

Phil's Soldering 101

Version 1



1. Safety:

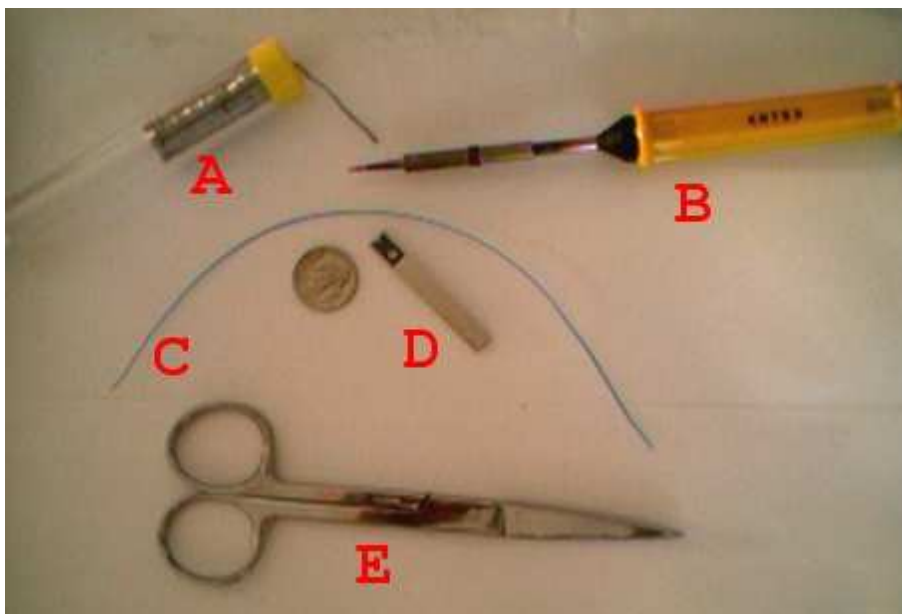
Always wear ANSI Z87.1 compliant safety goggles while soldering. These goggles are made of polycarbonate, a type of plastic that resists shattering into small sharp pieces. Also be sure to unplug the soldering iron when done.



2. Tools:

Obtain solder (A), soldering iron (B), wire-wrap (C), wire-wrap stripping tool (D), and scissors (E). A soldering iron holder and damp sponge are also needed (not shown). Solder should be of the 2 to 4 percent silver type. I highly recommend the ANTEX 12 Watt soldering iron model M/3U pictured below. It is inexpensive, small, and heats up in 45 seconds. It can be obtained from M. M. Newman Corporation, phone: (800) 777-6309. Make sure to also order a needle tip made of iron, specifically number 8-I. See the following website for more information:

<http://www.mmnewman.com/antexsi/antexpm.htm>



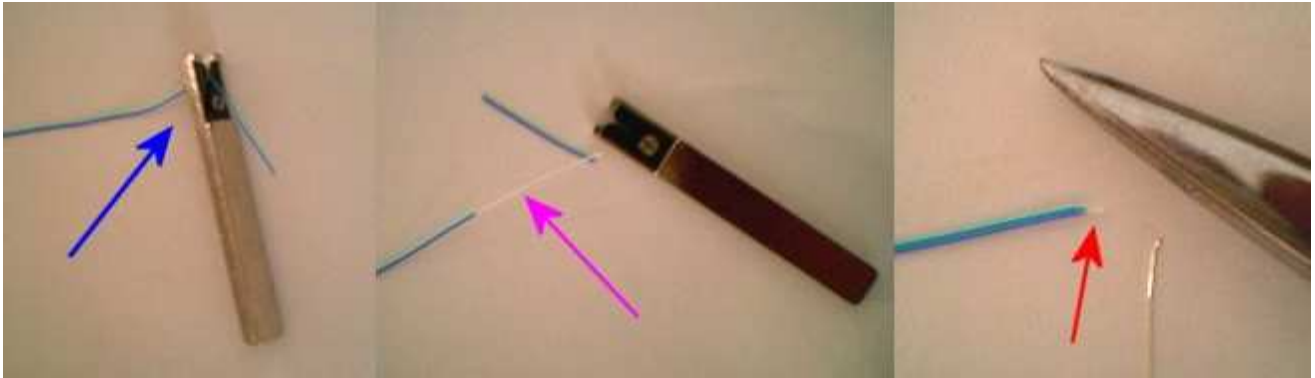
3. Iron Preparation:

