA to SMA cable is also required.

### 4.1 Master Calibration procedure

- 1. Set frequency range for Master Calibration (for instance 0 MHz 500 MHz). Click on "Center=" and "Span=" and specify Start and Stop frequency of the Master Calibration
- From VNWA top menu select "Setting" and select "Sweep" Specify: 8192 points time per sample: 3.3 mS

🗏 VNWA Sweep Settings 🛛 🛛 🔀	
Sweep Control Number of Datapoints = 8192 Measurement Time:	
Time per sweep = 27.31 secs Time per data point = 3.3 ms	
-Sweep Progress Display	
Progress lext Un	//

- 3. From VNWA top menu select "Measure" and "Calibrate" and select <u>Short Open Load</u> for TX calibration and follow the instructions shown on screen. For 2 Port Thru calibration "<u>C</u>rosstalk Cal <u>Thru Cal Thru Match Cal</u>" steps also need to be done using a short cable.
- 4. Once Calibration has been done, save the results in a Master Cal file: for instance with filename: *Master Cal 0-500Mhz*. Note: you may save any number of cal files.

EFull Calibration	X
Calibration Menu Correction Schemes	
Master Calibration Activated	
save current calibration as master cal.	
Reflect Calibration	Thru Calibration
<u>Short</u>	Crosstalk Cal
<u>O</u> pen	Ihru Cal 🛛 🔽 on / off
Load	Thru <u>M</u> atch Cal
Cal 🔽 on / off	Invalidate All Thru Calibrations

### 4.2 Reloading saved Master Calibration File

To load a previously save Master Calibration File:

- 1. From Top Menu select "Options" and "Setup" and "Misc. Settings"
- 2. Now select the required Calibration file for loading

## End of VNWA Master Calibration

## 5. Some Practical VNWA Measurements

## 5.1 Antenna VSWR and Impedance (S11 - 1 Port Device)

Antenna VSWR or Impedance measurements are typical examples of VNWA "One Port Measurements" The example below illustrates how VSWR measurement is obtained of an (144 MHz) Antenna from 400MHz to 450MHz (2 Meter Antenna used on 70 cm Band)



**Method:** (assume VNWA has been calibrated before) Connect Device Under Test (DUT) is Antenna to the VNWA TX

Connect Device Under Test (DUT) ie Antenna to the VNWA TX Socket

1. Set Frequency Start and Stop frequency

2. Set Measurements - select measurements to be displayed

(S11, dB), (S11, Real Z), (S11, Imag Z)

Press "Single Sweep" results are now displayed

3. Adjust the measurement scale if required to improve the graph appearance

Add Marker (Right Mouse Click and select "Normal Marker") and place on point of interest

In the example the Marker displays: Frequency = 434 MHz, VSWR = 1.61 Real Z = 78.75 Ohm andImag Z = 10.43 Ohm (Inductive)

## 5.2 VNWA Transmission Line Measurements (2 Port Measurement)

Filter Attenuation measurement is an example of VNWA "Two Port Measurements"

SDR-Kits – VNWA 2.x Self Installer Manual 1.2 - copyright 2011 by SDR-Kits

The measurements of attenuation (S21 dB) and input impedance (S11 Z) of a 400 MHz Surface Acoustic Wave (SAW filter)



Method: (assume VNWA has been calibrated before)

Connect Device Under Test (DUT) input to VNWA TX port and Device output to VNWA RX port

- 1. Set Start and Stop frequency
- 2 Select measurements to be displayed (S21, dB), (S11, Real Z), (S11, ImagZ) Press "Single Sweep" Results should be displayed
- 3 You can change the measurement scale if required to improve graph appearance
- 4 Add Marker (Right Mouse Click and select "Normal Marker") and place on point of interest
- 5 Graph position may be adjusted by placing curser here and dragging graph up or down.

In the example Marker 1 displays: Frequency = 400.09 MHz Attenuation = -12.05dB Input RealZ = 22.28 Ohm and Input imagZ = -5.76 Ohm (capacitive). Note: SAW filter is not matched to 50 Ohm impedance of VNWA TX and RX port.

### 5.3 Time Domain Reflectometry Measurement (T D R)

Below is an example of using the TDR capability of the VNWA to determine the characteristic impedance (and length) of a coaxial cable.



### Method:

- 1. Calibrate VNWA between 0 kHz and 1300 MHz with sweep of 2000 points and 4mS
- 2. Connect the Coax cable to VNWA TX port. Other end of Coax is left unconnected.
- 3. Perform S11 dB measurement as (shown as Trace 1)
- 4. Add Trace 2 as |Z| and Time (Use right hand mouse click and select "Trace Options")
- 5. Move curser over Trace 2 (shown as S11 |Z|), Next do right hand mouse click and select "Other" and "Time Domain. Time domain Setting window now appears as in picture.
- 6. Change the settings as shown in the example, Select "Stop Time" to be a little longer than the length of your coax cable. (10ns shown for measuring cable length up to 1m)

In the example Marker 1 displays: the characteristic impedance as 49.78 Ohm (each division is 1 Ohm!). The total length of the coax cable is actually 0.63m. Accuracy of this measurements depends on correct Velocity Factor of the cable type to be entered

### 6. VNWA Help file

Check you can open and read the VNWA HELPFILE. Open the VNWA Helpfile and take out time to familiarize yourself with the VNWA application: particularly with sections such as:

- Installation & Configuration
- Calibration
- Known Issues
- Verification of Proper Operation (Troubleshooting section)

intente Ludau I Tind	
indens   Index   Find	
Click a book, and then click Open. Or click another tab, such as Index.	
🔖 General	~
🕼 Getting Started	_
Startup Procedure	
🐤 Installation 🛛 🚽 🗕 🚽	
📚 Firmware upgrades	
📎 Configuration 🛛 🚽 🛶 🛶 🛶 🛶 🛶 🛶 🛶 🛶 🛶 🛶 🛶	
📚 Setting up the Display	
📚 Calibration	
🔶 Measurement	
📚 Time Domain Analysis	
📚 VNWA Main Menu Functions	
🔷 VNWA Additional Functions	
📚 Special Topics 🔄 🖉	
🔖 Known Issues 🛛 🗨 🚽	
🔖 Troubleshooting 🛛 🚽	~
	-

Note: a PDF version of the latest helpfile may be downloaded from: http://sdr-kits.net/DG8SAQ/VNWA/VNWA\_HELP.pdf

## 7. VNWA User Support

#### 7.1 VNWA User group

It is recommended you become a member of the DG8SAQ VNWA Forum on Yahoo where VNWA announcements and VNWA user experiences are shared. You will have the benefit of useful information including advice when new software and helpfile updates are available for download. <u>http://groups.yahoo.com/group/VNWA/</u>

Please use the DG8SAQ VNWA Forum to check for important announcements, documentation updates and to share your experiences building and using the DG8SAQ Vector Network Analyser.

#### 7.2 Acknowledgements

Acknowledgements and thanks to all the VNWA 2.x owners who tested 34.x and 35.x releases and patiently reported issues via the VNWA reflector. A special thanks for Kurt Poulsen OZ7OU for his diligent review of the this manual and for his sterling work on the VNWA Calibration Standards supplied by SDR-Kits.

Tom Baier and I acknowledge the contribution of Alan Rowe M0PUB for his expertise and efforts in providing the Installer package.

15th June 2011

Jan Verduyn Proprietor SDR-Kits

#### 9.8 Contact adress

SDR-Kits (Internet & mail order only) 14 Ragleth Grove Trowbridge, Wilts BA14-7LE United Kingdom

## email: sdrkits@gmail.com

www.SDR-Kits.net