

Electronics

TUNING IN VHF

Often all it takes to maximize the range of your VHF radio and minimize power loss is to install the proper antenna and coax. Here's what you need to know to diagnose your radio's performance.

RADIO-LOGY

Bandwidth: the range of frequencies required to transmit a signal; measured in megahertz (MHz)

Gain: the measurement of the effective radiated power, or signal; measured in decibels (dB)

Impedance: the combination of resistance and reactance; measured in ohms

Frequency: the number of radio waves, or cycles; measured in hertz

Radome: fiberglass shaft that houses the metal components inside the antenna

Out-of-Band Interference: strange noises emitted from even a squelched VHF radio caused from pagers and other commercial transmitters operating near the VHF band signal

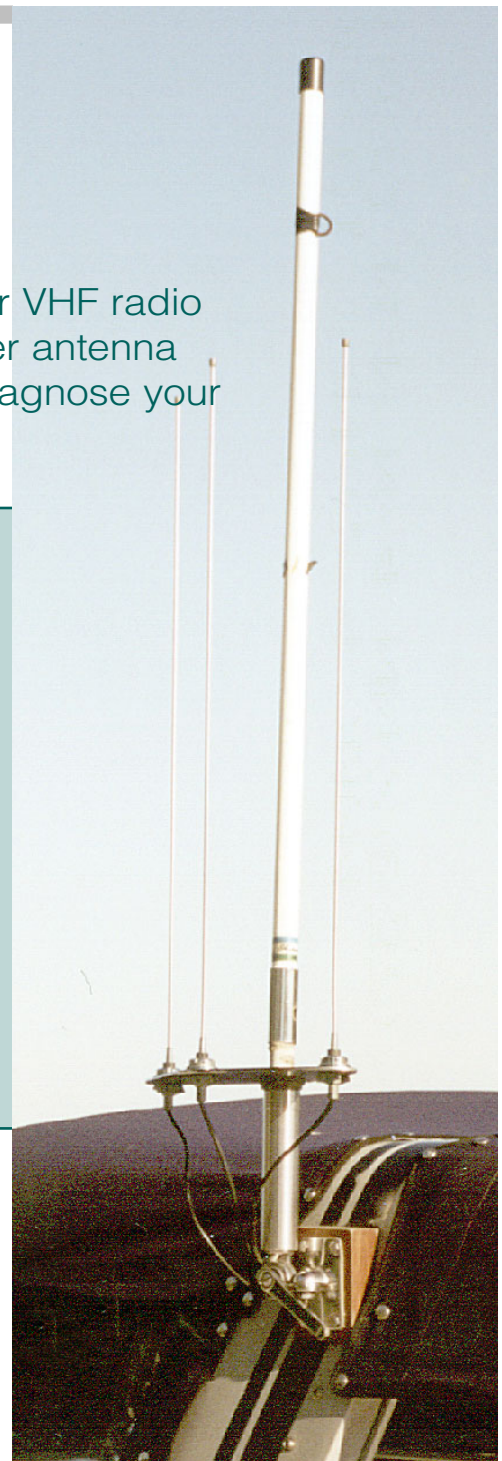
Wave length: distance between radio waves; measured in meters

By Jan Mundy

It's possible to improve the reception and range output from most VHF radios. The two key components are the antenna, which captures the electro-magnetic radio waves traveling through the atmosphere, and a cable to transmit these waves to and from the receiver. Matching both of these to the type of boat and the installation determines the power and quality of the signal. As most antennas and cable are sold with standard equipment, it's important to select the right package.

Tuned Elements

The common VHF antenna is much more than just a fiberglass whip. Inside the radome are various elements, joined together to form a collinear (vertically stacked) array, all designed to maximize the transmitted and incoming received signals. Some antennas have brass elements soldered end to end with coax cable, all held in place with foam spacers. Others have a solid brass core or copper wire. The ferrule on some units is brass.



Sometimes, stainless steel is used for better corrosion resistance. The more expensive the antenna, the better the internal elements, and as a rule, the better the reception.

VHF radios operate on a bandwidth of 156MHz to 162MHz with a wavelength of 2 meters. (To determine the frequency in MHz to wavelength, divide either by 300.) VHF antennas range from 1/4 to 5/8 wave, depending on the

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antenna length and style. The receiving zone is omnidirectional, meaning you can turn the boat in any direction without signal fade. Antenna length determines the gain, or power output measured in decibels (dB), and its height equals the range. VHF antennas are commonly classified as 3dB, 6dB and 9dB.

Coaxial cable (a.k.a. coax) consists of a center conductor, usually stranded and silver tinned, that's surrounded by a low-loss insulated jacket and braided or solid copper outer conductor to prevent moisture intrusion. The length of the run determines cable size. The smallest diameter coax, RG-58A/U, is normally supplied with most VHF antennas, but is not suited for all antenna installations.

Boosting Performance

Let's look at coax first, as there are fewer choices. The longer the run, the larger the cable diameter required to minimize power loss. Small diameter cable is adequate for small powerboats where runs are shorter than 6m (20'). A sailboat with a mast-mounted antenna, or a cruiser with the radio

All-in-one antenna systems, such as the Dantronics Delta Panama, enable simultaneous transmitting and receiving of VHF radio and cellular, and reception of AMIFM radio and TV.

