

Made Simple for Cruisers

Icom IC M802 Clipping

Overview

The Icom IC M802 has had a history of “clipping” that was supposed to be fixed a long time ago and yet the “clipping” shows its ugly head every now and then. If you have an Icom IC M802, even if it is new, it is possible for your radio to “clip”.

Understanding why the radio “clips” is a giant step forward in making sure that your radio does not have the “clipping problem”.

What is Clipping?

The IC M802 may be one of the most computerized radios in the industry. The radio actually has two central processors in it that make it work so well and stay on frequency. Central processors do not like radio frequency (RF) bouncing around and the output of the radio does not like the output signal coming back into the radio.

Without going into a lot of radio design and radio geek technology, the paper will provide a simplistic overview of what happens when RF gets into the transceiver box that does not belong. The simplest answer is the radio reduces the power out when it detects too much RF coming back into the radio.

The power reduction function is typical for transmitters as it is important to protect the output transistors of a radio when high levels of power come back into the transmitter. This is called reflected power or high SWR. High SWR typically occurs when there is a miss-match of the radio’s output impedance and the antenna impedance. The job of the antenna tuner is to make sure that the antenna impedance is the same as the transmitter’s impedance for all frequencies. (The antenna tuner is not capable of doing this job if the antenna or the grounding system is not adequate.)

Basic Clipping: When we talk our voice puts out different frequencies for each syllable and word we speak. When we speak into the microphone, the higher frequencies will tend to produce a larger RF amplitude signal out of the transceiver. If there is a miss-match in the antenna impedance, the some of the RF energy comes back to the transmitter (reflected signal). If the amount of RF coming back is too large, as measured in the transmitter, the transmitter will automatically reduce power. For example some words might go out at 100 watts and others at only 10 watts. If this happens while you are talking to someone, from the receiving stations point of view, it sounds like the radio is “clipping” some of your words/syllables as they hear some words/syllables loud and some weak or not at all making it very difficult to understand a sentence.

Stray RF Clipping: Again, the radio thinks that any RF coming back into the radio is bad. HF radios cannot tell the difference between stray radio frequency coming in to the sense point and reflected power as a result of an antenna miss-match. The IC M802 has more cable connections than most marine radios: The control head, speakers, antenna controller control, and even the coaxial cable that is

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routed to the antenna tuner. Each of these cables is a potential antenna that can pick up the RF signal that is being transmitted.

Metal boats tend to shield the RF signals from below decks. Metal boats also typically have a great grounding system. On fiberglass and wood boats, I have seen lights flash and speakers thumping when the HF SSB is transmitting. Those are clearly indications of RF signals being propagated all through the inside of your boat.

With all that Radio frequency around, it is very possible for it to get back into the transceiver box and cause “clipping”.

Also when you are in a marina with other boats, you can get strong reflected waves bouncing back into your boat from metal on the other boats such as masts.

What was the ICOM Repair for Clipping?

When the IC M802 was originally produced the allowable level of RF coming back into the radio was set very conservatively to maximize the protection of the radio. While this worked perfectly in a laboratory conditions with a perfect antenna system, it did not work well on the different types of installations found on cruising boats. The Icom fix was basically a less conservative point where the power reduction occurred. E.g. the IC M802 now allows a higher reflected radio frequency signal to come in before it reduces the power.

How to minimize the possibility of clipping?

One of the main reasons I wrote my second Icom IC M802 book, “Icom IC M802 Starting from Scratch”, was the fact that as I helped other cruisers get their radios working, I found some very poor installations. (“Icom IC M802 Starting from Scratch” provides complete details on what to install where and how to complete the testing.) Some of the poor installations were put in by “professionals”. Most of the radios had never been tested properly. In most cases, the only test was to transmit to a boat in the same marina. Checking communications across a marina for a radio that should transmit a ground wave up to 150 miles is not a valid test. Later when cruising, many radios do not work well. In some cases I found only transmitted with extremely reduced power. As the result of a “professional” installer using high voltage cable instead of coaxial cable between the transceiver and the antenna tuner one radio could not transmit across the marina, 100% clipping. So installation is very important.

The RF Path

First, make sure your antenna and radio frequency grounding system is adequate to allow the tuner to match the transceivers impedance and minimize the reflected RF signal. This is accomplished with a device called an SWR meter. An SWR meter is installed in line with the antenna output at the transceiver. The SWR meter will show how well the tuner is working with your antenna and grounding system. SWR meter are easy to use and not too expensive.

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In addition, as the environment wears on your system, connections tend to corrode. So doing a check with the SWR meter annually is a good practice and will provide an indicator of the antenna systems integrity. So an SWR meter is not money spent for a one time check.

Check the SWR/reflected power on each band (2,4,6,... MHz) and on the frequencies you typically or plan to transmit on. *(If you have a meter and do not know what to do, send me a note and I will help.)*

High reflects Power

If your SWR meter indicates you have a high SWR/reflected power, check the antenna and grounding system installation.

The antenna side of the tuner is usually fixed. As long as the connections are not corroded, it is what it is. I have tested hundreds of boats over the past years. I have found that one type of grounding method may work well on one boat, but not work very well on another boat.

Some of the typical grounding methods used include: Running copper strips throughout the boat; running one copper strip to a single hull through; installing a plate(s) on the bottom of the boat; some boats have tied into every piece of metal on the boat.

The only grounding system I have measure that always has a low reflected power reading on all bands is the KISS ground. That does not mean everyone should change out their ground to a KISS, but for a new installation or if the present system is having problems with high SWR/reflected power, you may want to consider a KISS ground. <http://www.kiss-ssb.com/>

Stray RF

Stray RF is a bit more challenging. Here are a list of things that will help minimize the potential for stray RF getting back into the transceiver and causing clipping:

1. Make sure your antenna tuner is installed close to the antenna and not close to the transceiver.
2. Make sure the high voltage wire connected to the antenna from the tuner is as vertical as possible. Do not coil spare wire, remove it.
3. Install at least five (5) snap on ferrite cores on the coaxial cable coming from the transceiver unit as close as possible or use an RF Isolator connected in line with the output. This will keep the radiated signal from coupling into the coaxial cable and back into the radio.
4. Install at least two (2) snap on ferrite cores on the coaxial cable going into the antenna tuner. You may also use another RF Isolator instead of the snap on ferrite cores.
5. Install a similar snap on ferrite core at both ends of the Antenna tuner control cable. Since this cable is smaller than the coaxial cable you can loop the cable through twice and get added rejection capability.
6. Install snap on ferrite cores on all the other cables connected to the transceiver box. Use the best snap on cores you can find. If you end up with radio shack cores, use two.

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Press the Tune Button

Last but maybe the most important key to eliminating clipping is to make sure your antenna tuner is tuned prior to transmitting. The radio is supposed to tune automatically (if in auto tune mode) when you transmit. I have observed that when the frequency is changed and the band has not been changed, the radio thinks it is still tuned and indicates it is tuned on the display.

For the best results with an Icom IC M802, when the frequency is changed, **Press the Tune button** before transmitting. The transceiver should always remain in auto tune, but press the tune button anyway before transmitting.

