



PicoVNA™
USB vector network analyzer

Quick Start Guide

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1. Introduction

Thank you for purchasing a PicoVNA vector network analyzer.

A single model is currently available:

- **PicoVNA 106:** a 6 GHz two-port VNA with built-in bias-T networks

For further setup information following basic installation, see the *User's Guide* supplied with the PicoVNA 2 software.

For detailed specifications see the *PicoVNA 106 Data Sheet*.

2. Safety information

To prevent possible electrical shock, fire, personal injury, or damage to the product, carefully read this safety information before attempting to install or use the product. In addition, follow all generally accepted safety practices and procedures for working with and near electricity.

This instrument has been designed to meet the requirements of EN61010-1 (*Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use*).

The following safety descriptions are found throughout this guide:

A **WARNING** identifies conditions or practices that could result in injury or death.

A **CAUTION** identifies conditions or practices that could result in damage to the product or equipment to which it is connected.








WARNING

To prevent injury or death use the product only as instructed and use only accessories supplied or recommended. Protection provided by the product may be impaired if used in a manner not specified by the manufacturer.

2.1 Symbols

These safety and electrical symbols may appear on the product or in this guide.

Symbols	Description
	Earth (ground) terminal
	Chassis terminal
	Possibility of electric shock
	Caution
	Do not dispose of this product as unsorted municipal waste

This terminal can be used to make a measurement ground connection. It is NOT a safety or protective earth.

Appearance on the product indicates a need to read this safety and operation manual.

2.2 Maximum input and output ranges



WARNING

To prevent electric shock, do not attempt to measure or apply signal levels outside the specified maxima below.

The table below indicates the maximum voltage of the outputs and the overvoltage protection range for input on the VNA. The overvoltage protection ranges are the maximum voltages that can be applied without damaging the instrument.

Connector	Maximum operating voltage (output or input)	Overvoltage or overcurrent protection
Ports 1 and 2	+10 dBm (about 710 mV RMS)	+20 dBm (about 2.2 V RMS)
Bias-Ts 1 and 2	±15 V DC	250 mA
Trigger and reference in		±6 V pk
Trigger and reference out	0 V to +5 V	Do not apply a voltage



WARNING

Signals exceeding the voltage limits in the table below are defined as “hazardous live” by EN 61010.

Signal voltage limits of EN61010		
± 70 V DC	33 V AC RMS	± 46.7 V pk max.



WARNING

To avoid equipment damage and possible injury, do not operate the instrument outside its rated supply voltages or environmental range.

**CAUTION**

Exceeding the overvoltage protection range on any connector can cause permanent damage to the instrument and other connected equipment.

To prevent permanent damage, do not apply an input voltage to the trigger or reference output of the VNA.

2.3 Grounding

**WARNING**

The instrument's ground connection through the USB cable is for functional purposes only. The instrument does not have a protective safety ground.

To prevent injury or death, or permanent damage to the instrument, never connect the ground of an input or output (chassis) to any electrical power source. To prevent personal injury or death, use a voltmeter to check that there is no significant AC or DC voltage between the instrument's ground and the point to which you intend to connect it.

**CAUTION**

To prevent signal degradation caused by poor grounding, always use the high-quality USB cable supplied with the instrument.

2.4 External connections

**WARNING**

To prevent injury or death, only use the adaptor supplied with the product. This is approved for the voltage and plug configuration in your country.

PicoVNA model	USB connection	External power supply		
		Voltage	Current	Total power
PicoVNA 106	USB 2.0. Compatible with USB 3.0.	12 to 15 V DC	1.85 A pk	22 W

**WARNING****Containment of radio frequencies**

The instrument contains a swept or CW radio frequency signal source (300 kHz to 6.02 GHz at +6 dBm max.) The instrument and supplied accessories are designed to contain and not radiate (or be susceptible to) radio frequencies that could interfere with the operation of other equipment or radio control and communications. To prevent injury or death, connect only to appropriately specified connectors, cables, accessories and test devices, and do not connect to an antenna except within approved test facilities or under otherwise controlled conditions.

