vna/J 3.1.12
Driver guide for mini Radio Solutions miniVNA*tiny*

Dietmar Krause

DL2SBA

Hindenburgstraße 29

D-70794 Filderstadt

Monday, 21. November 2016

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Changes

Version	Date	Who	Changes
3.0.0	06. September 2014	DL2SBA	Extracted from user miniVNApro manual
3.1.x	23. January 2015	DL2SBA	Updated “Driver info dialog” on page 11
3.1.11	5. November 2016	DL2SBA	Updated “Driver info dialog” on page 11 Generator output chart added on page 16
3.1.12	21. November 2016	DL2SBA	Fixed image on page “Output power vs. frequency” on page 16

Connectors

#	Usage
USB	Connect a USB-mini type-B connector to this port. The other end of the cable with a Type-A connector must be connected to a USB-Host adapter.
TX	This is the SMA port for reflection as well as transmission measurement.
RX	This is the 2nd SMA port for transmission measurement.

Power Supply

The miniVNA^{tiny} is powered by the host computer via the build in USB-mini type-B connector.

Firmware update

Attention: You're executing all these steps on your own risk!

Please use also other sources to verify the correctness of the described procedure.

Always execute the following actions only on a native operating system. Means not inside a windows emulator like Wine on Linux or similar stuff.

I've tested the firmware upgrade with vna/J successfully on Windows 7 and Windows 8.1 in 64-bit versions.

Do not use the firmware upload function on other operating systems as this may brick your analyser!

It is highly recommended to update always to the latest stable firmware release to gain most from the program features!

To upgrade the firmware inside the miniVNA^{tiny} please execute these steps:

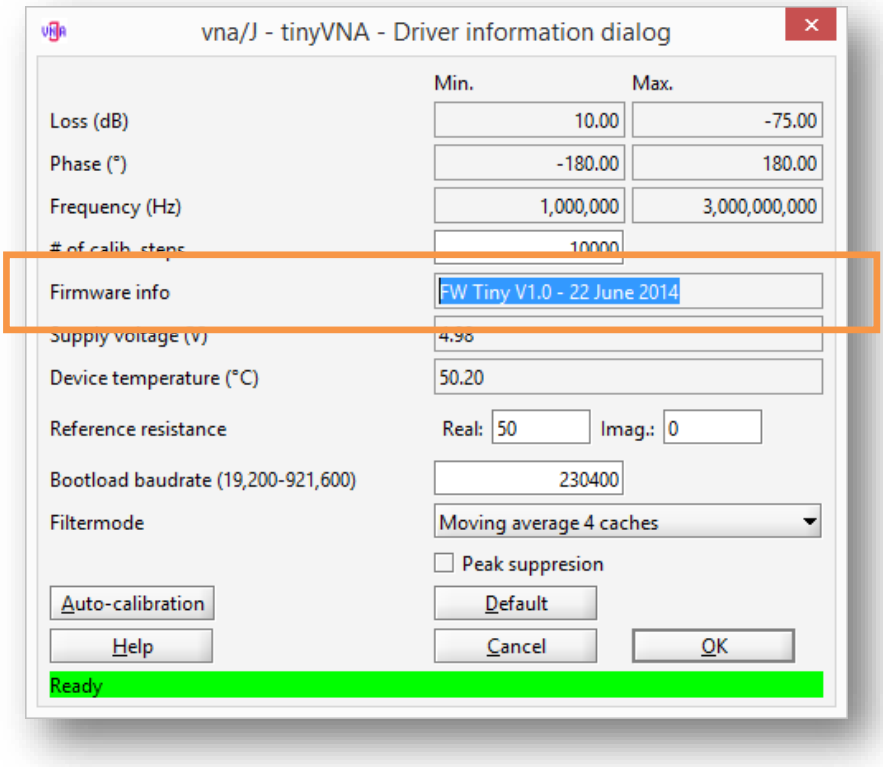
- Check currently installed firmware version using vna/J
- Download new firmware from mRS website
- Upgrade firmware of miniVNA^{tiny} using vna/J

These steps are described in detail in the following chapters.

Check currently installed firmware

You have to determine the currently installed firmware version on your miniVNA^{tiny}.

To do this, start vna/J, select the correct serial port and open the driver info dialog (menu ANALYSER/INFO). The firmware version is displayed like this:



Relevant is the firmware number, here displayed as V1.0.

Download new firmware

Check the available firmware versions on the mRS website:

