

vna/J 3.1.12 Driver guide for mini Radio Solutions miniVNA^{tiny}

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Table of contents

Changes	3
Connectors	4
Power Supply	4
Firmware update	5
Check currently installed firmware	6
Download new firmware	7
Upgrade firmware of miniVNA ^{tiny}	9
Driver info dialog1	1
Peak suppression1	3
Peak suppression OFF1	3
Peak suppression ON1	3
Auto calibration14	4
Generator miniVNA ^{tiny}	5
Output control1	5
Frequency control1	5
Frequency list1	5
Output power vs. frequency1	6
Main calibration datasets miniVNA ^{tiny}	7
Reflection1	7
Transmission1	8
Measurement basics1	9
License2	1
Dutch2	1
English2	1
Deutsch2	1

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.
тх	This is the SMA port for reflection as well as transmission measurement.
RX	This is the 2 nd 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 ANALYS-ER/INFO). The firmware version is displayed like this:

		Min.	Max.
Loss (dB)		10.0	-75.00
Phase (°)		-180.0	0 180.00
Frequency (Hz)	1,000,00	3,000,000,000
# of calib.ster	10	1000	n
Firmware info		FW Tiny V1.0 - 22 Ju	une 2014
Supply voltage	e (V)	4.98	
Device temper	rature (°C)	50.20	
Reference resi	stance	Real: 50 I	mag.: 0
Bootload bau	drate (19,200-921,600)	23040	0
Filtermode		Moving average 4 c	aches 🔹
		Peak suppresion	
<u>A</u> uto-calibrat	tion	<u>D</u> efault	
<u>H</u> elp		<u>C</u> ancel	<u>O</u> K
Ready			

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.

Home Forum How To Buy	FW Updates Download SW Manuals ANDROID Contact
EWIII	FW Updates
and the second sec	For miniVNA Tiny
niniVNATiny	Download Firmware V1.0 update 22/06/2014 to correct a bug in Generator mode
	For miniVNA PRO
· · ·	
	 Download Firmware V2.4 Download Firmware V2.5 update 31/03/2012 to gain the full functionality of the
PRO	latest VNA/J plus
miniVNA	 Download Firmware V2.6, last version
	NOTE: ALL Firmware updates form miniVNA PRO are available ONLY for s/n > 35
110	For transfer the HEX file to the miniVNA PRO or miniVNA Tiny use the built in
	update function of the latest VNA/J (see VIDEO)
XTENDER	

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.

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- 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.

🗐 🔮 🚍 👁 🕫		Wir	nZip - po	v45c_V1.0).zip			_ 🗆 💙	ĸ
Datei Home	Backup Tools	Settings	Window	Help	Upgrade			^	0
Add Files Compress	CipSend ZipShare	Send to •	k Unzip	Unzip a	nd Install Options - Entire WinZip Fi	ile View	Select	 Delete Rename New Folder Editing 	
Ame Name				Туре		Modified			
🎱 pcv45c_V1.0.h	ex			HEX-Datei		01.07.2014	13:13		7.
									9
Selected 1 file, 72KB			Total	1 file, 72KB				0	>

Upgrade firmware of miniVNAtiny

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.



		 Searc
	Messages	

The firmware is loaded and some basic information is displayed

🚯 vna/J - Firmware update
Please select a firmware-file for update
C:\Users\Dietmar\Desktop\miniVNA-Pro\miniVNApro Firmware\Official 2.4\v2.4.hex
Messages
Try to read firmware file
Firmware file successfully loaded.
Flash start address 0x0
Flash end address 0x4381
Flash memory offset 0x0
Flash memory size 0x4382
Close Auto-Reset Help Install

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.

:\Users\Dietmar\Desktop\miniVN	IA-Pro\miniVNA	pro Firmware	,2012-02-28\v29	3-2.4.hex	Search
	М	lessages			
ry to read firmware file					
irmware file successfully loaded.					
lash start address 0x0					
lash end address 0x4367					
lash memory offset 0x0					
lash memory size 0x4368					
tarting firmware download					
ending page 0 to device					
ending page 1 to device					
ending page 2 to device					
ending page 3 to device					
ending page 4 to device					
ending page 5 to device					

🕼 vna/J - Firmware update	X
Please select a firmware-file for update	
C:\Users\Dietmar\Desktop\miniVNA-Pro\miniVNApro Firmware\2012-02-28\v293-2.4.hex	Search
Messages	
Sending page 59 to device	
Sending page 60 to device	
Sending page 61 to device	
Sending page 62 to device	
Sending page 63 to device	
Sending page 64 to device	
Sending page 65 to device	
Sending page 66 to device	
Sending page 67 to device	
Firmware downloaded!	
Microcontroller Mega644	
EEProm size 2048 bytes	
Flash size 65536 bytes	
Page size 256 words	
Retried 0-times	
Firmware update successfully completed.	-
<u>Close</u>	Install

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.

