



# RigExpert AA-30.Zero DIY HF Antenna Analyzer

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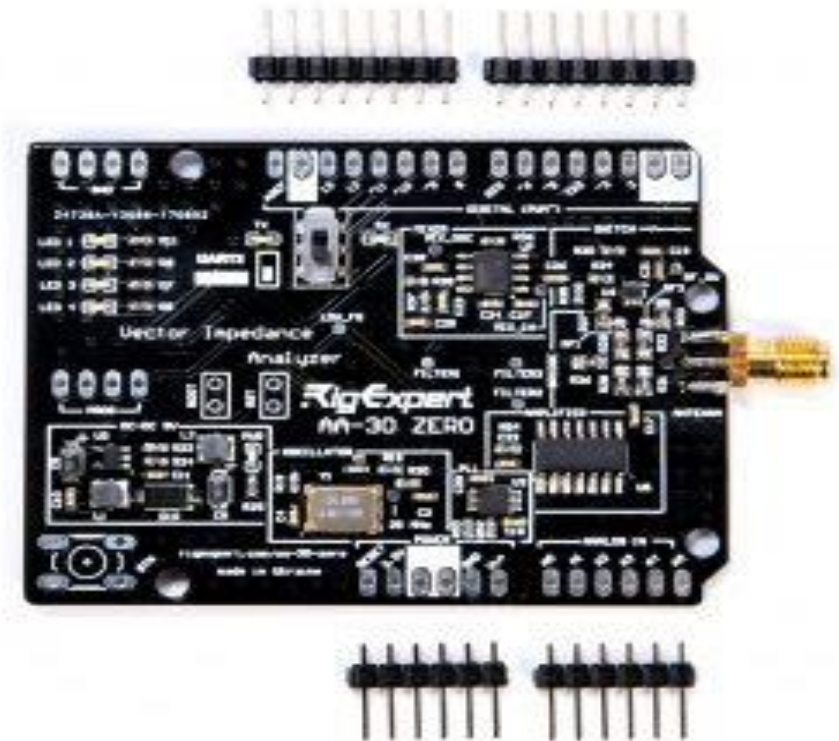
AMATEUR EXTRA, CHEROKEE AMATEUR RADIO SOCIETY

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# DIY Antenna HF Analyzer AA-30.Zero

- RigExpert offers a DIY version of their AA-30 HF Antenna Analyzer called AA-30.Zero (\$75 from [GigaParts](#), HRO, Ebay, others)
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- It is a standard AA-30 HF analyzer but without enclosure, LCD display and keypad.
- AA-30.ZERO gives radio amateurs a measuring tool that can be easily integrated into their own projects.
- It has everything necessary on board, so user can connect .ZERO to the PC (through USB-to-RS232 adaptor) and perform all the usual set of laboratory measurements.
- .ZERO works well with RigExpert AntScope software\*

\*An error message appears at bootup indicating old firmware but this is normal.



# AA-30.Zero Specifications

## Specifications

**Frequency range:** 0.06 to 30 MHz  
**Frequency entry:** 1 Hz resolution  
Measurement for 25, 50, 75 and 100-Ohm systems

**Housing:** none  
**Display:** 4 LED  
**Power supply:** external  
**Communication interface:** UART

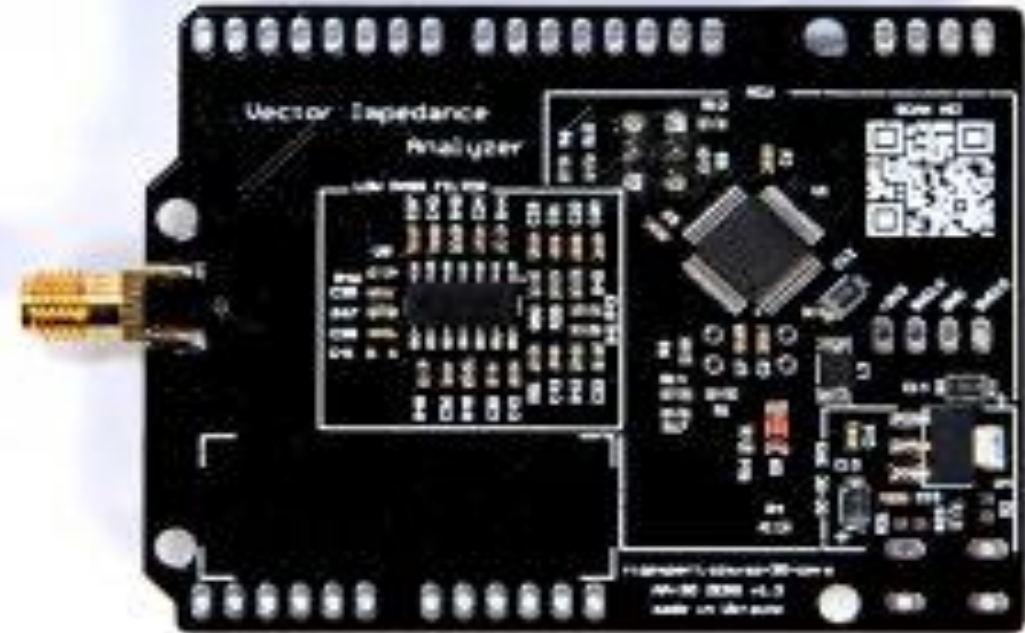
**SWR measurement range:** 1 to 100 in numerical mode,  
**R and X range:** 0...10000, -10000...10000 in numerical mode,  
**RF output**

