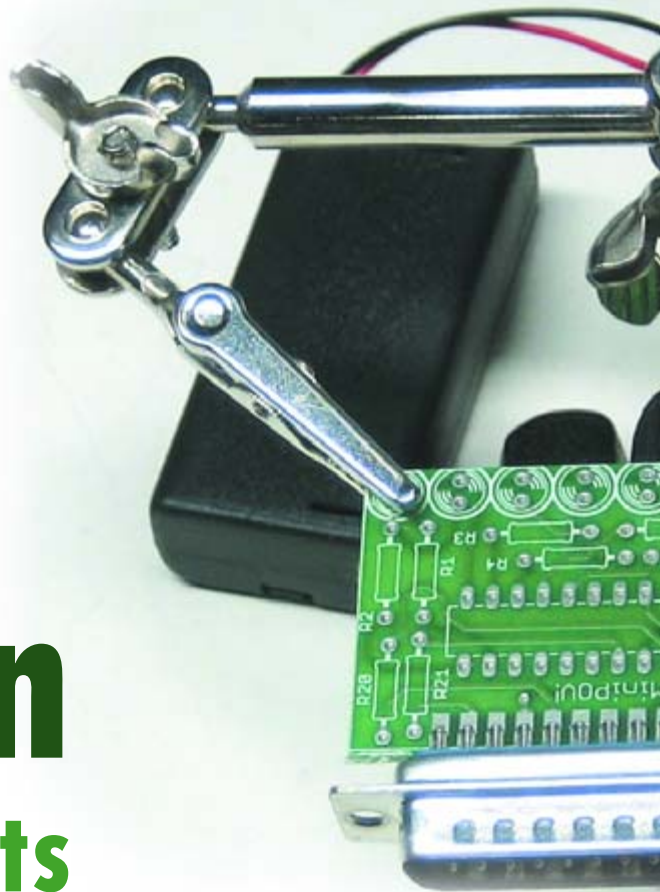


The circuits and circuit ideas in this Summer Circuits issue are bound to inspire many electronics enthusiasts to pick up a soldering iron and build something nice for themselves. Here we provide several basic tips for assembling circuits.

Hands-on Assembling Circuits



The minimum requirement for putting together a circuit is a soldering iron. A stand to hold the hot soldering iron is also very convenient. If you do a lot of soldering, it's a good idea to buy a temperature-regulated soldering station that always provides the correct soldering temperature.

Soldering tips

A soldering iron with a narrow bent tip is highly practical for soldering small components located between other large components. In that case, the entire iron must be relatively thin, and not just the tip. Various types of soldering tips, as well as special miniature soldering irons, are available for soldering SMD components (see inset). A good pair of tweezers is nearly indispensable for working with SMDs. A magnifying glass or loupe can also come in handy for checking soldering points on circuit boards.

If you select a type of solder with a flux core, you won't need any additional flux for soldering. Desoldering braid is very handy for removing excess solder. The braided wick of thin copper wires 'sucks up' liquid solder. A solder sucker is more convenient for removing relatively large amounts of solder.

Always keep the tip of your soldering iron clean. You can use a damp sponge, special metal shavings, or a tip activator for that purpose. Adjust the iron to the proper temperature (approximately 370 °C) and ensure that your workplace has good lighting.

Most electronics enthusiasts will still use 'ordinary' lead/tin solder at home. However, make sure you also have lead-free solder on hand in case you need to make repairs on boards assembled using lead-free solder.

Assembling circuits

A piece of prototyping board is an excellent choice for assembling a small circuit. Several types of boards are

available – with continuous copper strips, with independent islands, and with various other copper patterns. You can use thin, insulated copper wire to make connections between the various components.

A wide variety of adapter boards are available for experimenting with SMDs. Different types of SMD packages can be mounted on a small printed circuit board fitted with a standard 2.54-mm grid for headers and other components.

Making PCBs (or having them made)

Circuit board layouts are shown with some of the circuits in *Elektor Electronics*. Most of these circuit boards are available from *Elektor Electronics* or our business partner, The PCB Shop (Eurocircuits).

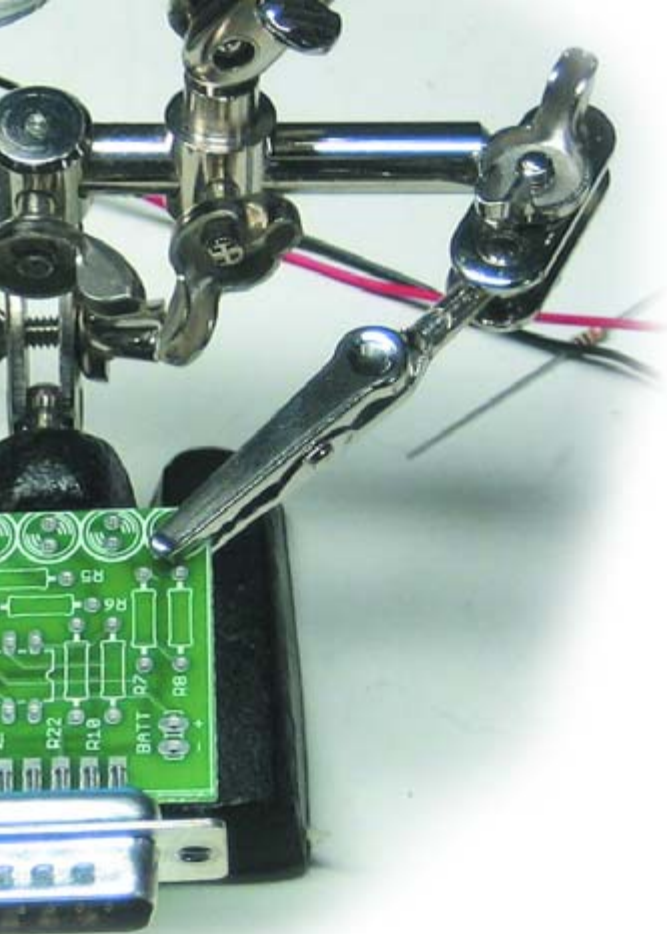
If you have designed a printed circuit board using a PCB layout program on your PC, you can make it yourself or have it made for you. There are several PCB firms these days (such as Eurocircuits and PCB-Pool) that make prototypes at acceptable prices, even for one-offs. Of course, you can also roll your own.

