vna/J 2.8.6
Driver guide for mini Radio Solutions miniVNA*pro*

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Changes

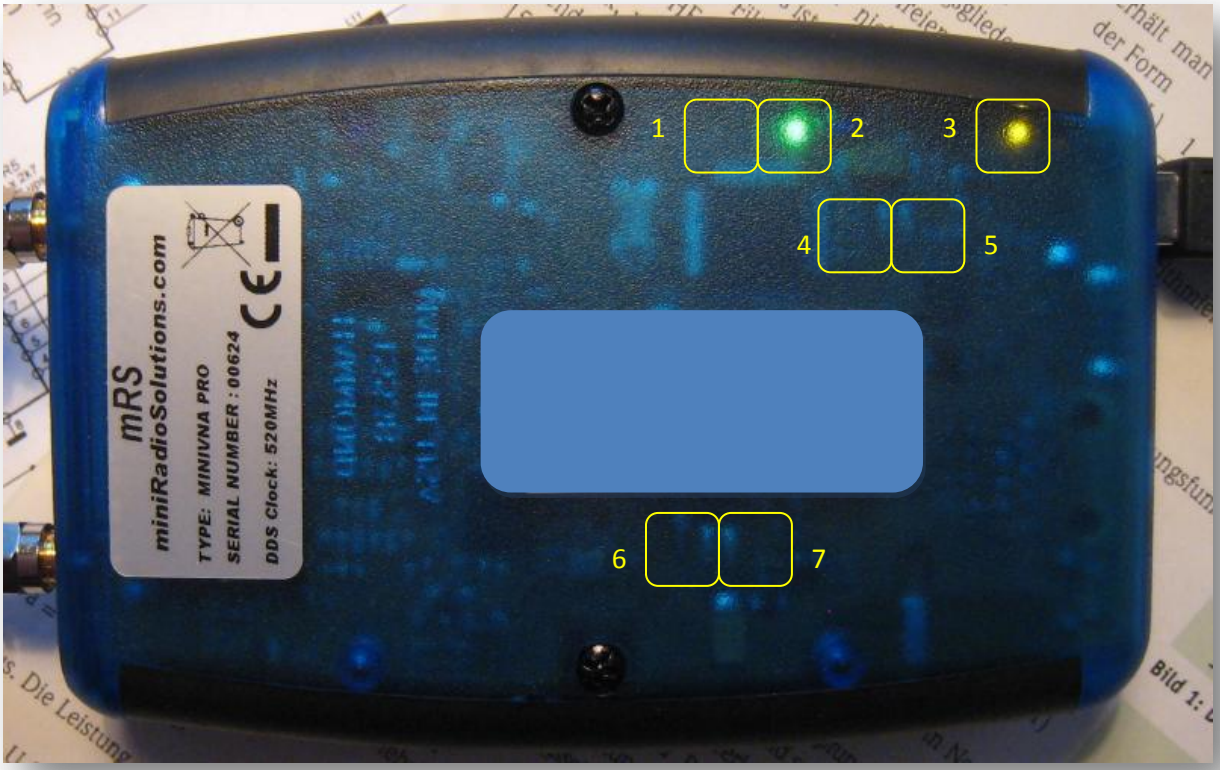
Version	Date	Who	Changes
2.7.0	01.02.2011	DL2SBA	Extracted from user guide
2.7.1	07.03.2011	DL2SBA	New chapters added • Scan window size • Indicators • Connectors • Power supply
2.7.2	18.05.2011	DL2SBA	Updated section regarding scan sizes
2.7.5	27.05.2011	DL2SBA	Added section regarding transmission measurement
2.7.6	18.06.2011	DL2SBA	Added calibration section with the Wimo provided standards
2.8.0	10.09.2011	DL2SBA	Updated section for firmware upgrade
	28.02.2012	DL2SBA	Updated section for firmware upgrade and driver info dialog window.
2.8.3	02.03.2012	DL2SBA	Updated section for firmware upgrade and driver info dialog window.
	11.03.2012	DL2SBA	Updated firmware upgrade section for mRS website
	10.04.2012	DL2SBA	Updated firmware upgrade section
	20.04.2012	DL2SBA	Sample scans with calibration standards added
2.8.4	30.08.2012	DL2SBA	Problem determination section added
2.8.5	07.10.2012	DL2SBA	Added Bluetooth script for Linux
	02.12.2012	DL2SBA	Removed scan width restrictions for older miniVNA^{pro} versions
2.8.6	21.03.2013	DL2SBA	Minor updates

Connectors and switches

#	Usage
USB	Connect a 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.
ON/CHG	Power switch. 1. Internal battery connected. 2. Internal battery disconnected See chapter "Power supply" for usage.
ACC	Connector for additional accessories. ***Do not connect any device other than a mRS certified device to this port. THIS IS NOT THE ETHERNET PORT OF THE MINIVNA^{PRO} ☺***
Func	Reset button. See chapter "Firmware update" on page 11 for usage.

Indicators

The miniVNA pro has several indicators on the backside:



#	Colour	Usage
1	Green	Analogue section activated. To reduce power consumption during battery operation, the analogue section may be deactivated by the firmware.
2	Green	Digital section activated. Always lit, while the miniVNApro is connected to an active USB-port or running on battery power.
3	Yellow	Li-Ion battery is being charged.
4	Yellow	Data transfer from remote PC to miniVNApro
5	Yellow	Data transfer from miniVNApro to remote PC
6	Blue	Bluetooth connection status • Blinking - searching for counterpart • Constant - connected
7	Blue	Bluetooth data transfer active

Power Supply

The miniVNApro has a build in Li-Ion battery for stand-alone operations with Bluetooth connection.

To run the miniVNApro as a stand-alone analyzer, move the switch to position 1. The analyzer then runs on battery power.

To charge the battery, connect the analyser to an active USB-host and move the switch is moved to position 1.

- During battery charging, the indicator (3) is lit.
- After full-charge, the indicator (3) goes off.
- It is not recommended to use the analyser during charging via the USB port.

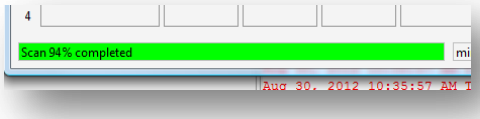
Problem determination

In this section I try to describe some recovery procedures for common handling errors.

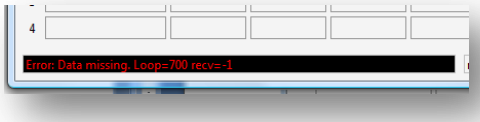
Error: Data missing. Loop=700 recv=1

Symptom

The scan starts, the percentage counter in the status bar increases, then suddenly stops at i.e. 94%



Some seconds later an error is displayed in the status bar. The numbers may vary but have the same cause.

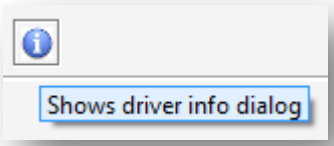


Cause

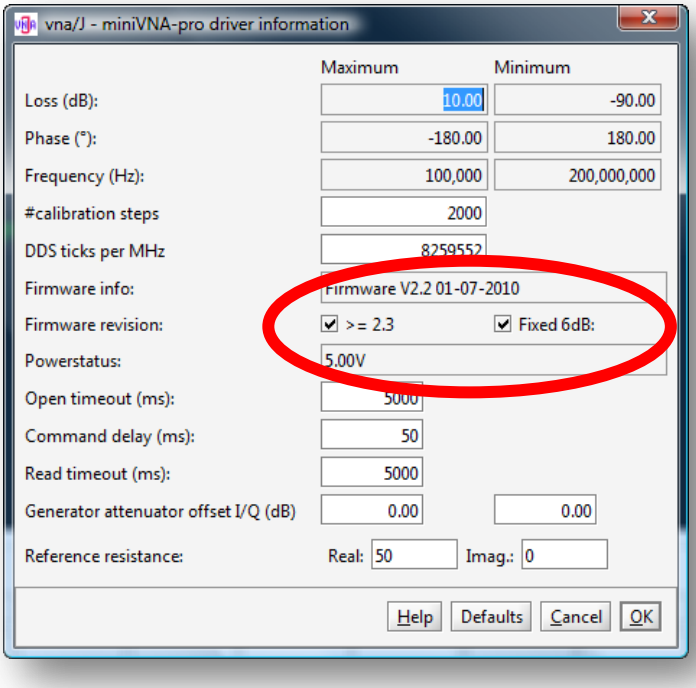
The connected analyser doesn't support variable scan sizes and the settings in vna/J are not correct.

Solution

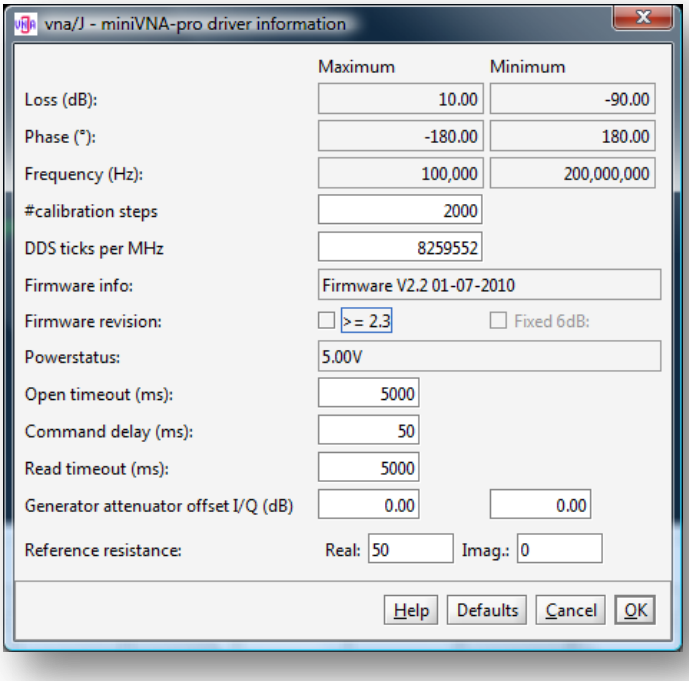
Check the firmware version of the connected analyser by opening the driver info dialog



The installed firmware of the attached analyser is 2.2 but the checkbox ">= 2.3" is checked



Uncheck the checkbox ">= 2.3".
Select the OK button.
Rerun the scan.