Increasing Life Span

When properly cared for, an uncoated fiberglass antenna should last for 10 years or more. Totally ignore it, and you'll be replacing it in five, as we did. Like all things made of fiberglass, UV reacts with the resin causing the radome to become brittle and eventually, crack. Water enters through the tiniest fracture, and corrodes the inside metal components. If it's not too far-gone, a patch of epoxy resin and fiberglass mat should hold for a time. Or epoxy glue on a PVC sleeve, the kind used as chafe gear on sailboat rigging.

Next time you're cleaning and waxing your boat, give the antenna the same treatment. Many newer antennas have a high-gloss polyurethane paint finish. Routinely apply wax to protect the finish, and when it becomes dull and faded, apply two protective coats of paint, sanding between coats. Use a latex paint or any other kind provided it doesn't contain lead or metallic chips.



mounted a distance from the antenna, requires a larger coax, such as an RG-8X. For lengths reaching 15m (50'), a better choice is RG-8U or RG213 to ensure against excessive transmitter energy loss between the radio and the antenna.

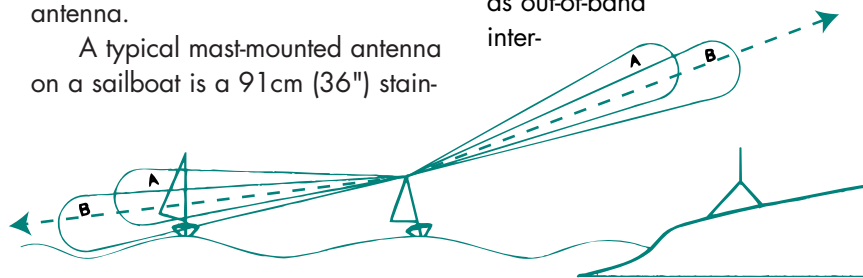
A typical mast-mounted antenna on a sailboat is a 91cm (36") stain-

less-steel whip with a gain of 3 dB. Small powerboats are usually supplied with a 2.3m (8'), 6dB antenna and very large cruisers or commercial boats have a very heavy 9dB, 6m (20') radome. Since length equals gain, then to achieve maximum power all that's needed is a big antenna, mounted as high as practical, and a powerful radio (25 watts preferred) to transmit and receive a good quality signal.

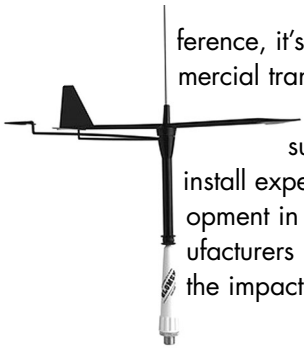
Unfortunately, because of the path taken by radio waves, it's more complicated. In fact, a small gain antenna mounted up high provides better reception, provided it's using the proper coax (i.e. RG-8X), than a taller, larger gain antenna mounted low. This is due to the direction of radio waves. VHF antennas radiate waves perpendicular to the antenna. When a boat is stationary, the high-gain antenna has a greater range. As a powerboat rolls or pitches, or sailboat heels, the high-gain antenna results in a decrease in the transmission beamwidth, causing the signal to fade. Powerboats could mount a 5.5m (18') 9dB antenna on the stern, but a better option would be a 2.4m (8') 6dB mounted on the fly-bridge or above the wheelhouse.

Filtering Option

Around metropolitan areas, busy harbors or shipping channels, it's common to hear high-pitched chatter, chirps, squeaks, whistles and other strange noises emitted from even a squelched VHF radio. Known as out-of-band inter-



When a powerboat rolls or a sailboat heels, this motion narrows the radiated signal, and if aimed at the surrounding water or upward toward the sky, causes fadeout and intermittent reception. When this happens, a high-gain antenna (B) has greater range but also a greater decrease in the transmission beamwidth than a lower gain antenna (A).



Combo windvane and stainless steel VHF whip for mast mounting.

ference, it's caused from pagers and other commercial transmitters operating near the VHF band. In the past, the only means to suppress these annoying sounds was to install expensive external filters. A recent development in antenna design offered by some manufacturers is a built-in filter that helps to reduce the impact on the radio receiver without affecting the transmitting range. It's a good option but expensive. You can pay as little

as US\$60 for a short, 3dB stainless-steel whip, or more than US\$500 for a 7m (23') 9dB fiberglass antenna with a built-in filter and all stainless-steel components.

-Tip-

FINE TUNING

Mount Once

Antenna bases come in various mounting configurations in stainless steel (most expensive), chrome-plated Zamak or nylon (cheapest). A ratchet mount provides a quick and easy way to raise and lower a powerboat antenna when passing under bridges or for storage. Not all mounts are created equal. On our powerboat, vibration and rough seas would pop the gears on the nylon ratchet mount. Replacing it meant drilling new holes, rebedding, and a lot of extra effort for hardware that we assumed would do the job. All mounts accept a standard thread so buy a good one. If your existing one is of poor quality, replace it.



Split Reception

Turn your VHF antenna into an AM/FM radio antenna with the Shakespeare 4357 marine band splitter. It allows the VHF antenna to operate on the FM band as well, with only a nominal power loss in VHF reception.

Best Radio Check

Though it's standard practice to test VHF radio performance by calling for an on-air radio check, it's bad protocol to tie up the radio waves. Instead, purchase a radio-testing meter that measures a radio's output power and the power being received by the antenna. Definitely, a much better option.

Determining Antenna Range

Here is the formula to calculate the range of your antenna:

Square root of height (in feet) above water x 1.42
= range in miles

Courtesy Shakespeare