

SOLDERING IS SIMPLE IF YOU UNDERSTAND THE PHYSICS

Bob Dörner

Objective: Soldering is bringing the two parts being joined up to the melting point of solder in the presence of a wetting agent ("flux"), then introducing a bit of solder.

EQUIPMENT & SUPPLIES: An ordinary cheap soldering pencil of 25 Watts or less is fine. A temperature-controlled solder station is better yet! I like fine gauge Kester 60/40 (tin/lead) or Multicore solder. (Tree huggers have induced the common usage of lead-free solder. That stinks. It is hard to work with.) Any small can of rosin flux is important to have and lasts a long time. Inexpensive needle nose pliers, diagonal flush cutting pliers and wire strippers are also needed in printed circuit board assembly. It is occasionally necessary to unsolder a component, hence solder wicking (copper braid) and a solder sucker are good additions to the list.

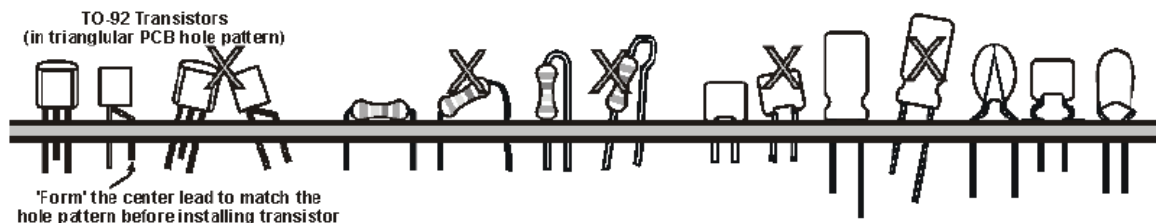
SAFETY SAM SAYS: Hot irons and hot solder burns... so don't wave the iron around, lean on it or leave it unattended! Also note that the cord of the soldering iron can easily be melted and destroyed. The fumes released while soldering should not be inhaled. Although they contain little lead (not hot enough to vaporize much) the rosin vapors are harmful. When clipping leads use caution as they can fly a surprising distance, so wear glasses or safety goggles.

QUICK P.C. ASSEMBLY: Identify every component value and polarity very carefully. If necessary, clean the p.c. board. Insert the components in the board on the proper side of the board, flush with the board surface. Hold the component in place by bending the excess leads outward at about a 45 degree angle away from the component on the solder side of the board.

I put many (or all) of the components in place first and then solder them all at the same time. (I do not place and solder them one at a time as suggested in many instruction manuals). However, before you solder double check that everything is in its proper place, IC chips are especially difficult to unsolder!!! Solder each connection as shown on the next page. The idea is get in, solder, and get out quickly. This requires a clean board, well tinned iron and high quality solder.

I never use a "heat sink" as experience has taught me they are ordinarily not necessary. I do avoid soldering semiconductor and IC chip leads in rapid succession so as to avoid heat build up. When repairing old equipment or with low quality boards it is often helpful to dip the solder into the flux to assist the cleaning and wetting of the joint. You can solder copper, brass, tin cans, semiconductor slabs (thermistors & photocells) and if you are careful it is possible to solder batteries to repair or make rechargeable battery packs.

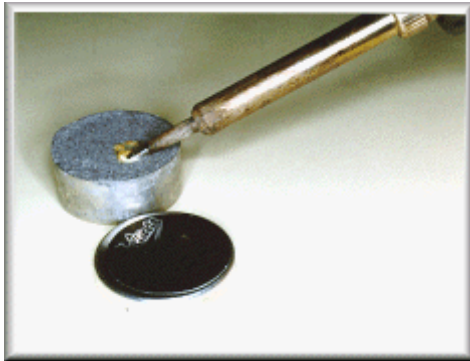
Unfortunately lead-tin solder will not adhere to NiChrome heating or resistive element wire.





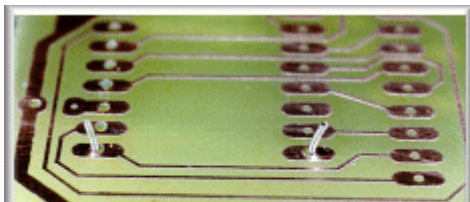
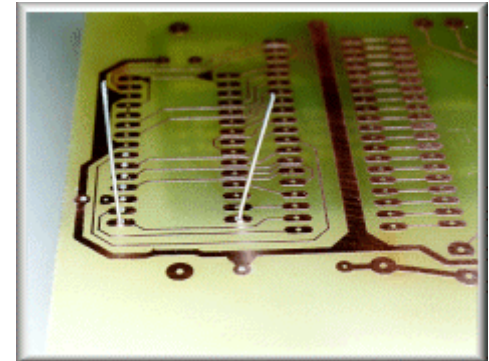
(Left) Printed circuit board copper tracks must be clean to begin with, especially if they're not previously "tinned" with solder. Clean any raw p.c.b. copper tracks gently with an abrasive rubber block, fine sand paper, scrubby.

(Right) Clean the soldering iron tip using a damp sponge or paper towel. The iron shown is an Ungar temperature-controlled soldering station. Other popular brands of soldering equipment include Weller and Antex.



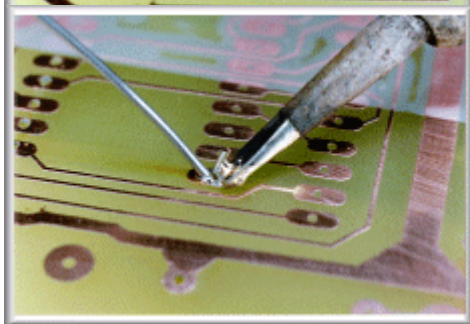
(Left) A useful product is rosin paste for tinning the iron. Troublesome joints can be prompted to solder with a tiny bit of added rosin flux. Electronic solder has a flux core and ordinarily does not require additional flux. New tips must be tinned **immediately** when used for the first time.