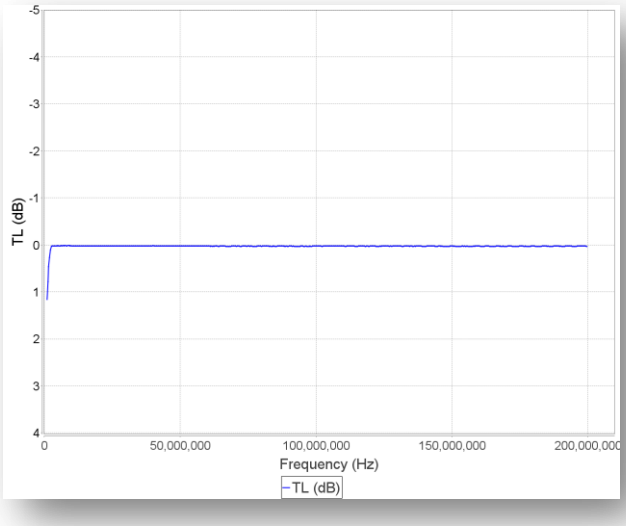
Hint: It is recommended to updated the firmware of the attached analyzer. Please check chapter "Firmware update" on page 11.

Firmware update is only available for miniVNA^{pro} with serial number > 35

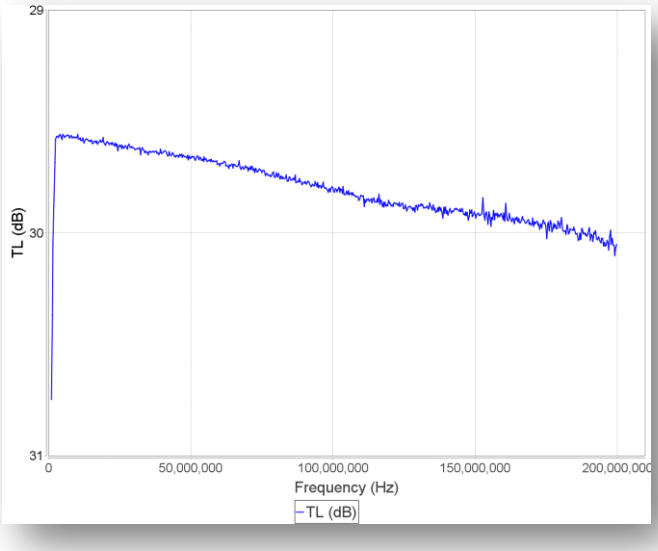
Transmission measurement shows slightly too low values

Symptom

After a proper calibration



Measuring a good attenuator pad shows slightly too low values

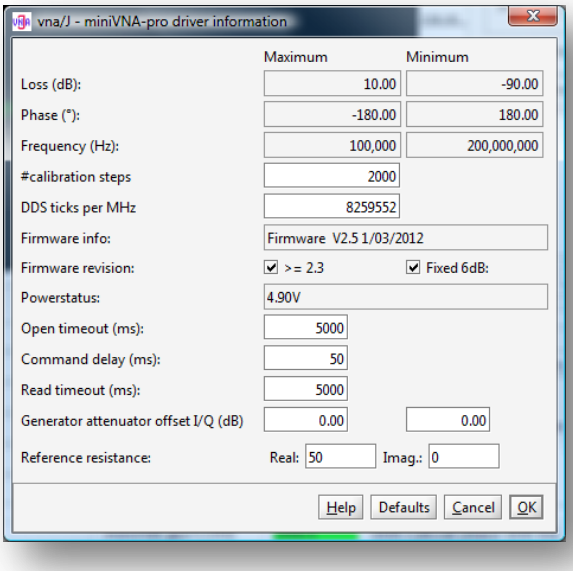


Cause

Some miniVNA[pro] analyzers generate a too strong generator signal, which causes an overload to the internal RF detector.

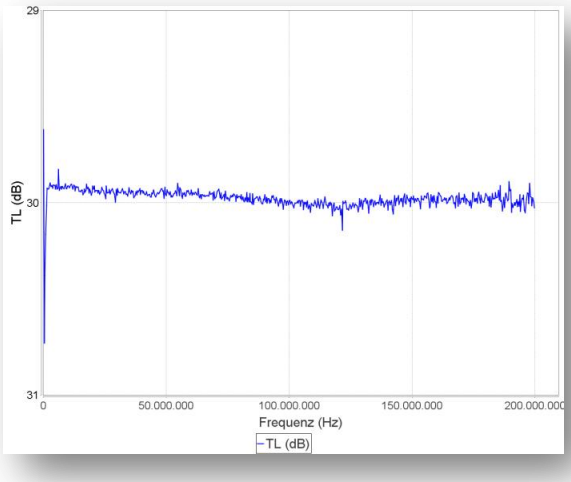
Solution

Check that the firmware version is at least 2.3 and that the checkbox "Fixed 6dB" is checked.



Now redo all transmission calibration.

Now the transmission measurement should show a much higher precision.



Hint: Please check also chapter "Transmission measurement miniVNApro" an page 24 for more details. It is recommended to updated the firmware of the attached analyzer. Please check chapter "Firmware update" on page 11.

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 XP, Windows VISTA 64bit and Mac OSX 10.7.3

The USB support on Linux may cause problems during updating the firmware and you may brick your miniVNA^{pro}. Please upgrade only via a Linux system, if scanning with your currently installed firmware works flawlessly!

Do not update the firmware via a Bluetooth connection, this will not work and you may brick your analyser.

Check that the slider switch is set to position 2 (away from the USB connector) else the firmware upgrade will not work.

All Firmware updates are available ONLY for miniVNA^{pro} with serial number > 35.

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^{pro} please execute these steps:

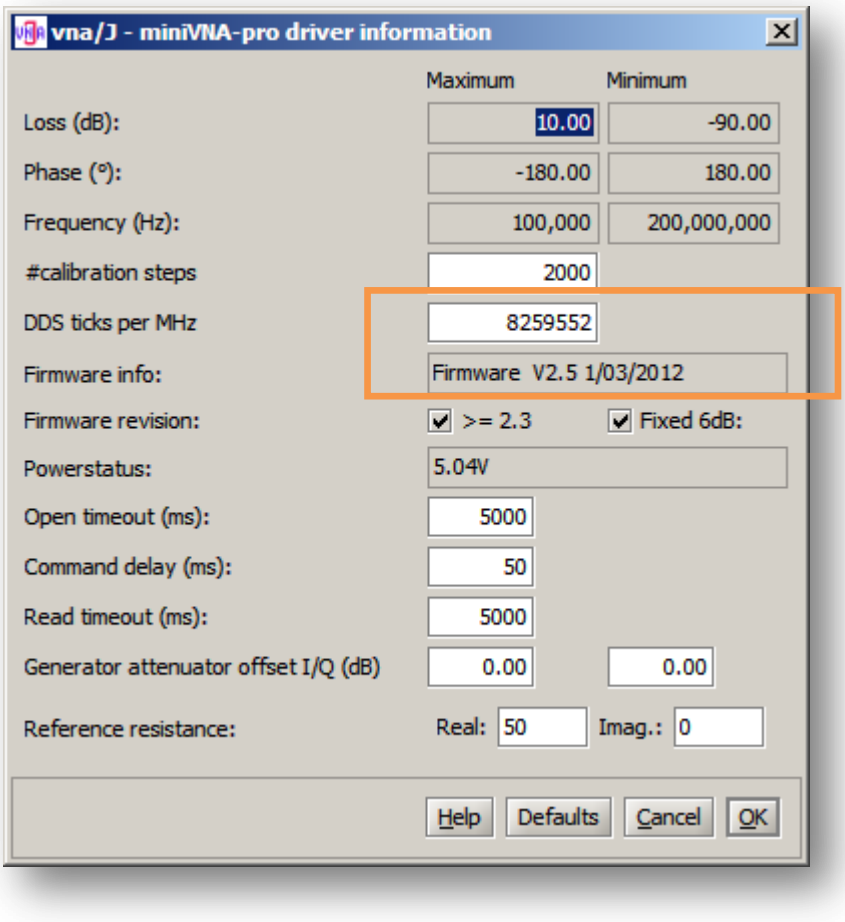
- Check currently installed firmware version using vna/J
- Download new firmware from mRS website
- Upgrade firmware of miniVNApro using vna/J

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^{pro}.

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:



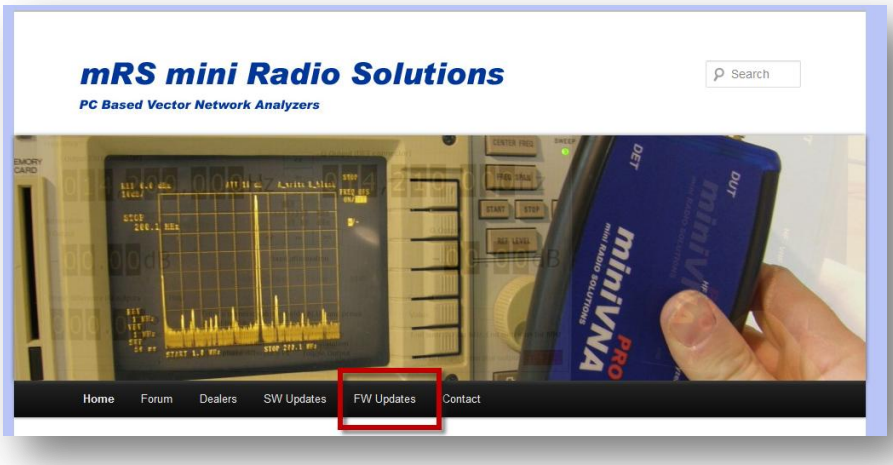
Relevant is the firmware number, here displayed as V2.5.

