

# *ANTENNA ANALYZER*

# *MAX6*



## *USER MANUAL*

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## **Introduction**

Whenever phrase MAX 6 is used in manual, it concerns both MAX6 180MHz and MAX6 500MHz.

## Equipment



The set includes

- Analyzer
- Remote control
- BNC/UC adapter
- Batteries charger
- USB cable
- SD card with drivers and exemplary software
- Case

## Purpose

Analyzer MAX6 are products designed and made by radioamateurs, which means that they are perfectly optimized for this kind of people. Because of their usability, they are also suitable for measurement in professional radio workshops as in CB services.

## Technical specifications

Output impedance of analyzer - 50 ohms

Input impedance of RFprobe - 50 ohms  
 A useful range of the analyzer 1-180 MHz (or 500MHz)  
 A useful range of wobulator 1-180 MHz (or 500MHz)  
 Measuring range SWR up to 1:1.04  
 Measuring range of impedance 0-1000 ohms for HF+50 MHz,  
 Measuring range of impedance 0-400 ohms for VHF/UHF  
 Measuring range of phase |0-180| degrees  
 Output power ~ 20mW (10mW 500MHz)  
 Dynamics of wobulator 80dB  
 MAX Power measurement: 100 mW 20dBm  
 Powersupply 2x3.7V 1250 mAh- Li-Ion  
 Charging - stabilized power supply 12V +-20%  
 Working time of battery - up to 4 hours (up to 1.5h - 500MHz)  
 interface to computer - USB 1.0 or 2.0

### Appearance:

Keyboard  
 LCD screen  
 Activation and deactivation of power  
 LED indicator of activated power  
 Indicator of battery charger  
 IR remote control reader  
 BNC input/output of measuring signal of antennas and generator  
 BNC measurement output of power meter and wobulator  
 DC 5.5/2.1mm connector to charging battery +12V (possibility of external AC with 7-10V)  
 USB port type B (printer)  
 PS2/6pin connector to connect external ACC devices.  
 SD/MMC card connector  
 RESET button (in hole)



## Structure

MAX6 are build in SMD technology. They are based on newest measurement technology of company Analog Device and processor technique of company ATMEL. Components which are used in MAX6 are high quality. Because of that, you can obtain high accuracy of measurements. At the same time, simple design causes that less experienced users can build and calibrate above mentioned analyzators



## Features

VNA measurement of SWR antennas standing wave ratio

Impedance measurement of antenna at power place.

The length of the line measurement (transmission line damage diagnosis.)

Line impedance measurement

RS resistance

XS reactance measurement

PHS phase measurement

WOB wobulator

AM power measurement and AM modulation depth

Save of measurements at SD card

Summary of measurements in table – all parameters mentioned above are written in numbers for beggining, middle and end of measurement range

## Cooperation with PC

Analizers MAX6 are equipped with USB connector to be able to connect to PC. Drivers allowing communication of FTDI company, can be downloaded from the internet site [www.ftdichip.com](http://www.ftdichip.com) .

Analizers cooperate with most of software to VNA.

Software dedicated for our analizers is VNA306, IGVNA, Z-PLOT, VNA PA7N dla WINDOWS,

vnaJ written in JAVA for WINDOWS, LINUX and I-OS APPLE and also software called MAX6 from GooglePlay on ANDROID.

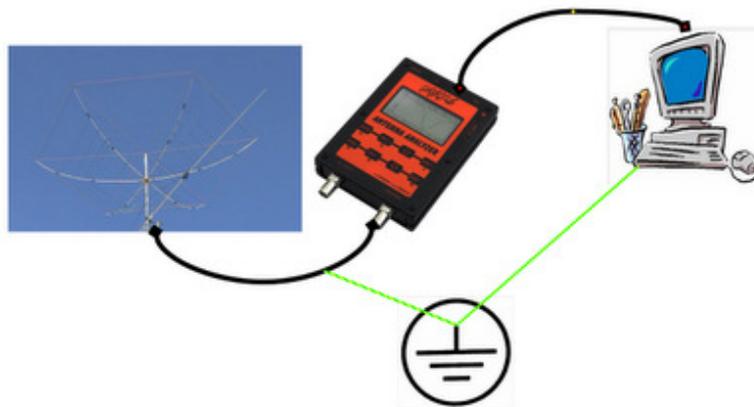
After installing software you must check what number of serial port was assigned to our device and set it in program as instruction says.

