FA-VA5 Antenna Analyzer Setup with VNWA Windows Software



Introduction -

This document shows how to setup the FA-VA5 600 MHz Antenna Analyzer for use with the DG8SAQ VNWA Windows Application program. A more comprehensive document written by **Michael Knitter DG5MK**, who is the FA-VA5 designer is available <u>here</u>: (Ref 1)

Also Joe Fellner OE5JFE has made a Video covering same subject: <u>https://youtu.be/FnfoTX5_DBo</u> The VNWA Application program offers the advantage of using the PC Software allows for quicker and more accurate measurements as the more powerful processor in the PC performs all the data processing whilst the FA-VA5 is just used as a simple hardware data measurement platform. See also the FA-VA5 Assembly and Operating Manual page 26 onwards.

- Configurable Number of Datapoints from 1 up to 8000
- Measuring time per Datapoint can be selected from Fast (40 msecs) Standard (55 msecs) and Precise (150 msecs)
- Supports saving and loading BNC Calibration files (.ckf) for more accurate measurements.

FA-VA5 Analyzer file Installation and setup in 6 steps

- 1. Download and Install the DG8SQ VNWA Software
- 2. Download and install the Silicon Labs USB Com Port Driver
- 3. Connect the FA-VA5 to the PC and configure the Com Port connection
- 4. Entering of FA-VA5 Frequency and Sweep Parameters
- 5. Calibration using a Precision BNC Calibration set
- 6. Taking first measurements

1. Download and install the DG8SAQ VNWA Windows Software

- Download the current general release VNWA Windows PC Software from: <u>http://www.sdr-kits.net/DG8SAQ/vnwaupdate.php?path=installer&source=Sdr-kits</u>
- Install the VNWA PC Software on your PC.
 Note: this VNWA software version is suitable for Windows 10, 8.1, 7 and Windows XP.
 A license code is NOT required, please leave this field blank
 For detailed instructions, see the VNWA "Getting Started Manual" on the following link: https://www.sdr-kits.net/documents/VNWA W10 W8 W7 Installation.pdf

2. Download and install the Silicon Labs USB Com Port Driver

Download the FA-VA5 USB Comm Port driver from the link below and save it in your Download directory.
 Note: there are different drivers for Windows 10 and for Windows 7 and 8.1 and XP. Select the driver for the Operating System of your PC. See picture on next page.
 https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers

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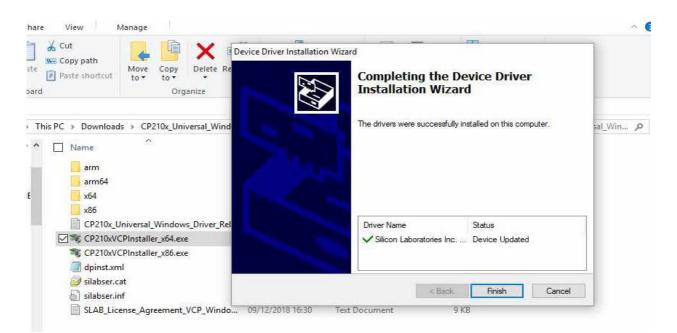
- Find the Driver zip-file in the Directory where it was downloaded into.
- Unzip the Driver zip-file and save the extracted Driver file in a different directory (Unzipping is generally done by selecting the zip-file and with a Right Hand Mouse click and selecting Extract button)

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- Open the unzipped Driver directory as shown in the picture on next page.
- If your Computer has a 32 bit operating system, start the driver installation by clicking on the file CP210xVCPInstaller_x86.exe
- If however your Computer has a 64 bit operating system then start the driver installation by clicking on the file **CP210xVCPInstaller_x64.exe**

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Name	Date modified	Туре	Size
arm	09/12/2018 16:29	File folder	
arm64	09/12/2018 16:29	File folder	
хб4	09/12/2018 16:30	File folder	
x86	09/12/2018 16:30	File folder	
CP210x_Universal_Windows_Driver_Rel	09/12/2018 16:29	Text Document	20 KB
💐 CP210xVCPInstaller_x64.exe	09/12/2018 16:29	Application	1,026 KB
SCP210xVCPInstaller_x86.exe	09/12/2018 16:29	Application	903 KB
dpinst.xml	09/12/2018 16:30	XML File	12 KB
🥔 silabser.cat	09/12/2018 16:30	Security Catalog	13 KB
📓 silabser.inf	09/12/2018 16:30	Setup Information	10 KB
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• Driver Installation should now start and complete after less than 30 seconds as shown below