2.5 Environment



WARNING

To prevent injury or death, do not use the VNA in wet or damp conditions, or near explosive gas or vapor.



CAUTION

To prevent damage, always use and store your VNA in appropriate environments.

	Storage	Operating
Temperature	-20 °C to +50 °C	+15 °C to +35 °C
Humidity	Up to 80% RH (non-condensing)	
Altitude	2000 m	
Pollution degree	2	



CAUTION

Do not block the air vents at the back of the instrument as overheating will cause damage.

Do not insert any objects through the air vents as internal interference will cause damage.

2.6 Care of the product

The product and accessories contain no user-serviceable parts. Repair, servicing and calibration require specialized test equipment and must only be performed by Pico Technology or an approved service provider. There may be a charge for these services unless covered by the Pico three-year warranty.



WARNING

To prevent injury or death, do not use the product if it appears to be damaged in any way, and stop use immediately if you are concerned by any abnormal behavior.

**CAUTION**

To prevent damage to the device or connected equipment, do not tamper with or disassemble the instrument, case parts, connectors, or accessories.

When cleaning the product, use a soft cloth and a solution of mild soap or detergent in water, and do not allow liquids to enter the instrument's casing.

Take care to avoid mechanical stress or tight bend radii for all connected leads, including all coaxial leads and connectors. Mishandling will cause deformation of sidewalls, and will degrade performance. In particular, note that test port leads should not be formed to tighter than 5 cm (2") bend radius.

To prevent measurement errors and extend the useful life of test leads and accessory connectors, ensure that liquid and particulate contaminants cannot enter. Always fit the dust caps provided and use the correct torque when tightening. Pico recommends: 1 Nm (8.85 inch-lb) for supplied and all stainless steel connectors, or 0.452 Nm (4.0 inch-lb) when a brass or gold-plated connector is interfaced.

3. System requirements

To ensure that the PicoVNA pulse generator and PicoVNA 2 software operate correctly, you must use a computer with the system requirements and one of the operating systems shown in the table below.

Processor Memory Free disk space	As required by the operating system
Operating system	Microsoft Windows 7, 8 or 10. 32-bit or 64-bit.
Ports	USB 2.0 (also compatible with USB 3.0)
Display resolution	1280 x 720 minimum