- Connector type: SMA, included, not mounted
- Output signal shape: square, 0.06 to 30 MHz
- Output power: +13 dBm (at 50 Ohm load)

**Power**

- Supply: External 5V
- Current consumption (max) 150 mA

**General data**  
Dimensions (W x H x D) 55 mm x 69 mm x 5 mm (PCB only w/o c  
(2.1 in x 2.7 in x 0.2 in)  
Weight 310 g (10.9 Oz) w/o connectors  
Operating temperature 0...40 °C (32...104 °F)



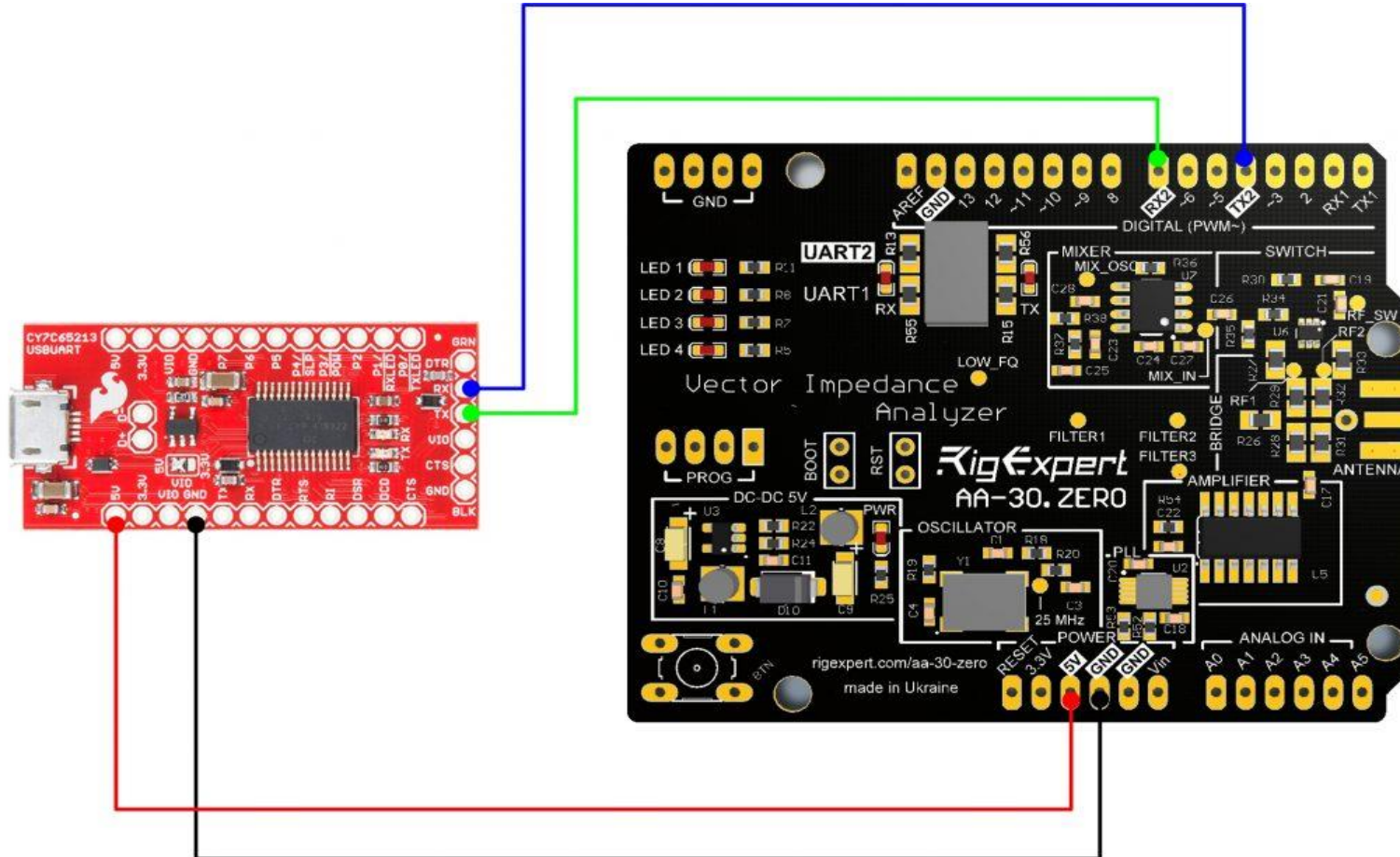
# That's nice, so what's in it for me?

