

OWLRC RC ANTENNA SWR METER

User Manual

Ver 1.2



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Introduction

This "RC Hobby" grade SWR METER, measures the forward & reflected waves to determine the working efficiency of an antenna. The meter can be used to run a full scan from 5.645Ghz to 5.945Ghz to indicate the working efficiency (SWR Value) and Center Frequency of an antenna. An optimized antenna will significantly expand the antenna working range and minimize signal loss in complex terrain. When the SWR value is 1.0, means high frequency energy has been 100% transmitted, without energy reflection loss.

How it works

The 5.8Ghz coupler will pick up the signal from the internal transmitter and convert it to a forward voltage and reversed voltage, then send them to the main board for analyzing and mapping the SWR charts.



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Background

We started this project in 2017, at beginning we wanted to DIY good antennas to maximizing VTX range and quality , but we couldn't afford a \$20000-30000 vector network analysis for recreational purpose, so we decided to build a simple device to check one of important indicators of an antennas: **SWR**

Antennas affects video transmission range and quality significantly. Without the full testing from million dollars equipments, it's impossible to get a full technical specification of antennas. Thus, SWR measurement is the most simple and efficient way to examine an antenna, at least it shows us how many power has been transmitted or reflected.

Although we did a lots of efforts to make it accurate as possible, but it's still a hobby toy, it's not design to compete professional devices, however it shall be qualified for hobby or recreation purpose, such as DIY or tuning antennas.

Specification

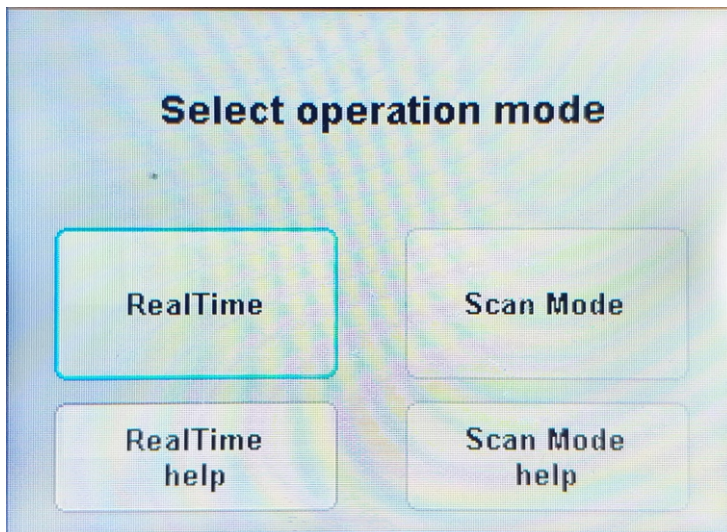
- Frequency range: 5.645Ghz to 5.945Ghz
- Power input: DC 12v or 3S Li-Po only
- Screen: TFT 2.8" touch screen
- Antenna Connector: SMA Female
- Internal signal transmitter: 5.645Ghz to 5.945Ghz, 200mw

Accessories

- DC 5.5 x 2.3 mm to XT60 adaptor
- Quick guide
- SMA to RP-SMA; SMA to IPEX UFL; SMA to MMCX (**Optional**)



Main Menu



RealTime: Realtime mode allows to check SWR using internal transmitter from channel to channel, there are 8 available channels on Real-time mode.

Scan Mode : Scan mode is used to run a full range of available frequencies from 5.645Ghz to 5.945Ghz and mapping a SWR charts for antennas.

- **Activate internal transmitter for 2-3 mins warming up to achieve more accuracy result**



Do not activate the device without an antenna

The device may create interference to video feed when activated

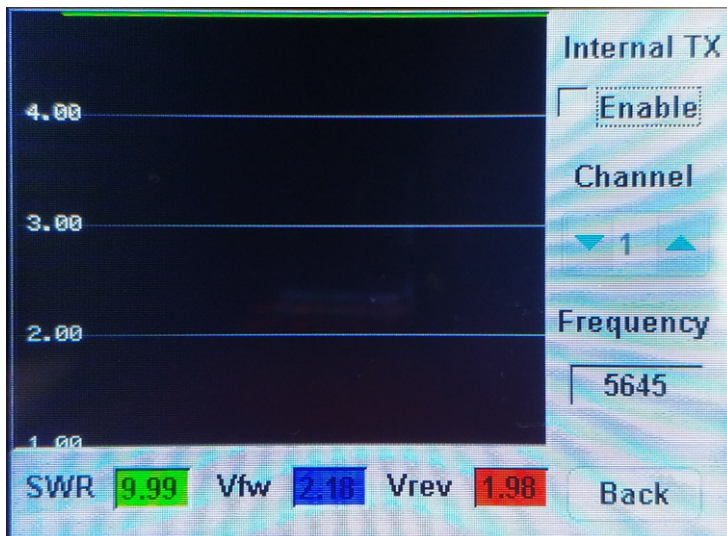


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RealTime



Realtime mode allows to check SWR using external(no longer support) or internal transmitter (switchable with Enable check box).

