

How To Solder

Soldering is a useful skill for a network support person.

Matthew Bell demonstrates the technique.

In the early days of networking, the average network analyst's tool-box consisted of a multimeter, a set of screwdrivers and a soldering iron. In these days of software diagnostics the requirement to go in and "get your hands dirty" is diminishing, but a soldering iron is still a useful tool. There are many opportunities for custom cables to be made up, repairs to existing cabling carried out and so on

Tools

The essential tool for soldering is, of course, the soldering iron. For most soldering tasks a relatively low power (20 to 25 watt) iron will be more than sufficient and quite cheap (US \$30 to \$40). Some good quality solder is the next necessity; look for a reasonably fine solder made for electronics use and that has flux already in it. Solder is soft alloy, that tends to oxidise when heated. The flux inhibits the oxidation process so keeping the solder easy to handle and the joint clean. Other than that, some fine sandpaper to clean joints and a pair of wire cutters will come in handy.

Soldering

Figure 1 shows the steps to soldering.

1. The pieces to be joined should be clean and free of grease. Fine sandpaper or wire-wool is ideal for this. The pieces should then be placed together in the required configuration, and secured in position. Crocodile clips, pliers, masking tape etc can all help here. There are few things more frustrating than to almost finish soldering a joint only to have the pieces spring apart.
2. Once the joint is ready, the soldering iron should be tinned. This means that a small amount of

solder should be melted onto the tip of the iron, and then the tip wiped onto a damp cloth or sponge. The tip of the soldering iron should then be coated in a thin layer of clean, shiny solder.