The first step is to use an inkjet or laser printer to make a good, opaque overlay film. Films specially designed for this purpose are commercially available. Use a hair dryer to dry the print after printing, and if necessary print the layout on top again to obtain good opacity.

After that you can use the film to expose the photosensitive circuit-board material (using a second-hand UV lamp, for instance).

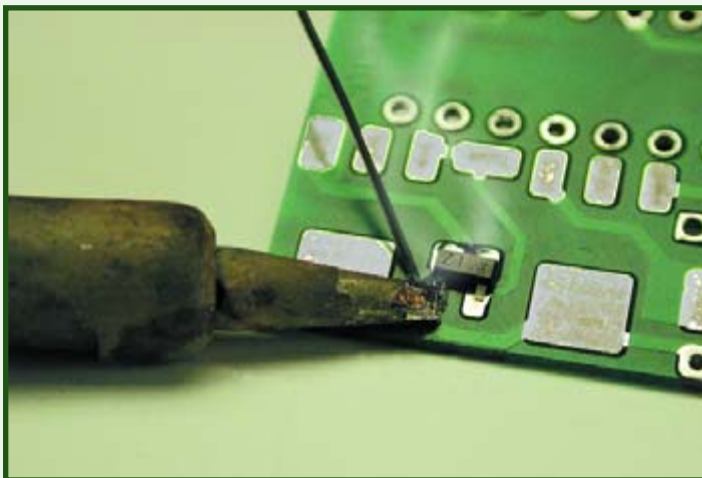
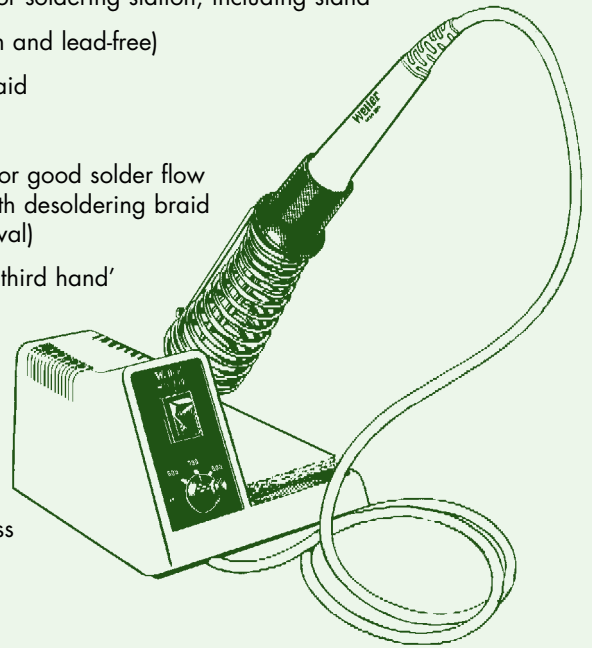
You can use granulated iron chloride to etch the circuit board. It does not have to be heated, so it generates less vapour. That also means you can etch the board right away, because it works at room temperature. This chemical can be regenerated so it can be used several times, and it is less aggressive than other etchants.

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Standard tools

- Soldering iron or soldering station, including stand
- Solder (lead/tin and lead-free)
- Desoldering braid
- Solder sucker
- Soldering flux for good solder flow (also for use with desoldering braid for solder removal)
- PCB holder or 'third hand'
- Tweezers
- Cutters (side cutters) for cutting off protruding pins
- Loupe or magnifying glass



Soldering SMDs

It's perfectly possible to handle SMD components using the conventional method (a normal soldering iron with a fine point, solder, and extra flux for very small components).

First use tweezers to place the small components (such as resistors, capacitors and transistors) in the proper locations, and then secure one pin or solder pad using a drop of solder on the tip of the soldering iron.

Check whether the component is still properly positioned, and correct the position if necessary. After that, continue with the other solder pad(s) by heating the component and the solder pad. Feed solder under the rounded surface of the tip. The flux in the solder and the capillary action between the component and the solder pad will cause a tight solder joint to be formed. Finally, return to the first solder point, heat the solder already there, and add a bit more solder to create a sound solder joint here as well.

With a multi-pin IC, first align the IC properly and then solder one of the corner pins in place. Check the positioning again, and then solder a pin in place on the other side. If the IC is still properly positioned, you can now solder the other pins, taking care to allow enough time for IC to cool down in between. It's good practice to inspect your soldering afterward with a loupe. If there are shorts between the pins, you can use copper braid and liquid flux to remove the extra solder.

A different method can be used with ICs that have very narrow pins. After carefully aligning the IC and securing it at two corners, you can solder all the pins using a generous amount of solder. It doesn't matter if that causes shorts between the pins. Next, use desoldering braid to remove the excess solder, which will also eliminate the shorts between the pins.