When enabled - Channel is selected with spin box. Vfw indicates forward measured value and Vrev indicates returned value. SWR is calculated according to Vfw and Vrev values. Graph indicates change of value in real-time.

SIG indicates is SWR value shows no signal is detected.

ERR shows error condition if Vrev is more than Vfw.

- **Activate internal transmitter for 2-3 mins warming up to achieve more accuracy result**



Do not activate the device without an antenna

The device may create interference to video feed when activated

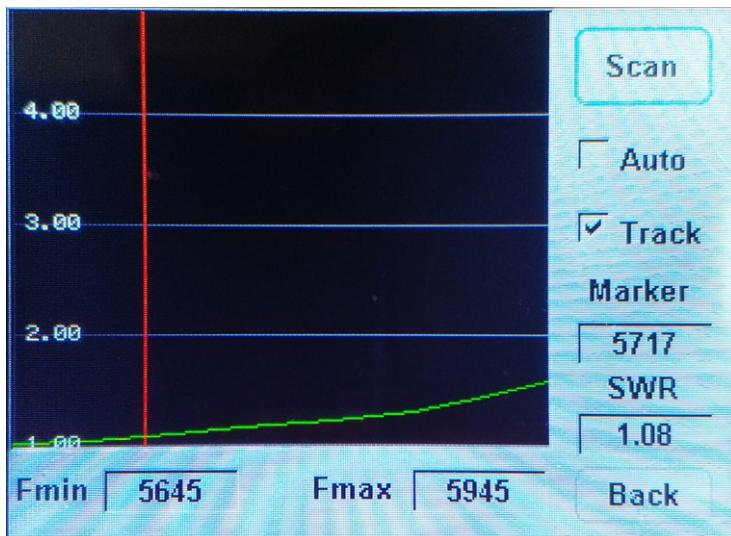


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Scan Mode



Scan mode is used to check SWR on full range of available frequencies with internal transmitter.

Scan button runs scan. Auto check box allows to run in continuous cycling mode. Scan position shown with yellow marker. Red marker can be moved with touch on graph. Frequency and SWR will be indicated on the right. Track check box allows to auto-detect minimal SWR value and will move marker there as checked or on scan end.

- **Activate internal transmitter for 2-3 mins warming up to achieve more accuracy result**



Do not activate the device without an antenna

The device may create interference to video feed when activated



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Testing Antennas

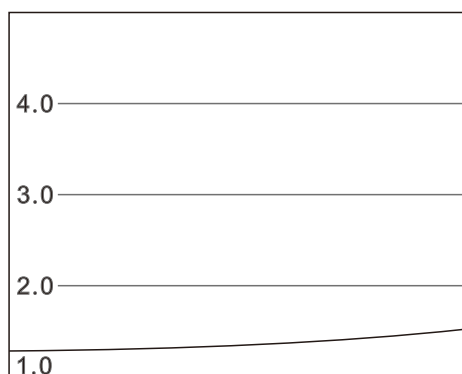
Preparation:

- Reliable power source. Power the device with a DC 12v adaptor is recommended
- Keep the surrounding area clean and no obstacle during the test. especially keep it away from high reflection object such as coils, metal materials or any magnetic items.
- Examine the SMA connector and make sure its clean and not touched to the side metal plate.

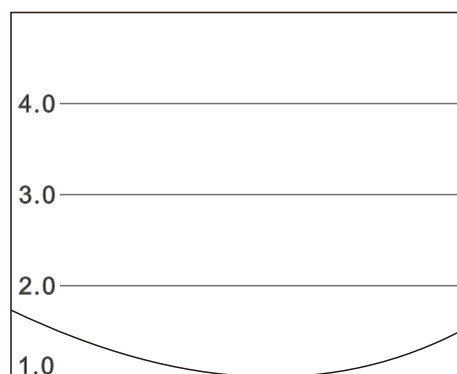
Ideally, the antenna should work at 1.0 SWR, it means all signal power been transmitted without single loss. In reality, there is always some loss on an antenna. High frequency antennas requires a very high building precision (0.1mm accuracy for example) and very sensitive to building materials even the solder you use. Some of well designed antennas will have larger tolerance when you building them, such as Pagoda Patch.