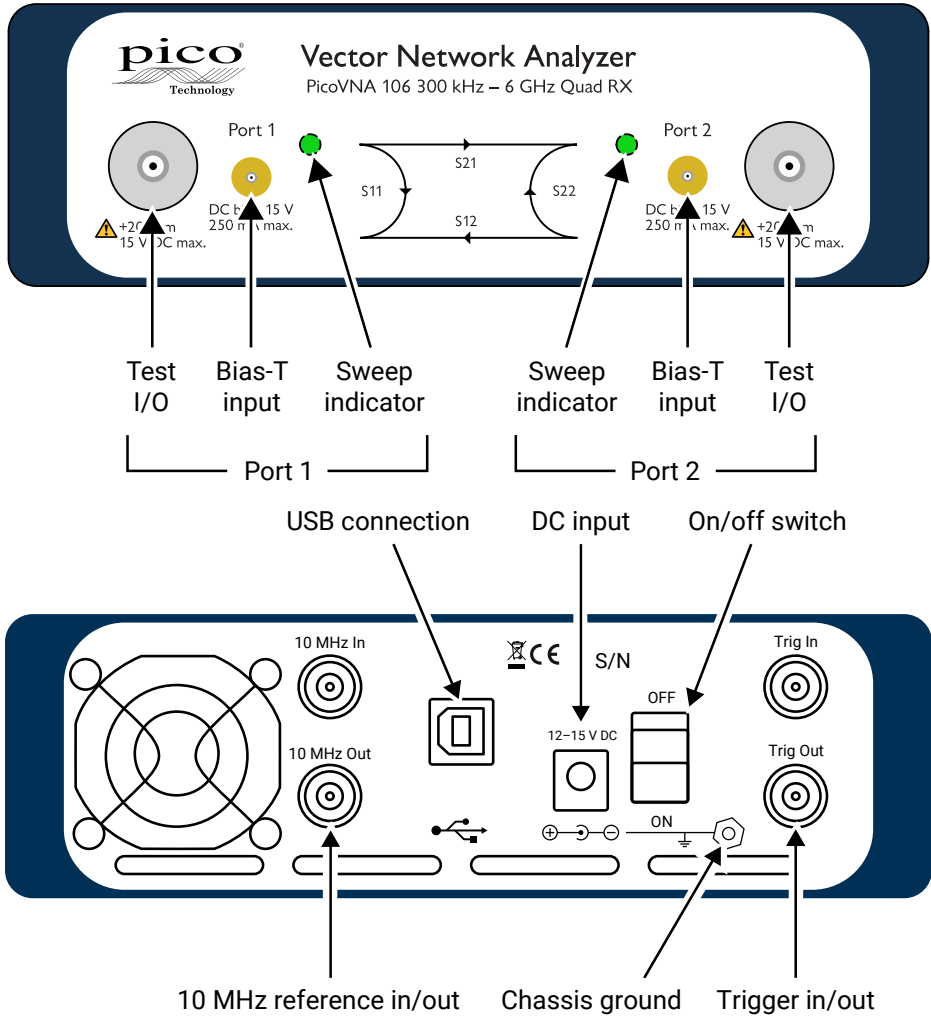
4. Contents of your PicoVNA kit

The PicoVNA 106 vector network analyzer kit contains the following items:

- PicoVNA 106 vector network analyzer
- PicoVNA 2 USB flash drive
- DC power supply with four international plug adaptors
- USB 2.0 cable, 1.8 m
- SMA/PC3.5/2.92 and N-type fixed wrenches
- Quick Start Guide
- Storage and carry case

Some product packs may contain additional items. For a full list of all available kits and additional accessories, see the *User's Guide* or visit www.picotech.com.

5. External connections



6. Installing the PicoVNA vector network analyzer

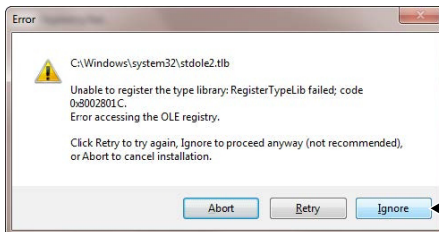
6.1 Installing the software

1. Obtain the PicoVNA 2 software installer from the USB flash drive supplied with your VNA or from:
www.picotech.com/downloads.
2. Run the installer (right-click and **Run as administrator**) and ensure that the installation was successful.
3. Connect the PicoVNA 106 unit to the computer and wait while Windows automatically installs the driver.

The installer creates a support directory at **C:\Users\<user name>\Documents\Pico Technology\PICOVNA2**. This directory contains the following files:

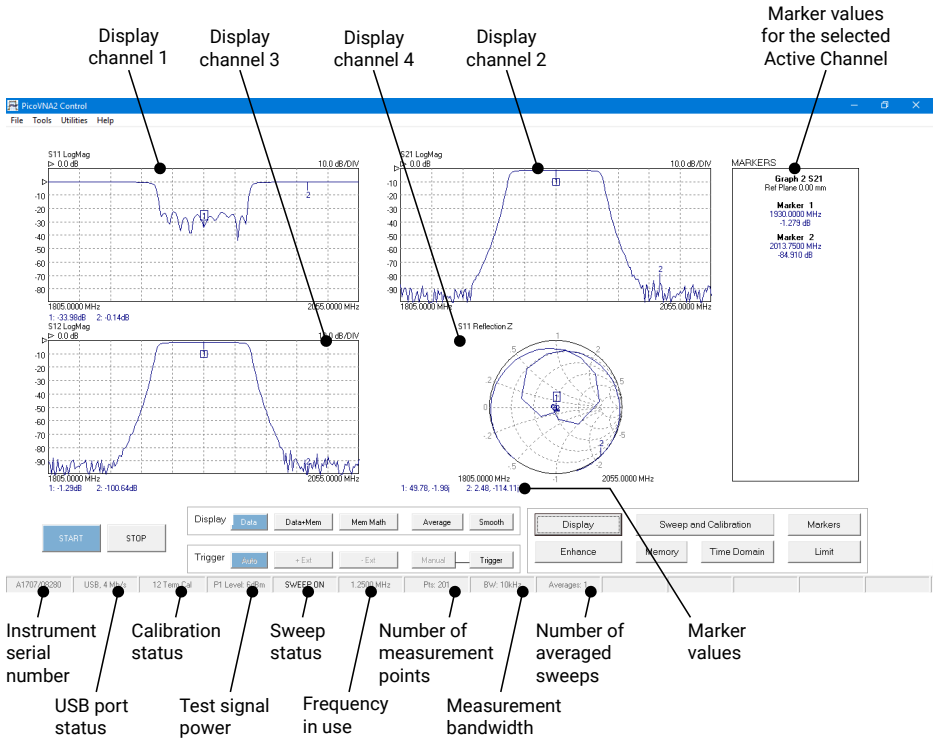
- **xxxx-log.txt** This is the status log file. 'xxxx' is the serial number
- **CalKits\DefUnc.dat** Default measurement uncertainty values
- **DefCal.cal** Default calibration data (last used calibration)
- will appear after first connection to a VNA device
- **FactoryDefaults.cal** Backup calibration data from factory