Download new firmware

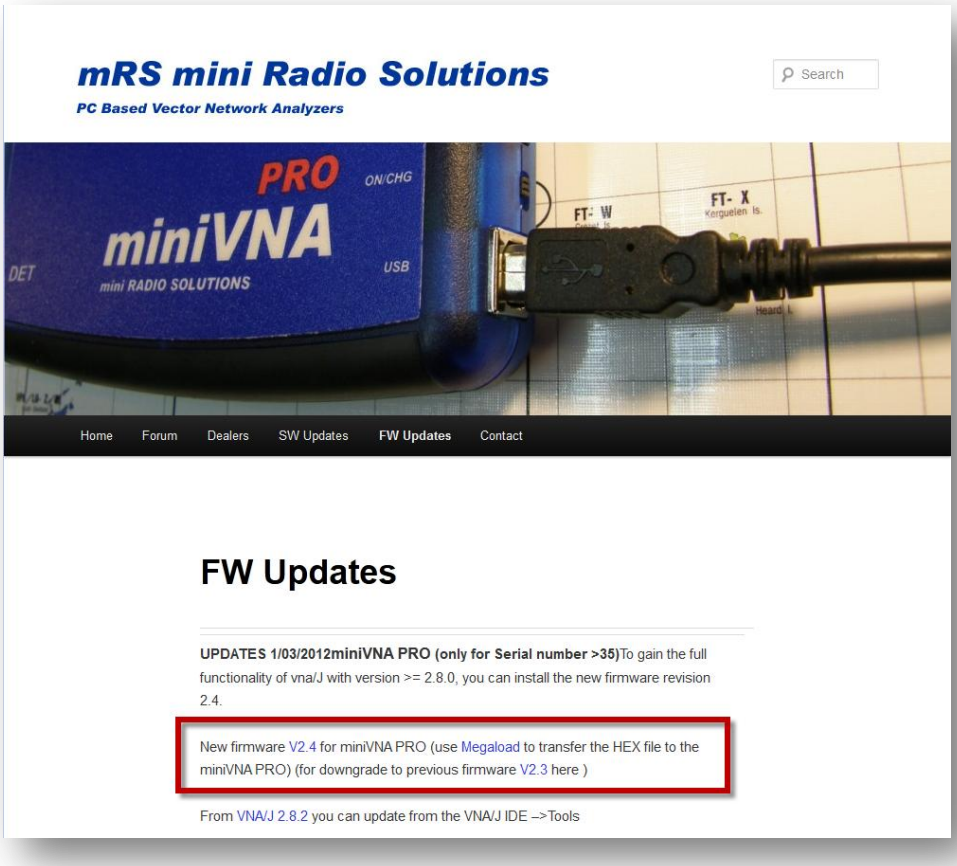
Check the available firmware versions on the mRS website:

http://www.miniradiosolutions.com

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

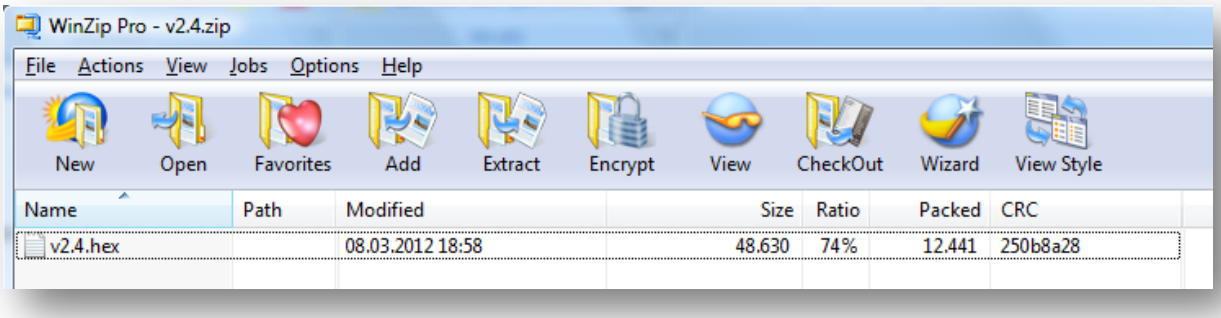


on the website to navigate to the firmware section.



If a newer version, as the one currently installed on the miniVNA^{pro} is available, currently a file named 2.4.zip is available for download.

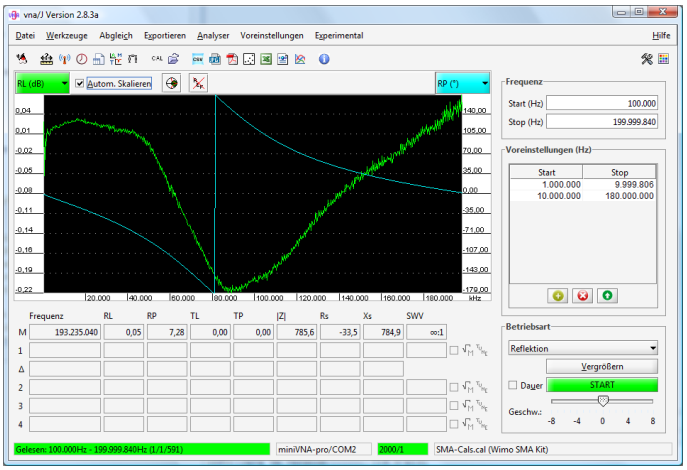
- Download this file to your computer to your preferred download location.
- Unzip the file so you have a file named 2.4.hex on your computer.



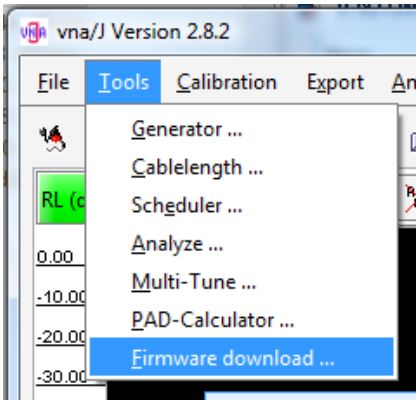
Upgrade firmware of miniVNA^{pro}

Execute now these steps to write the downloaded firmware file to the miniVNA$^{pro.}$

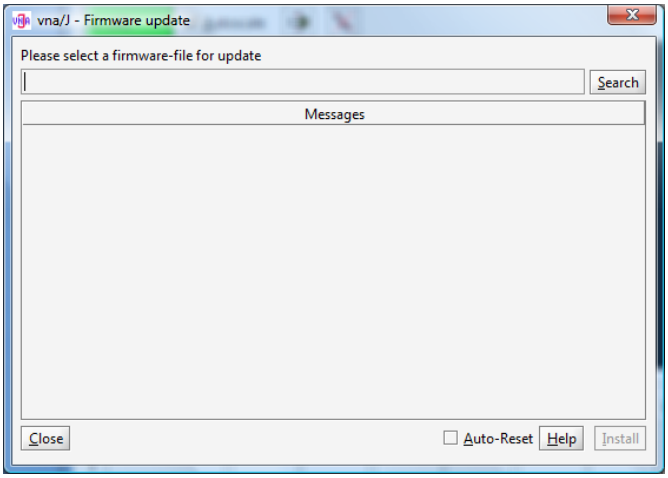
Open vna/J and ensure, that the correct analyser type and port is selected. To verify, execute a test scan.



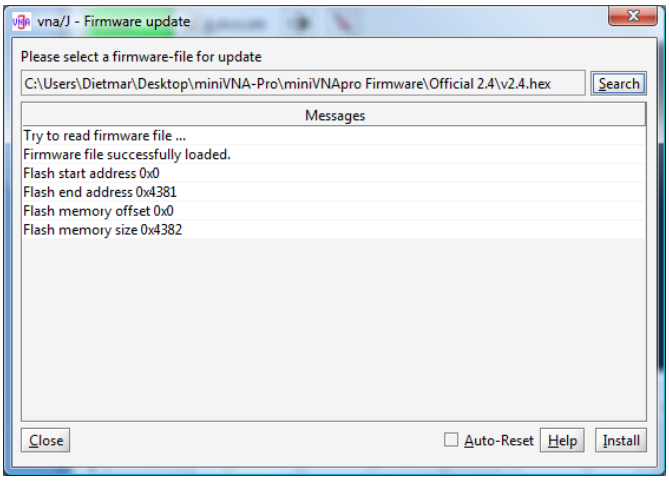
Select "Firmware download" from the tools menu



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



The firmware is loaded and some basic information is displayed



From this step on the procedure differs, whether you have currently installed a firmware version less than 2.5 or >= 2.5.

- When you have installed a version less than 2.5, you have to press the red FUNC button on the miniVNA^{pro} by yourself.
- When you run a firmware version >= 2.5, there is also a firmware command to start the firmware download.