3. The amount of time the iron should stay on the joint depends to a large extent on how much ma-

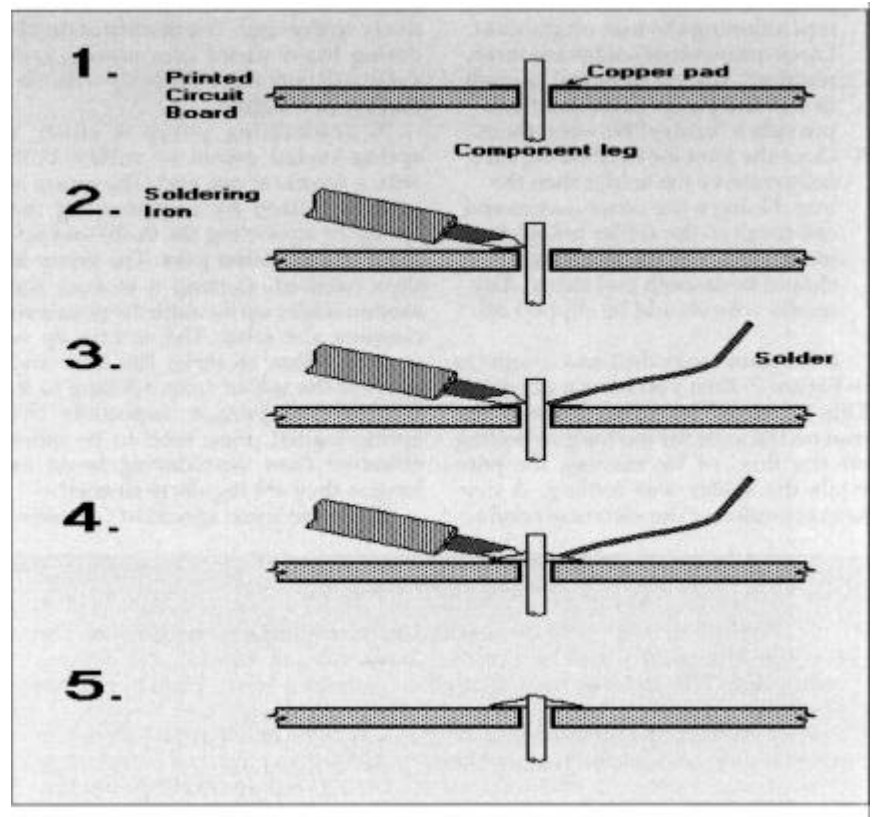


Figure 1 - Steps in soldering

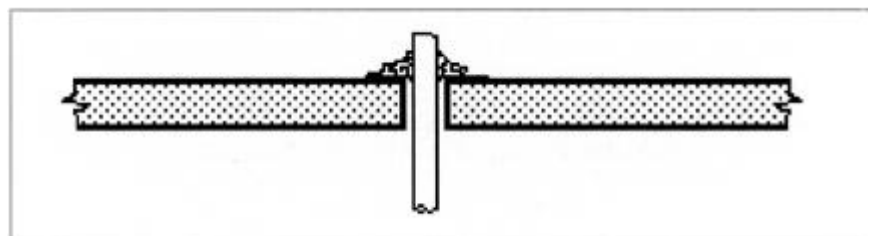


Figure 2 - D y joint

terial needs to be heated. With a small component being soldered to a printed circuit board, the iron should not stay on for more than a couple of seconds. Similarly with connectors where metal pins are inserted into plastic holders, as if the soldering iron is kept on for too long the plastic will melt.

4. When you think the joint is ready, introduce some solder onto the joint. It should flow freely, and this is helped if you can get the solder between the iron and the joint. If the solder doesn't melt, try repositioning the iron on the joint. Large amounts of solder are rarely required. Aim to have just enough to coat the pieces of the joint and provide a "bridge" between them.
5. Once the joint looks finished, carefully remove the solder then the iron. Doing it the other way round can result in the solder being stuck to the joint. The soldered joint should be smooth and shiny. Any excess wire should be clipped off.

If the joint looks dull and rough (as in Figure 2) then you have a dry-joint. This is caused by either keeping the iron on the joint for too long so boiling off the flux, or by moving the joint while the solder was cooling. A dry-joint provides a poor electrical conduc-

tor as it has many fracture lines in it. Dry joints should be removed and re-made.

Removing Solder

Removing solder from a joint usually requires either desoldering braid or a desoldering pump (sometimes built into a soldering iron). Desoldering braid is usually copper braid soaked in flux. The joint is heated, then the desoldering braid applied to the joint. The solder is drawn into the braid, so leaving the joint relatively solder-free. The quality of desoldering braid varies enormously, and some will only work properly with certain types of solder.

A desoldering pump is either a spring-loaded piston or rubber bulb with a nozzle at one end. The pump is primed (either by compressing the spring or squeezing the bulb) and applied to the heated joint. The pump is then released, causing it to suck the molten solder up through the nozzle so cleaning the joint. The nozzle tip is usually teflon to resist the heat and prevent the solder from sticking to it. Desoldering pumps, especially the spring-loaded ones, tend to be more effective than desoldering braid as long as they are regularly cleaned.

There are some specialist "desolde-

ring stations" that include an electric pump to remove the solder. While remarkably efficient, they are very expensive and unnecessary for the vast majority of PC support departments.

Tinning

There is another use for a soldering iron. If you have to deal with stranded wires (ie, a wire that is made up of multiple strands of copper) it can be difficult to ensure all the strands go where you want them to, and not to accidentally create short-circuits. By applying a thin coat of solder to the wire (tinning it), the strands will be kept under control and the wire will be much easier to manage. Simply strip back some of the insulation from the wire and twist the strands together. Then, applying the soldering iron to one side of the wire, feed solder into the strands to join them together.

Note that tinning is not recommended where the wire will be clamped into position. Solder, being a very soft alloy, cold-flows under pressure. It would be possible that a wire tightly clamped into a connector could, over time, have the solder flow away from the pressure spot so loosening the connection.

Conclusion

A bit of practise goes a long way. If you can get hold of an old printed circuit board and some wire, practise making and desoldering joints until you can do it reliably.

Safety First

It should really go without saying that a soldering iron gets hot! The average iron used for light electrical work runs at around 250 degrees centigrade. This is more than enough to provide a nasty bum if you are careless.

Also, the flux used in the solder tends to spit when hot. It's painful enough when a tiny spot lands on your skin, if it landed in your eye it would be considerably worse. Always wear some form of eye protection when soldering. This is also true when using wire cutters to clip off excess wire - the small, sharp piece of wire is often ejected at considerable velocity. Finally, try and avoid breathing the fumes coming off the solder for too long. There is considerable debate as to the long-term effects of solder **fumes**, some studies suggest that if considerable quantities are inhaled then lung damage may result (flux is quite reactive).

Be careful about what equipment you work on. A mistake made in a printer cable may result in a broken printer, but a mistake in a power supply or monitor could be dangerous. Only tackle equipment such as monitors, power supplies, uninterruptable power supplies, laser printers and electrostatic printers if you are qualified to do so. Also, do not attempt to repair surface-mounted components unless you have specialist equipment and training.



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