On Windows 7 machines it is common to see the following error message:

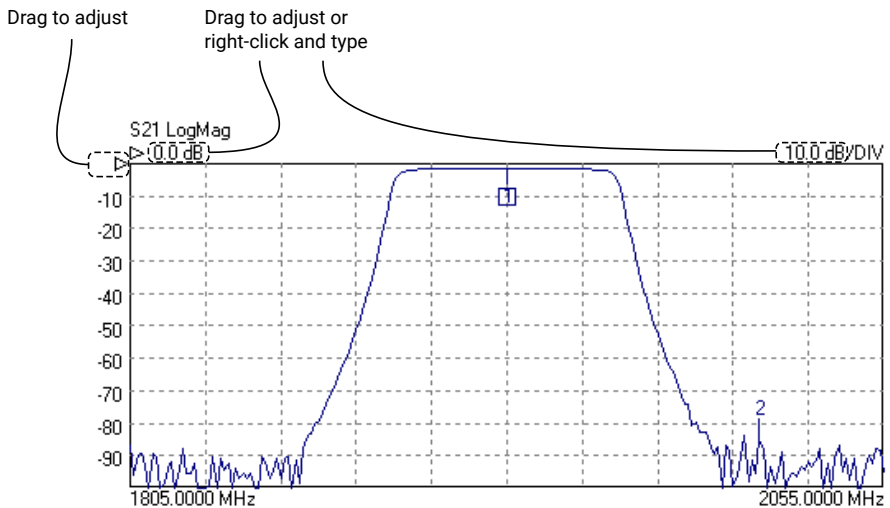


It is safe to click **Ignore** to continue

6.2 The PicoVNA 2 main window

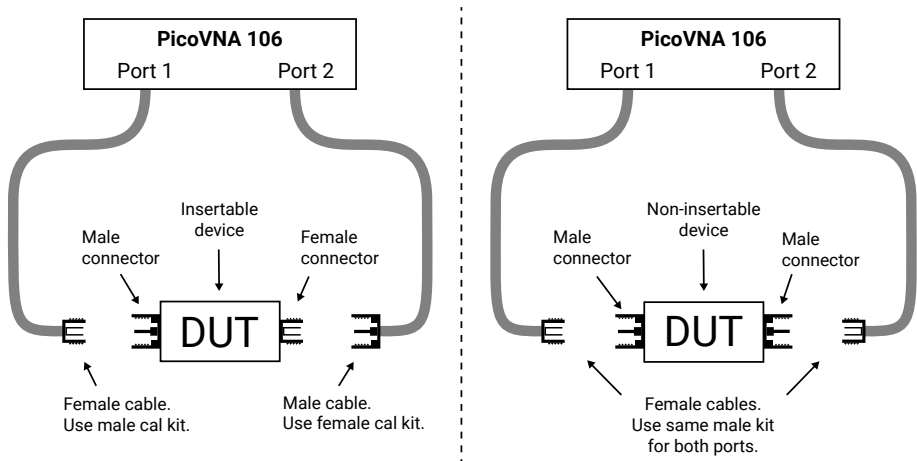


You can adjust the vertical scale of any of the rectangular plots in the above window, as follows:



6.3 Loading the calibration kit(s)

If the device to be tested is 'insertable' (one female and one male connector), two kits are required. Otherwise a single kit is required. See diagrams below:



- Run the PicoVNA 2 software
- In the main menu, select **Tools > Calibration kit**
- Click **Load P1 kit**, locate the data file for your Port 1 cal kit (on the USB flash drive supplied with the cal kit) and then click **Apply**
- If a different cal kit is to be used on Port 2, click **Load P2 kit**, select the data for your Port 2 kit and then click **Apply**

Select the calibration kit(s) required depending on the device to be tested. For quicker access in future, you may wish to copy the cal kit data to your **C:\Users\>\Documents\Pico Technology\PICOVNA2\CalKits** folder. You can do this using the **Save Kit** button in the **Cal Kit Editor**.

6.4 Setting the resolution

Before proceeding with a calibration, click **Enhance** in the main window to set the minimum resolution bandwidth that you need the calibration to support. Lower values will result in a slower calibration.

Measurement	Calibration bandwidth	Calibration averaging	Calibration power	Comments
Fastest speed	10 kHz	None	+0 dBm	Set bandwidth to 10 to 140 kHz during measurement
Best accuracy and ~100 dB dynamic range	100 Hz	None	-3 dBm	Set bandwidth to 100 Hz during measurement
General use, fast speed, ~90 dB dynamic range	1 kHz	None	+0 dBm	Set bandwidth to 1 kHz during measurement
Best dynamic range	10 Hz	None	+6 dBm	Leave bandwidth unchanged during measurement

6.5 Setting up calibration parameters

Click **Calibration** to open the **Calibration** window:

1. Set sweep parameters

2. After setting the required sweep bandwidth, apply values

3. Select measurement required

4. Perform required calibration steps.

5. **IMPORTANT!**
On completion, apply calibration

The cal kits that you have loaded

Any sequence is possible, but down-then-across order usually minimizes the number of connection steps.

6.6 Setting up display parameters

Click **Display** in the main window to open the **Display Set Up** window:

1. Select one-channel, two-channel or four-channel view

2. Select channel to show in the Markers panel

3. Select channel to set up

4. Check to show vertical scale values on graphs

5. Apply settings before selecting next channel

When finished, click **Start** in the main window to begin measurements.

6.7 Running in demo mode

Demo mode allows you to explore the PicoVNA 2 software without the need to have an instrument running.

- To enter demo mode, run the PicoVNA 2 software with no instrument connected.
- Click **Ignore** in the dialog that appears.

PicoVNA 2 will then offer you a selection of demonstration measurements.

7. Further information

7.1 Free newsletter

Pico Technology sends out a free monthly newsletter by email. This gives news of product launches, software upgrades and application notes, as well as hints and advice. We treat your e-mail address and other details as confidential and will not pass them to any third party. To subscribe, visit:

www.picotech.com/newsletter

7.2 Software updates and replacement

The latest versions of all Pico software and manuals can be downloaded free of charge at:

www.picotech.com/downloads

If you require a new software disk, please contact Pico Technology or your distributor. There may be a small charge for this service.

7.3 User's guides

The *PicoVNA User's Guide* is available on the USB flash drive supplied and from:

www.picotech.com/downloads

7.4 Specifications

The *User's Guide* and *Data Sheet* contain the latest specifications for your PicoVNA vector network analyzer.

7.5 Technical support

Regularly updated technical support information can be found in the Pico Technology support forum:

www.picotech.com/tech-support

7.6 Warranty and returns

These PicoVNA vector network analyzers are supplied with a three-year return-to-manufacturer warranty. For full terms and conditions, see the *PicoVNA User's Guide*.

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