🖷 vna/J - tinyVNA - Driver information dialog		×
	Min.	Max.
Loss (dB)	30.00	-80.00
Phase (°)	-180.00	180.00
Frequency (Hz)	1,000,000	3,000,000,000
# of calib. steps	10000	
Firmware info	FW Tiny V1.0 - 22 June	e 2014
Supply voltage (V)	4.98	
Device temperature (°C)	51.20	
Reference resistance	Real: 50 Ima	ag.: 0
Detector phase correction (-5 < x < 5)	0.00000	
Phase temp. correction (-5 < x < 5)	1.10000	
Detector gain correction (0.85 < x < 1.15)	1.00000	
dB temp. correction (-0.1 < x < 0.1)	0.01100	
Bootload baudrate (19,200-921,600)	230400	
	Peak suppresion	
Auto-calibration	<u>D</u> efault	
Help	<u>C</u> ancel	<u>О</u> К
Ready		

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 tempera- ture	Displays the current device temperature.	
Reference re- sistance	Here the complex value can be specified, which is used to calculate data in reflec-	Real -5000 5000 Imaginary -5000 5000

 ¹ Please read chapter "Calibration procedure in the vna/J user guide for details regarding calibration data.
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 11

Control	Description	Range
	tion mode.	
Detector phase correction	Internal parameter.	Please use the default value
Phase temp. cor- rection	Internal parameter.	Please use the default value
Detector gain cor- rection	Internal parameter.	Please use the default value
dB temp. correc- tion	Internal parameter.	Please use the default value
Bootloader baud rate	Sets the baud rate used for firmware up- dates.	19.2000Bd – 921.600Bd
Parl and the second second		0.00
Peak suppression	anomalies occur at 1.045GHz and 1.500GHz.	On, Off
	See chapter "Peak suppression" on page 13 for details.	
	Please restart application after changing this option.	
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 pa- rameters	
ОК	Stores the parameters and close this dia- log	
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 <u>Auto-calibration</u> in the driver info dialog.

	vna/J - tinyVNA - Auto-Calibration
Please connect about 1.5m of RG58 coaxial cable with open end to the TX connect Then press the Continue-button to start the calibration. Continue Cancel	
-	

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

vna/J - tinyVNA - Auto-Calibration ×
Reading raw data done. Now calculating calibration values. This may take some time ! Continue Cancel Continue Cancel
. The time needed for calibration depends on the CPU performance of the P
on is done a message box is shown. Confirm with OK button.
vna/J - tinyVNA - Auto-Calibration
Calculation of calibration data ended successfully.

If you want to retain the new calibration data, do not forget to close the driver info dialog with the <u>0</u>K button!

Generator miniVNAtiny

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

Generator	×	
127,100,000 Hz	Frequency 3,500,000 7,000,000 14,000,000 21,000,000 28,000,000	
ON AIR Tune the frequency with the mouse-button or mouse-wheel OK		

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

Output control



. When the output is active, this field is invert-



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

Frequency control

AIR



Every digit **best 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 **user** 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 NRP2² and NRP-Z81³ power sensor⁴.



² <u>https://www.rohde-schwarz.com/de/produkt/nrp2-produkt-startseite_63493-8475.html</u>

³ https://www.rohde-schwarz.com/de/produkt/nrpz81-produkt-startseite_63493-9323.html

⁴ German high tech made its way around the globe ;-)

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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 cosine correction factor
- $ccf = cos(config.phaseCorrection * \pi / 180.0)$
- correct the I/Q data
 - o I = I * tcf
 - \circ Q = Q * tcf
 - o Q = (Q * config.gainCorrection I * scf) / ccf;
- Store corrected ${\rm I}/{\rm Q}$ 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 sine correction factor
 scf = sin(config.phaseCorrection * π / 180.0)
- Calculate cosine correction factor ccf = cos(config.phaseCorrection * π / 180.0)
 - correct the I/Q data
 - o I = I * tcf
 - \circ Q = Q * tcf
 - o 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

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Deutsch

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