(Right) Insert components and splay the leads so that the part is held in place.



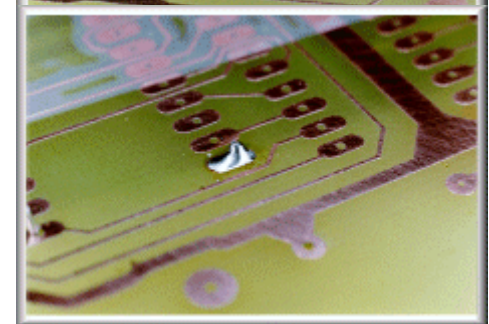
(Left) It's usually best to snip the electronic component wires to short length after soldering. Use caution since the wire scrap can fly and hit your eye.

(Right) Apply a clean soldering iron tip to the copper solder pad and the component lead, in order to heat **both** items at the same time. A bit of melted solder on the iron helps to heat the joint rapidly.



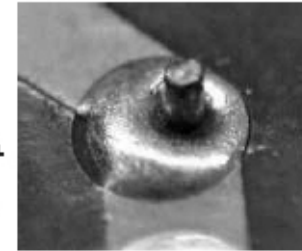
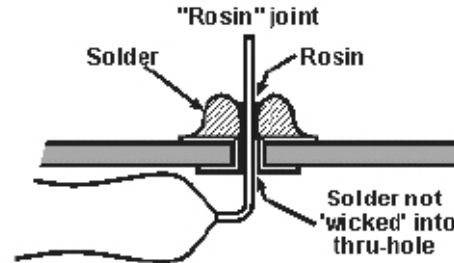
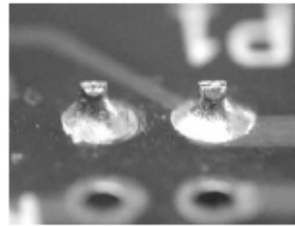
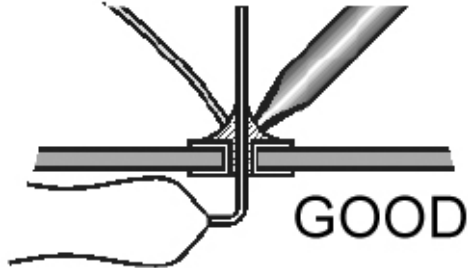
(Left) Continue heating and apply a few millimeters of solder. Remove the iron and allow the solder joint to cool naturally.

(Right) It only takes a second or two, to make the perfect joint, which should be nice and shiny. A good solder joint resembles a "Hershey Kiss."

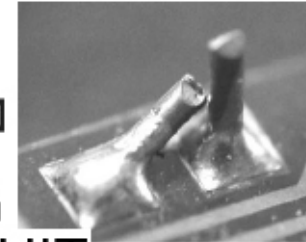
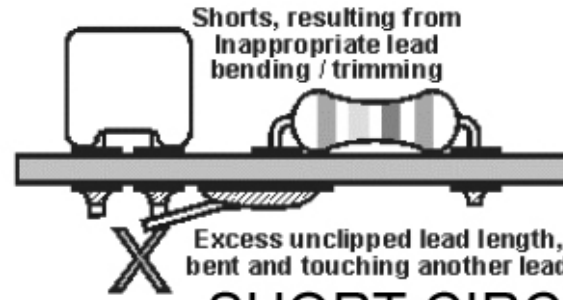
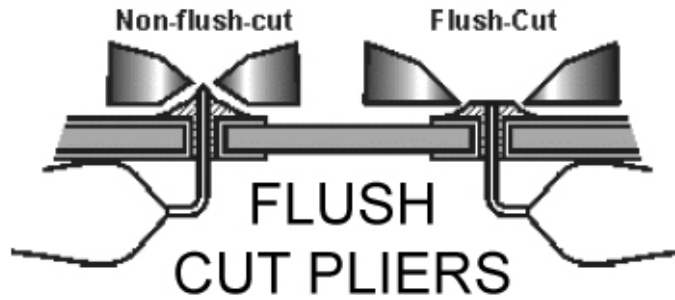


PICTURES HELP

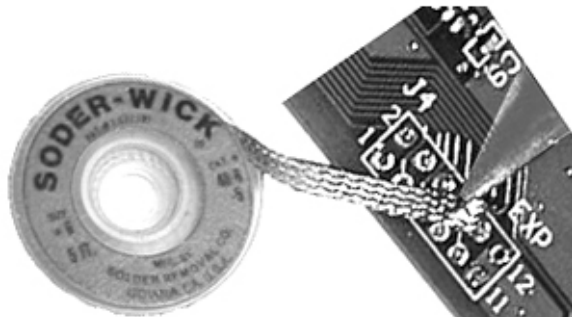
After the joint is hot (~2 secs.)
apply solder AT the joint and
then allow a SMALL amount to
melt and 'flow' into and around joint



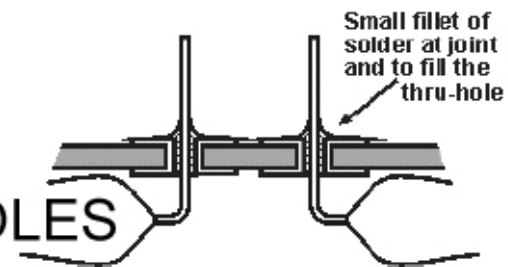
UNACCEPTABLE



SHORT CIRCUIT



DOUBLE SIDED
PC BOARD WITH
PLATED THROUGH HOLES



A STAND
IS NICE!



SOLDER SUCKER