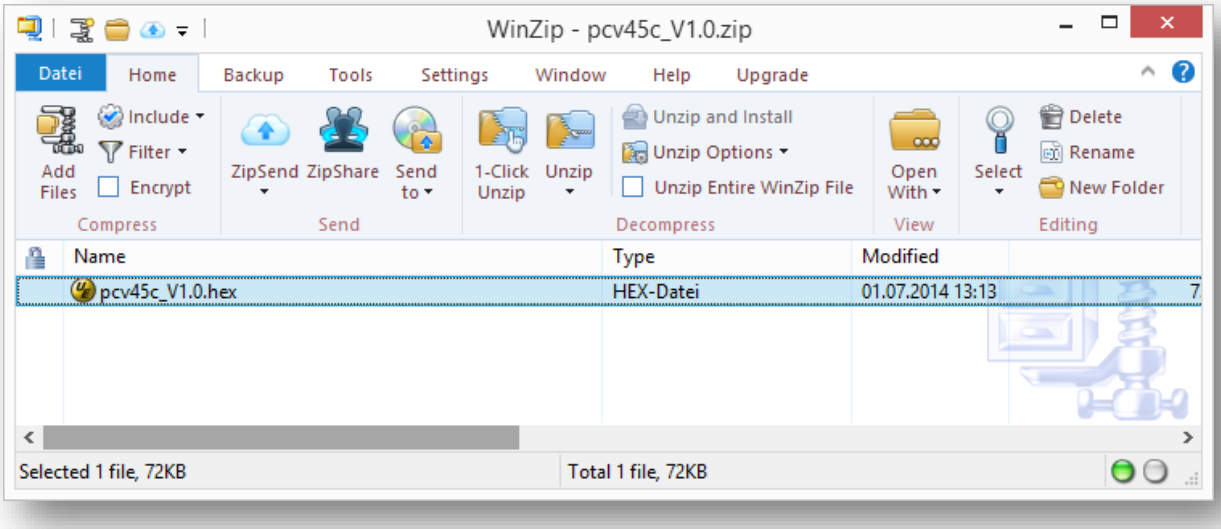
http://www.miniradiosolutions.com

Use the link **FW Updated** in the navigation bar

on the website to navigate to the firmware section.

If a newer version, as the one currently installed on the miniVNA^{tiny} is available, currently a file named **pcv45c_V1.0.zip** is available for download.

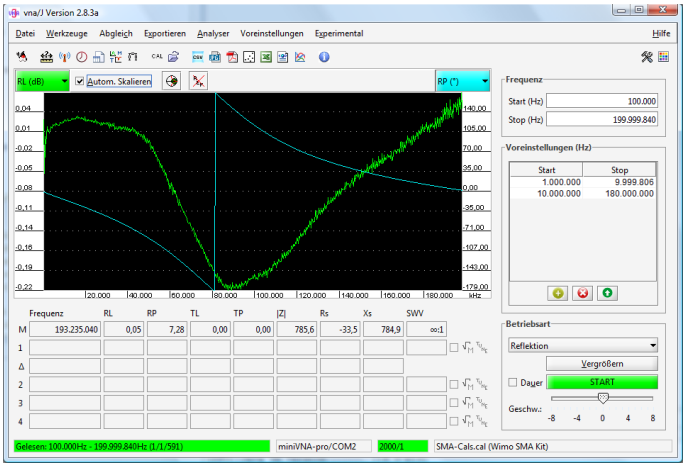
- Download this file to your computer to your preferred download location.
- Unzip the file so you have a file named **pcv45c_V1.0.hex** on your computer.



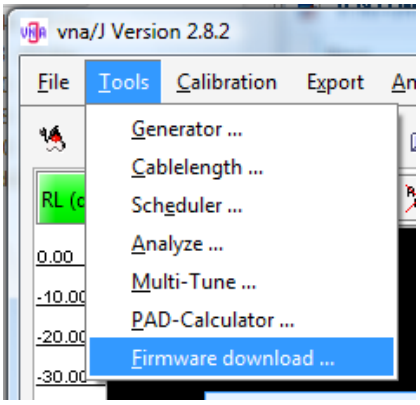
Upgrade firmware of miniVNA[tiny]

Execute now these steps to write the downloaded firmware file to the miniVNA[tiny].

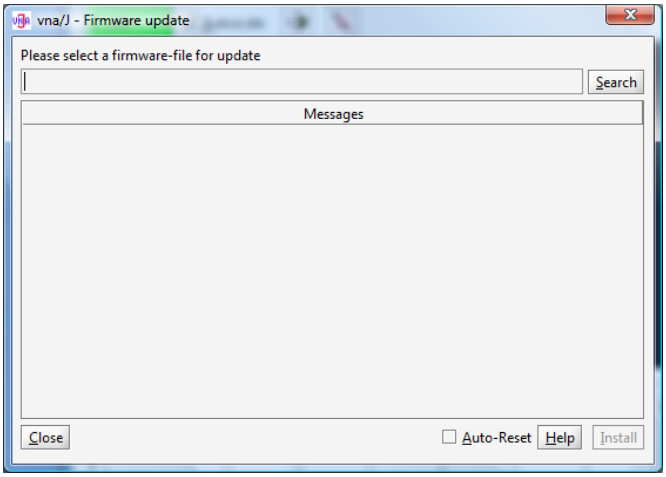
Open vna/J and ensure, that the correct analyser type and port is selected. To verify, execute a test scan.



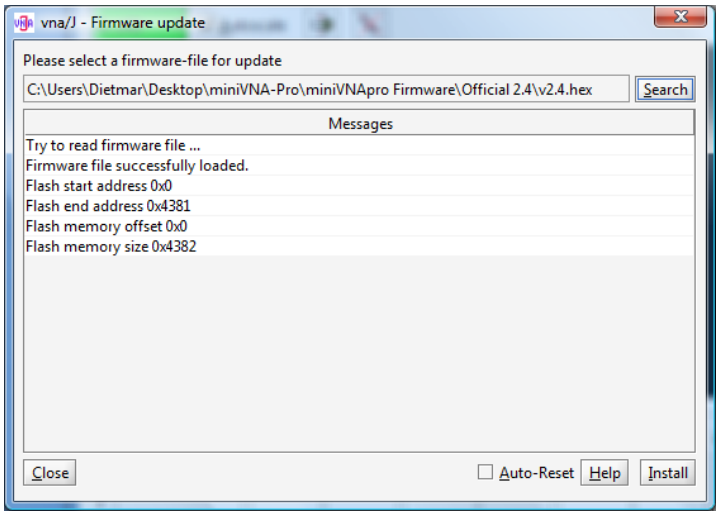
Select "Firmware download" from the tools menu



