The Cruising Club of America

SINGLE SIDEBAND

TRANSMISSIONS, CONNECTIONS

and

GROUNDING

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Ground Waves and Transmissions

Assuming the equipment is in good order and there is adequate grounding for an SSB, two types of radiation will be emitted when transmitting. They are the ground wave and the desired propagation radiated into the atmosphere. The ground wave is a portion of the emission that radiates out at the base of the antenna on the water surface (or land) for a short distance in all directions although sometimes this can be a several miles. The ground wave can interfere with other yacht SSBs in the immediate area even if tuned to another channel.

The desired emissions from the antenna radiate out, bounce off the ionosphere and reflect back down to earth. This reflection takes place at different altitudes depending on the frequency. Higher frequencies penetrate deeper into the ionosphere and therefore reflect back down to earth at a greater distance from the antenna than lower frequencies.

The ionosphere rises when warmed by the sun which moves the reflection point farther away from the transmitter. The overall result from this phenomenon is, higher frequencies typically (but not always) have greater range and during daylight hours.

This reflection of the radio waves is what gives the great range. However, there is no free lunch. SSB communications depend upon a reflected signal to achieve the great range, but there is a gap or blank area in all directions between the ground wave and the reflected transmission. This gap is called the "Skip Zone". The Skip Zone distance is greater with higher frequencies with the point of reflection further away. For this reason and for courtesy to other SSB stations at great distances, higher frequencies should be used only when necessary.

Restated and within limits, the higher the frequency, the greater the range but also the Skip Zone. From a practical aspect, a yacht in Trinidad attempting to talk to a yacht in Grenada on 12 MHz will most likely need a relay from a third yacht in at least the Bahamas or even farther away because Grenada will be in the skip zone. This also means that everyone at great range in all directions will be receiving your signal (called "reading the mail"). This is a discourtesy to them because a 2 or 4 MHz frequency would work just fine for the short range in this example.

An approximation of Tx/Rx range by frequency band <u>depending greatly upon conditions</u> is:

Freq Band		Day	Night
2 MHz		100	300
4		300	800
6		400	1000
8		500	1200
12		2000	800
16		4000	Unreliable
22		Worldwide	Unreliable

Ground Plane (Counterpoise) and Connections

All of these radiated transmissions need something to push against and that is the ground plane on the yacht. Most references cite that a yacht's ground plane should be a minimum of 100 square feet although

we find that we can get by with a little less. Tops and bottoms of metal water tanks (but not fuel tanks) make excellent components of a ground system when keel bolts are not available.

If you can receive but have never been heard at reasonable distances, an inadequate ground system may be the reason. If you only recently can't be heard, corrosion may have occurred at the connection to the antenna followed by the connection of the antenna feed wire to the tuner.

Copper foil should be used to connect the radio to the ground plane. Two or three inch wide foil is available from discount marine firms. When two or more foils are to be connected, they should be soldered to ensure a permanent electrical connection. Since copper is a great conductor of heat, the soldering iron/gun should be rated at 150 watts and preferably more. The ends of the foil connected to the SSB, VHF, etc. should be folded or cut at the corners to create a "V" shape. Punch a hole in the foil for the connection bolt.

Antenna Tuners and Connections

The antenna tuner should be located as close to the antenna as possible. This is usually under the deck adjacent to the backstay on most sailboats. The feed wire should be connected to the antenna tuner with a soldered ring connector. The preferred wire to use for the antenna feed is GTO-15 although any wire that is not coax and capable of handling 150 watts without heating up will work. GTO-15 is available from most large marine outlets. When installing, add a little additional length of wire to form a drip loop so as to avoid water from reaching the tuner's antenna output terminal.

Many antenna tuners have a screw in the bottom to allow moisture to drain out. This screw should be removed or at least loosened enough to allow condensation to discharge.

Most articles about using the backstay for an antenna recommend putting the lower insulator over six feet off the deck so that the crew won't accidentally touch the backstay when transmitting. On the other hand, the antenna base should be as close to the water surface as possible which would put the isolator close to the deck.

This conflict can easily be resolved by installing a length of PVC tubing over the backstay so that the wire can't be accidentally touched during transmission. By isolating the active wire portion of the backstay, the lower insulator can be installed low, enhancing transmission.

For an excellent and in-depth discussion on this, see Eric Steinberg's article that covers the installation of SSB antennas at: http://www.farallon.us/info.htm. Also, check the sidebar tab "Offshore Communications and Electronics on the CCA Website, http://www.cruisingclub.org.

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