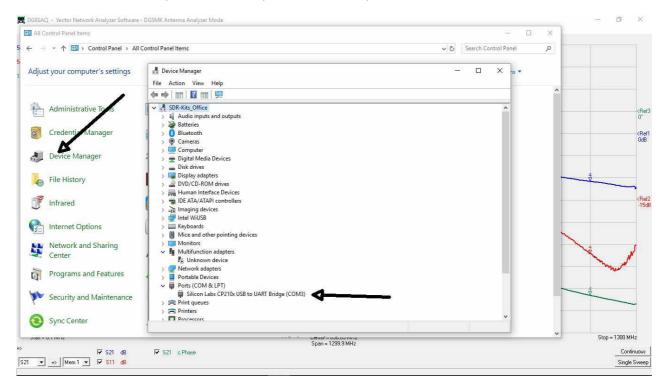


3. Connect the FA-VA5 to the PC and configure the Com Port connection

- Next step is to find the Port number which the Driver installation has created.
- Using a suitable USB Cable Connect the FA-VA5 Antenna Analyzer USB port to a PC USB port. Check that "**USB**" is displayed on the VA5 display to verify USB Mode is active.

 On PC select Control Panel and select Device Manager and search for "Ports" In the example below the Driver Com Port is marked as COM 3 - Write this down

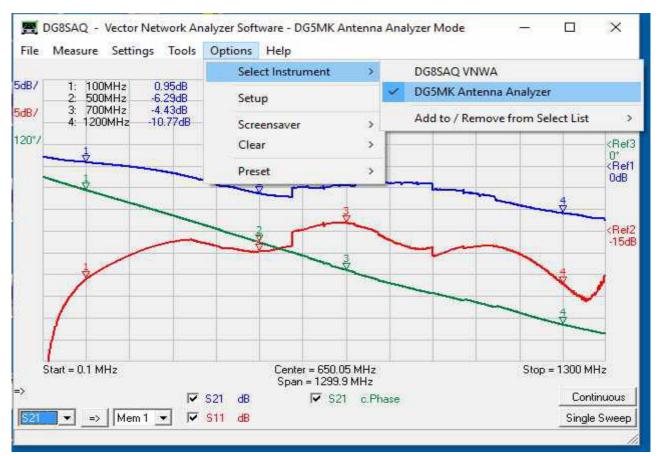
Note: If no Port is shown then check the USB cable, whether USB is enabled on the FA-VA5 or check the 5 solder connections opposite the USB socket of the USB Daughter board to the Main PC. These solder pads are the only active data and power connections between these two boards.



• Start the DG8GSAQ VNWA PC Application and click **Options** and **Select Instrument**: and **Add to/Remove from Select List** tick the **DG5MK Antenna Analyzer** as shown below.



• Click on **Options** and **Select Instrument** once more and tick the box to select **the DG5MK Antenna Analyzer.**



Note: A VNWA License code is **NOT** required as soon as the DG5MK Antenna Analyzer is selected.

• Click on **Options** and **Setup**, the screen below is displayed. Now press "**Rescan**" and the box **Port** and use the slider to see what **Com Ports** are available. **Select** the same **COM** number as before.

🔝 Instrument r	elated Setup		×
	"DG5MK Antenna Analyzer" Name = DG5MK Antenna Analyzer dli Version V2.0	not found	
Instrument Name	DG5MK Antenna Analyzer	Default	
Port	Сомз	Rescan	
Baud Rate	115200 Baud (default)		
	ING when exceeding instrument freque	ency range or	

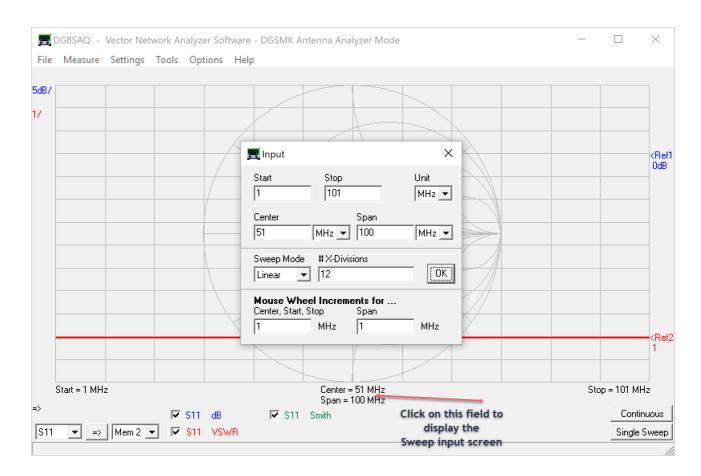
• The Instrument related Setup screen should now show **connected** and the FA-VA5 Antenna Analyzer is now controlled by the PC Application.