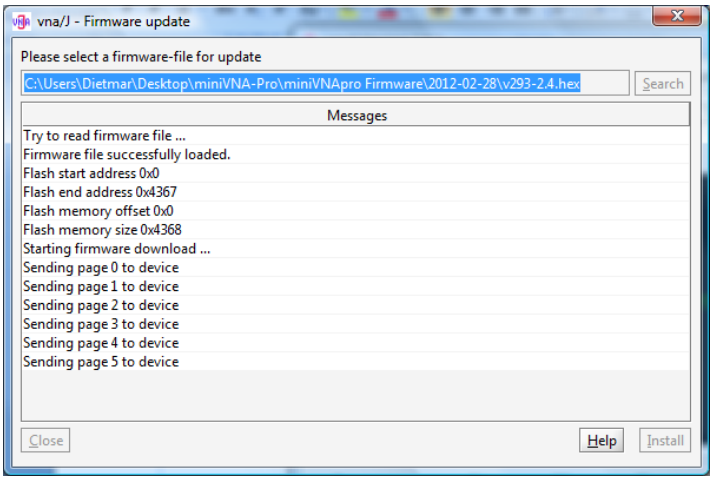
Press the "Search" button to select the previously downloaded new firmware file.



The firmware is loaded and some basic information is displayed

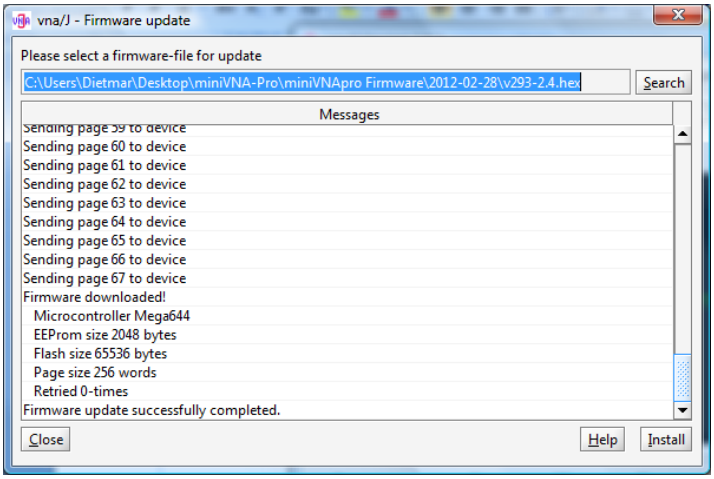


Select the “Install” button and the download of the firmware starts after the soft-reset of the miniVNA[pro].



After firmware download was successful, some information about the device is displayed.

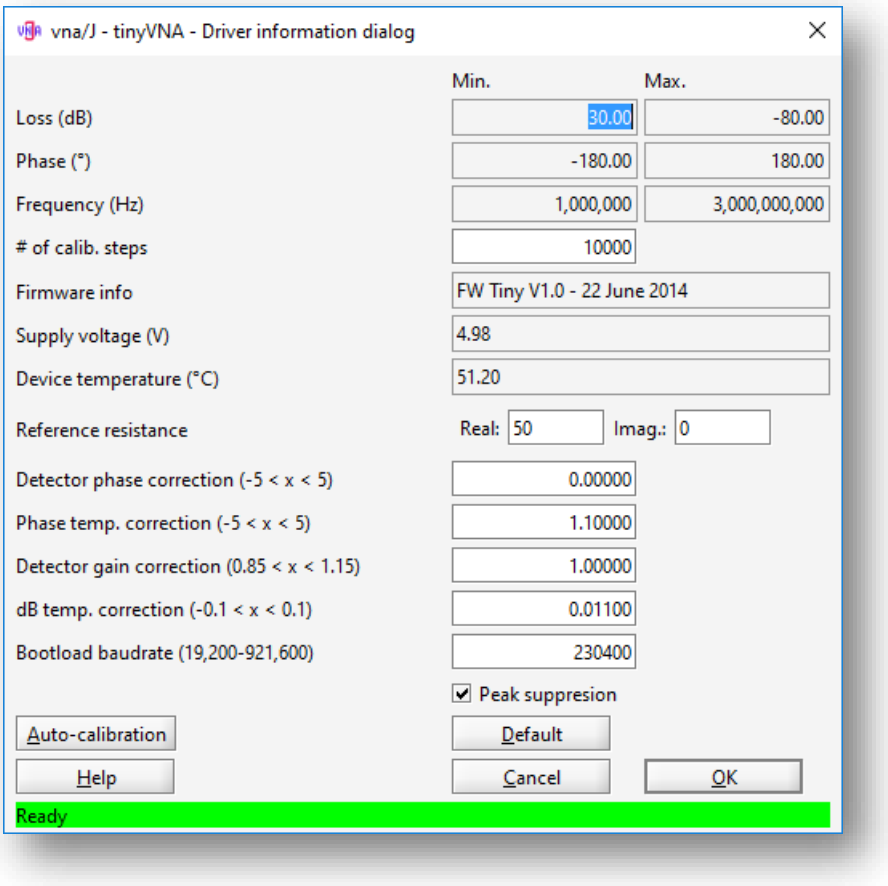
Close this dialog and the miniVNA[tiny] is ready for use with the new firmware.



