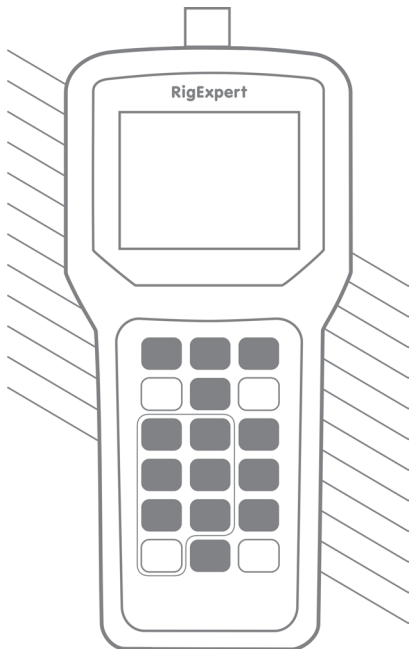# ZOOM series

Antenna and cable analyzer

RigExpert®

Software manual

Table of contents

1. Connecting RigExpert Antenna Analyzer to your computer

RigExpert Antenna Analyzer can be connected to a computer running Windows 2000/2003/XP/Vista/7/8/10, as well as Mac OS (version 10.6 or higher) operating systems.

The latest version of the software may be found at the **Downloads** section of the *rigexpert.com* website. Windows and Mac OS are available as separate downloads.

Important:

To avoid damage caused by possible electrostatic discharge, always follow this sequence:

1. Connect the coaxial cable to the antenna connector of your analyzer.

2. Connect the analyzer to the USB port of your computer.

Software manual

2. Updating the firmware

A **Firmware update tool** available at the **Downloads** section of our website will automatically download latest versions of the firmware. Just run the program and follow on-screen instructions.

You may also download binary files of the firmware for the off-line updating, if necessary.

The LCD of the analyzer will flash during the firmware update process.

> **Notice:**
> *It is safe for the analyzer to cancel the firmware update process at any time, and then start it over.*

3. AntScope program

The main function of the **AntScope** program is to show measurement results on the "big screen". The AntScope is a great companion to your RigExpert analyzer which adds functions previously available in expensive, professional grade equipment only.

3.1. Quick start

1. Connect your analyzer to the PC as described in section 1 of this manual. Make sure the analyzer is turned on.

2. Run AntScope. Under Windows, the program will automatically detect the analyzer type. For AA–230 ZOOM under Mac OS and Linux, select serial device name and analyzer type in the **Configure** menu.

3. Select **Measurement** – **Range** menu (or press **F9**). In the **Scan** window, select a desired frequency range (or click "**Set full range**") and a number of points to set the scan resolution. Click **OK** to perform the scan.

4. After the scan is complete, use **F2** to **F8** keys to switch between charts displaying various parameters: SWR, phase angle, complex impedance (parallel and serial models), return loss, impulse and step responses, and reflection coefficient at Smith chart.

The screen shot below shows a typical AntScope screen:
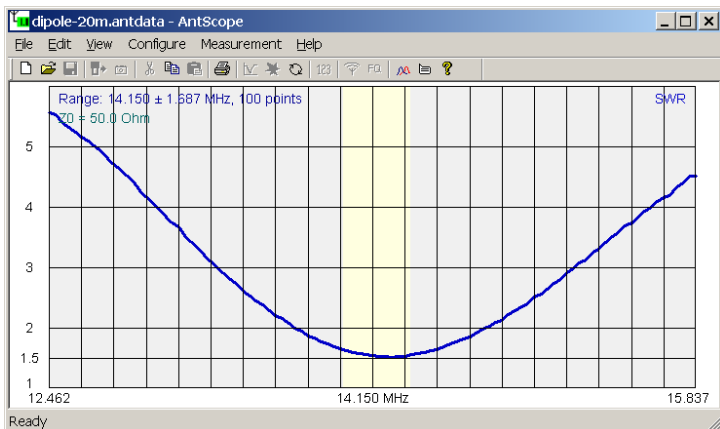
3.2. Data window

You will see a pop–up data window when the cursor is moved over the graph, displaying various parameters of a load:
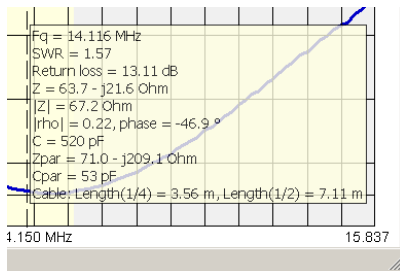
3.3. Saving/loading data

Go to **File** – **Save as…** menu to save current measurement to a file, then select **Open…** to retrieve the saved data.