Note: If no COM Port number is shown, then unplug the USB cable and reinsert the cable. Now repeat the previous step. Sometimes the **Rescan** button needs to be pressed a second time before a COM Port number is displayed.

Instrume	ent related Setup		×
Default Instrum	er = "DG5MK Antenna Analyzer" nent Name = DG5MK Antenna Analyzer imk.dll Version V2.0	connected	
Instrument Nar	me DG5MK Antenna Analyzer	Default	
Port	COM3	▼ Rescan	
Baud Rate	115200 Baud (default)	•	
107	enna Analyzer V2.0 firmware V1.07		
I Display W/ 0.01 MHz.	ARNING when exceeding instrument freque 600 MHz	ency range of	
_			

4. FA-VA5 Basic Operation Parameters:

• Two screens are important to get familiar with the FA-VA5 functions: The first one is the **Frequency Input** screen. A single click on the **Center and Span field** will display the Input screen. This is where you can now enter the **Start** and **Stop frequencies**.



- The second screen is for Sweep Settings and Dataset Import This screen is selected by clicking "Settings" and then "Sweep Settings" tab
- You can select the number of datapoints from 1 to a maximum of 8192. This compares to only 100 points when the FA-VA5 is used as a standalone unit.
 Sweep mode offer a choice of three samplingtimes per datapoint. Standard, Precise and Fast, with sampling time per datapoint of 55, 150 and 40 msecs respectively. Note: a longer sampling time increases accuracy however at expense of a slower sweeptime.
- Sweeptime = (number of datapoints selected)
 x (measuring time per datapoint) and shows
 the duration of a single sweep.

Sweep Control		
lumber of Datapoints =	250	
weep Mode	standard	•
dditional Delay =	0	ms
feasurement Time:		
ime per datapoint = 55 weeptime = 13.75 sec		
Sweep Progress Displa	y	
🔽 Progress Bar Or	n Proj	gress Bar Color
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5. FA-VA5 Basic Calibration

Short

<u>O</u>pen

Load

Cal 🔽 on / off

M

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Before using the FA-VA5 with the VNWA PC Application a Short – Open and Load Calibration (SOL) must be done. Any Master calibration which you may have done and stored on the FA-VA5 is **NOT** used by the PC Application.

• To start PC Calibration go to Settings and click on Calibration Kit Select the tab Simple SOLT Model Settings and enter the Open, Short and Load parameters. The example below shows how the parameters are entered for the SDR-Kits Precision 600 MHz calibration kit, as individually measured and printed on the datasheet supplied with the kit.

🖀 Calibration Settings	×
General Settings Simple SOLT Model Settings SOLT Simulation Settings Special Settings Measurement Simulation	
OSL Calibration Standard Setup	
OPEN: Delay = -41.66 ps => one way electrical length = -4.371 mm	
SHORT: Delay = -113.52 ps => one way electrical length = -11.91 mm	
LOAD : Delay = -272.17 ps => one way electrical length = -28.56 mm	
LOAD: R = 43.97 Ohms C II = 0 IF L_ = 2.52 nH	
Note: The Delays above are correction values, i.e. the NEGATIVE of the delays of the standards!	
THRU Calibration Standard Setup	=
THRU: Transmission Factor = 1 => attenuation = 0.0000 dB	
THRU: Transmission Delay = 0 ps => electrical length = 0 m	

If you click the General Settings, you can save these parameters as a Calibration file in the Directory ٠ VNWA/DefCalKit. Use file name: BNCxxx Male Load simple VNWA model where xxx is the serial number of the Precision Calibration Kit and you can always reload these Cal kit parameters in the future.

		E Full Calibratio	on		/
 To start the actually calibration (using the 	9	Exit Calibration	Master Calibration	Cal Kit	
Frequency Range, Sweep Settings and Ca	libration	Calibration Menu	Correction Schemes		
Kit parameters specified in the previous s	teps)				
go to the main VNWA menu and click on		BNC_female_B025	25 Male Load, simple		
Measure and Calibrate.		-Reflect Calibration		Calibration	X
A new screen "Full Calibration" will be di	splayed.	<u>S</u> hort		Calibration	~
Follow the instructions displayed on scree	en:			Connect SHORT to N	WA output!
		<u>O</u> pen			in output
		Load		OK	Cancel
🚍 Full Calibration X					
Exit Calibration Master Calibration Cal Kit		Cal 🗌 on .	/ off		
Calibration Menu Correction Schemes			—		
BNC_female_B025_25 Male Load, simple Reflect Calibration					