Remark: You can also use this procedure to downgrade to a previous firmware release!

Driver info dialog

The driver info dialog for the miniVNApro is available via the menu ANALYSER/INFO or the  icon in the toolbar.



Control	Description	Range	
#calibration steps	Sets the number of calibration steps used as preset during calibration[1].	200 to 25.000	
Firmware info	Displays the firmware info	---	
Supply voltage	Displays power-supply info	---	
Device temperature	Displays the current device temperature.	---	
Reference resistance	Here the complex value can be specified, which is used to calculate data in reflec-	Real Imaginary	-5000 … 5000 -5000 … 5000

[1] Please read chapter "Calibration procedure in the vna/J user guide for details regarding calibration data.

Control	Description	Range
	tion mode.	
Detector phase correction	Internal parameter.	Please use the default value
Phase temp. correction	Internal parameter.	Please use the default value
Detector gain correction	Internal parameter.	Please use the default value
dB temp. correction	Internal parameter.	Please use the default value
Bootloader baud rate	Sets the baud rate used for firmware updates. Default is 230.400Bd.	19.2000Bd – 921.600Bd
Peak suppression	Due to internal oscillator switching two anomalies occur at 1.045GHz and 1.500GHz. See chapter ”Peak suppression” on page 13 for details. Please restart application after changing this option.	On, Off
Auto-calibration	Phase correction of the detector circuits of the analyser. See chapter “Auto calibration” on page 14 for details.	---
Default	Restore default values for all driver parameters	---
OK	Stores the parameters and close this dialog	---
Cancel	Do not change any parameters and close this dialog	---

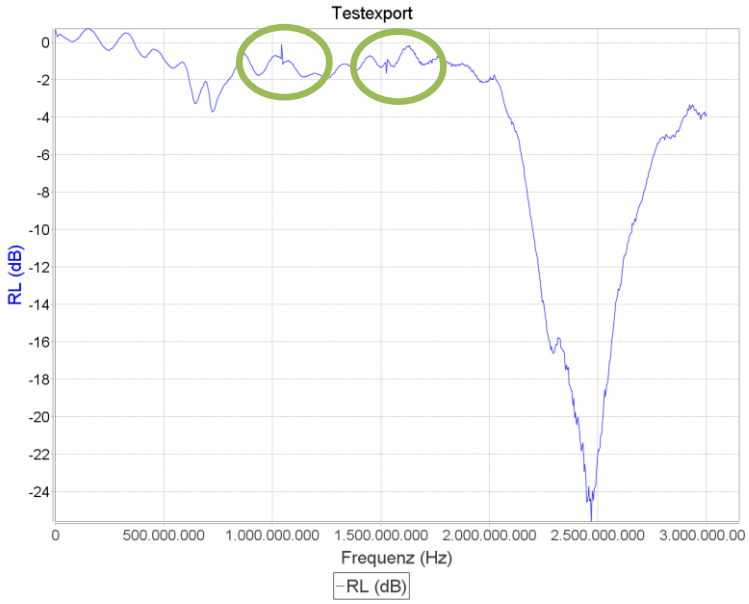
Peak suppression

Due to internal oscillator switching there are two peaks in the measured data at 1.045GHz and 1.500GHz.

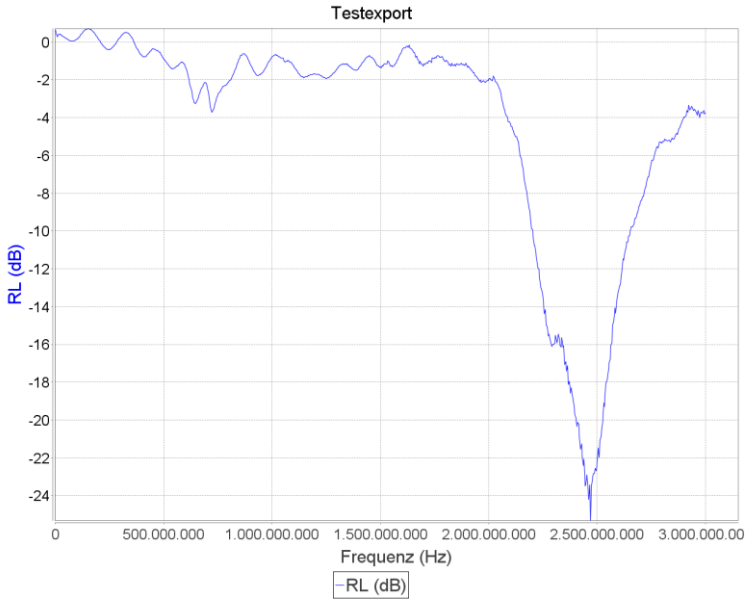
These peaks are more or less aesthetical glitches than real problems. As they appear exactly at these two frequencies, they can be visually ignored by the user.

These peaks can be removed when selecting filter mode 0 and checking the checkbox “Peak suppression”.