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- AA-30.Zero is compatible with Arduino Uno as a shield. Uses Arduino for I/O (No UART required)
- AA-30.Zero can be connected via UART to tablet or laptop for portable operation.
- Free Windows AntScope software download
- Example Java Processing App Available
- Powered by USB (No Power Supply/Battery required)
- When paired with Arduino, can become a standalone SWR measuring instrument to auto adjust antennas, or remote measurement
- Write your own C++ (Arduino) or Java (Processing Environment) Application



# UART to AA-30.Zero Standalone Example

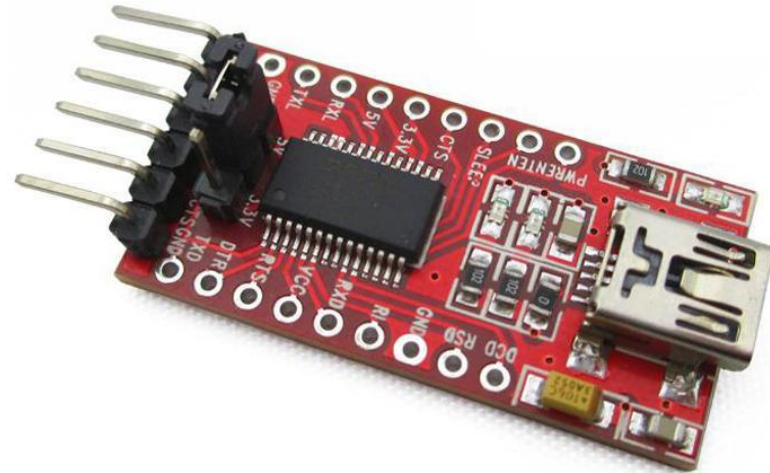




# FTDI USB to Serial Interface

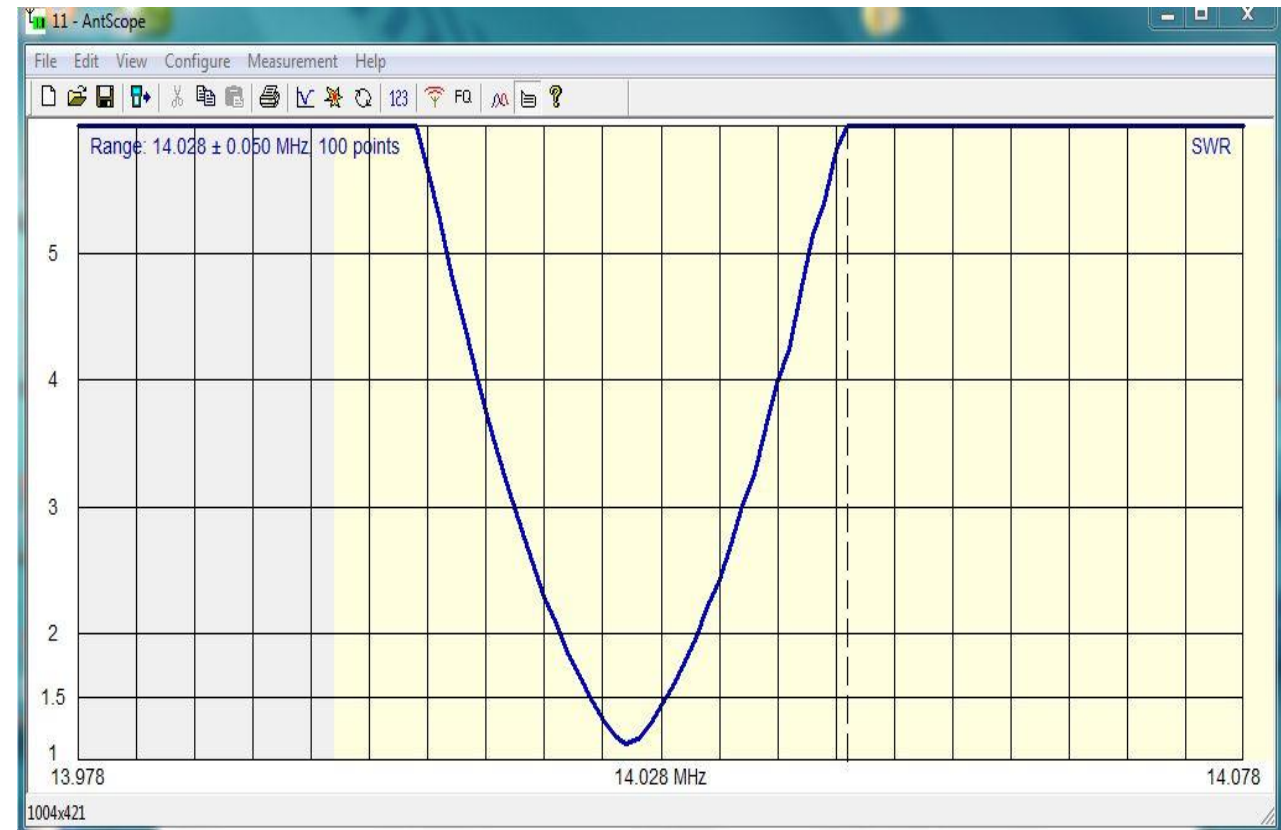
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- FTDI Driver works well with Windows (Windows 10 finds correct driver)
- Connect 4 wires (Vcc, GND, TX & RX) and you are ready to roll. (DIY at it's simplest)
- Readily available Arduino Kit jumper wires provide easy hookup.
- 3.3 or 5 Volt Operation or powered by USB
- Solder posts to it or use existing posts



