

# Grounding? Three Reasons

By Scott McMillian CTO Electric yacht

## 1. Lightning protection.

There is some evidence that having your rigging and everything metal connected to a common grounding point will provide some level of lightning protection. However, there is really no conclusive evidence. This is the case where you would ground to a keel bolt. Better is an exposed bronze "shoe" on the outside of the hull.

## 2. Electric shock.

In this case, all of the low voltage dc negative connections (the 12Vdc system and the 48Vdc system in our case) are connected. Also, the ac ground is connected to this ground, as well. The theory is that with one side connected everything will have a common reference and the chance of touching two pieces of equipment or wiring causing a shock is minimized. This is in the ABYC standard E-11.

## 3. Galvanic corrosion.

This gets somewhat complicated. Traditionally, it was recommended to connect all metal through hulls, rudder post and the engine together. This makes them all at the same potential. It allows a sacrificial zinc connected to any one of these to protect them all. It makes perfect sense when the boat is free of shore power. However, it actually increases the chance of damage to everything that can be caused by improper shore power grounding in your boat, or your neighbor's or the marina wiring itself. In recent years there is a trend of getting away from bonding everything metal that touches seawater together. It is to lessen the risk of problems when connected to shore power.

Actually, a floating system has a great deal of merit in preventing the kind of issues that can happen when connected to shore power. Volvo made this possible years ago with their saildrives by electrically isolating the drive from the engine. The engine is still connected to the internal grounding system, the saildrive is not. Yanmar does not do this. Talk to anyone familiar with the subject and you will usually hear there are lots of problems with Yanmar and corrosion and few with Volvo.

With conventional engine systems, a proper grounding system is never floating. The engine is connected to seawater through the shaft. This path can be broken by the use of certain flex couplers.

In our case, we isolate the prop shaft from seawater by mounting the bearings in plastic housings. This breaks the electrical connection, minimizing the risk of corrosion issues due to connection to shore power in a marina. You should "ground" the negative battery as per E-11. This provides protection from electrical shock while connected to shore power while minimizing the risk of corrosion to your propeller and shaft. The motor and frame are grounded to the B- terminal on the motor controller, so you need not worry about connecting the frame to the grounding system.

You should connect the 48V and 12V negatives together at one point to form a common dc negative bus. I would do this by connecting the negative terminal of the 12V and 48V batteries together. You could do this at a common ground stud, for example. They should only connect at one point.

I would not ground it to the water. There should be a connection to the ac safety ground (green wire), preferably through a galvanic isolator.

Scott