Peak suppression OFF



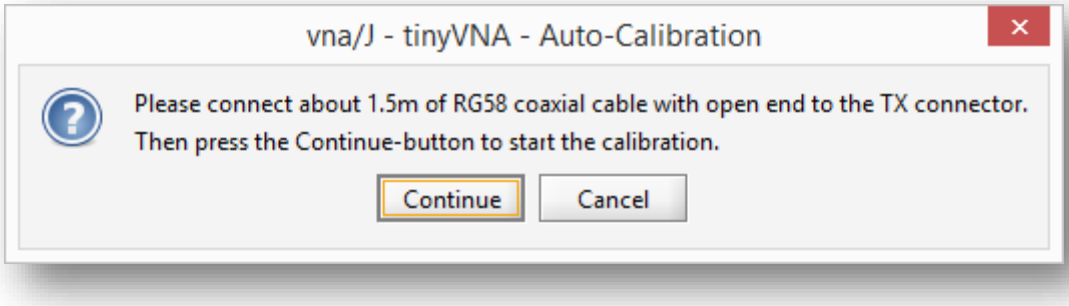
Peak suppression ON



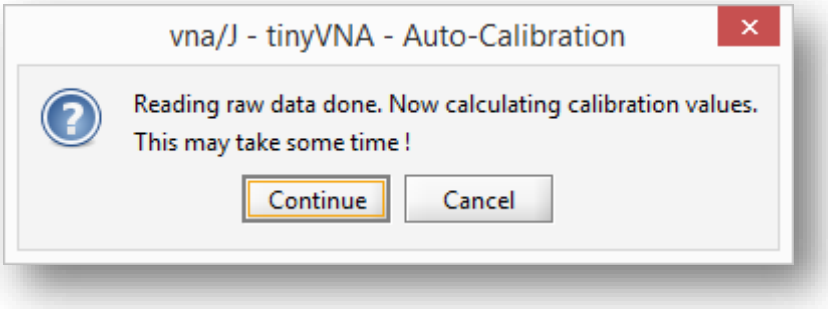
Auto calibration

For optimal results in reflection mode, a phase calibration of the detector circuits should be done.

This calibration can be started with the Auto-calibration in the driver info dialog.

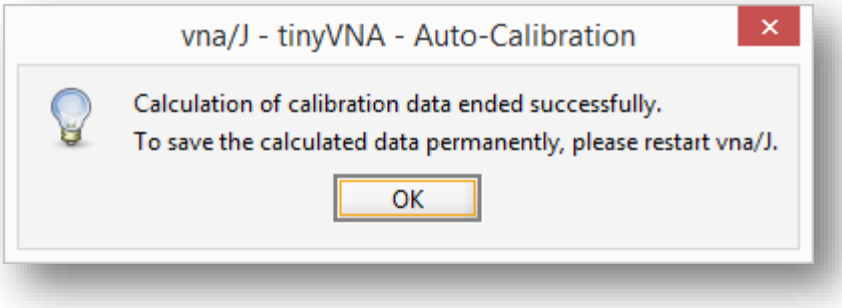


Please attach a RG-58 coaxial cable to the TX connector and click Continue. Now four scans are executed. After the fourth scan, a message box is show, that now the calibration data will be calculated.



Click Continue. The time needed for calibration depends on the CPU performance of the PC.

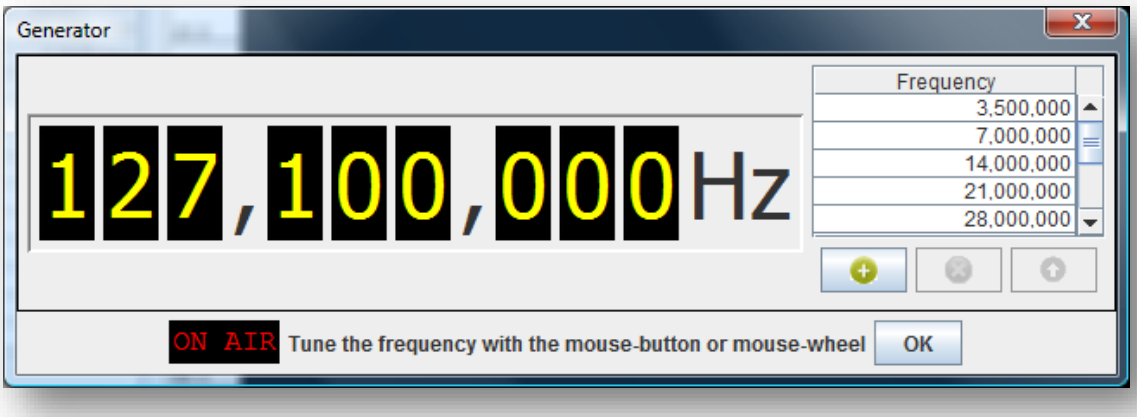
When calculation is done a message box is shown. Confirm with OK button.



If you want to retain the new calibration data, do not forget to close the driver info dialog with the OK button!

Generator miniVNA[tiny]

Using this dialog, the attached VNA can be used as a simple frequency generator.



The frequency range is determined by the loaded driver. Details can be viewed in the driver info dialog.

Output control

The output is switched on, when clicking 

. When the output is active, this field is inverted: 

. To switch off the output, click on this field again.

Frequency control

Every digit 

of the frequency panel can be controlled with the mouse:

- A left-click increases the number by one.
- A right-click decreases the number by one.
- The digit can also be controlled using the mouse-wheel.