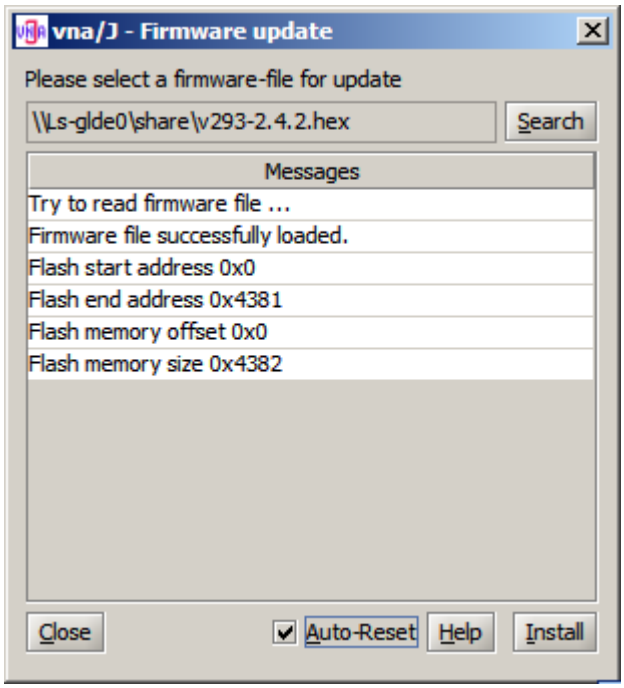
Firmware version >= 2.5

If the currently installed firmware version on the miniVNApro is higher than 2.4, you should follow these steps.

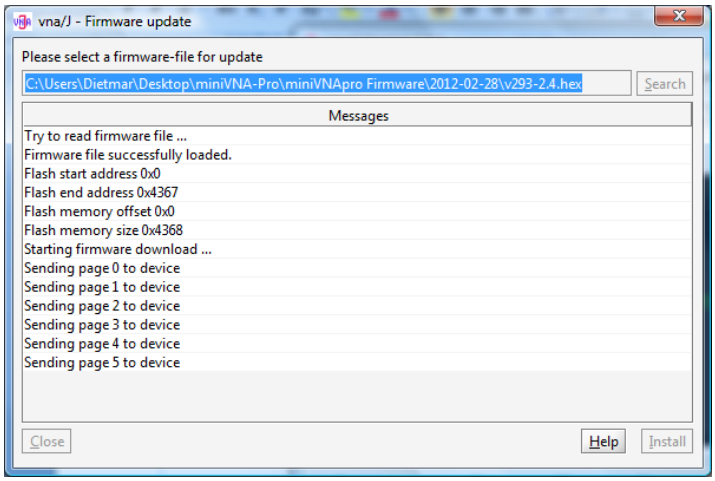
This firmware implements a soft-reset in the miniVNA protocol, so that no further manual interaction is necessary (pressing the reset button).

Remark: If you have installed an earlier release, please use the steps described in the next chapter.

Select the radio button “Auto-reset” in the button bar of the firmware update dialog.

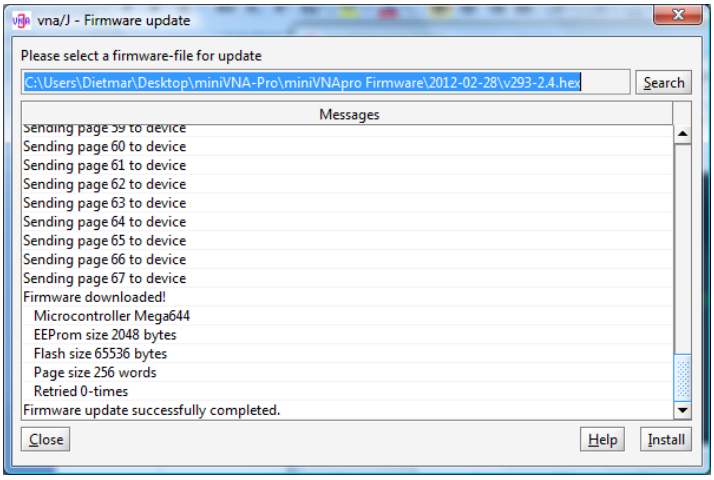


Select the “Install” button and the download of the firmware starts after the soft-reset of the miniVNA^{pro}.



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

Close this dialog and the miniVNA^{pro} is ready for use with the new firmware.

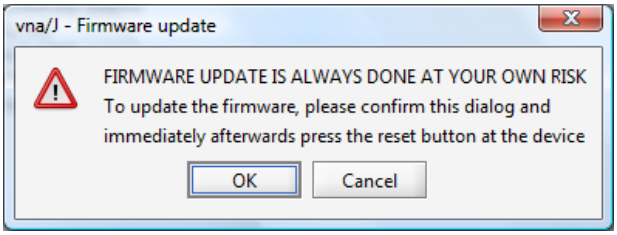


Firmware version < 2.5

If the currently installed firmware version in the miniVNA^{pro} is lower than 2.5, follow these steps.

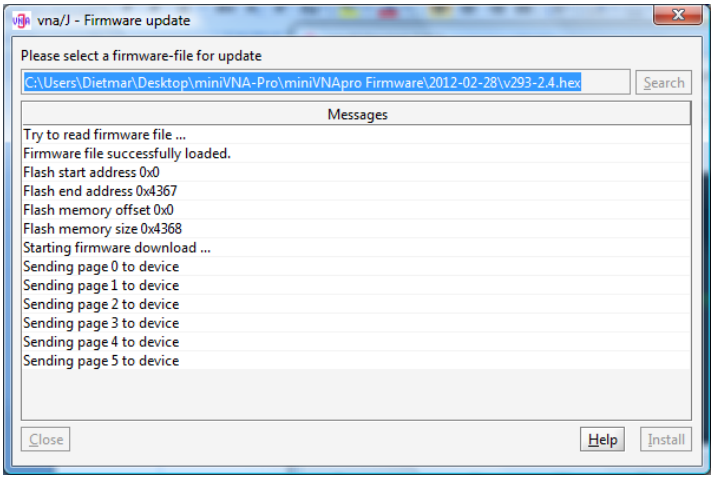
Remark: If you have installed a later release, please use the steps described in the previous chapter.

Press the "Install" button on the firmware update dialog



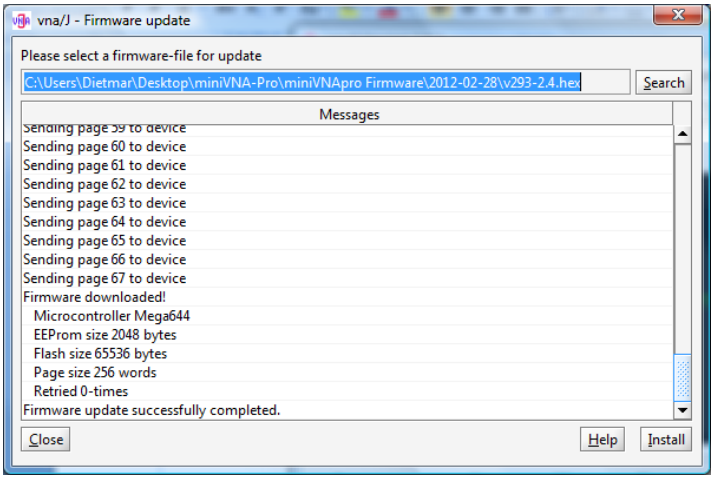
Press "OK" in the popup-dialog and immediately afterwards press the red reset button on the miniVNA^{pro}.

The download of the firmware starts after the release of the reset button.

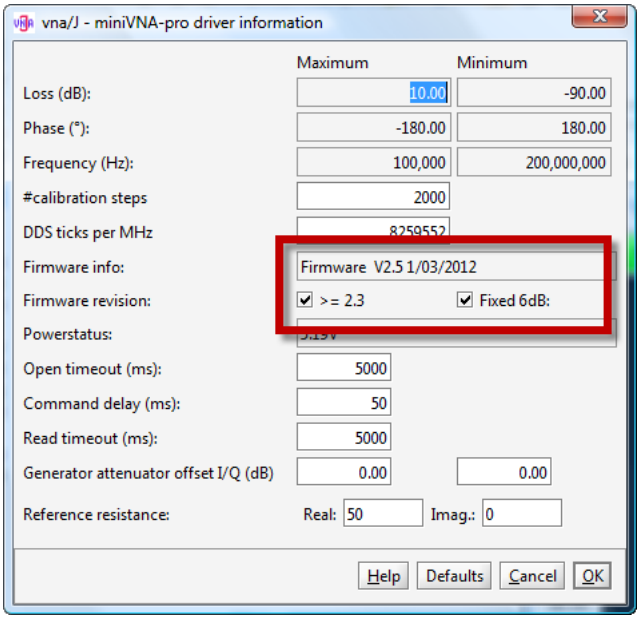


After firmware download was successful, some information about the found device is displayed.

Close this dialog and the miniVNA^{pro} is ready for use with the new firmware.



If you have upgraded from version lower than version 2.3 , please read chapter "Driver info dialog" on page **Fehler! Textmarke nicht definiert.** and chapter "Driver info dialog" on page 21 to use all the features of the new firmware.

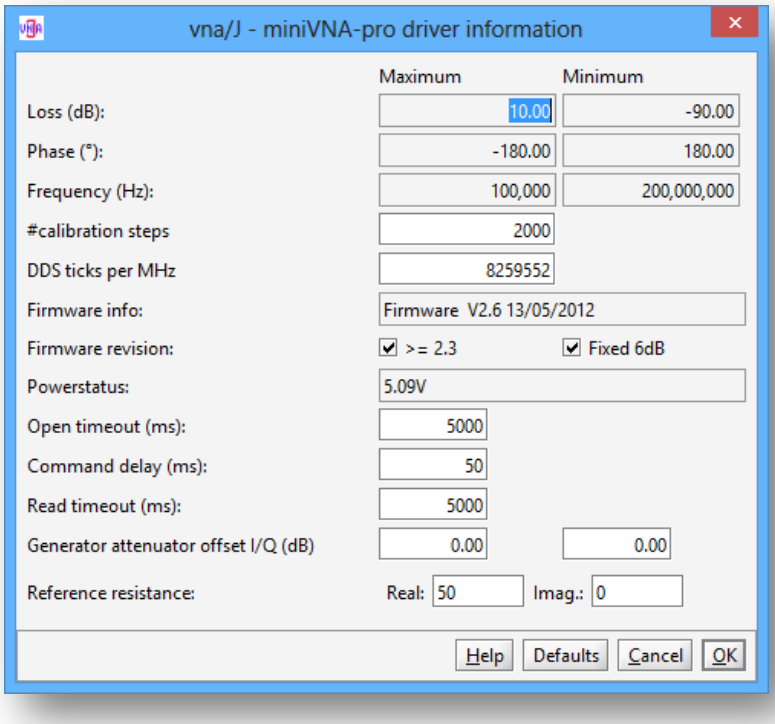


Remark: These steps can also be used, if the currently installed firmware version in the miniVNA^{pro} is higher than 2.4.

