RigExpert®

Antenna Analyzers

Software Manual

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1. Connecting RigExpert analyzers to the computer

RigExpert antenna analyzers can be connected to a computer running Windows 2000/2003/XP/Vista/7/8, as well as Mac OS (version 10.6 or higher is recommended) and Linux operating systems.

For Windows, all necessary drivers and software are installed automatically from the supplied CD.

For Mac OS (only Intel-based Macs are supported) and Linux, please see the README file in the corresponding folder on the CD for installation instructions. You will need to install the Wine emulator for these operating systems to be able to use the analyzer software.

The latest version of the software may be found at the Downloads section of the www.rigexpert.com website.

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.

Analyzer mode:

For using programs other than LCD2Clip, place your analyzer into the "PC mode". This mode is activated automatically when the analyzer is turned on with cable connected to a USB port of the PC. Alternatively, press the ^ (up arrow) key on the analyzer after switching it on to enter the "PC mode".

See the Troubleshooting section on our website in case of a problem with connection to the computer.

2. Updating the firmware

Latest versions of firmware are available on our website and can be easily uploaded to the analyzer via USB.

Unzip the firmware update file, run the program and follow on-screen instructions. To determine the virtual COM port number under Windows, use the ListRE program (see below).

For Mac OS and Linux, please see the README file in the corresponding folder to find out how to determine the serial device name.

The whole process will take up to three minutes. For AA-200/230/230PRO/500/520 it is recommended to have batteries fully charged before performing the update. Please remove batteries from AA-30/54/170/600/1000 analyzers before updating the firmware. It is safe for the analyzer to cancel the upload process at any time and start it over.

3. ListRE program

The ListRE program is designed to show virtual COM port numbers assigned to different RigExpert products under Windows.
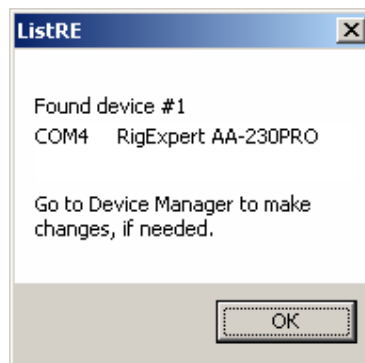

You may run this program at any time when the analyzer is connected to the PC.

For Mac OS and Linux, please see the README file in the corresponding folder to find out how to determine the serial device name.

4. LCD2Clip program

The LCD2Clip program takes screen shots of the analyzer's LCD. After starting this program, you may simultaneously press ▐F▐ and ▐6▐ on the analyzer's keypad to take a screen shot.

Center frequency, kHz

146 200

Ok – enter, **cancel** – discard
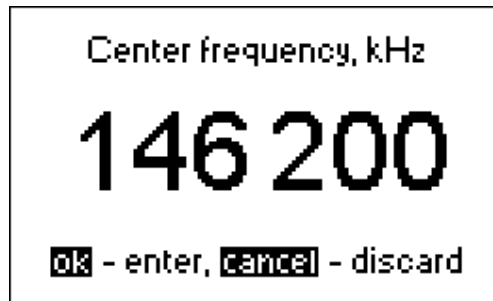
The picture is automatically placed to the clipboard so you may easily insert it into a Microsoft Word document or an e-mail message. You may also save it to file by using a graphical editor such as Paint.

Under Windows and Mac OS, just run the program and the analyzer will be automatically detected. Under Linux, please see the README file for comments about running this program.

5. FlashRWE program

The FlashRWE is a utility which helps manipulating the content of 100 graph memories of RigExpert antenna analyzers.

The functions of this program are:

- Reading graph memories from the analyzer and saving them to a file;
- Writing graph memories to the analyzer from a file;
- Erasing graph memories;
- Resetting the analyzer to restore factory settings.

FlashRWE is a command-line utility. In the Windows Start menu, select "Run" and enter "cmd.exe". A separate window with command prompt will open. Type "cd C:\Progam Files\RigExpert Antenna Analyzer\" and press Enter to change working directory to the location of the FlashRWE.

Command line parameters:

FlashRWE.exe <port number> <R|W|E|S> <filename.ext>

<port number> is a virtual serial port number;
 R, W, E or S is a command which corresponds to "Read", "Write", "Erase" or "reSet";
<filename.ext> is a file name and extension for reading from or writing to. This file may only be used by the FlashRWE utility. You cannot open it by any other program.