Please notice that data is saved in native AntScope format (**.antdata** files or files without extension in older versions of AntScope), which cannot be open in other programs. Use **File** – **Export** menu to export data in various formats.

For instance, CSV data can be easily imported into a *Microsoft Excel* sheet. **R** and **X** (active and reactive parts of impedance) values are saved into the CSV file for each point on the graph. To calculate SWR or other parameters, use corresponding formulas.

3.4. Saving images

To paste the graph to other software (such as *Microsoft Word*, a graphical editor, or an e–mail message editor), just select **Edit** – **Copy image** menu in the AntScope. You may also press **Ctrl-C** or **Ctrl-Ins**. Paste an image from a clipboard to your program.

By using the **View** – **Graph size** menu, choose one of standard sizes of the image.

3.5. Screen shots

To take a screen shot of the analyzer, use the **Edit** – **Copy analyzer's screen** menu. The screen shot is placed to the clipboard automatically.
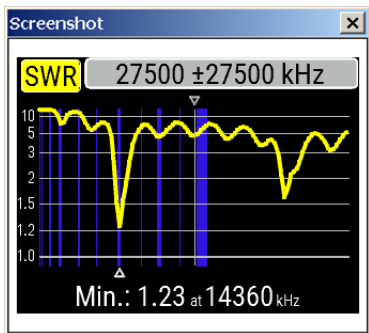
3.6. Analyzer memory

You may download a previously save graph from one of memory slots of your analyzer. Make sure the analyzer is connected to your computer, then select **File** – **Read from analyzer** menu.

Select a memory slot from the list, then press **Choose** to download the data.

3.7. AntScope menus

• **File**

New – discard old measurement, create new

Open… – open existing file

Save – save measurement results

Save as… – save measurement results, give a new name to the file

Import from

> **CSV file…** – load data from a CSV file exported by other programs
>
> **Touchstone file…** – load data from a Touchstone S1P file

Export to

> **CSV file…** – save results (frequency, R and X) to a CSV file (contents of the csvheader.txt file will be added as a header; by default this file contains a header for the Zplots program)
>
> **NWL file…** – save results (frequency, R and X) to an NWL file
>
> **Touchstone file…** – save results to Touchstone S1P file in different formats

Read from analyzer… – read a graph from the analyzer memory

Print – print current graph

Print preview – preview printing

Print setup… – open printer setup window

Exit – close the program window

- **Edit**

    Copy image – copy the graph to the clipboard (to paste to other programs for viewing or editing)

    Copy analyzer's screen – take a screen shot and place it into the clipboard

- **View**

    Toolbar – show or hide tool bar

    Status bar – show or hide status bar

    Graph size – set graph size to one of standard sizes

    SWR – show SWR graph

    Phase – show phase graph

    Z=R+jX – show R, X, Z (series model)

    Z=R‖+jX – show R, X, Z (parallel model)

    Return loss – show return loss graph

    Time domain reflectometer – show TDR graph (see below) (AA–230 ZOOM only)

    Zoom in TDR, **Zoom out TDR** – zoom graph in the TDR mode (AA–230 ZOOM only)

    Smith chart – show Smith chart

    Set SWR circle radius – set radius of reference circle (in SWR units)

    Zoom in graph, **Zoom out graph** – zoom the vertical axis of the graph

    Info under cursor – show numerical values of various parameters (a data window) when the cursor is moved over the graph

    Show previous graph – put a graph over an old one

• Configure

    AA-xxx Analyzer – select the corresponding analyzer

    Imported data – this menu is automatically selected if
             the data was imported from a CSV or an S1P file

    COM port… – select virtual COM port number or serial
             device name, if needed (only for AA–230 ZOOM)

    Units – set metric or US units

    System impedance – set reference impedance for the system
             (usually 50 or 75 Ohm)

    Apply OSL calibration – apply calibration data to
             the current display (see below)

    Save last measured data – save calibration data (see below)

    Parameters of calibration standards – select a model or load
             the parameters (see below)

    Cable parameters – enter cable impedance, velocity factor,
             cable loss, etc.

