

The tools needed for project building

A few basic tools are necessary before you can build your first electronic project. But which tools should you buy? In this chapter we take a look at the tools you will need to get started in hobby electronics, and explain how they are used.

by GREG SWAIN

As with any other hobby, it does cost some money to get started in electronics. But don't be intimidated. Very few tools are required for basic project work, and the overall cost of these can be quite modest.

In fact, some of the tools required may already be on hand in the family tool box.

Let's assume that you're starting from scratch, though. As a bare minimum you will require the following:

- soldering iron
- set of screwdrivers
- long nose pliers
- side cutters
- wire strippers

These tools are illustrated in the accompanying photograph and, with the exception of the soldering iron, are from the well known Xcelite range. They are all you need to assemble many electronic projects, particularly those where the metalwork or case comes pre-drilled.

The soldering iron

The most expensive item will be the soldering iron. This should have a rating of between 10 and 25 watts, and may be either a mains operated type or a low voltage type operated from a transformer. There is no set preference for either.

So how do you choose which type best suits your requirements?

To some extent, it all boils down to a matter of personal preference. The low voltage types generally have the advantage of being smaller and lighter than equivalent mains types, and are often preferred for this reason. Another ad-

vantage is that the accompanying transformer includes an in-built rest to hold the iron when it is not being used.

The main disadvantage of a low voltage iron is the fact that you do need the transformer. It is an expensive item, often costing more than the iron it is to power. Taken together, the two items will cost roughly twice as much as an equivalent mains-powered soldering iron.

If you want to save money then, the mains-operated type is the one to go for. The latest types are quite light and compact, although they would tend to be a little more tiring on long jobs than the low voltage types.

Another type of soldering iron which you might like to consider is the controlled temperature type. While a very light 10W iron of the simple type is OK for soldering ICs and component leads to a PC board, it will not be suitable for heavy duty work. Temperature controlled irons, on the other hand, provide the option of a relatively small tip for light duty work, and yet have sufficient power for heavy duty jobs.

As with the simpler uncontrolled types, controlled temperature soldering irons can be either mains or transformer operated. Their higher cost makes them hard to justify at hobby level, however, unless the iron is to be used for a variety of jobs.

So you see the choice is really up to you. Simply choose the soldering iron that best suits your requirements and your budget. Typical soldering irons suitable for general purpose hobby work are marketed under such brand names as: Mico, Scope, Weller, Adcola



This Weller-Xcelite tool kit contains a soldering iron and all the tools you'll need to get started.

and Lotring.

One word of warning though! It's best not to get an iron with a carbon element. Sooner or later you'll want to solder CMOS integrated circuits, and the heavy currents flowing from the carbon element to the copper tip of this type of iron present a potential hazard for these devices.

OK, that covers the soldering iron. What about the other tools?

Screwdrivers

A set of four or five blade screwdrivers with blade widths ranging from 2mm up to 10mm should suffice for most project work. The 2mm size will



Buy the tools separately if you prefer. Included here are side cutters, long nose pliers, wire strippers, a nut runner, Phillips head and blade screwdrivers, and a 25W soldering iron.

be useful for getting at the small grub screws used to secure a wide range of front panel knobs, while at the other end of the scale the 10mm size will come in handy for such jobs as securing transformer mounting screws.

What is important here is that you should always use the correct screwdriver for the job. The blade should be a snug fit into the slot and should be approximately the same width as the diameter of the screw head.

If you use a screwdriver that's too small, its blade will twist in the slot. This can cause damage to both the screw head and the screwdriver itself.

Long nose pliers & side cutters

Long nose pliers and side cutters (also called diagonal cutters) are tools that you will use quite frequently, so make sure that the tools you buy are well made and comfortable to hold. Those with box joints are usually the strongest, while plastic grips on the handles can be a great aid to comfort.

Both tools are available in various sizes. The best size for general purpose hobby work is around 150mm in length.

Strictly speaking, a pair of wire strippers is not really necessary. It's quite possible to strip wire insulation using a razor blade or a small pocket

knife. You do, however, run the risk of cutting into and damaging the wire conductors with this method.

The best advice is to buy a pair of wire strippers. Their cost is quite modest and they will do the job faster and neater than alternative methods. Another possibility here is to buy a combination wire stripping and side cutting tool.

Those are all the basic tools you will need to get started in electronics. Not very many, are there?

Of course as one progresses in electronics, other tools become desirable. The serious electronics enthusiast

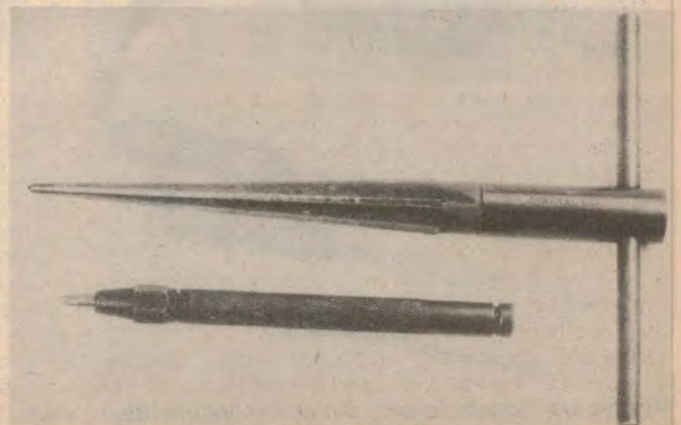
eventually ends up with quite a collection of tools, and can tackle anything from metalwork to loudspeaker cabinets.

