TESTING FOR CONNECTIONS BETWEEN THE SHORE POWER GROUND AND BOAT GROUND

Disconnect (unplug) the shore power. Plug in and switch all shore power items on. (Make sure your inverter is off if you have one.) Use an ohmmeter to measure the resistance from each of the pins in your shore power inlet to the negative bonding system. All should be greater than 1 million ohms although readings as low as 100,000 ohms are not uncommon due to salt and moisture.

If the reading is low you need to find where the connection is and correct it. Unplug items one at a time until you find the culprit. MAKE SURE THAT THE SHORE POWER GROUND HAS NOT BEEN CONNECTED TO THE BOAT GROUNDING SYSTEM ANYWHERE. Unplug your battery charger and measure resistance from each of its power cord pins to the 12 volt outputs. All should be greater than 10 megohms. Check any other items that connect between the 120 volt system and the 12 volt system or engine frame, or anything grounded to the battery. Check amplified antennas which might be grounded to the rigging and be grounded by the coaxial cable to the TV or VCR.

If you have any other connections to shore (telephone, cable TV), do the same test on them - disconnect from the dock and measure from incoming connections to your boat ground system.

When you have removed all connections from your underwater metal items to the shore connections you are well on the way.

FURTHER TESTS

You can also temporarily disconnect the ground lead in the shore power connection of the boat you are checking. Measure the AC voltage, the DC voltage and the DC current between the ends of the ground circuit after disconnecting.

If the AC voltage is above 1/4 volt while the shore power breaker is on but disappears when the breaker is off, then there is AC leakage on the boat. You can usually track it down by turning off shore power items on the boat one at a time to find the culprit. Once isolated it should be repaired or replaced. If all appliances are off but it still comes and goes with the shore power breaker, then it is leakage in the AC wiring. Check the shore power connectors, all junction boxes, outlet boxes, light

fittings, breaker panels etc., to look for dampness or corrosion.

AC leakage can reduce the DC isolation provided by a Galvanic Isolator. If the AC voltage is above about 0.25 volts and you can't repair the appliance causing it, then you may need to install a Galvanic Capacitor. Some Galvanic Isolators come with a capacitor already installed but they don't specify the size so if you see this AC voltage it is inadequate. See the articleDOES MY GALVANIC ISOLATOR NEED A CAPACITOR TO CONDUCT AC?.

If the DC voltage is below 1 volt, a galvanic isolator will provide the protection you need.

If the DC voltage is above 1 volt you have a serious problem that may not be solved with a galvanic isolator. First check that the DC source is not coming from the boat by disconnecting all 12 volt DC sources on the boat either at the battery positive terminals, or with a main switch, but check that the main switch is actually disconnecting everything. Sometimes there are circuits like bilge pumps and alarms that are intended to remain on even when the main switch is off. If removing all sources eliminates the DC voltage, then reconnect and subsequently remove DC loads one at a time until you find the culprit. Once isolated it should be repaired or replaced.

If the DC voltage is still above 1 volt after disconnecting all on board DC batteries and chargers, then the DC must be coming from the dock ground. This is probably being introduced by faulty wiring in another boat connected to the common dock ground that is feeding down the ground line to all the other boats. The best way to isolate this problem is to wait until the other owners are away, or live-aboards have gone to work, and disconnect their shore power cords (after first turning off the dock breaker) one at a time until the voltage goes away. Please remember to replace them and restore power as you go. Having isolated the culprit, you have a public relations problem to convince the owner that he is not only risking damage to his own boat, but to all the other boats on the dock. Showing how disconnecting their shore power cord makes the DC voltage reading go away should convince them.

The DC current should be below 20 milliamps, +/- depending on the size and type of boat. Significantly higher readings indicate active galvanic action. Compare this reading to the current flowing with a galvanic isolator in the ground circuit to verify that it is providing

protection.

There are other sources of electrolysis that you can't correct. The boats each side of you in the marina may be connected together through the dock ground lead and one may be eating up the zincs rapidly on the other. If your boat sits between them, this current may take a short cut by going in an item near one boat, and exiting via your zinc near the other. This will eat up your zinc too even though you are not connected to them. The best solution here us to use zinc fish while you are at the dock. They are large lumps of zinc, often cast in the shape of a fish, that are cheaper and easier to replace than the zincs on you shaft.

The "fish" come with a copper wire already attached which is also used to hang them in the water. They have an alligator clip on the end of the wire and this should be connected to the negative bonding circuit on your boat. If it is not conveniently available in the cockpit in the vicinity of the prop, you might consider installing a stainless bolt for clipping it to, with the head of the bolt inside the deck connected to the negative bonding system. Clipping it to the shrouds or railing will only work if somewhere on the boat the shrouds are connected to this boat negative bonding system.

Metal boats are more of a concern because if electrolysis eats a hole in your hull you can sink. Protection on metal boats depends on coating the hull with an epoxy insulator to minimize the amount of metal connecting to the water. Zincs are then placed all round to provide protection from places where the the coating has failed and for unpainted underwater items. There are electronic devices which use your 12 volt battery to inject current into the water just like the zincs do, to protect your metal boat. I personally have had some very bad experiences with these and highly recommend you throw them overboard. Although they can provide protection when they are working, the potential for disaster if they fail is not worth the saving in cost of a few zincs, which you have to install anyway in case the 12 volt supply is not available. Even when working correctly, I find the chlorine generated at the electrodes can eat up your underwater paint job.

http://www.yandina.com/electrolysis.htm