

# Tech Tips

by Bill Whitney

This column is a forum for sharing the vast range of practical experience accumulated by our membership and not just my favorite boat maintenance topics. It is intended to be the place where you, the reader, can ask technical questions and either obtain direct answers in this column or direction to appropriate reference material.

Since you have not asked for specifics since the last newsletter, I'm suspicious that you may not know how to contact me. You can contact me via e-mail at [wmcwhitney@earthlink.net](mailto:wmcwhitney@earthlink.net), or better yet, see me at one of the FSS meetings.

Just to refresh your memory the planned topics for this column were; electrical wiring, alternators and regulators, batteries, grounding and bonding, radios and antennas, and instrumentation (navigation aids, depth, speed, GPS, LORAN, etc.). We have already covered wiring, alternators and regulators, batteries, bonding and grounding, radios and antennas; so let's talk about instruments and instrumentation. This is a big topic, so it will probably be divided into two or more installments.

To begin with, let's start with a statement: "All instruments are subject to errors and/or misinterpretations." A warning: "If you don't know how to use an instrument, or understand its' limitations, you are better off without it." And some advise: "Caution and commonsense when using quality instruments will usually yield good information." But enough of this, hopefully you'll get my point as we look at instrumentation systems more closely.

The basic "instrument" aboard all vessels is the marine compass. Its' a truly remarkable, reliable piece of gear once it is properly adjusted for the boat that surrounds it. Since there are numerous good books on compasses and their use, including the venerable "Chapman's", there is no necessity to explain how this simple instrument works. But its simplicity can also be its weakness if you don't understand magnetism. If you have moved any major ferromagnetic (i.e. iron, steel, etc.) components on the boat since the last time the compass was checked you may have a problem and not know it. Likewise, if you have moved any electrical wiring or changed the current flow in wires close to the compass, you could also have a problem. Even the storage of your toolbox or placement your favorite binoculars too close to the compass could significantly alter your port of arrival.

You should check your compass at least annually, preferably after all your gear is in its normal stored location. There are several ways to do it. I usually consult the almanac (or Eldridge) and use the sun's azimuth at sunrise but another simple way is to use a fixed range on a calm day. You can also use your LORAN or GPS, but remember to pick a position that is at least 10 miles away from your current position. You also need to make sure you have programmed the readout for a magnetic heading. If you have set up the GPS or LORAN for a true heading verify that you have set the variation correctly. If the compass heading has changed more than 2 or 3 degrees you

should have the compass / vessel system checked by a professional compass adjuster. The main point here is to check your compass at least annually.

Another group of instruments that we tend to ignore are those that monitor the engine functions. 99% of the time we take these instruments totally for granted, until something suddenly doesn't seem right and you really need know what is going wrong. Now you're really aware of the gauges. But are they right?.....Do they even work? Have you ever checked them? For most of us the honest answer is no, we never have. We always took their readings at face value and never questioned their accuracy.

From a practical standpoint, you don't really have to calibrate these instruments, but you do need to check their operation before starting the engine and during the warm-up process. You also need to know what the "right" reading should be. Do you? Electrical gauges have the unique characteristic of having both a mechanical zero and an electrical zero. This property makes them easy to check for basic operation. Before you turn anything on (like the ignition key), look at where the needle rests. This is the mechanical zero. When you first apply power to gauge, but before you start cranking the engine, the needle will move (sometimes jump) to the electrical zero position. When you see this movement it indicates that the winding inside the meter movement are good and the bearings that support the needle are OK. If you don't .....well something could be wrong. (Or, in the case of a temperature gauge, you may have an older style mechanical gauge that does not have an electrical meter movement.) An electrical meter movement should move freely.

The actual value that it reads is less important as long as you know what it displays when the engine is warmed up and operating normally. In fact many modern meters don't even display a numerical value, just an approximate value. The word "Hot" doesn't really tell you much, except that this relative value is above the "Normal" range of the engine. But again, the main point here is not the technical complexity of the engine gauges. Its that they have to work, and that you really need to know what a "normal" reading is BEFORE the information supplied by the gauge becomes critical.

As with the compass, these instruments need to be checked for proper operation. My recommendation is that you take a serious look at them every time you run the engine. This way you know what the normal reading is and you will be aware of anything that is changing over time, like a heat exchanger that is slowly becoming less effective, or an alternator that isn't recharging the batteries.

In the next article we will get into the navigation instruments and the things to be aware of when approaching that unfamiliar harbor in the dark on a rainy night.