Frequency list

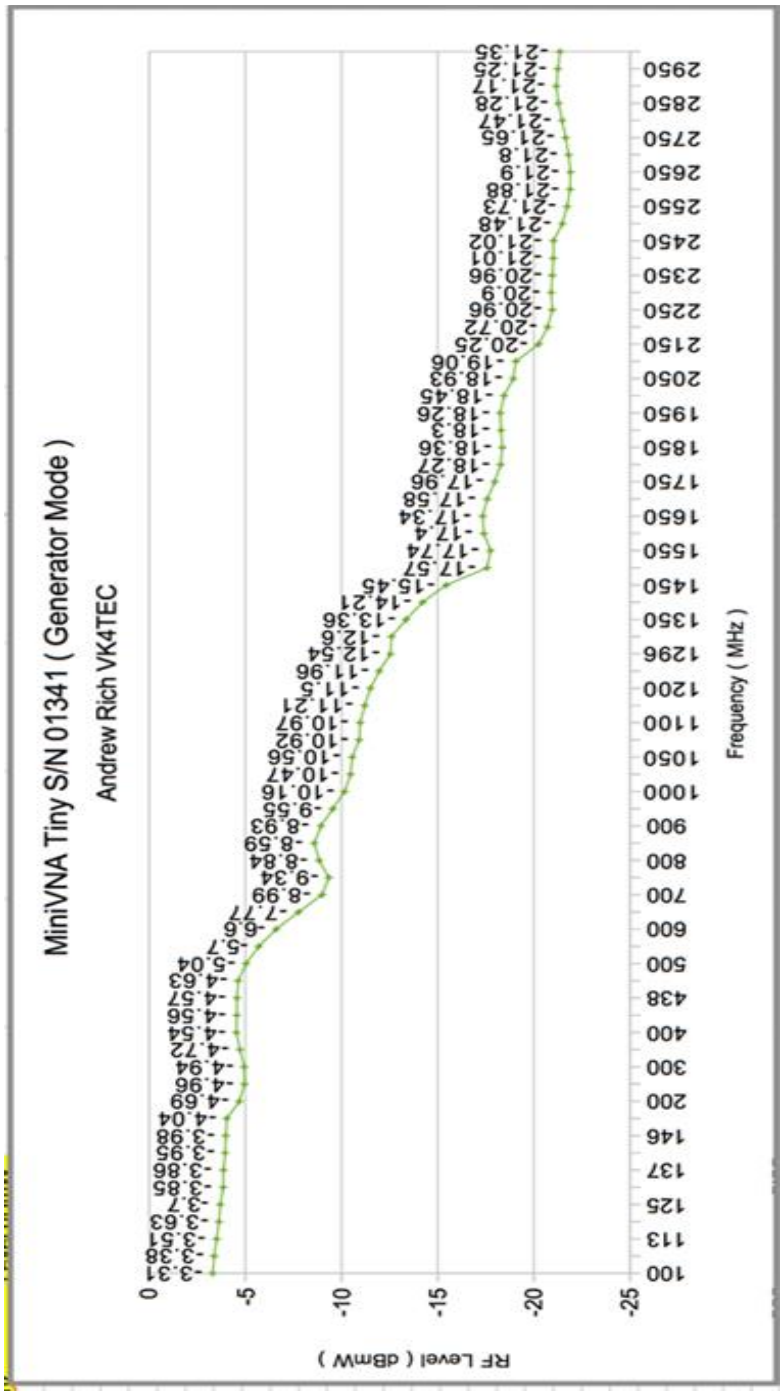
By double-clicking with the left mouse button on an entry in the presets list, you can quickly set the frequency to the desired value. A selected list entry can also be used clicking the  button.

Entries in the presets list can be deleted by selection an entry in the list and clicking on  .

A currently entered frequency can be added to the list clicking on the  button.

Output power vs. frequency

Thanks to Andrew Rich, VK4TEC and Geoff Robinson, VK4KJJ we have precise output power chart over frequency. They used a ROHDE & SCHWARZ NRP2[2] and NRP-Z81[3] power sensor[4].