Add solder to the soldering iron. It may smoke (let it) as impurities burn off. Wipe the iron on the sponge. Do this until the iron tip looks shiny (red arrow) like a dime. The iron is now tinned.



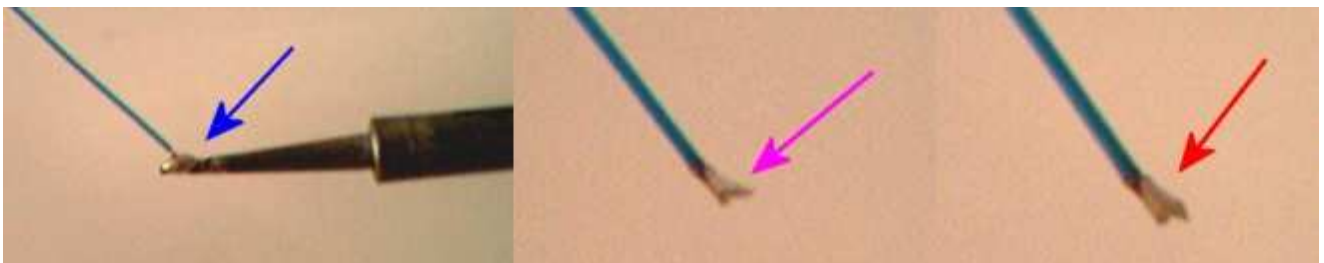
4. Wire Preparation Part A:

Insert one end of the wire-wrap into the stripper tool (blue arrow), pull towards the short end to strip (purple arrow) and then use the scissors to cut all but 1 mm of the bare wire (red arrow).



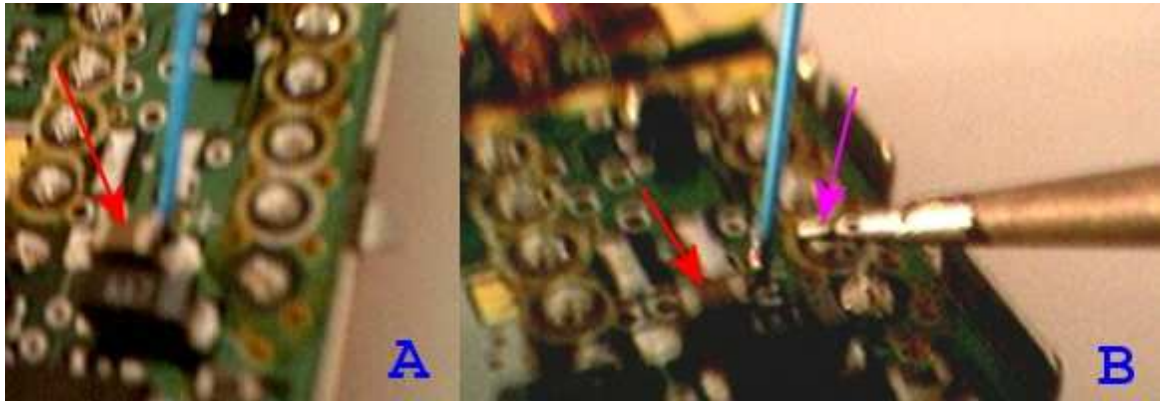
5. Wire Preparation Part B:

Add solder to the iron. Dip the 1 mm of exposed wire into the solder (blue arrow) until very little solder is left on the wire (purple arrow). This may take several tries but is by far the most important step. Wipe all excess solder off the iron with the sponge and then heat the solder on the wire until it is no longer jagged or horned (red arrow). Notice how little solder is placed on the wire.



