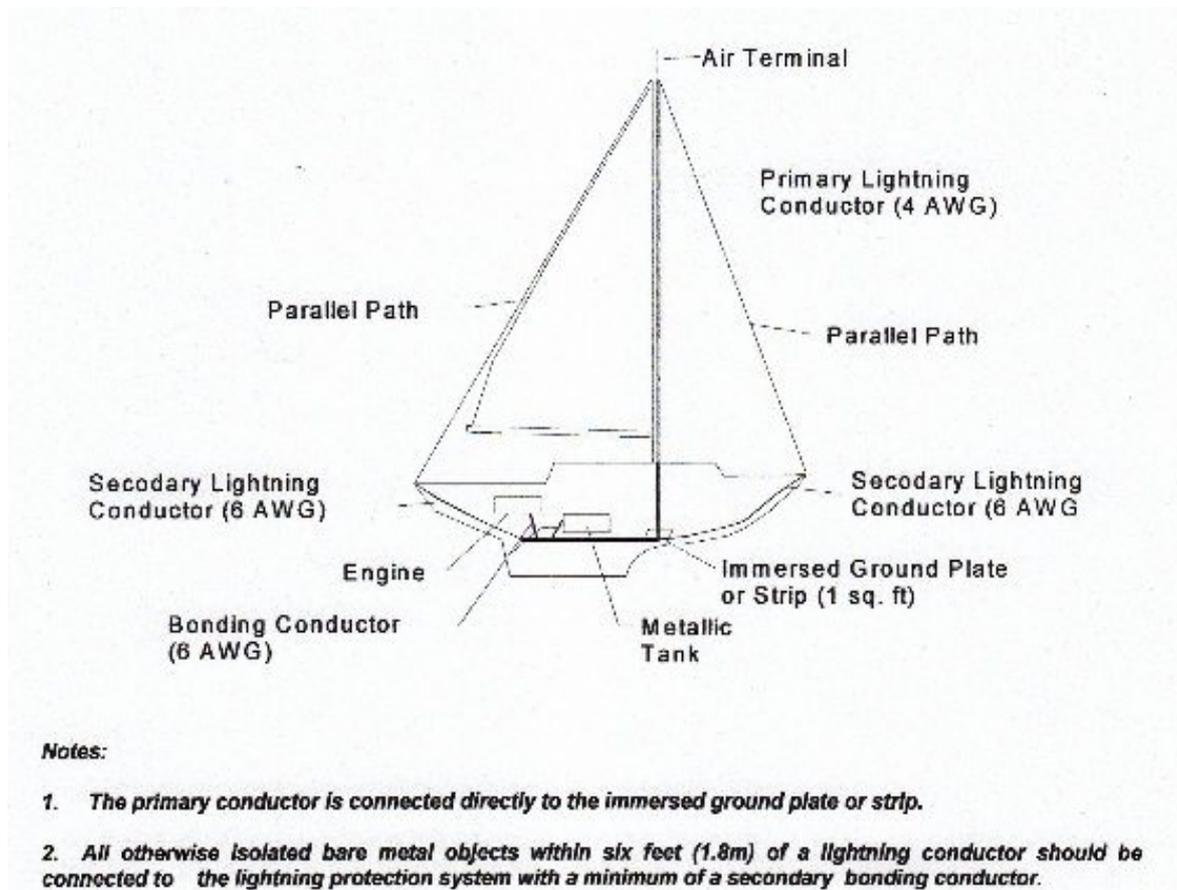


## How to, Lightning Protection, Electric Propulsion

Written by Ed Sherman

Monday, 16 May 2011 12:55 - Last Updated Tuesday, 27 December 2011 13:39

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### Basic Lightning Protection System as per ABYC TE-4

One of our readers wrote in last week with a question about lightning for his sailboat. What really caught my attention was that he is also converting the propulsion system from diesel to electric. Since he is (wisely) electrically isolating the electric motor from the propeller shaft and propeller, he's lost one of the potential links to ground through the bottom of the boat that a lightning protection system needs. Joe's letter follows:

Hi Ed,

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I am installing an electric motor into my 1977 Orion S&S 35 sailboat. Consequently, upon removal of my diesel, there is no grounding system. The shaft of the new motor is isolated so I can't use it as ground. I have a lead keel and was considering hooking a grounding bus to a keel bolt. I was also going to do the same with the chainplates for lightning protection. The wiring diagram calls for 4/0 AWG cable. Here are my questions:

Does my ground cable need to be 4/0 AWG as well? What size Bus might I need?

What size cables are best for lightning protection?

If I am struck, doesn't that fry everything that might be tied to the same ground? Is there a way to isolate lightning from boat ground?

All of this is new to me, so please pardon the numerous questions.

Thanks,  
Joe

So, let's sort through this for Joe, because this is a question I get fairly often. First of all let's consider the primary conductor shown in the diagram above. It lists 4 AWG wire as the requirement. Its important to remember here that on a boat with an aluminum spar, the mast will serve as the primary down conductor. On boats with carbon fiber spars, the ABYC does not consider the spar a suitable conductor. Obviously, a wooden mast is not good either, an actual cable needs to be routed up the spar. I'm not sure whether Joe's Orion uses a wood or aluminum spar. I'm going to assume it is aluminum. Also important to know here is whether the mast is deck or keel stepped. If it is keel stepped, all that's needed is to run a **4 AWG** cable from the mast base to one of the keel bolts.

As for the chainplates, we consider those as secondary conductors within the system. Use **6 AWG** wire to connect to either a bus bar or directly to a keel bolt.

If the system is not going to be connected directly to a keel bolt, a minimum 1 square foot ground plate, preferably made of solid copper stock should be mounted on the outside of the hull.

Joe's question about other items like electronic equipment that may be attached to the same ground system being vulnerable is certainly a valid concern. The short answer here is that yes, any electronic equipment connected to the system might be subject to damage after a strike. Its important to understand that the sole purpose of any LPS (lightning protection system) is to protect people from harm and hopefully prevent the boat from sinking. There are absolutely no

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guarantees related to equipment protection. The safest, sure bet is to disconnect the equipment from the system during a lightning event.

As for the size of the bus to use, this is always an interesting guess. The actual strength of a lightning strike is a huge variable. But, based on the historical 4 AWG, 6 AWG values for wire that TE-4 recommends, a bus bar that could be used to link secondary 6 AWG conductors might be a Blue Sea # 2104 or 2107. These are about the most heavy duty units available without getting into custom made equipment.

Joe, I hope these answer your basic questions about LPS. Hey, we'd love to see some pictures of your electric conversion project too! How about sharing?