Soldering Clinic

by Vincent P. Lipton
From the March 2009 AMA Insider

The following guidelines will help you achieve good, reliable solder joints, and will hopefully encourage you to be more adventurous with your model's on-board control systems.

Rule One: Use a small soldering iron for small jobs (small wires and connectors) and a large iron for large jobs (landing gear wire, tinplate, music wire, etc.). In a pinch, you can wrap a piece of thick copper wire tightly around the tip of your "blunderbuss," extending the copper wire tip about 1/2 inch beyond the tip of the oversize soldering iron or gun, thereby creating a small iron. Be sure to run the solder around the contact region between the big tip and the coil of wire, to make a good thermal contact.

Rule Two: A good solder joint is usually made from the standard 60/40 blend of lead and tin. If this alloy is allowed to oxidize by being overheated, or heated for too long, the binding properties of the solder degrade seriously. Don't use solder that has been sitting molten on the iron tip for more than five seconds. Wipe it all off. Discarded solder blobs are useless; don't save them. Always use fresh solder.

Rule Three: Keep a piece of dampened (not soaked) sponge nearby to clean oxidized solder off the iron tip. This must be a natural sponge, not one made from foam or plastic (which melts). You'll find the green Scotch-Brite kitchen pads ideal. Clean off your soldering iron tip on this just before you make any solder joint. The tip of your iron should look bright and shiny just before you apply it. Oxidized solder looks dull and grainy. Get rid of it! I find that I discard 70% of my solder by cleaning it off and replenishing it with fresh, but its well worth it.

Rule Four: Always use resin-cored solder. You should never need liquid or paste acid-flux if you prepare your work correctly. The resin core melts when you apply solder to the job and acts as a cleaning and flow agent so the solder will bind properly.

Rule Five: Use only enough solder to bind the two objects together. Extra solder does nothing to increase strength, but only adds weight.

Rule Six: Always tin both parts before joining together. Tinning means heating the areas to be joined, applying solder to the junction of the hot tip and the part, and ensuring that the part is evenly coated with a good, shiny film of solder.

Joining Electrical Wires
1. Strip off 3/32- to 1/8-inch of insulation.
2. Tin the wire so it looks uniform and shiny.
3. If the solder "drags" and looks dull and grainy, apply the iron again, apply more solder, and clean off the excess.
4. Slide a piece of heat shrink tubing approximately double the wire diameter and about 3/8-inch long over one of the wires.
5. Lay the two tinned ends side by side.
6. Heat briefly with the iron so they flow together.
7. Slide the heat shrink tubing over the joint and heat with your heat gun or the barrel of your soldering iron. Once it cools, pull on the wires to make sure the joint holds.

Joining Steel Wire
1. Prepare the joining surfaces by thoroughly sanding them with sandpaper. (Ed. Note: It's also wise to wipe the wire with acetone or lacquer thinner to remove any trace of manufacturing oils before you sand the wire) This provides a good surface for the solder to stick. Treating each piece separately, heat the contact area with the iron and apply solder. Rub the tip all over the contact area, while applying fresh solder and flicking off oxidized solder, until the contact area is shiny and well tinned. While the steel wire is still hot and the surface solder is still molten, quickly wipe off the solder with a dry cloth. You'll notice a different color between the rest of the steel wire and the tinned surface indicating that solder has penetrated the wire surface and has prepared the contact area for binding.

2. Place the two tinned areas together and wrap with fine copper wire. Strands taken from multistrand heavy electrical cable is ideal, but have the strands ready for use before you start. After wrapping tightly, twist the ends of the binding wire together (so they don't unwrap). (Ed. Note: Using a extremely short piece of brass tubing slipped over the two wires and crimped is simpler and doesn't have to be any heavier) Heat the whole joint with the iron and apply fresh solder. Because you pretinned the steel wires, you'll find that solder will readily flow into the joint and adhere properly to the surfaces. Any time you see convex blobs of solder you can bet the joint has not soldered properly. Apply more heat, flick off the old solder, and apply fresh.

Editor's Additional Note: The use of Sta-Brite solder on landing gear legs would seem more appropriate inasmuch as it has greater holding power. The writer of this article was undoubtedly recommending resin-core solder to avoid corrosion which can be caused by normal acid-core/silver solder flux. In November 2005 I described a solder flux which does not leave corrosion. I have used this flux for the past four years and have had no trace of corrosion resulting. This flux is available at HN Electronics, http://www.ccis.com/home/hn/