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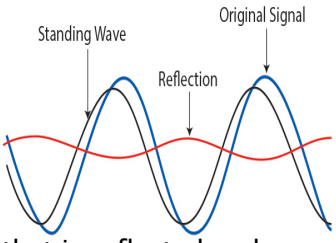
A look at SWR with MW0JWP

SWR, (Standing Wave Ratio).



SWR is defined as the ratio of the amplitude of the standing wave (unwanted) in the maximum to the amplitude at the minimum along the transmission line. SWR characterizes the degree of matching of the loading Wi-Fi antenna and the feeder (coaxial cable or feeding waveguide). Sometimes SWR is given for matching the output of the wireless Wi-Fi Access point and it's feeder.

In practice, there always exists some part of the transmitted energy that is reflected and returned back to the transmitter. Too much reflected energy degrades the operation of the wireless transmitter or can even damage it.

Typically, the SWR is perceived from the point of view of the maximum and minimum alternating voltage along the coaxial line, which is called the ratio of the standing voltage wave or VSWR. For example, the value of the VSWR 1.2: 1 means the RF voltage due to standing waves along the transmission line, reaching a peak value of 1.2 times greater than the minimum RF voltage along this cable. The SWR can also be defined as the ratio of the maximal amplitude to the minimal amplitude of the electric field strength, magnetic field strength or currents of the power line. These relationships could be identical If we are neglecting the loss of the transmission line itself.

When a reflected wave appears, the SWR increases in direct proportion to the degree of feeder and load mismatch. In practice, the Voltage Standing Wave Ratio (VSWR) is more often used. This parameter must be specified in the technical requirements for the transmitting device. In addition, there are standards for the maximum permissible level of SWR.

The SWR is the inverse of the traveling wave ratio (TWR).

With poor load match, standing waves appear in the cable, which worsen the work of Wi-Fi equipment as a result of:

- reduces the efficiency of the feeder, and, therefore, the overall efficiency of the transmitter; the real sensitivity of the receiver decreases;

- reduces maximum power that can be brought to the antenna-feeder device;

- matching of the transmitter and receiver with the antenna-feeder device is difficult.

But, it can be concluded that the existing antenna-feeder device will work much better if the SWR is reduced to 1 only after comparing its characteristics with the existing equipment with SWR and SWR = 1.

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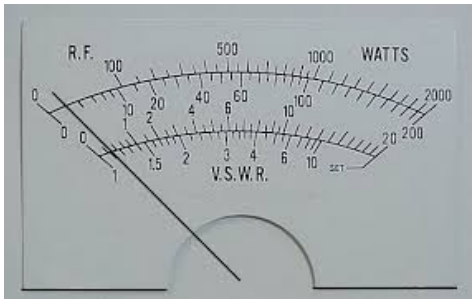
To measure the standing wave ratio, special measuring instruments called the SWR meters are used. Since the SWR is a coefficient of the load impedance relative to the characteristic impedance of the transmission line used (which together determines the reflection coefficient), this SWR meter can only interpret the impedance that it sees in terms of SWR if it was designed for this specific impedance. In practice, most of the transmission lines used in modern applications are coaxial cables with a resistance of 50 or 75 Ohms, so most SWRs correspond to one of them.



How to Correctly Use an SWR Meter:

If you want to maximise your radio antenna's performance, you'll need to tune it using an appropriate SWR meter. An SWR meter helps ensure clear transmission and can even detect significant issues with your radio.

However, understanding SWR meter readings can be pretty tricky. To make life easier, I've created this neat little guide on using an SWR meter so that you can get the most out of your antenna.

Continue reading below to learn what an SWR meter is, why you need one, and how to use it correctly.

1) Make Sure You're at Least 6 Meters Away From Any Structures

If you want your reading to be as accurate as possible, you need to ensure there isn't anything obstructing your signal. Buildings, trees, or other objects may prevent the signal from reaching your antenna and cause your SWR reading to be false.

Try to find an open field or parking space to use when conducting your test. Also, make sure that there's nobody in the way if you have someone within your vicinity.

Furthermore, don't test in an enclosed area like a parking garage or basement, as the walls can distort the signals.

2) Disconnect Your Coaxial Cables and Antenna From Your Radio

You'll find both the antenna and coaxial cables connected to the back of your setup. Unscrew the cables and remove them from the ports before starting your test. Removing the antenna allows you to test the SWR directly between the antenna and the transmitter.

Some cables look similar, and mixing them up can cause malfunctions. Make sure to read through the manual so that you know which is which. You can also consider adding a label so you'll see each component's cable in the future.

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3) Connect the Coaxial Cable to the Transmitter Port on the SWR Meter

Every standard SWR meter has a transmitter port either on the back or side of the device. You should notice an “XMIT” or “transmitter” marking next to the appropriate port. Connect your coaxial cable to the port and rotate it until it's firmly in place.

Some SWR meters come with built-in connecting ports. In that case, you'll need to use those. It's also important to note that some CB radio manufacturers refer to the coaxial cable as the “jumper lead”.

4) Insert the Antenna Cable into the SWR Meter

Next, you need to plug your antenna into the SWR meter. You'll see that the antenna port is marked either “antenna” or “ANT”. Insert it into the appropriate port the same way you did with the coaxial cable. Make sure that it's plugged in securely.

This stage is also a good time to double-check that you've plugged everything into the appropriate port. If not, your readings will be unreliable, and you'll need to start the test over.

5) Turn on the SWR Meter

Note: Please note that not all SWR meters require power. Basic SWR meters do not light up and do not have an on/off switch.

Find the power button on your meter and activate it. Typical meters have a power button or switch located right on the face of the device. If not, check the back or sides of the device. You should notice the meter's display light up upon activation.

Older meters come with a “Function” button, which works as a power switch. If, for some reason, you press the wrong button, turn the device on and off to restore it to its default settings.

6) Calibrate the Meter (Analogue Devices)

If you're using an analogue meter, you'll need to calibrate it manually. You can do so by turning the calibration dial. Keep turning the dial clockwise until the arrow on the display reaches all the way to the right and stops moving. Once calibrated, you can start using the meter as soon as you turn it on.

The basic SWR meters will have a switch with FWD and REF. For these SWR meters put the switch to the FWD position, then key the transceiver turning the rotary controller until the needle is in the set position, then put the switch to the REF position for the SWR reading.