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.



Parameter	Description	Range
#calibration steps	Sets the number of calibration steps created during calibration. The number of calibration steps has no measurable influence on the regular scan time. Only the time for creating a calibration dataset increases more or less linear to the number of calibration steps. Please read chapter “Calibration procedure in the vna/J user guide for details regarding calibration data.	200 to 25.000
DDS ticks per MHZ	Sets the number of DDS ticks used for a step of 1MHz	A good start is 8259552. Use the frequency calibration function in the tools menu to get this

Parameter	Description	Range
		value setup correctly. Must be between 999.999 and 999.999.999
Firmware info	Displays the firmware info	String defined by the firmware developer.
Firmware revision **>= 2.3**	Informs the driver, that a miniVNApro with an installed firmware version of greater or equal to 2.3 is installed.	
Firmware revision **Fixed 6dB**	Enables the fixed 6dB attenuation during transmission mode.	Please see chapter "Transmission measurement miniVNApro" on page 24.
Open timeout	Time to wait for opening the communication port.	Usually done within milliseconds. Only on slow machines, it may take longer. 5.000ms is a good choice. Must be between 500ms and 99.000ms
Read timeout	Maximum wait time between sending a command to the vna and no character is received.	Usually within 500milliseconds. Only on slow machines, it may take longer. 5.000ms is a good choice. Must be between 500ms and 99.000ms
Command delay	Time between sending the individual command characters to the vna.	Usually 50 milliseconds are fine for the miniVNApro. Must be between 50ms and 99.000ms
Generator offset I/Q (dB)	Some miniVNApro have a slight generator gain offset. This can be corrected using these values independent for the I and Q channels.	-100dB ... +100dB
Reference resis-	Here the complex value can be specified, which is used to calculate data in	Real -5000 … 5000

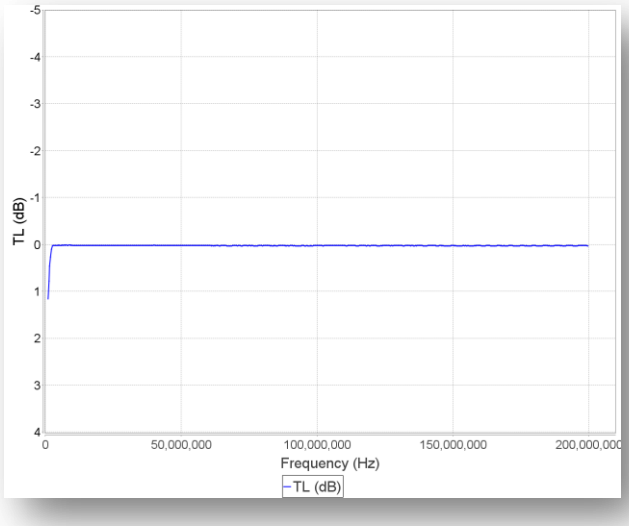
Parameter	Description	Range	
tance	reflection mode.	Imaginary	-5000 … 5000

Transmission measurement miniVNApro

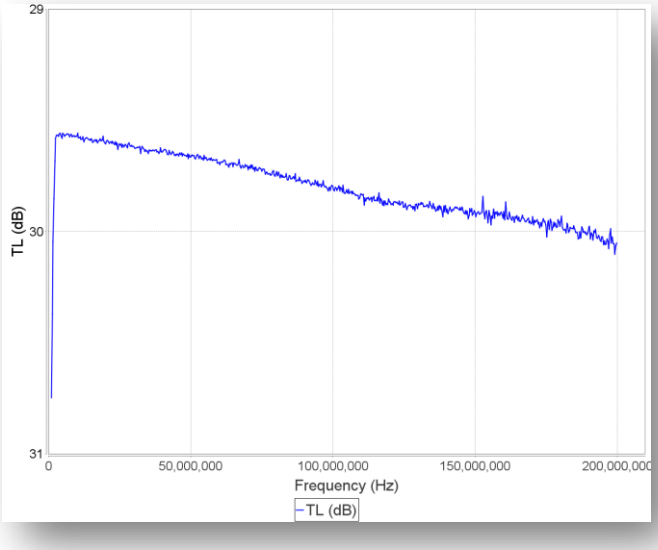
My miniVNApro has the small problem, that the generator signal is a little bit too strong (about 0.5dB) , so that a correct transmission measurement is not possible.

You can check your version of the miniVNApro this way:

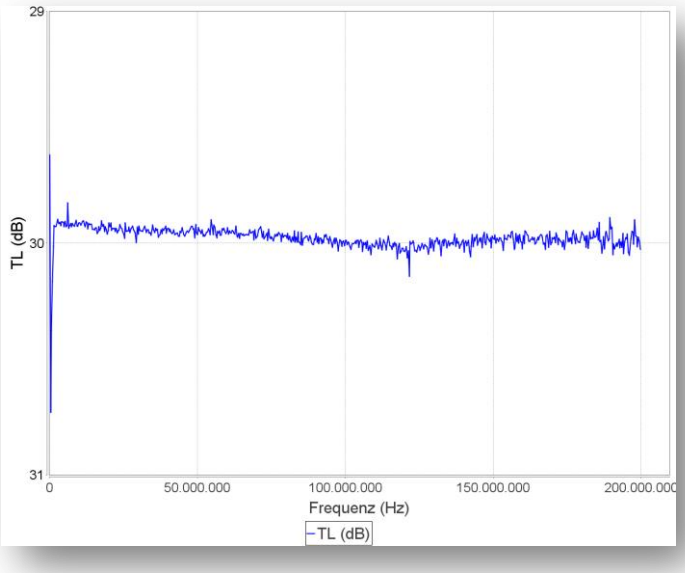
- Do a transmission calibration with the checkbox "Fixed 6dB" in the driver-info dialog **NOT** selected.
- Save the calibration with a name like ***TRAN_0dB***
- Execute a loop-scan. This should result in this diagram



- Now insert a good, well know attenuator pad in the loop cable. I've inserted a 30dB pad. This should give a reading like this:



- As can be seen, the attenuation is about 0,5dB too less.
- Now open the driver info and check the "Fixed 6dB" checkbox.
- Do a transmission calibration and save the calibration with a name like ***TRAN_6dB***
- Now redo the loop-scan. This should give the same diagram as before.
- Now redo the scan with the attenuator pad in series and you should get a flat reading:

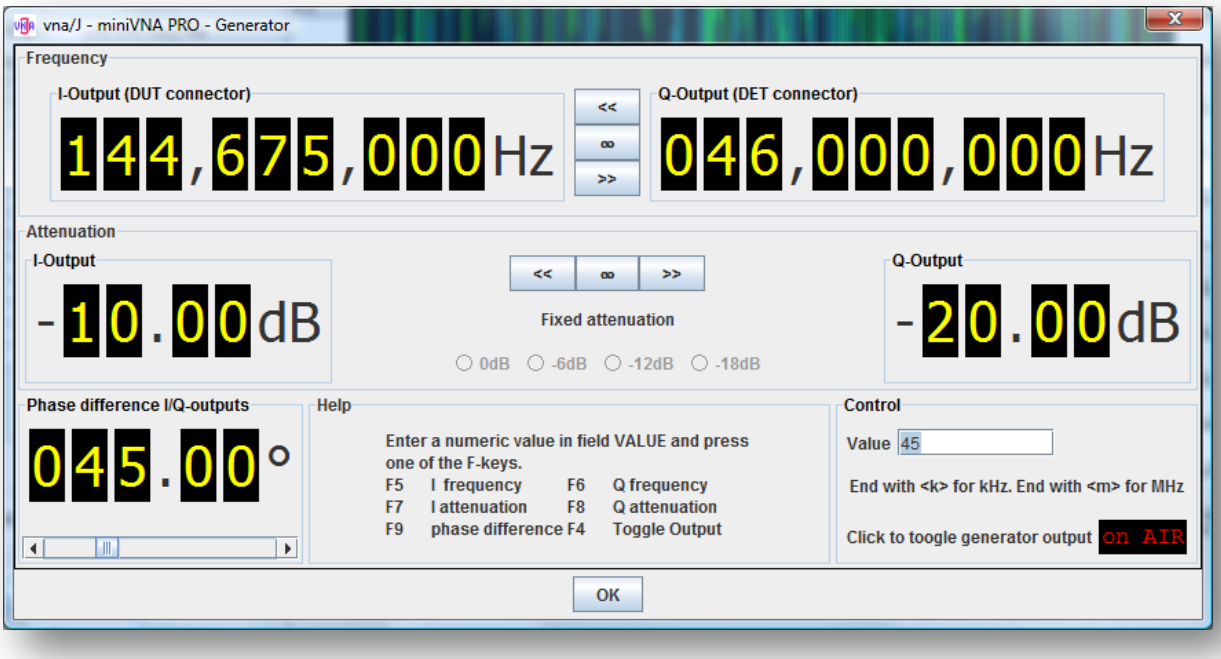


Note: *Please ensure, that you always use the same setting of the "Fixed 6dB" checkbox for calibration as well as for measurement.*

I recommend using always the "Fixed 6dB" checked. This will reduce the transmission dynamic range from about 90dB to about 84dB but with a much better accuracy!

Generator miniVNA PRO

Using this dialog, the attached miniVNA PRO can be used as a simple frequency generator as well as a versatile I/Q-signal generator



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 I or Q 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.