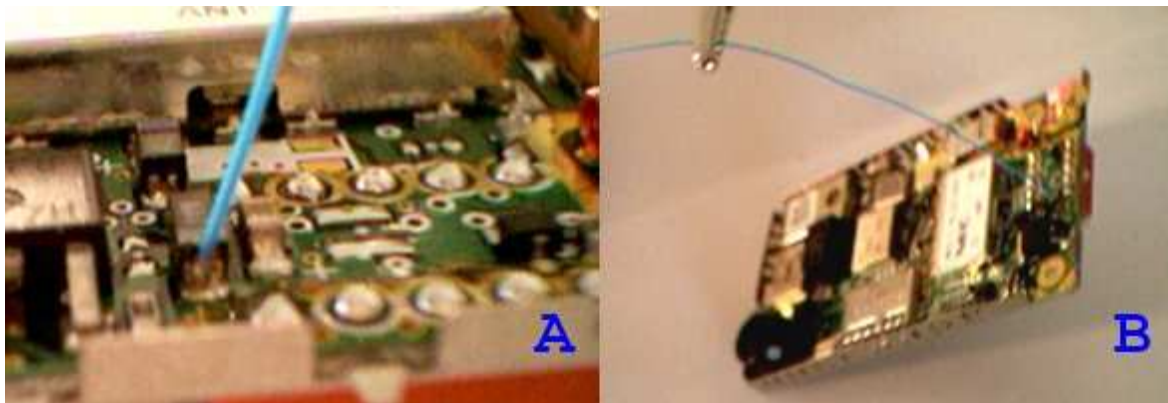
6. Soldering:

Wipe all excess solder from the iron with the sponge. DO NOT add any additional solder (this is key to making a good clean surface-mount connection). Touch the wire (A) to the component (here a surface-mount capacitor indicated by the red arrows). Using the side of the needle tip (purple arrow) apply heat for ~4 seconds while sandwiching the wire between the iron and component. If solder does not flow wait 30 seconds to allow for cooling and then re-apply heat. The connection should become shiny when the solder flows properly.



7. Examine:

The soldering is now complete (A). Examine the connection visually. Do not be afraid to handle the connection, it should be very strong (B) and will not come apart unless you pull with significant force (more than you will accidentally apply). If the connection fails while handling, consider it a blessing because it was not a good connection. No need to lament, just re-apply heat and try again.

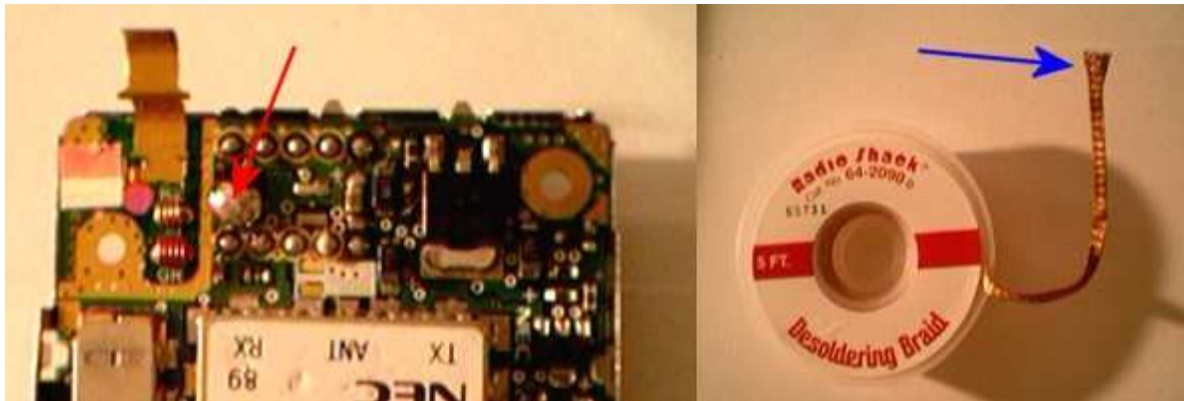


8. Tips:

Practice making ~15 connections like the one above on a junk surface-mount board like the old phone PCB above. Make sure to never overheat the board or any of its components. Heat kills electronics! Use a low wattage soldering iron (Radio Shack irons are not recommended). Four seconds is not a hard and fast rule. What is important is solder flow. Once the solder is hot enough you will see it flow according to gravity and capillary action. A few moments after this, remove the soldering iron. Make sure to hold the wire in place for a few seconds while the solder cools.