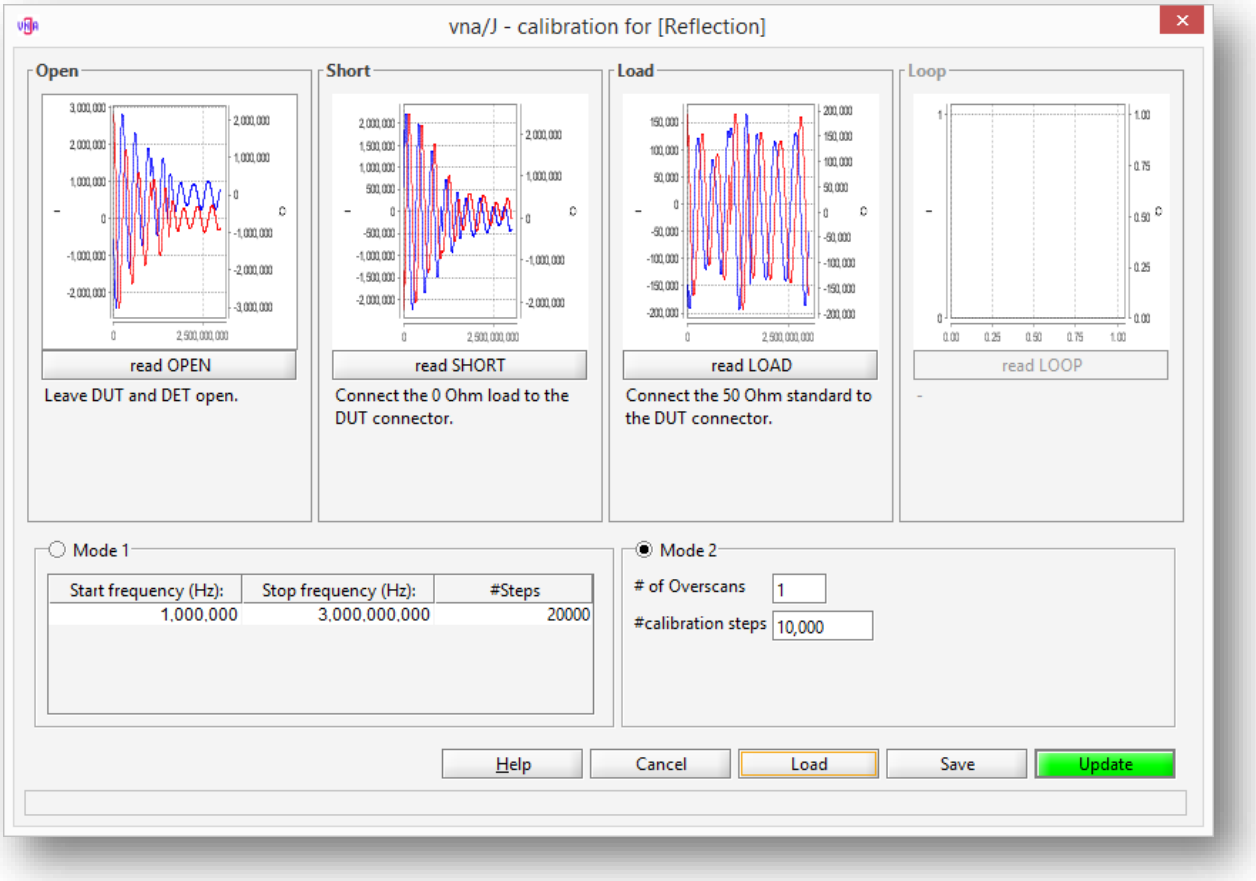


[2] https://www.rohde-schwarz.com/de/produkt/nrp2-produkt-startseite_63493-8475.html
[3] https://www.rohde-schwarz.com/de/produkt/nrpz81-produkt-startseite_63493-9323.html
[4] German high tech made its way around the globe ;-)

Main calibration datasets miniVNA[tiny]