The values range is 100.000Hz to 200.000.000Hz.

Attenuation control

Every digit  of the I or Q attenuation 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

The values range is 00.00dB to 60.20dB

Phase control

Every digit  of the I or Q attenuation 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

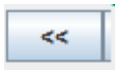
The values range is 000.00° to 180.00°

The phase difference can also controlled using the slider below the five digits.

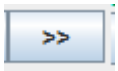
General input

The values can be controlled via the separate digits of by entering a numerical value in the field **VALUE** and pressing one of the described function keys on the keyboard:

F5 Write the entered value to the I frequency field
F6 Write the entered value to the Q frequency field
F7 Write the entered value to the I attenuation field
F8 Write the entered value to the Q attenuation field
F9 Write the entered value to the phase field



Copies the value from the Q field to the I field



Copies the value from the I field to the Q field

Link the I and Q fields. Means, changing i.e. the I field also changes the Q field by the same amount. This works only when changing the field values using the digits

Bluetooth handling on Linux

Erik, SM3HEW has provided a script to handle problems of Bluetooth-detection on Linux machines:

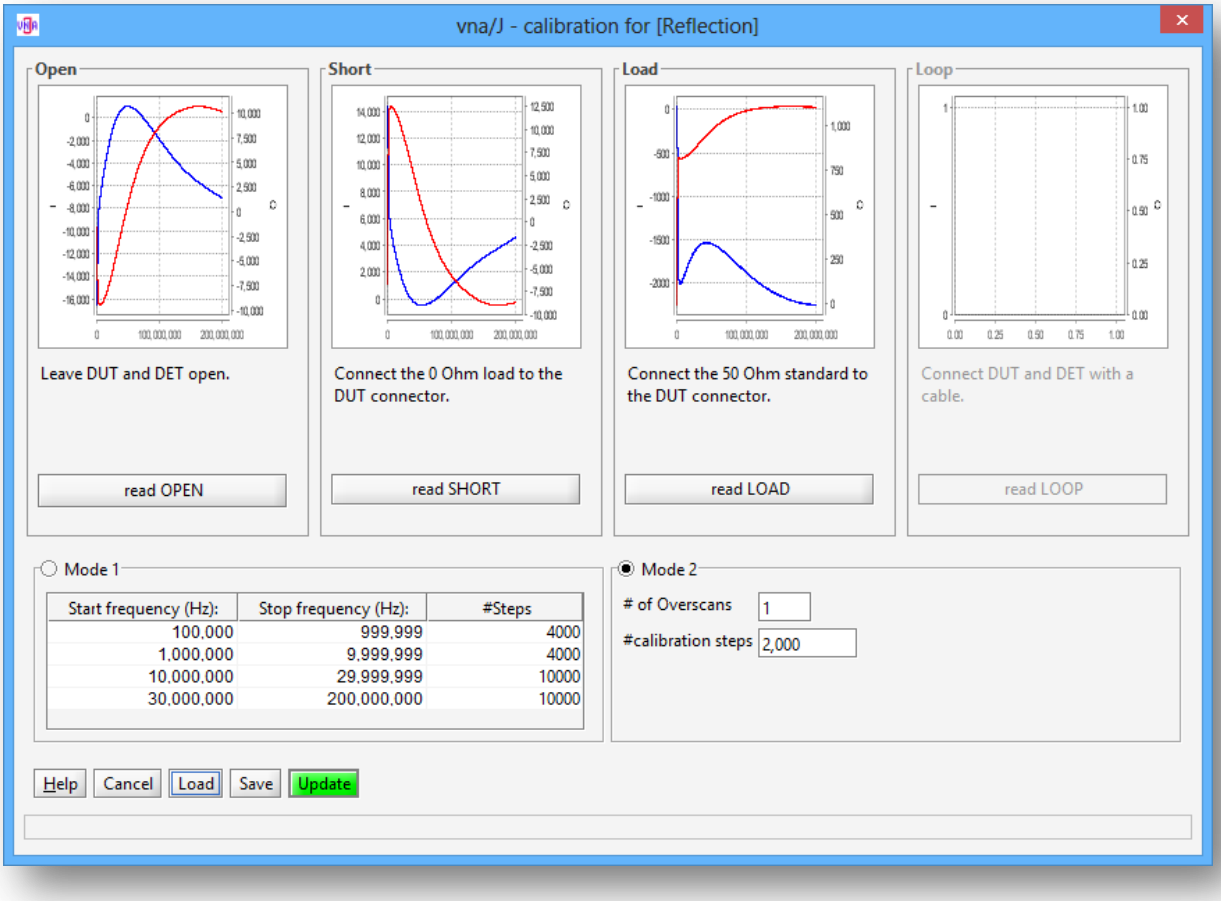
```
#!/bin/sh
#  Author: Erik Westman, SM3HEW, sm3hew@gmail.com
#
#  Copywright, GNU
#  The main idea with this script is to catch bluetooth whenever it is avaible.
#
# hcitool scan, collect BT-device-MAC of the vna.
# Hooks up  "PRO snxx" i.e. miniVNA and connect it to /dev/rfcomm0 wich is used
# in the miniVNAPro application.
# The Bluetooth unit is working in background and is supposed to automatic scan and
# connect to the miniVNA
#
# If you have problem with /usr/bin/rfcomm, i.e. Can't open RFCOMM device: Permission denied
# sudo chmod 6755 /usr/bin/rfcomm   # This is a work-around and is a potential security risk.
# In 32-bit Ubuntu this is managed in /etc/udev/rules.d/descriptive-name.rules with content:
# KERNEL=="rfcomm?", RUN+="/usr/local/etc/fix-rfcomm.sh". The fix-rfcomm.sh contains:
# chmod 3777 /dev/rfcomm0
#
# It is a symbolic link called ~/vnaJ/ to the running release, for instance
# vnaJ.2.6.5/ directory.
# Make this link  and also make a symbolic ling to the jar-file, i.e vna.2.5.6.jar
# It is also a symbolic link in the vnaJ directory
# This makes it easy to handle any release from this script, just modifing the sym-link

#java -jar  ~/vnaJ.2.6.5/vnaJ.2.6.5.jar & #This string, using symlinks is the same as the row
below.
#/usr/lib/jvm/java-6-sun/jre/bin/java -jar

# To use proxy..
# java -Dhttp.proxyHost=143.237.88.22 -Dhttp.proxyPort=8080 -jar vnaJ &

# Without proxy..
java -jar  ~/vnaJ/vnaJ &
#xterm &  # Debugging purpose
JAVA_PROC=$! #Catch the childproc java-pid, i.e the miniVNApro
while [ 1 ]; do  #forever
   # grab status, Bluetooth-MAC
   RF_STATUS="`rfcomm show rfcomm0 2>/dev/null|awk '{print $4}'`"
   #echo "Status:$RF_STATUS"
   sleep  2
   if [ -z $RF_STATUS ]; then
   #  echo  "BT-Device down! Restarting.."
      VNA_BT_MAC="`hcitool scan|grep "PRO sn"| awk '{ print $1; }'`" #Fetch the mac-addr
      rfcomm  connect  rfcomm0 $VNA_BT_MAC 2>/dev/null 1>/dev/null &
      #rfcomm connect  rfcomm0 00:12:6F:07:5E:B2 2>/dev/null 1>/dev/null &
   fi
   # kolla om miniVNApro java har stängts ned, avsluta denna processerna
   JAVA_TERMINATED="`ps ax|awk '{ print $1 }'|grep $JAVA_PROC`"
   if [ -z $JAVA_TERMINATED ]; then
      #echo Terminating Parent, child is dead!!
      rfcomm release rfcomm0 2>/dev/null
      kill $$
      exit
   fi
done
```

Remarks: You can download the script from my website http://www.vnaj.dl2sba.com.
As I do not own a Linux machine, I cannot give any support for this script.
Please contact Erik SM3HEW by Email - you will find his address on QRZ.COM

