

Marine Counterpoise (Ground Plane) Basics

Counterpoise: A force or influence that balances or equally counteracts another.

In radio, the counterpoise is also called the “ground plane”. It is unique to radio in that this isn’t an electrical ground, but instead it is an RF (Radio Frequency) ground which equally balances the antenna and provides a “springboard” for the RF energy that the signal uses to radiate from the antenna.

Is a counterpoise really necessary?

A counterpoise is absolutely critical to proper marine radio operation. Without it, the entire radio system will not function as designed.

Is a counterpoise part of my antenna?

No, your antenna does not include a counterpoise. It must be constructed and it must be of sufficient physical size to do the job. There are a few ways to be assured that you have a counterpoise of sufficient size.

What is used to make a counterpoise?

There are a number of choices. You can use products that mount to the outside of your hull which make direct contact with sea water and that have through-hull connections. If you have not yet decided upon a vessel, you may have the option to have the counterpoise installed within the hull as copper or bronze mesh that is laminated within the composite material. The boat builder can be of help in this situation.

You can choose to install a sintered bronze plate to the outside of the hull that will help to provide a counterpoise. As an example, you can get these plates from companies like Newmar and the Guest company. They will help to provide direct contact to the sea; however, you may still need to provide additional surface area within the hull to give the radio system the best coverage possible. The phrase “bigger is better” is absolutely true in marine SSB radio. A larger antenna and a larger counterpoise can ensure that SSB communications are reliable and not prone to poor or intermittent communications.

How do I connect to the counterpoise?

Your counterpoise connects from your boat to the tuner for your SSB Antenna. The tuner will have a connection point that is used to attach a conducting strap to your counterpoise. Where possible, use only flat copper foil (this can be found at marine supply companies) or flat copper flashing (this can be found at roofing supply companies) to connect the tuner to the counterpoise. If you use wire, the RF signal will have a tendency to attach itself to the wire through a phenomenon called the “skin effect”. The RF signal on your counterpoise can create problems, so avoid wire and, instead, use flat or braided materials to connect from the tuner to the counterpoise. Many marine supply companies provide rolls of copper foil that are available in different widths. 3” wide foil is easier to handle and manipulate than wider foil. This foil can be run throughout the inside of the hull, at or below the waterline.

If I already have a counterpoise and need to increase the physical size of my counterpoise in order to improve radio operation, what do I do?

To increase the size of the counterpoise, you can attach foil to the existing counterpoise and run the foil throughout the inside hull of the vessel. You can also use this same copper foil to connect to your metal water tanks and to a keel bolt. These other connections will also help to increase the physical size of the counterpoise. Keep in mind that you may be connecting to dissimilar metals, so be sure to use a good-quality anti-oxidizing paste between the connecting surfaces in order to eliminate corrosion.

A marine environment promotes corrosion. How do I minimize the effects of corrosion in my counterpoise?

When you transmit, there will actually be RF current flowing within the counterpoise. If the counterpoise is connecting to the sea, the current can cause accelerated corrosion to anything connected to the counterpoise (such as your tuner) and cause damage unless there is a DC-blocking point between the radio and the counterpoise. Also as previously mentioned, you should use anti-corrosion paste at all connections. You can't completely eliminate corrosion, but you can minimize it to a significantly using the proper installation practices.

A counterpoise is critical to the installation of your SSB radio and the larger the counterpoise, the better your radio system will operate. Be aware of corrosion and know how to minimize the effects and maintain your equipment. A good counterpoise will take effort to install but it will be well worth it so that you can minimize maintenance on your equipment and provide reliable communications.