Method of using programs to operate VNA is included in manual of this program.

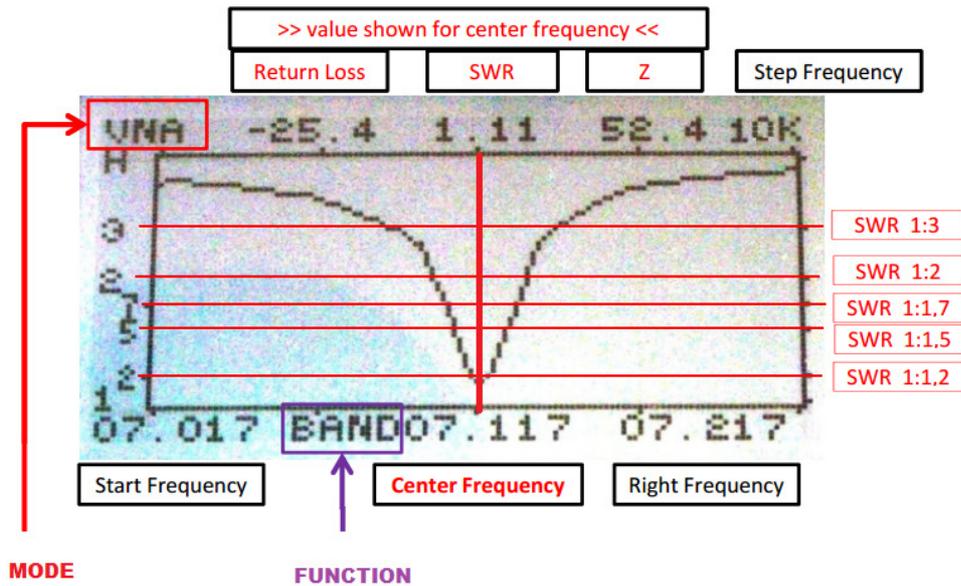
### **IMPORTANT SAFETY INFO !!**

**Always discharge antenna before measure, just short center pin with shield**

**Antenna shield and PC ground must be connected together before measure.**



## Information displayed on LCD



Information about displayed value above plot is available after long press MODE button. Pressing and hold MODE button we change backlit.... in this same time we see help about LCD top line... We don't need remember this ;-)

## How to use MAX6 - basic info

### Turning ON/OFF analyzer:

Turning ON – hold button POWER for 2 seconds until information about battery level is shown on screen, release POWER button.

Turning OFF – hold button POWER for 3 seconds until inscription "RELEASE POWER BUTON..." is shown on screen then release POWER button.

### Reset procedure

If, during work of analyzer freeze/hang up will appear - analyzer does not react on commands from keyboard or on screen appear random signs and also analyzer can't be turned off with POWER button. You need to use thin filament or pin to push **RESET** button which is placed in small hole on the side of cover, near SD slot.

### Measurement of antennas in VNA mode

Connect the antenna to the input ANTENNA/OUT

To select the desired band use buttons BAND (+/-)

To change frequency measurement (center) use buttons FREQ (+/-)

Sequentially press the wheel to select the type of retuning with button FUNC

ZOOM – Zoom in, zoom out the preview range,

LEFT – change the frequency of the low F,

RIGHT – change the frequency of the high F,

STEP – change of pace retuning

After setting frequency and span, look at characteristic of antenna and read SWR and Z for middle frequency.

Rest parameters after changing measuring window with MODE button.

### Measurements of filters

Connect the measured filter or circuit to the ANTENNA input and RF INPUT

Press the MODE key to select the measuring window WOB

Use the BAND (+ / -) to select the desired band

To change frequency measurement (center) use buttons FREQ (+/-)

Sequentially press the wheel to select the type of retuning with button FUNC

ZOOM – Zoom in, zoom out the preview range,

LEFT – change the frequency of the low F,

RIGHT – change the frequency of the high F,

STEP – change of pace retuning

After setting selected frequency and span you can see characteristic of filter.

### Measurements of attenuation

Press the MODE key to select the measuring window WOB

Use the BAND (+ / -) to select the desired band

To change frequency measurement (center) use buttons FREQ (+/-)

Sequentially press the wheel to select the type of retuning with button FUNC

ZOOM – Zoom in, zoom out the preview range,

LEFT – change the frequency of the low F,

RIGHT – change the frequency of the high F,

STEP – change of pace retuning

To input ANTENNA and RF INPUT connect BAYPAS - short cable

To ANTENNA and RF INPUT connect short cable terminated with BNC.