Second line purchases

Typical second line purchases will include: an electric drill, drill bits, centre punch, Phillips screwdrivers, nutdrivers (also called spintites), nibbling tool, hacksaw, tapered hand reamer, a small hammer, vice, files, steel rule and scriber. All these tools are extremely useful, especially for working on instrument cases and metal chassis.

Let's take a look at some of these

Two useful metalworking tools: a 3-12mm tapered reamer (top), and a centre punch.



tools and see how they are used. First up, some tips on buying an electric drill.

The electric drill you buy should be double insulated, have a 10mm capacity chuck, and preferably have two speeds. The mechanical speed control types are generally more powerful than the electronically controlled types, but are also more expensive. Keep in mind, too, that an electric drill is handy for other jobs around the home, so buy accordingly.

Buy a very good set of twist drills to go with your electric drill. A comprehensive set ranging in size from 1.5mm to 6mm will do for a start. Don't buy cheap drills; they won't last long and are quick to blunt.

An electric drill is not difficult to use, provided a few basic points are observed. When drilling in metal, for example, it is always a good idea to centre punch the position of the hole first. A centre punch is a small cylindrical tool with a hardened steel point.

If you don't centre punch the hole position first you will find that the drill tends to wander when starting. When the drill does "bite" it will probably be not quite in the right place, and the resulting hole will be off-centre.

When using an electric drill to drill a large hole it is also a good idea to drill a small pilot hole first. You'll be able to position the hole much more accurately if you do. As a bonus, your drills will last longer. Deburr all holes using an over-size drill bit, either fitted to a hand drill or twisted with your fingers.



An 11-piece set of nutdrivers (spintites) from the Xcelite tool company.

Most of the screws you come across will be of the familiar slotted head variety. Sooner or later though, you're going to come across Phillips head (or crosshead) screws, which require the use of specially designed screwdrivers. As you might expect, these are called Phillips screwdrivers, and a set of five or six will make a valuable addition to your tool collection.

Nibbling tool

OK, so what's a nibbling tool? Well, you can see what one looks like by referring to the photograph. It's a tool for producing cutouts of any shape in sheet metal panels. As its name im-

plies, it lets you "nibble" away the metal piece by piece until the desired cutout is achieved.

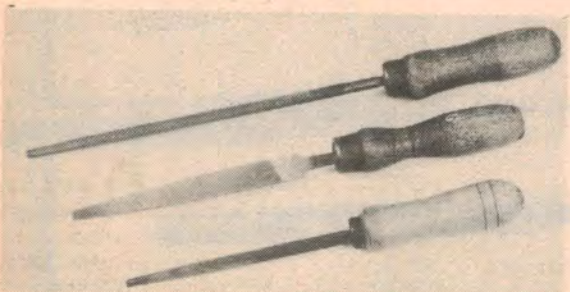
Before the tool can be used, a pilot hole large enough to clear the cutting head must first be made within the cutout area, using a drill and hand reamer. The head of the tool is then inserted through the hole, the metal edge inserted into the cutter, and the handles of the tool squeezed together to make the cut. The cutting head is then advanced to cut out the next piece of metal.

The way in which the tool is used is shown in one of the photographs.