Main calibration datasets miniVNA^{pro}

Reflection

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

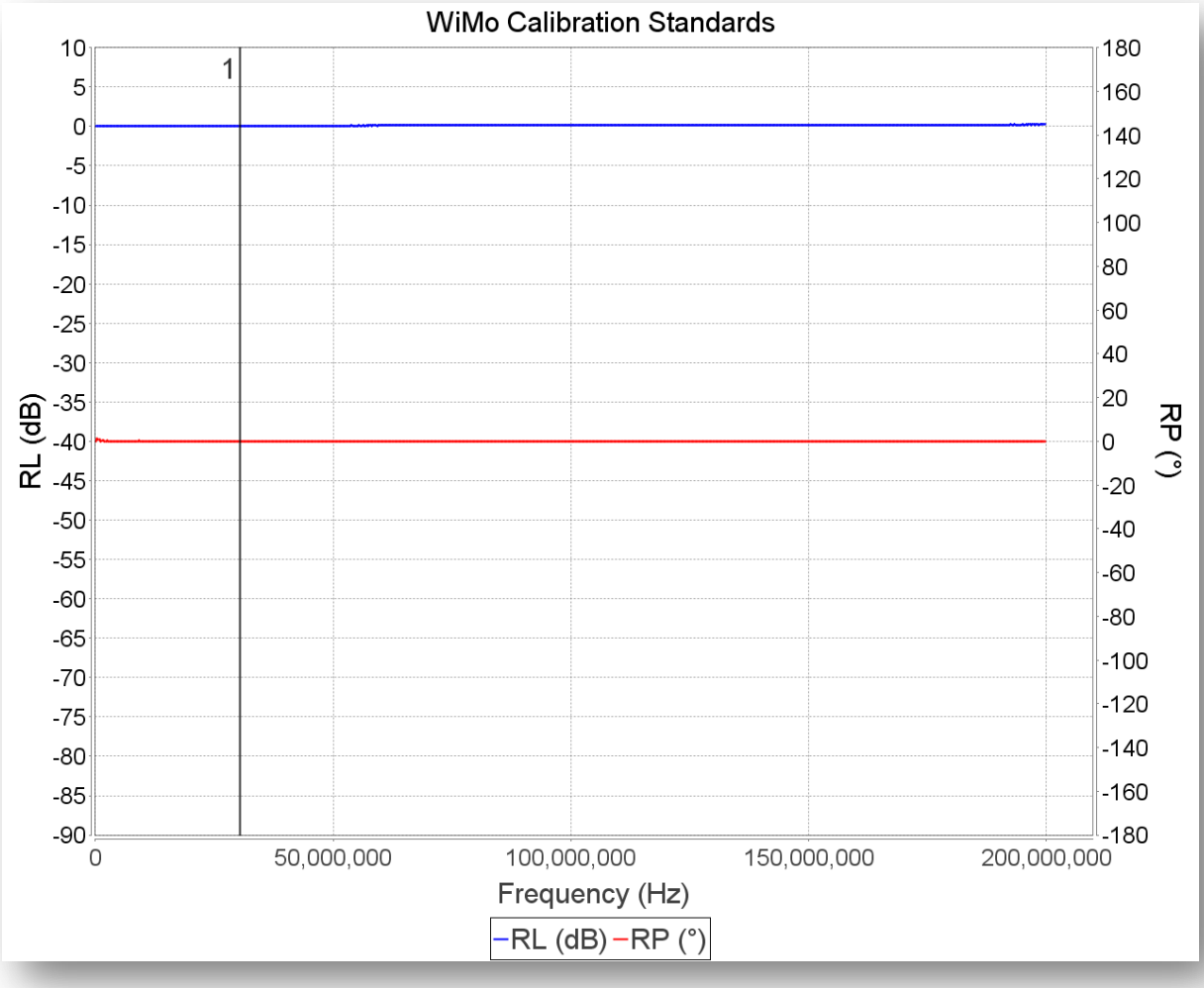


The standards provided by WiMo with the analyser give a slightly different calibration set due to the reduced length of the standards.

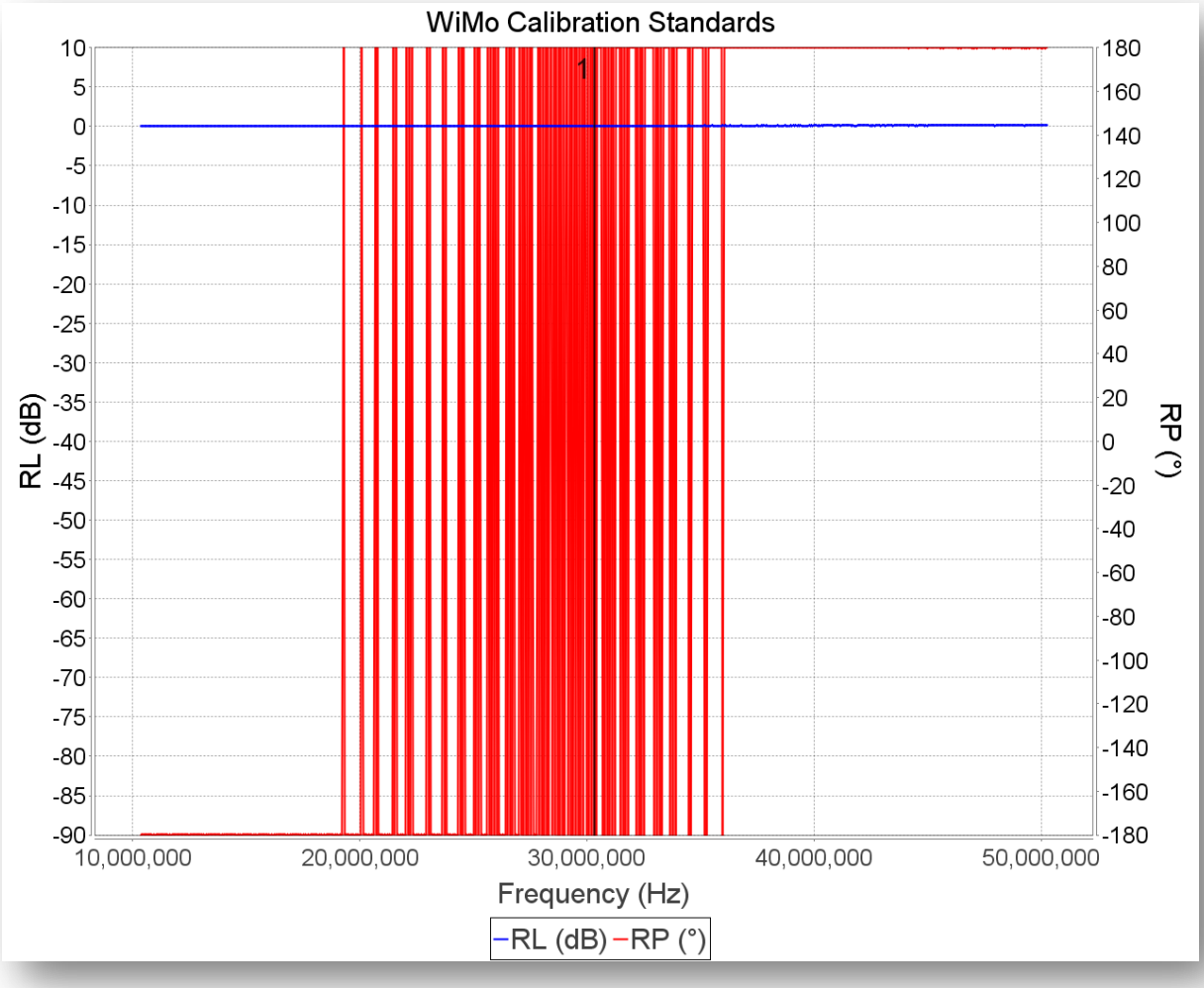
Please take care, that the OPEN and SHORT calibration curves look different. When I screw the open-standard too tight on the SMA socket, the OPEN standard will create a short on the socket and the curves for OPEN and SHORT look identical.

Executing scans with the calibration standards should create similar curves:

