THE GREEN WIRE

by Captain John McDevitt

The different colors of the wires that distribute power around a boat should indicate what they are doing for us. Let's consider the green wire (or green with a yellow stripe) and what it should be doing for us… and shouldn't be doing to us.

THREE TYPES OF ELECTRICITY

First, let's talk about the three different types of electricity we find in our boats. Yes, I did say three!

DC electric (direct current) generally comes from the boat's batteries. The wire colors should be red for hot and yellow or black for ground. We control DC power through a battery switch and then a series of fuses, switches, and/or breakers leading to the DC devices. The DC conductors (wire) are normally current carrying.

Next is AC electric (alternating current), which generally comes from the marina shore power, a generator, or an inverter. The wire colors should be black and white (add a red in 240v systems). We also control AC power through a series of circuit breakers leading to the AC devices. The AC conductors (wire) are normally current carrying. Once again, under normal circumstances, there is productive electricity there.

I will call the third type of electricity GC or **garbage current.** These are non-productive, unwanted types of electricity, which find their way into our boats. Examples are lightning, static electricity, electrolysis, stray AC electric, stray DC electric, faults from other nearby boats, and other sources. We can not manage or disable this current with a circuit breaker, switch, or simply by unplugging the shore power cable as we do with AC and DC electric. In fact, we usually don't even know when our boat is experiencing these non-productive types of electricity.

GC CONTROL

What do we do if we can't control this garbage current and we don't even know when it is happening?

We install a grounding system so that when this unwanted electricity occurs on our boat, it is safely channeled to a ground so that it doesn't wander destructively causing problems for our boat, other boats, and perhaps an unfortunate soul in the water near our boat.

What does the green wire do, and why do we need it? And yes, we certainly do need it!

I would also like you to remember that in addition to standing for garbage, the G in GC stands for **green** (or green with a yellow stripe). Under normal circumstances, the green wire should have no electricity running through it. The only time we find current in the green wire is when one of those non-productive sources of garbage electricity is running around the boat—and that should be fixed. Current on the green wire almost always will cause damage.

Something else to know is that the green (or green with a yellow stripe) wire runs continuously from the boat through the shore power cord, into the power post, up the dock, and back to the marina's ground source. The green wire on the dock also runs uninterrupted from power post to power post. Therefore, if we have garbage current in our green wire, it could very well be coming from another boat on the dock.

ISOLATION

A working galvanic isolator should be installed in series in the green wire on every boat. This should prevent low-level garbage current from leaving your boat and causing problems for others or from entering your boat from another boat and causing problems for you. At the same time, should a higher, more dangerous amount of electricity enter the green wire, the galvanic isolator will allow it to pass through and up the dock to safe ground.

BONDING IS GREEN WIRE, TOO

Without turning this article into a chemistry lesson, you should know that when two different types of metals are submerged in water, deterioration is likely to occur to the weaker (anode) or less noble of the two metals. There are a number of different kinds of metals that go into the underwater gear we have on our boats, and it is difficult to avoid this.

One of the things that is done to protect these metals is to bond them all together using green bonding wire running from each of the underwater metals to the boat's ground. This brings all the bonded metals to the same electrical potential, and corrosion is minimized. Installed sacrificial zincs or anodes also help mitigate the inevitable corrosion potential.

This green wire bonding system is normally a non-current-carrying wire. If there is AC or DC electricity in this system, something is wrong.

For example: a hot wire is run from a switch, fuse, or breaker for a new stereo. The device needs to be grounded, and the installer finds a green wire and ties in the stereo ground. (A DC black or yellow wire is correct here). The stereo will probably work fine, but when the stereo is on, the green wire is now carrying current to everything attached to it. The rest is history, and so perhaps are your underwater metals.

ADVICE

Boats are fairly complex electrical beasts. Normal maintenance along with the addition and/or replacement of any electrical gear should be performed by an ABYC-certified electrician (*abycinc.org*). An annual inspection by one of these techs is not a bad idea either. Most of the incidents of underwater corrosion can be traced to electrical short-comings.

If you are familiar with the operation of an inductive amp meter, you can clamp the meter safely around the green wire on your boat or the shore power cord without disconnecting anything. This will tell you if there is current on the green wire. You should power up and activate each device one at a time for 45 to 60 seconds during this test. A stove with an AC fault won't show up unless you power it up and turn it on.

If you see a reading on the meter during this test, the fault is associated with that device. Turn off the breaker, and don't use the device. Have it serviced or replaced immediately by an ABYC-certified electrician.

About the Author: John McDevitt holds six ABYC Certifications and a 100 Ton USCG Masters License. He is involved in sales and service at Bluewater Yacht Sales in Stevensville.