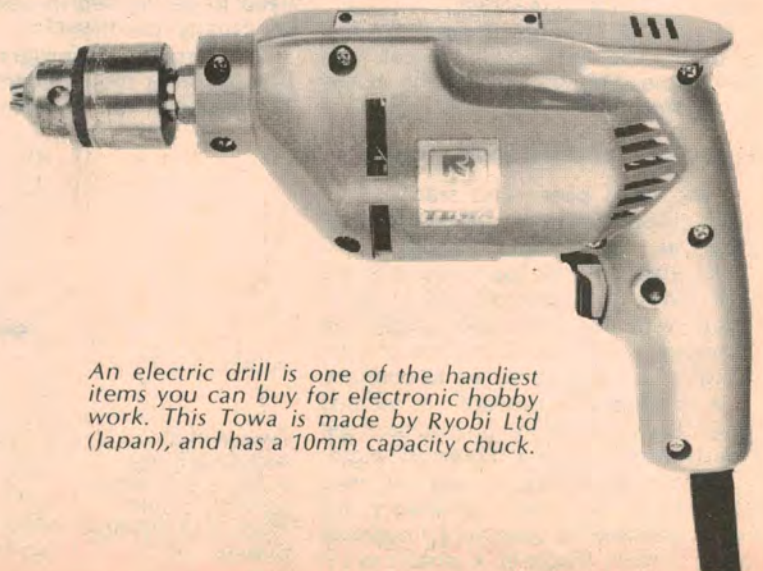
A hacksaw is useful for cutting



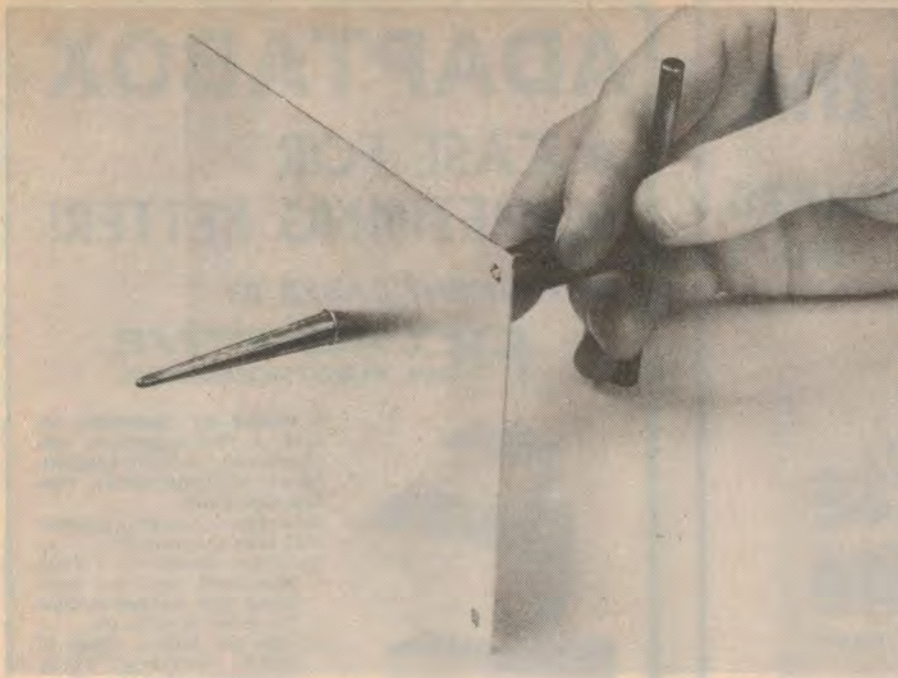
Left: this small battery-powered drill is especially useful for drilling holes in printed circuit (PC) boards. Suitable drill sizes for PC work are 0.8mm and 1mm.



This file set includes round, flat and triangular files.



An electric drill is one of the handiest items you can buy for electronic hobby work. This Towa is made by Ryobi Ltd (Japan), and has a 10mm capacity chuck.



A nibbling tool is used for making cutouts in sheet metal panels.

The tools in action: reamer (top), nibbling tool (right).



Large holes in metal work are easy with a chassis punch set.

aluminium, plastic and a wide range of other materials. It's a fairly simple tool to use, provided you adopt the correct technique. The blade should be inserted with the teeth facing forwards (away from the handle) and tightened until it gives a definite "ping" when plucked with the finger. A dull "thung" means that the blade is too loose.

Use a fine-toothed blade when cutting thin aluminium or plastic sheeting, to obtain a reasonably smooth finish. A coarser blade should be used for thicker materials.

Hand reamer

Another tool likely to be unfamiliar to many is the hand reamer. This features a number of tapered steel cutting edges, and is mainly used for enlarging holes in plastic and sheet aluminium. For large holes, a reamer can give a much neater and more accurately positioned hole than an equivalent size drill.

Make sure that the reamer you buy has a gentle taper, similar to the one shown in the photograph. The ideal reamer for electronics work tapers from 3mm up to 12mm, and has an overall length of 140mm. Another popular size has a taper from 4mm to 22mm.

A reamer is used by first drilling a small clearance hole. The tip of the reamer is inserted into the hole, and the tool then turned in a clockwise direction until the hole reaches the required size.

Make sure that you always turn the reamer in a clockwise direction. Tur-

ning it anti-clockwise will blunt the cutting edges.

There's one important item that we haven't even yet mentioned — the multimeter. A multimeter is a piece of test equipment which performs voltage, current and resistance measurements on electronic circuits and components, and is an essential item for the hobbyist. It can carry out all the basic checks required in building and, if necessary, troubleshooting electronic projects.

We'll deal with the multimeter in greater detail in a later chapter.

We could go on and list many other tools, but these tend to be more specialised and are seldom used by the hobbyist. Included in this general category are such items as Allen keys, plastic alignment tools, scissor clamps, rivet guns, crimping tools, chassis punches and hole cutters.

The important thing to remember is don't go overboard when buying tools. Buy each tool only as you need it, not because you think you might be able to use it. A tool that is never used is a waste of money.

Finally some good advice. Always use the right tool for the right job. Use the wrong tool, and you run the risk of damaging both the tool and the component.

Don't skimp when buying tools. Buy the very best that you can afford and look after them. A shadow board or a tool box is a good idea. That way, your tools won't become lost and you'll be able to use them for many years to come.

FOOTNOTE: Xcelite tools are sold by Radio Despatch Service, 869 George St, Sydney 2000, and from other outlets. Other reputable brands are available, and information on these will be available from tool stockists and electronics retailers.