tions and the cable. Any warmth indicates excessive resistance.

The most likely trouble spot is the point at which the negative battery cable bolts to the engine block. This frequently becomes corroded and highly resistive, even though it may look fine on the surface. If it's warm, disconnect the cable and scrape or file all mating surfaces down to clean metal. Then reconnect it, at the same time adding a corrosion inhibitor. There are various proprietary compounds, but Vaseline works fine.

The next most likely trouble spot is the connection at the battery post, especially on wet-cell batteries (the type that need topping up with distilled water). Once again, the mating surfaces should be cleaned and the connection tightened and protected with a corrosion inhibitor.

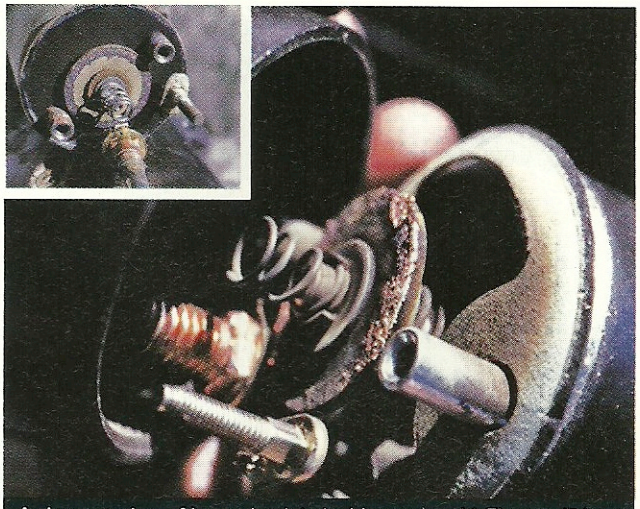
The cables themselves are often undersized on boats, especially in the case of long cable runs from the battery to the engine: the longer the cable run, the larger the cable must be to keep the voltage drop below a given level. If you feel any warmth in these cables, replace them with larger ones.

THE OTHER SIDE

To perform a volt-drop test on the positive side of the circuit, place one meter probe on the positive battery terminal and the other on the positive stud on the starter motor—the one to which the large cable or heavy strap is bolted—and have someone crank the starter. Once again, any resulting drop should be well under 1.0 volt. If it is too high, feel the connections and cables for warmth and clean or replace as necessary.

There are generally more connections on the positive side of the circuit than on the negative side. To narrow down the location of the problem, place the meter probes across the two big terminals on the solenoid and have someone crank the starter. Any voltage reading while cranking is caused by a voltage drop within the solenoid itself. If it's more than a tenth or two of a volt, the solenoid points need cleaning. This is well within the competence of an amateur mechanic, but beyond the scope of this article.

Next try the volt-drop test across the main terminals of the battery isolation switch (if fitted—not all boats have one on the cranking circuit). With the switch turned on and the starter cranking, you should once again not read a drop of more than a tenth or two of a volt. If the reading is higher, turn the switch on and off a dozen times and test again; the switching action may clean the points. If the voltage drop remains high, replace the switch.



A close-up view of burned points inside a solenoid. These will be adding resistance to the cranking circuit

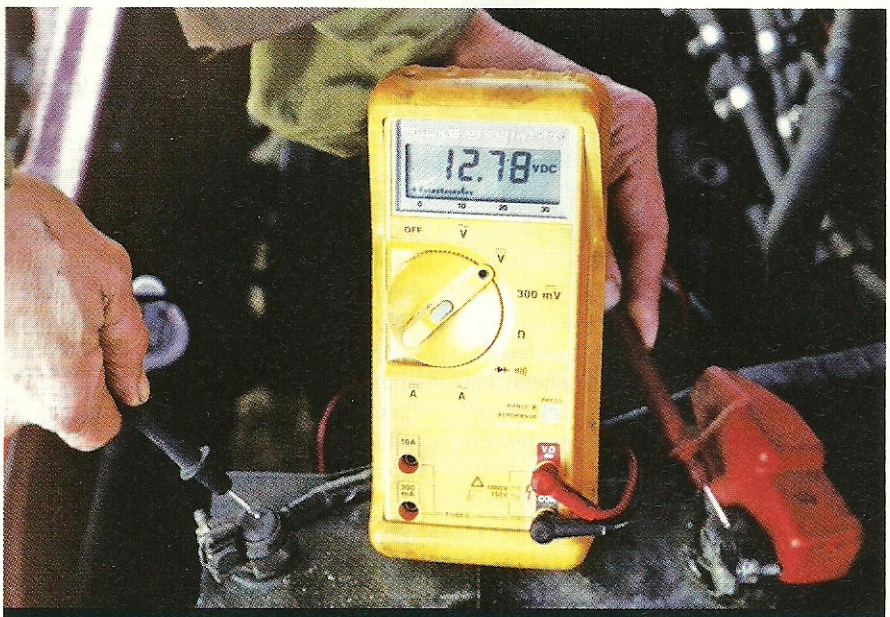
You can also place your meter probes at the ends of each individual cable run to measure the voltage drop in that section of cable. Scratch around to make a good contact with the terminals on the cable. If there's a fuse in the cranking circuit, test across the cable connections to the fuse. This may reveal poor connections between the fuse and the cables.

Note that in all cases, the voltage drop test is only meaningful while the circuit is under a load—in other words, while the starter is cranking.

DON'T BE SHY

A volt-drop test can be applied to any other piece of problematic electrical equipment on the boat. In fact, it's the single most valuable tool for troubleshooting electrical problems.

One of the great things about a volt-drop test is that with the voltmeter in its volts mode, as opposed to amps or ohms, it's very difficult to damage the meter or hurt yourself. So don't be shy. If your engine won't crank or cranks sluggishly, have the courage to do a little troubleshooting. You will quite likely identify the problem in a matter of minutes. Not only will this save an expensive visit from a mechanic, but you'll also feel rather pleased with yourself!



Testing across the battery terminals during cranking. This battery is fully charged and cranking has not yet commenced. During cranking we can expect the voltage to drop to around 12.0 volts and then stabilize

PHOTOS BY ROGER CALDER