Examples:

FlashRWE.exe 4 R march2010.bin
>   – read memories from the analyzer (virtual COM port number is COM4) and save them to "march2010.bin";

FlashRWE.exe 5 W february2010.bin
>   – write memories to the analyzer (virtual COM port number is COM5) from "february2010.bin";

FlashRWE.exe 6 E
>   – erase graph memories (virtual COM port number is COM6);

FlashRWE.exe 7 S
>   – reset the analyzer and restore its factory settings (virtual COM port number is COM7).

Before running FlashRWE, make sure the analyzer is connected to the computer and is in the "PC mode".

Windows Vista users must notice that they are only able to write to files located inside the C:\Users*username*\ folder, if User Account Control is turned on. Alternatively, you may run cmd.exe in the "Run as Administrator" mode to avoid this restriction.

Under Mac OS, provide the serial device name instead of the serial port number, as described in the corresponding README file.

Under Linux, provide the /dev/ttyUSB port number instead of the serial port number, as described in the corresponding README file.

6. AntScope program

The main function of the AntScope program is to show measurement results on the "big screen". Additionally, it allows saving data to a file to be able to view it later or compare to new measurements.

Quick start:

1. Connect your analyzer to the PC as described in section 1 of this manual. Make sure the analyzer is in the "PC mode".
2. Run AntScope. Under Windows, the program will automatically detect the virtual COM port number as well as the analyzer type. For 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 the desired frequency range (or click "Set full range") and the 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 graphs displaying various parameters.

The screenshot below shows a typical AntScope screen:
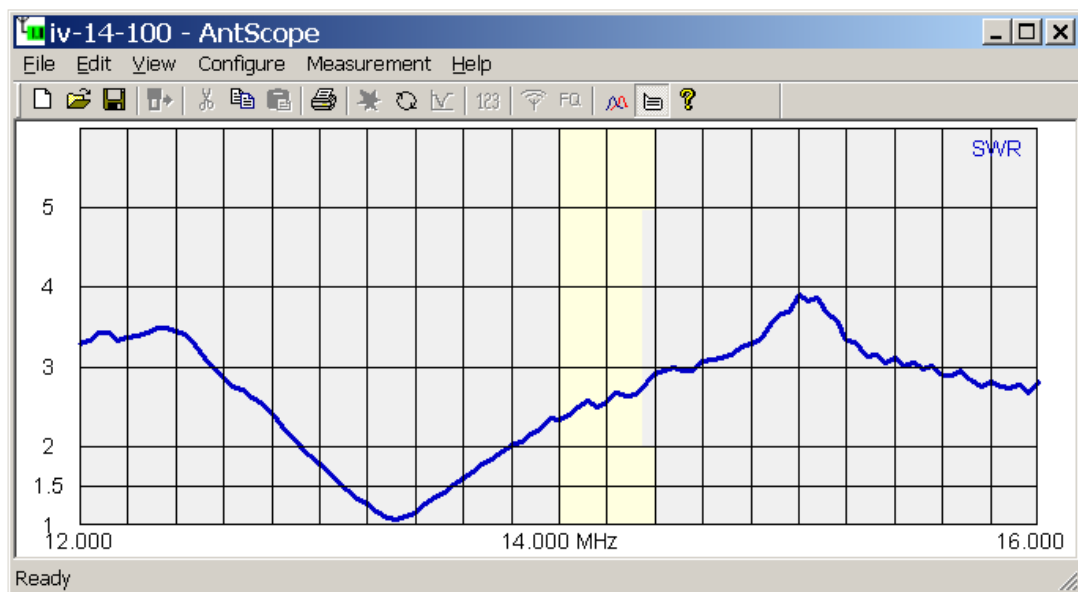
AntScope menus:

- File

    New – discard old measurement, create new
    Open… – open existing file (please select the analyzer model before opening)
    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 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
            (except for AA-30)
    Print – print current graph
    Print preview – preview printing
    Print setup… – open printer setup window
    Exit – close the program window

- Edit

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

- 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)
    Zoom in TDR, Zoom out TDR – zoom graph in the TDR mode
    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 when the
        cursor is over the graph
    Show previous graph – put a graph over an old one

AntScope menus (continued):