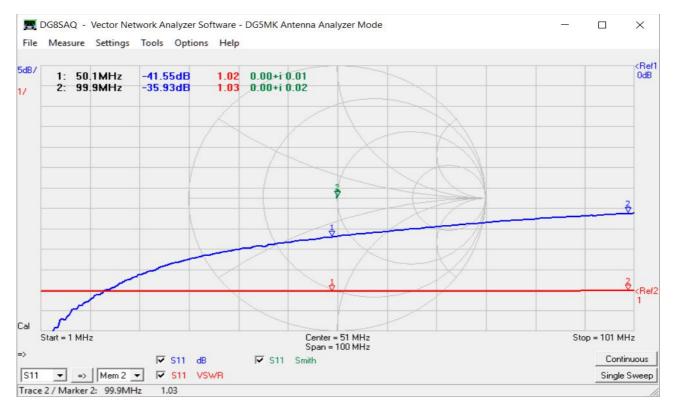
After calibration of the Sort, Open and Load • elements has been done, the screen to the Left will be displayed. You can save the actual calibration file by clicking on **Calibration** and **Save as** fields with a suitable file name: for example Calibration 1-100 MHz Standard 28Dec18

6. First Measurements

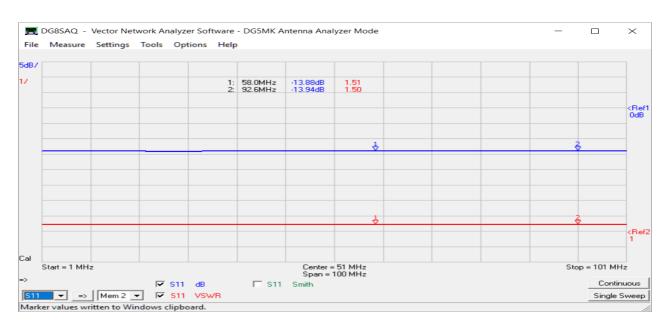
• Once Calibration is done, we can conveniently measure what the 50R load performs like in practice.

The return loss and VSWR of the calibration load are displayed below. It shows that the calibration was good as the measurements are as expected.

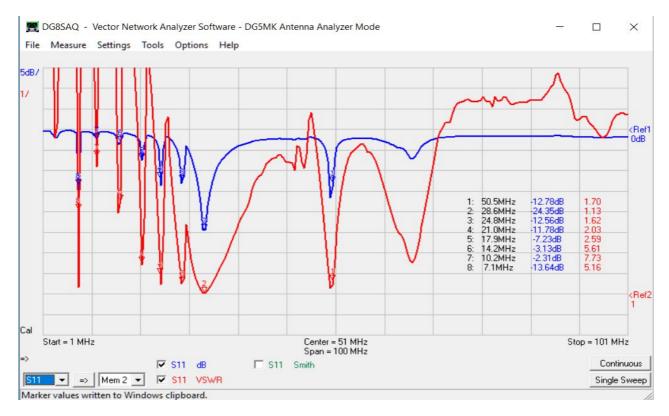
• Frequency Markers can be easily added with a right hand mouse click on the trace and selecting "Add Frequency Marker" "Normal" Click on the marker number to select the desired frequency. Multiple Frequency Markers may be added.



• I happen to have a 75 Ohm BNC Load, this is what we measure: VSWR is about 1.5:1 throughout the frequency range 1-100 MHz - as expected



• The final example: this is actual antenna measurement of a multiband half wave trap vertical covering from the Amateur Radio Bands from 7 MHz up to 50 MHz, This shows that some maintenance is needed on 30 Meter and 20 Meter traps.



I wish you much success using the FA-VA5 with the DG8SAQ Windows Application Software.

Original version 30-12-2018 Jan Verduyn G5BBL SDR-Kits

Other References and Links:

Reference 1: Comprehensive description of FA-VA5 operation with VNWA windows Software <u>https://www.dg5mk.de/media/IV_Meter/FA_VA5_VNWA_English_V02_with_addendum.pdfSDR-Kits</u>

Reference 2: Excellent Videos by Joe Fellner - OE5JFE on assembling the FA-VA5 kit:<u>https://www.youtube.com/watch?v=m67hDfm0XOE</u>

Reference 3: Joe's Video on how to perform FA-VA5 Firmware update and SOL Calibration. <u>Funkamateur FA-VA5 600MHz Vector Antenna Analyzer Kit - Firmware update and SOL</u> <u>calibration</u>

Reference 4: Joe Fellner 3rd Video covers the topics in this presentation, installation of the DG8SAQ VNWA Application, Setting up FA-VA5 USB connection and VA5 Calibration.

https://youtu.be/FnfoTX5_DBo