In most of case, when you testing some qualified antennas, commonly you will get this kind of results. (drawing below)

However some antennas shows "too perfect" SWR value, this is not because of bad accuracy, but it's from the limitation on components we used, the testing results is tend to offer a reference value, not an absolute value. As a hobby grade device, it's hardly to get an absolute value, keep the SWR value low as possible is the key for antenna tuning.



Antennas in this pattern adapts most of frequency. Good for multi-flier.



Antennas in this pattern works on only few frequencies. Good for fixed-channel flying.



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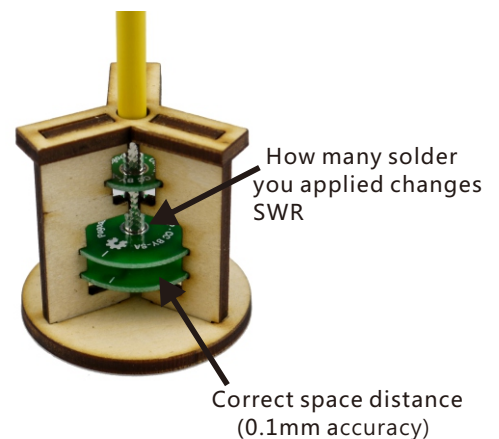
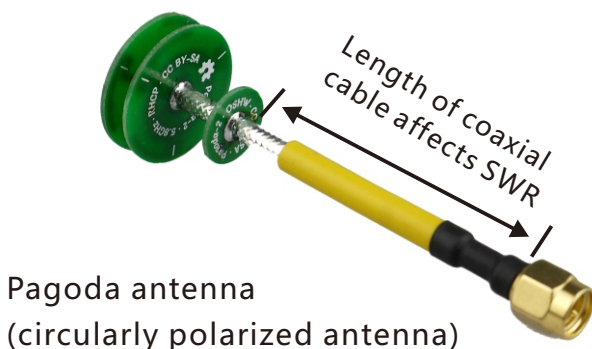
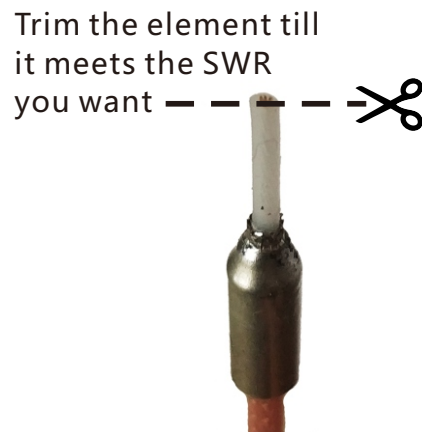
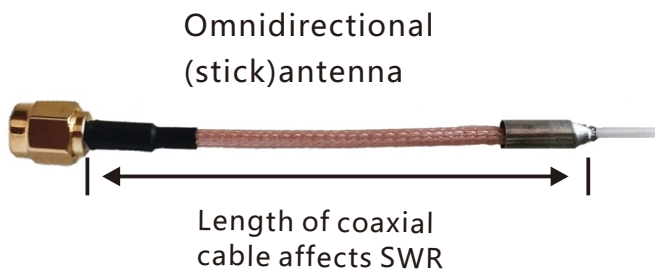
Tunning/Building Antennas

Preparation:

- Prepare a suitable testing environment for SWR meter (refer last page)
- High quality coaxial cable, high quality solder and high quality SMA connector are necessary.
- Proved or well calculated antenna date and building plan.

There are many different antenna designs but only few are suitable for RC purpose, such as Pagoda antenna, clover(mushroom)antenna, omnidirectional (stick)antenna...etc. omnidirectional antenna is good for open areas and circularly polarized antenna is good for multipath environments.

Here are two examples how to tuning omni and polarized antennas.



References Information

Choice of Antennas: we highly recommended an omni antenna (includes polarized antennas) + patch antenna combination. This can cover close and long range flying on most of circumstances.

Clover/Pagoda antenna: Good gain, perfect radiation, no dead zone. But easy to get damaged after crashes .

Patch antenna: Excellent gain, narrow radiation pattern but good for long range flying.

For receiver: Clover (circularly polarized) antenna + Patch antenna is suggested.

For Transmitter:

a. Stick antenna is good for Racing, gate or open field with no obstacles.

b. Clover (CP) antenna is good for Freestyle, woods or any complex terrain.

c. Stick/patch is good for aerial photo, long range flying.

Caution: SMA to RP-SMA/UFL/MMCX adapter will affect the SWR. Actually any kind of adapter will slightly changed the SWR.

Support

For repairing or after-sale service, please contact local dealers or retailers. If there is a problem to get assistant from them, please do not hesitate to contact us at : owlrc@owl-rc.com

Or our Facebook group:

facebook.com/groups/206020743301458/

For more information, please visit our website:

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