- 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
  - Units – set metric or US units
  - System impedance – set reference impedance for the system (usually 50 or 75 Ohm)
  - Connector parameters – set connector parameters (AA-200, AA-230 and AA-230PRO)
  - Enable Anti-RF – turn on or off the Anti-RF feature (AA-500 and AA-520 only)
  - Use calibration data – apply calibration data to the current display (see below)
  - Save calibration – save calibration data (see below)
  - Cable parameters – enter cable impedance, velocity factor, cable loss, etc.
  - Transmission line options – add or subtract cable from measurement results
    (except for AA-500 and AA-520)

- Measurement
  - Range… – select range and start measurement
  - Run – start measurement in a 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,
    set amplitude (AA-200, AA-230 and AA-230PRO)
  - Continuous mode – restart measurement when it finishes
  - Auto start – automatically run measurement

- Help
  - Software manual – display this file
  - About AntScope – output version number and other data

# 7. Time domain reflectometer (TDR) mode

(RigExpert AA-170/200/230/230PRO/600/1000)

This mode (press F7) displays impulse response and step response graphs which show how electromagnetic wave reflects from discontinuities in a cable. Additionally, a tooltip 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 are set in the Configure – 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 screenshot 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.
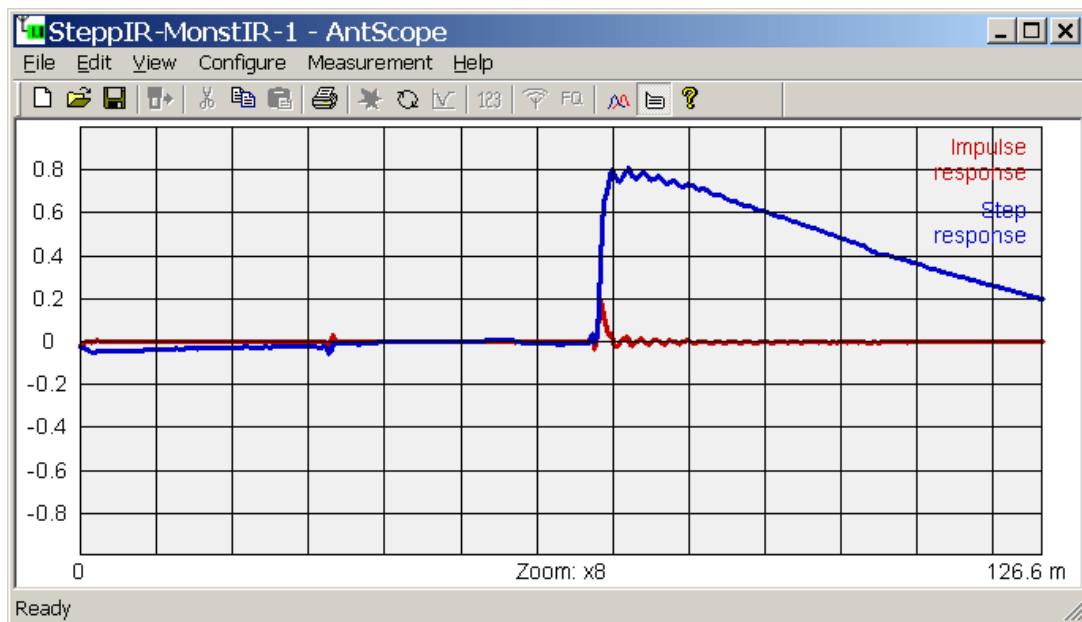
If the discontinuity is found, impulse response and step response graphs will not let you know the exact reason of the problem, but will help in finding its location. You could see how discontinuities of different nature affect impulse response and step response graphs by experimenting with various cables, connectors and loads.

8. Calibration mode

(All analyzers, except RigExpert AA-500 and AA-520)

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.

In the AntScope, select a required measurement range and perform a scan with one of these loads connected to the analyzer or even to the far end of the cable. Use "Save calibration" from the Configure menu to save the result (the data is stored as S1P files in the AntScope folder). When all three data files are saved, the "Use calibration data" menu item becomes accessible in the Configure menu. If this menu item is checked, calibration will be applied to next measurements.

Once the calibration is made, it remains valid until a frequency range (or a number of measurement points) is changed in the AntScope.

Please notice that calibration is only applied to data on the screen, so using the Save command from the File menu will save "raw" data without calibration. Using the "Export to" command will apply calibration to the exported data.