    Transmission line options – add or subtract cable from

- **Measurement**

  Range… – select range and start measurement

  Run – start measurement in the previously selected range

  Single-point – start measurement at a single frequency

  RF on/off – turn on or off RF output (RF generator mode)

  Set frequency and amplitude – set frequency for single–point or generator mode (Note: amplitude can't be set)

  Continuous mode – restart measurement when it finishes

  Auto start – automatically run measurement
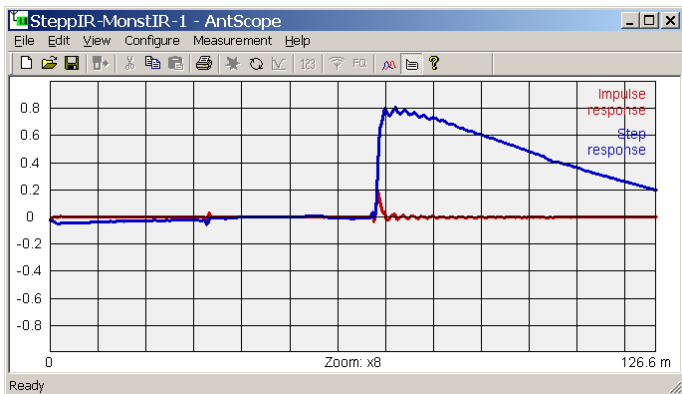
- **Help**

  About AntScope – output version number and other data

3.8. Time domain reflectometer (TDR) mode

This mode (press **F7**) displays **impulse response** and **step response** graphs which show how electromagnetic wave reflects from discontinuities in a cable. Additionally, a tool tip near the cursor shows estimated value of the impedance of a cable at the corresponding distance. This will let you know if your cable is in a good or a bad condition.

For best results, perform a scan over the full frequency range with 1000 or more points. Make sure the characteristic impedance and the velocity factor of the cable are set in the **Configure** – **Cable parameters** menu. This will let you see the exact distance to the discontinuity. For TDR measurements, it is not important if the cable ends with antenna, open circuit or short circuit.

The following screen shot was taken in the real measurement. It shows 33 meters of 50 Ohm coaxial cable, antenna switching relay, and additional 35 meters of cable ending with an HF antenna.

If the discontinuity is found, impulse response and step response graphs will not let you know the exact reason of the problem, but will help in finding its location. You could see how discontinuities of different nature affect impulse response and step response graphs by experimenting with various cables, connectors and loads.

3.9. Calibration mode

Although RigExpert analyzers are designed to provide suitable precision without any calibration, a simple "**open-short-load**" calibration method may be used to improve the result. Moreover, this method may be used to remove the effects of a cable, so accurate measurements at the far end of the cable become possible.

For this method, three calibration standards are required: an "**open**", a "**short**" and a "**load**" (usually, a 50–Ohm load). For better results, these standards should be of a good quality. Additionally, physical length of all loads should be the same.

If the user can measure parameters of calibration standards precisely (such as in a metrology laboratory), the **Configure** – **Parameters of calibration standards** – **Loaded from files** menu may be chosen. Then, parameters of all three standards should be loaded from S1P files by using the **Configure** – **Parameters of calibration standards** menu. Please notice that S1P files should contain relatively many data points (1000 or so) and should cover frequency band which is not narrower then the user expects to use with a RigExpet analyzer.

In case of ideal parameters of all three calibration standards, the **Configure** – **Parameters of calibration standards** – **Ideal models** menu should be selected.

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Doc. date: 19–Aug–2016