THE COMPUTER CORNER

No. 274: Belt vs Suspenders*

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[*Stan roughed out the original article and Pat, who had done a project on just this subject while in engineering school, contributed several important points to this final edition.]

What do you do when you need a ring or spade terminal on the end of a wire? Solder one on? Crimp one on? Its a puzzlement!

Well, there are several issues. We hams know that a well-made solder joint will tend to prevent any RF from leaking from poor connection between the elements of the joint owing to the electrically secure connection between the copper wire and the metal of the terminal. Also, we assume that the solder filling in the gaps between multiple strands of copper in a terminal will exclude air, and thus prevent or delay oxidation of the copper over the years. Such oxidation has been known to induce high resistance between copper and terminals, leading to heating problems and even the generation of RF noise. Solder is also useful because its low melting point poses minimal risk of damage to components. Chalk one up for a well-done solder joint. On the other hand, solder has little mechanical strength, leading to the well-accepted practice of also providing a mechanical interlock (e.g., a wire wrapped around a terminal) with the solder joint.

Indeed, solder connections are sometimes avoided or even forbidden. American Boat and Yacht Council standards forbid solder as the sole means of electrical connection for wire terminations (though you can solder after crimping). We know that, correctly applied, a solder joint can be strong and highly conductive as mentioned earlier. On the other hand, solder joints are somewhat brittle and prone to failure when they are under constant vibration. That is why motorsport organizations tell their folks to avoid solder joints when reliability is critical. Closer to home, the National Electrical Code *prohibits* soldered connections in service wires and ground or grounding wires. Service wires are upstream from over-current devices (breakers or fuses), and a fault resulting in a high current might melt the solder in a connection, leading to loose elements and a more serious current fault or even an explosion in a service panel. Aside from service wires, a melted solder connection in a ground/grounding wire could lead to a poor ground connection or no ground at all. Of course, this is dangerous and could lead to shock or electrocution. Electricians avoid solder connections like the plague, and claim soldered joints are a thing of the past. They go for pressure connectors, either crimped or bolted, and call them “solderless”.

So, what is one to do? As you may know, Stan does lamps, and this includes chandeliers. Chandeliers must be grounded (for good reason, which is the topic for another article), often with an unobtrusive bare stranded copper wire that snakes down the chain from the ceiling to the fixture, along with the two-wires that supplies the hot and neutral lines to the bulbs. At the top, the electrician can connect the bare wire under a screw in the service box that effectively grounds that end. But often there is no such screw available to connect the bare wire to the fixture. The best way to fix this is to

terminate the stranded ground wire in a 3/8” ring terminal that surrounds the threaded rod of the chandelier itself. But how to make that ring terminal secure (physically and electrically) to the ground wire? Stan takes the “belt + suspenders” approach. He removes any plastic from the new ring terminal and securely crimps it (using a proper tool) to the ground wire. A strong pull tests that crimp connection. Then, using rosin-core (of course) solder, he solders it. CYA! The best of all possible worlds! It really cannot get more secure than that.

Pat points out that this general approach is good for hams, too. That is, solder joints should have mechanical stability to improve reliability. A crimped joint, even if a tiny bit loose, may accomplish this in combination with proper soldering.

To sum up, the best approach is to properly crimp the connection and test it by trying to pull it apart. A tight crimp will be about as strong as the wire, and if properly crimped, it will not come apart. Then solder it for top notch electrical continuity, excluding the air, and so on.

So, think about that the next time you are installing terminals at that repeater site. Or on the wires in that heavy duty power supply. Or wherever. Happy computing!