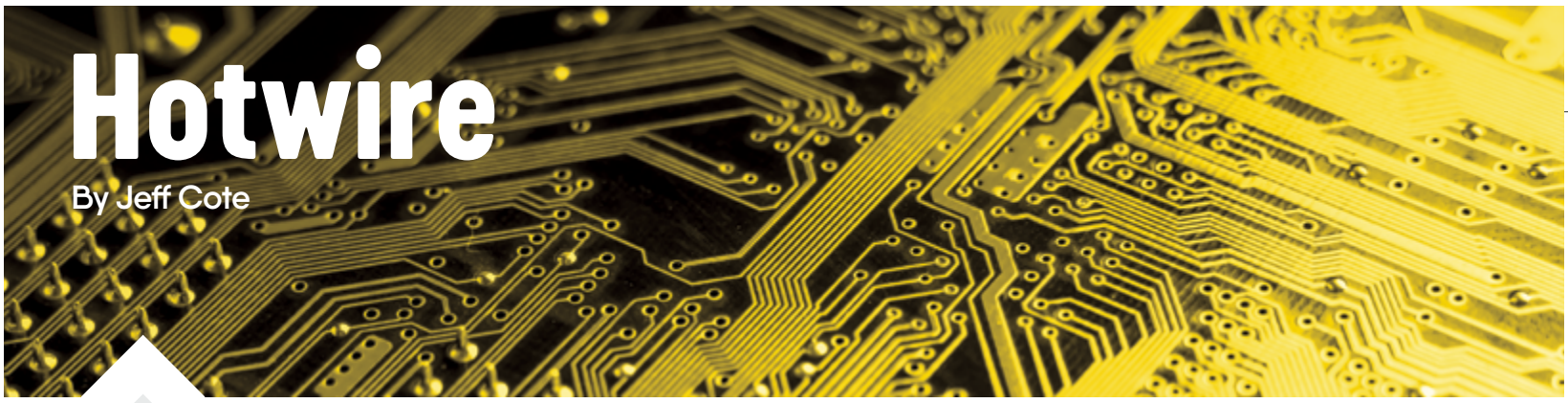

# Hotwire

By Jeff Cote

## *Looking Forward: Heading Sensors vs. GPS*

I am a boater who experienced a catastrophic electrical fail on my maiden voyage. When I returned to the dock, I decided there had to be a more reliable way to boat. I started Pacific Yacht Systems over 11 years ago with the goal of providing reliable and safe electrical and electronic systems for boaters. It really is the heart of every modern boat, and these systems, simple or complicated, are based on industry standards designed to keep you and your family safe.

My personal philosophy has always been to do things right versus making things work. I believe the secret to the company's success has been "expertise through repetition." We concentrate on a few things and do them over and over. In 2018 alone, PYS completed projects on over 1,000 boats here in the Pacific Northwest. All our technicians receive American Boat and Yacht Council (ABYC) training, updates, and share tips and tricks on a daily basis. We live for this stuff, and this concentrated approach makes us specialists in the industry.

While reflecting on a topic for my debut *Hotwire* column, I got to thinking about a recent client. He was a bit confused about the differences between heading information given by GPS units versus heading sensors. He asked, "If I already have a GPS connected to my chartplotter and radar, do I really need a heading sensor?" The quick answer is: yes! Course over ground (COG), provided by a GPS, is only reliable if the boat is travelling at a good speed with little current or wind.

Let's look at a few of the differences between heading sensors and GPS. Typically, a heading compass (aka flux gate compass), also referred to as a heading sensor, provides heading information to the autopilot. Heading provides the direction that the boat's bow is pointed relative to the magnetic north pole or geographic north pole.

In contrast, a GPS receiver provides position (latitude and longitude), COG, and SOG (speed over ground). COG and SOG are measurements related to solid ground. The challenge with a GPS receiver is that it knows where your boat was a second ago and where it is now. It then does a series of calculations to determine COG. However, when you start to go slow, the GPS has trouble determining COG with any accuracy.

Additionally, a boat that is anchored or tied to a dock (not underway) has no accurate COG value. Under conditions where the boat is experiencing wind or current, the heading and COG may differ. This difference will typically be greater for boats travelling at slow speeds and in a direction that is not directly parallel to the direction of the wind or current.

The source of COG for most modern marine electronic systems is a GPS sensor/receiver, which may be internal or external to the boat's multi-function display. The newer heading sensors on the market have incorporated solid state accelerometers and rate gyros for improved performance. Until recently, most affordable GPS receivers transmitted position, COG, and SOG once per second, or 1 Hz. Newer GPS receivers have increased to five times per second, or 5 Hz, while marine heading sensors transmit at 10 Hz.

The Garmin SteadyCast Heading Sensor is an easy-to-install solution that provides fast calibration and good heading accuracy. It aligns the boat's bow to its actual orientation. The heading output rate is 10 Hz with an accuracy of plus or minus 3 degrees, which ensures that your chart orientation and boat heading line match up with reality even in rough waters or at anchor. It retails for approximately $200.

The Garmin 9-Axis Heading Sensor is a premium solution with a heading output rate of 10 Hz and accuracy of plus or minus 2 degrees. It also allows for MARPA tracking and greatly improves the radar overlay experience. The nine-axis MEMS technology installs easily with the N2K plug and play interface for Garmin chartplotters; calibration with other displays is also supported. It is built to withstand bilge environments and can be installed in any orientation located away from magnetic interference. The suggested retail price is approximately $800.

Generally, autopilots that are 10 years or older will have a fluxgate compass that provides heading value. If your autopilot is less than a decade old, you will most likely have a 9-axis heading sensor as part of your autopilot system. If your boat doesn't have an autopilot, it is worth considering the Garmin SteadyCast heading sensor. It is really useful to know the boat's heading, even when your boat isn't actually moving. For instance, at night when the orientation of your bow to the surroundings is less visible, you can see your heading directly on the chartplotter at slow speeds or even at anchor. For boaters who don't have a heading value from an autopilot, a heading sensor will prove to be very useful as the charts and radar image will overlay as you would expect it to be. NWY


**Installation notes:**
It looks like it comes ready out of the box, but the internal compass must be calibrated on the water after a heading sensor is installed. Failure to do so may result in inaccurate compass readings. Compass calibration needs to be done in calm seas in an open area away from other boats. Avoid congested areas and waters with strong currents because calibration will be difficult and possibly hazardous.

Jeff Cote is a systems design engineer and owner of Pacific Yacht Systems – a full-service shop delivering marine electrical and navigation solutions for recreational and commercial boats. Visit their website and blog for info and articles on marine electrical systems, projects, and more at pysystems.ca.