# AntScope Software (Windows)

- Shows SWR as function of frequency
- Can continuously display SWR measurement
- Configurable for center frequency or frequency limits
- Configurable for number of sample data points
- Displays Phase
- Displays Return Loss
- Displays  $Z=R+jX$
- Displays  $Z=R || +jX$
- Time Domain Reflectometer (TDR) Function
- Compare Stored Graphs



# Parts List & Approximate Cost

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Component	Price	Source
AA-30.Zero	\$75 (Was originally \$65)	Gigaparts
UUART (FTDI Osepp recommended)	\$10	Fry's or Ebay
Wire Jumpers (4)	\$1	Ebay
UHF Female to SMA Male Coax Cable Adapter	\$3	Ebay, HRO, Gigaparts
USB Cable	\$5	Varies with PC/Tablet etc.
Cigar Box	\$2	Cigar Bar Woodstock



# Important AA-30.Zero Commands

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Command	Description	Response
ver	returns analyzer type and firmware version	AA-30 ZERO XXX
fqXXXXXXXX	set center frequency to XXXXXXXXXX Hz	OK
swXXXXXXXX	set sweep range to XXXXXXXXXX Hz	OK
frxNNNN	perform NNNN measurements in the specified range	output frequency (MHz), R and X for every measurement

# Reference and Example Output

Frequency	Resistance (R)	Reactance (x)
14.10725	49.23778	-0.7773
14.1073	49.36485	-0.82939
14.10735	49.49734	-0.678
14.1074	49.55741	-0.72593
14.10745	49.52387	-0.80795
14.1075	49.60099	-0.91862
14.10755	49.66671	-1.11132
14.1076	49.66314	-0.96065
14.10765	49.77251	-0.97854
14.1077	49.93838	-0.92658
14.10775	49.95951	-1.0881
14.1078	50.08454	-1.00724
14.10785	50.12773	-1.12341
14.1079	50.22975	-1.22525
14.10795	50.16902	-1.31194
14.108	50.26614	-1.30862
14.10805	50.46008	-1.35831
14.1081	50.39478	-1.24734
14.10815	50.56317	-1.3179
14.1082	50.59253	-1.53303
14.10825	50.76592	-1.48949

## SWR Calculation

CASE 1. R and X known.

$$S = \frac{1 + r^2 + x^2}{2r} + \sqrt{\left(\frac{1 + r^2 + x^2}{2r}\right)^2 - 1}$$

# RigExpert AA-30.Zero Conclusions

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The AA-30.Zero is a single-port vector network analyzer (VNA) that provides signed, complex impedance measurements of RF loads from 100 kHz to 30 MHz. It is perfect for a simple DIY project that will provide Amateur Radio Operators an antenna analyzer that covers 100 kHz to 30 MHz. It is an accurate, easy-to-use instrument for hams primarily interested in HF antenna and component analysis. When paired with an Arduino and some programming can provide an inexpensive dedicated SWR measuring instrument for antenna tuning, and remote operation.

**All this for an investment of under \$100 and can be fully completed in less than one evening!**

# RigExpert AA-30.Zero Links

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AntScope Software;

[AntScope Software](#)

RigExpert Manuals;

[AA-30](#) User Guide & [AA-30.Zero Schematics](#)

[Software Manual](#) & [Programmers Reference](#)

[Getting Started with AA-30.Zero](#)

[GitHub](#) link with C++ and Processing Sample Code

[Arduino IDE Programming Environment](#) (C++)

[Processing Environment](#) (JAVA)

[QST Article](#) Review with full Specs (AA-30)

