

Troubleshooting marine SSB radio

R Medero March 2015 – Partially complete, still working on this doc

Low Transmit Power

1. Verify antenna connections are good – Check connections between tuner and antenna as any connections exposed to elements will eventually fail.

Check coax connections between radio and tuner. Verify that they are snug and clean. Perform continuity test by disconnecting both ends and verify no continuity between shield and center conductors on one end (end A) then connect shield and center of other end (end B) together. Verify not more than 10 ohms is measured on end A.

Whip antennas can fail and can be verified with SWR meter. Connected SWR meter between radio and tuner, perform tune operation and verify SWR is low. Starting at top, remove one section of antenna at a time including connection at base, and verify that SWR (without retuning) changes as each is removed.

2. Verify power to radio is good – Verify power at radio is good while transmitting. Set radio to high power (if feature present) Measure voltage at as close to radio as practical while transmitting and whistling into mic. Verify you have at least 12v. If large voltage change is observed it could be the meter is sensitive to radio frequency interference, connections are resistive, wire is too small or too long, or battery is weak. To help determine meter reading is true, connect 12v light bulb where meter is connected and observe change in brilliance. Use different meter if you suspect reading is false.

3. Verify tuner is operating – Listen to tuner when tuner is turned on. On most rigs such as ICOM this is when the transceiver is turned on. You should hear relays in the tuner make a click sound. This verifies the tuner is powered up. If no sound is heard verify tuner control cable connections. On ICOM radios verify there is near 12 volts between the red and black wires. NOTE: Take care to not connect the red wire to any other wire as this can blow a fuse in or damage the transceiver or tuner. Another method to verify tuner is powered, set radio a frequency where a weak signal is heard (can use static if weak station not found). Disconnect tuner control cable while listening and verify signal level decreases. Reconnect control cable and very signal level increases.

If radio has a tune button verify that radio momentarily indicates it is transmitting when button is pressed. If it does not, verify tuner control cable connections. On ICOM radio: Momentarily connect green(key) wire to black(GND) wire and verify radio indicates transmitting while connection is made. If it does not then problem is in cable or radio. Momentarily connect white(start) wire to black(GND) wire and verify radio indicates transmitting while connection is made. If it does not then problem is in cable or tuner. When tune button is pressed you should hear relays in the tuner click.

On ICOM M802 the display will indicate when tuning is successful by indicating TUNE in upper area of the display. If not successful it will indicate THRU. If radio is indicating it is transmitting when tune

button is pressed, but not indication that tune operation succeeded, check coax connections between radio and tuner and antenna and ground connections on tuner.

Tune succeeds on some frequencies and not others. Very ground is good (see counterpoise info in other doc's), antenna connections are good, and antenna length including wire from tuner to antenna is not near $\frac{1}{2}$ wave length (about $502/\text{frequencyInMegaHertz}$). If you suspect it is the near $\frac{1}{2}$ wave problem then add few feet of wire to antenna. Then verify other frequencies tune ok.

4. Antenna connections and tuner operation seem OK, but signal output is still low, verify radio is drawing expected amperage while transmitting loud audio (or CW if you know how to do that). A 100 watt radio should draw more than 15amps (20a for 150w radio). Verify radio is set to highest power and whistle in the mic while transmitting and note the amperage draw. If amperage is too low, the cause could be poor antenna match, voltage at radio too low while transmitting, not enough audio drive (bad mic or mic gain set too low) or bad component in radio. If amperage is as expected, it is unlikely issue is with radio or tuner, check antenna connection, GTO wire and tuner ground.

Difficulty Receiving

1. Verify receive (RF) gain is set to maximum, squelch if off, audio frequency based filtering is off (DSP filtering found on some ham rigs).

2. Electrical RF noise (interference) is the most usual cause of issues with receiving. RF noise is commonly generated by electronic stuff you have on board, onboard neighboring vessel or on land. Refrigerators, solar panel charge controllers, AC charges and inverters are among the worst offenders, but can be most anything from LED or CF lights, to watermaker controls. Most radios have signal strength indicators that are useful for measuring RF noise level. On the IC-M802 for example there is a bar graph in the lower left of the display. Under good noise conditions there should be only 1 or 2 bars illuminated when no one is transmitting. While sometimes naturally occurring noise can be higher, if 3 or more bars are illuminated that is an indication of local electrical noise.

RF interference can sound like static or it can sound like some man made signal. Also the interfering noise can come as conditions change in the device that is generating the noise. The controller for DC refrigeration is one example of a device that sometimes interferes on frequencies we commonly use. The noise from this device can sound like data or Morse code signals and will drift in and out of frequency you are monitoring.

To locate a noise source on your vessel wait for the frequency to be clear (no one transmitting), observe the signal level indicator while listening to the noise. Remove power from (NOT JUST TURN OFF) all electrical devices while observing change in noise. Then power each on one by one again observing change in noise. If there is no way to disconnect solar panels from controller you can try placing heavy cloth over the panel to shade the sun.

3. A good transmitting antenna is also good for receive. You can verify your antenna using your transmitter, see steps above in **Low Transmit Power**

4. While usually not necessary tuning your antenna will improve reception. You might find that once tuned and a band such as 4MHz then switching to the 8MHz band for example, receive signals are very

low. In most rigs you have 2 options, setting you tuner to the THROUGH mode (bypass), or you can tune on the new band. On the M802 through mode is F key then TUNE key.