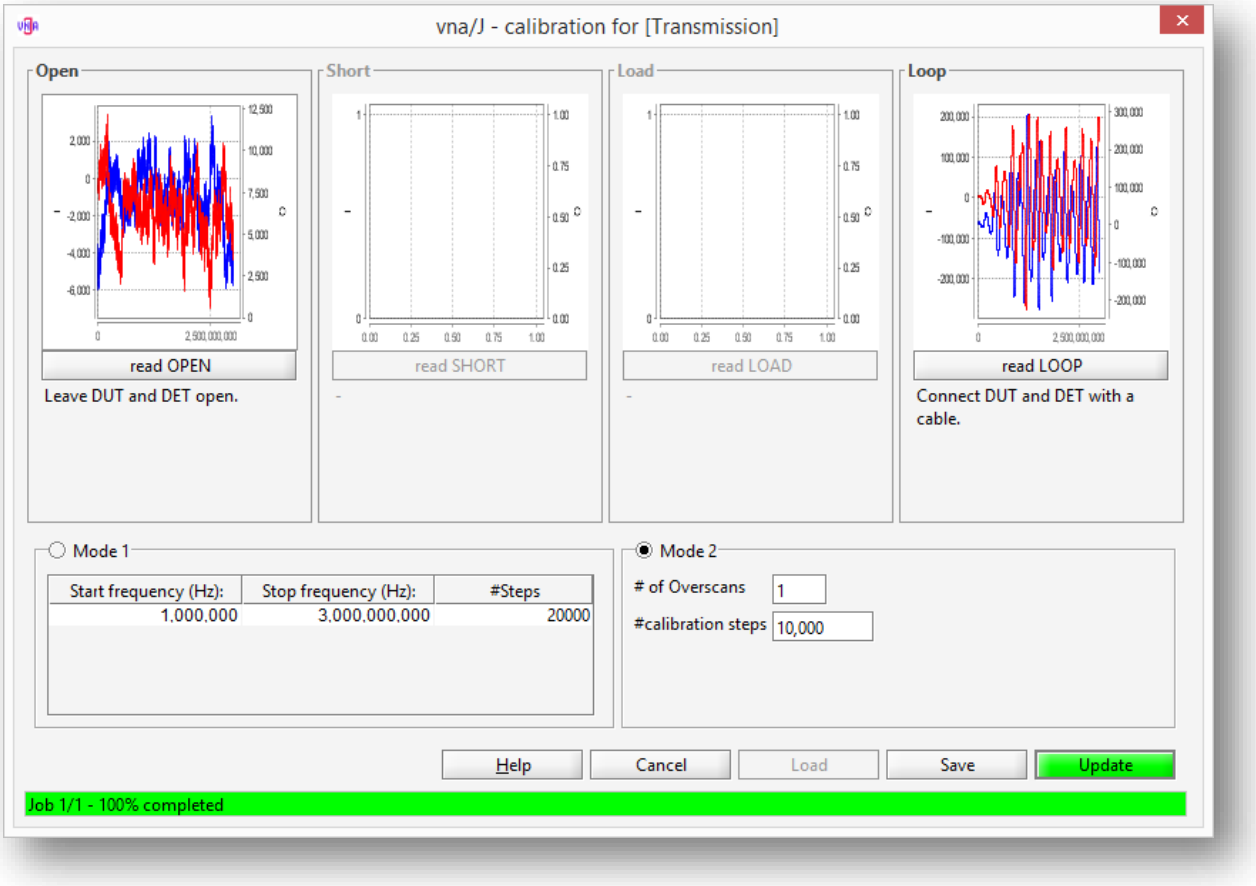
Reflection

These calibration curves are created using the supplied WiMo SMA Calibration kit:

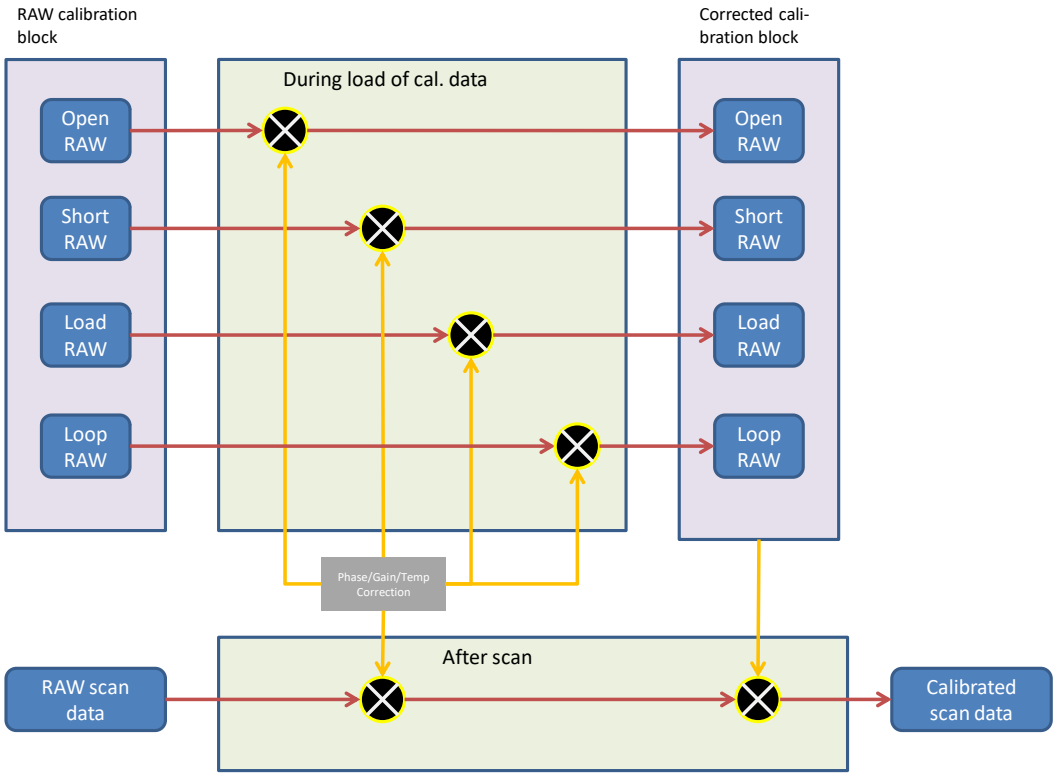


Transmission

I've used two SMA-BNC adaptors and a short 20cm RG58A/U cable to create the calibration curves:



Measurement basics



While loading calibration data:

- Load raw I/Q data from calibration file.
  Data in calibration file is unmodified data[5] directly read from the vna
- Calculate temperature correction factor
  tcf = 1 – ((40°C – calibrationTemperature) * config.TempCorrection)
- Calculate **s**ine **c**orrection **f**actor
  scf = sin(config.phaseCorrection * π / 180.0)
- Calculate **c**osine **c**orrection **f**actor
  ccf = cos(config.phaseCorrection * π / 180.0)
- correct the I/Q data
  - I = I * tcf
  - Q = Q * tcf
  - Q = (Q * config.gainCorrection - I * scf) / ccf;
- Store corrected I/Q data in corrected calibration block

While loading scan data:

- Read raw I/Q data from vna device
- Calculate temperature correction factor
  tcf = 1 – ((40°C – conversionTemperature) * config.TempCorrection)
- Calculate **s**ine **c**orrection **f**actor
  scf = sin(config.phaseCorrection * π / 180.0)
- Calculate **c**osine **c**orrection **f**actor
  ccf = cos(config.phaseCorrection * π / 180.0)
- correct the I/Q data
  - I = I * tcf
  - Q = Q * tcf
  - Q = (Q * config.gainCorrection - I * scf) / ccf;
- Calculate **I**F-**p**hase **c**orrection
  ipc = (calibrationTemperature – conversionTemperature) * config.ifPhaseCorrection
- Calculate RL, RP, SWR based on the previously created calibration data and the corrected raw data
- Correct RP
  RP = RP + ipc
- Calculate X, R, Z
- Now we have a calibrated sample

[5] The filtering (moving average) is done directly after the I/Q data is read from the vna prior to all calculations above.

License

Dutch

English

Deutsch