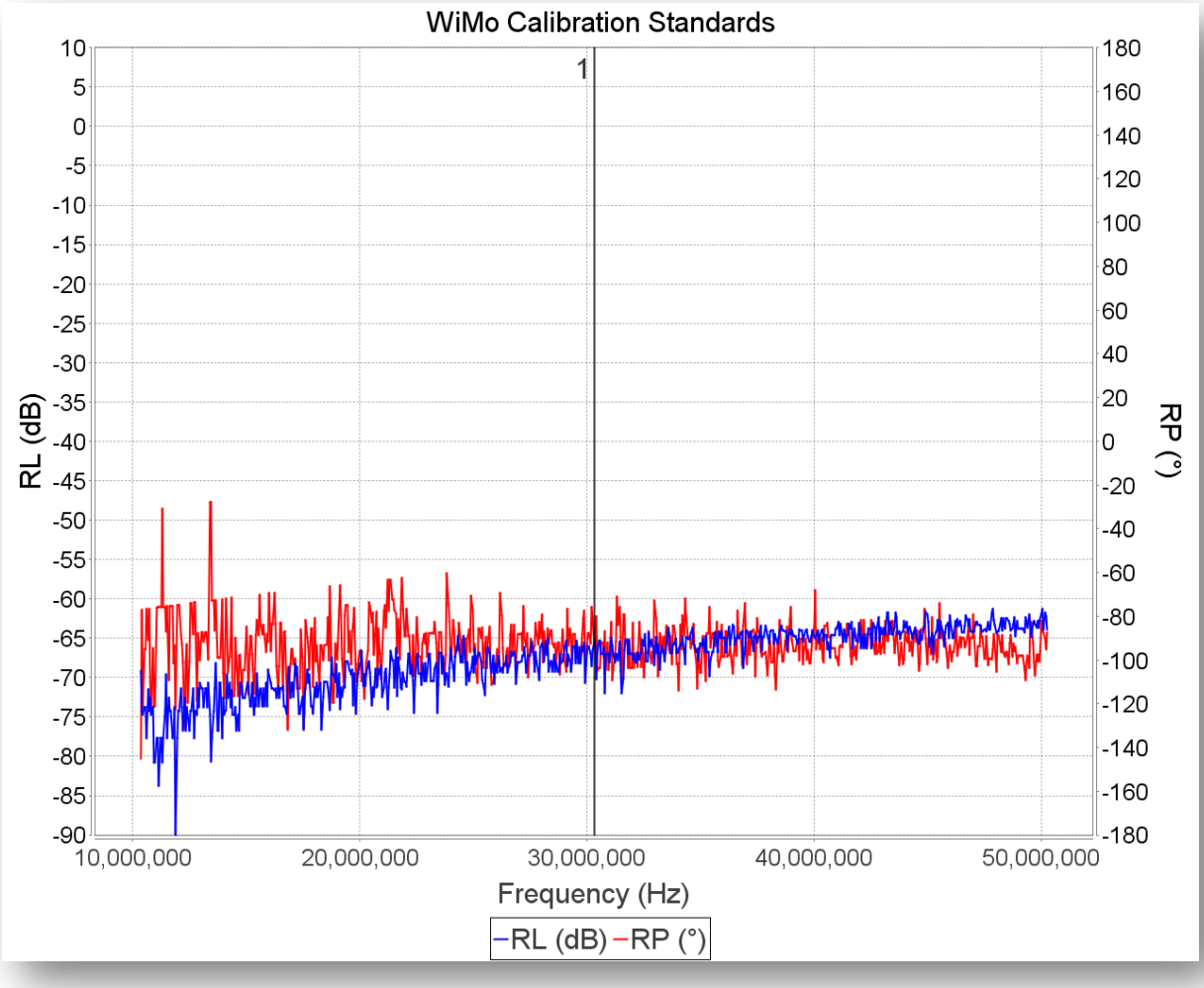
Open standard



Short standard

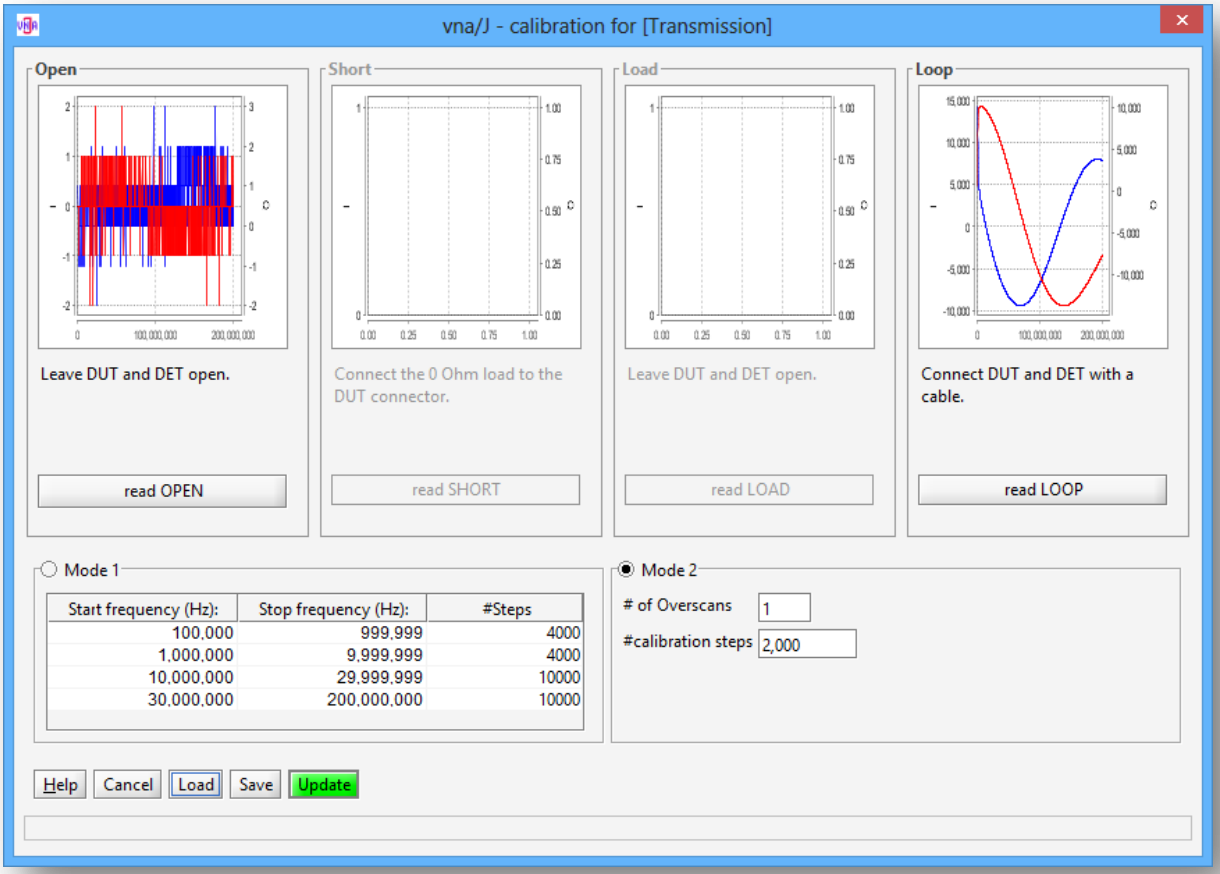


Load standard



Transmission

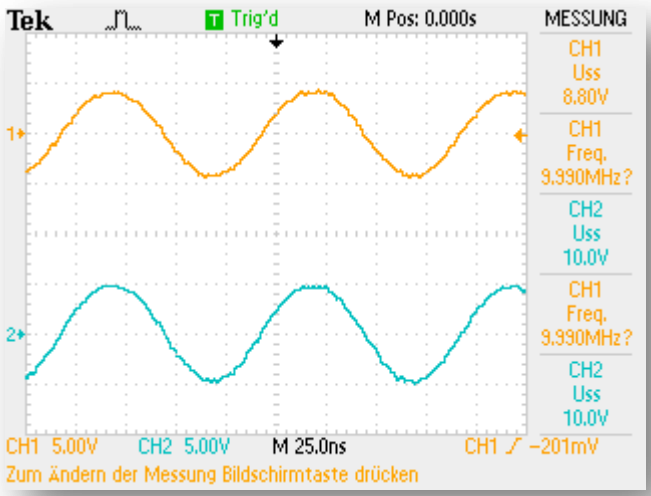
I've used two SMA-BNC adaptors and a short 20cm RG58A/U cable to create the calibration curves:



Generator signals

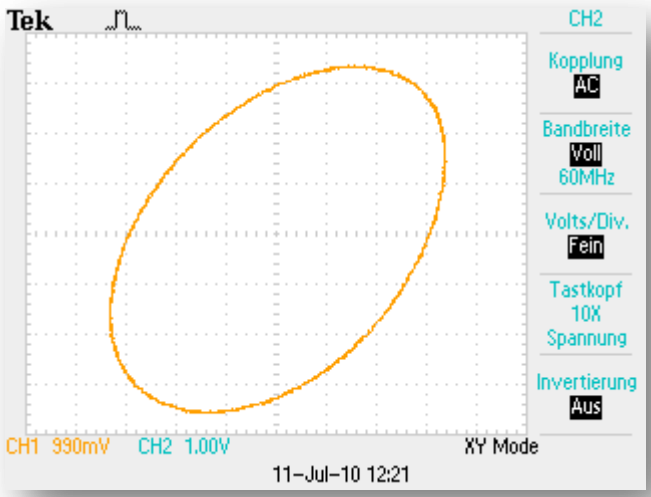
All signal are measured using a Tektronix low-cost digital scope TDS 2002B.

The generator signals are fed into the scope using about 25cm of RG58 coax cable. The cables where terminated with 50Ohm resistors.

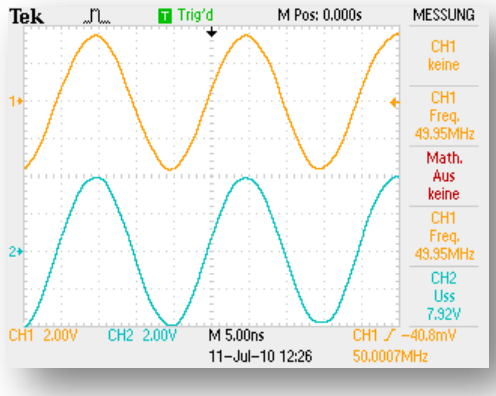


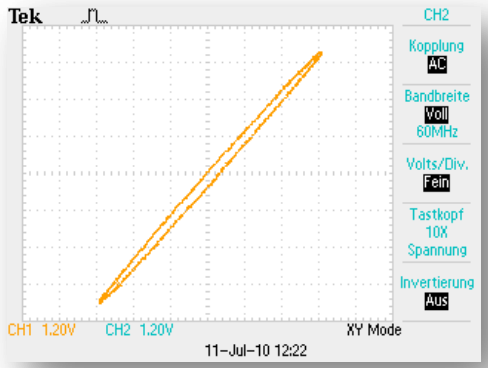
Phase difference

Both channels fed with DUT signal

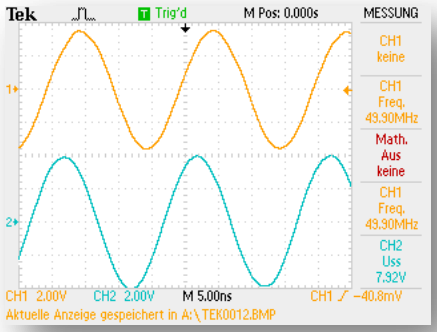


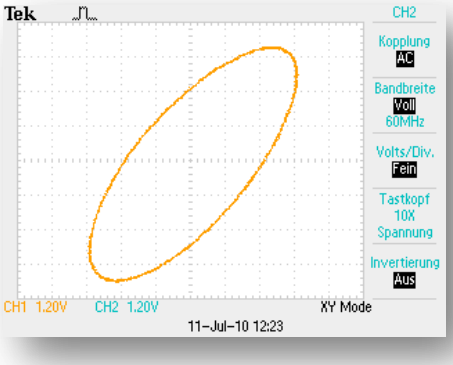
Phase difference 0°



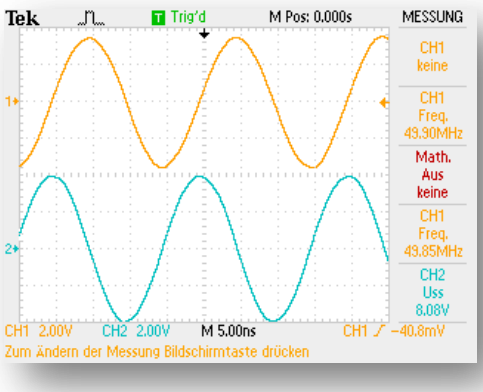


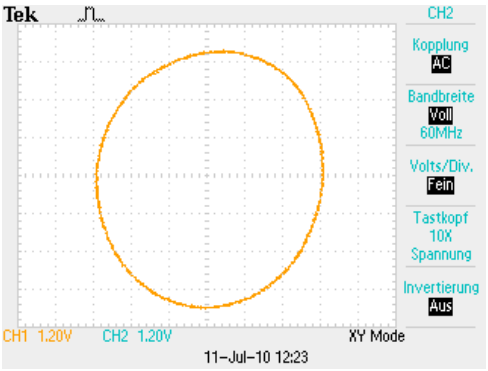
Phase difference 45°





Phase difference 90°





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