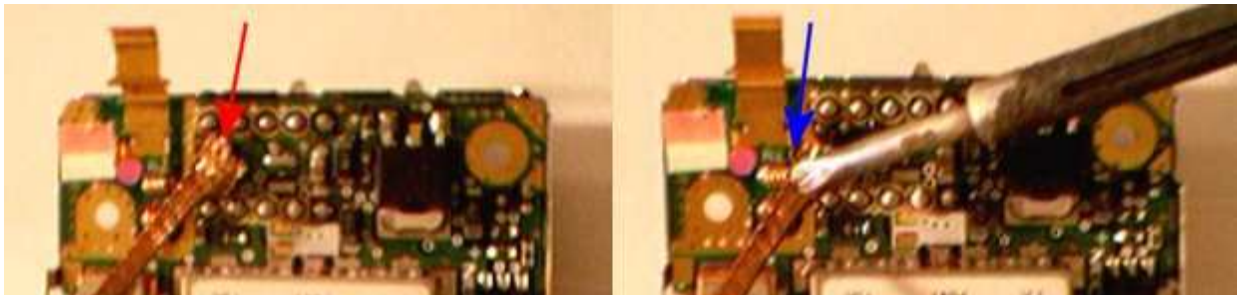
9. Fixing a Mess Part A:

Lets say you have a big mess like the one below (red arrow). Please note that kind of thing cannot happen when using the method described above. Desoldering braid (blue arrow) to the rescue! Notice how the braid has been purposely flared at the end.



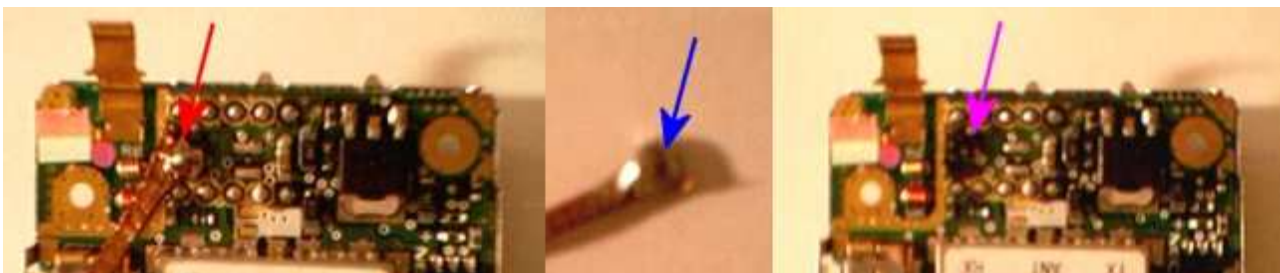
10. Fixing a Mess Part B:

Touch the braid to the mess (red arrow). Now press on the braid using the soldering iron (blue arrow). It takes solder to flow solder (an engineer told me that back when I worked for a defense contractor); therefore, you may have to heat the solder directly for a moment before using this technique. DO NOT overheat the components. There is no rush.



11. Fixing a Mess Part C:

Notice how the solder gets sucked up into the braid (red arrow). Pull away when hot and most of the solder will be stuck to the braid (blue arrow). The mess is gone (purple arrow). Small remaining amounts are often best removed by direct application of the iron (via capillary action).



12. Final Exam:

You have read everything so I am giving you a grade of A+. You are now an expert at soldering. I can be reached at just_rtfm@yahoo.com with any comments. dr phil :)



'Don't make me destroy you.'

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