Read signal strength for compact input/output in dBm.

Then, after disconnecting BAYPAS, you connect measured section of line, read value of the signal in dBm i subtract from the previously read values for compact input/output. The calculated difference is the attenuation measured line in dB.

## Measurements RF power

### **WARNING !!!!**

**ANALYZER MAX6 HAS GOT MEASURING INPUT  
WITH MAXIMUM POWER INPUT LIMIT  
20dBm or 100mW.**

Connecting directly device with a higher power may cause damage to analyzer. To measure higher powers you have to use suitable damper with load corresponding connected power. Pressing the MODE key to select the measuring window WOB or AM  
To input RF INPUT connect signal source  
Read value of the connected signal and if needed take into account the size of the connected damper adding its value.

## Charging batteries of analyzer

In analyzers MAX6 there are used two lithium-ion batteries 3.6V of capacity 1200-1500mAh. You should be charging them using charger provided set 12v. Time of charging is about 6-8 hours - until LED diode(charging indicator) is completely extinguished.

### **WARNING !!!**

**You should not store analyzer with no charged batteries**

**You should not use added charger as adapter during normal work of analyzer in case of discharged batteries. During charging batteries it's not allowed to turn on analyzer.**

**Work of analyzer from outer source of voltage 8-10.5V 0.5A for MAX6 180MHz and 8-9.5V 1A for MAX6 500MHz is allowed.**

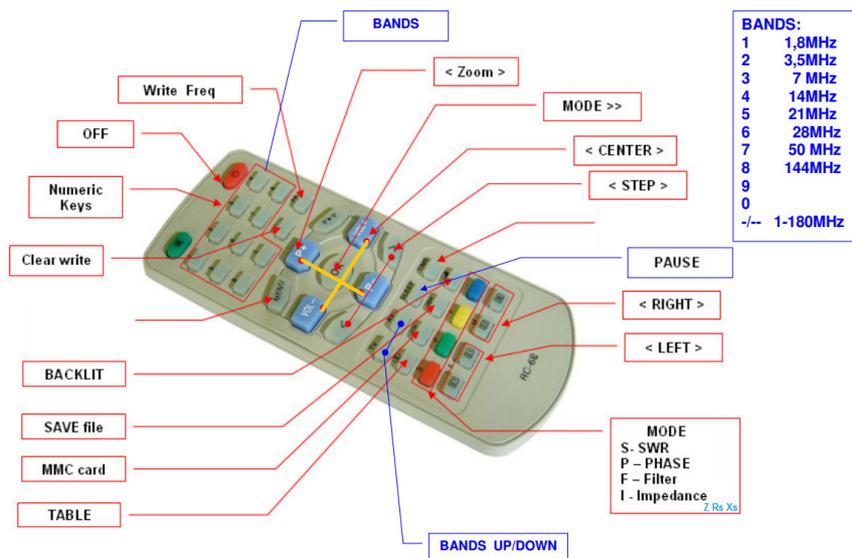
## Turning on Bluetooth transmission (optional)



Some models of MAX6, for clients wish, are equipped with bluetooth module. To turn transmission ON, you have to normally turn analyzer ON holding POWER button and during initialization, after window with level of charged battery is shown, you have to press and hold BAND+ button, until message about concatenating module is shown on window. Next, in your device (tablet, telephone) with which you want to connect analyzer you have to turn ON option to look for bluetooth devices and after finding, connect it. If code PIN is needed enter 1234

## Remote control

Operating analyzer with using buttons, may be problematic for some users, that's why analyzers MAX6 have remote controls – known as external keyboard. Description of the functions assigned to keys below:



## Uploading new software

Sometimes, there is published new software for processor Atmega128 used in MAX6. To update software, you should contact author of software by e-mail (sp3swj@gmail.com) giving him a serial number of analyzer(can be read on screen during turning analyzer ON).

As reply, you will receive file of type HEX, which should be uploaded on SD card, after turning its name to max6.hex

Then, you have to put SD card in MAX6, holding button FUNC, you press POWER and after a while process of uploading software begins. You have to wait until analyzer turns OFF by itself (screen goes off and the speaker is no longer showing activity)