PRACTICAL ELECTRONICS

Tagstrips, circuit boards and breadboards

Printed circuit boards are great, particularly where a circuit must be built up in large numbers. But if you're building up a circuit and a PC board isn't available, you don't necessarily have to design and produce one yourself. There are quite a few alternative approaches, which can be faster and easier.

by GREG SWAIN

The popular method for building electronic projects is to mount the components on a printed circuit board (PCB). So before discussing some alternative building aids, let's first take a refresher course on PCBs.

A printed circuit board is a thin sheet of insulating material which carries a pattern of bonded copper tracks. The copper tracks are usually on one side of the board only, and act as "electrical wiring" between the components to connect them according to the circuit diagram.

Two main types of insulating material are used for PCBs:
1) Epoxy bonded fibreglass — often called epoxy or glass for short; and
2) Synthetic resin bonded paper (SRBP).

Holes drilled through the PCB allow the electronic components to be mounted. As a rule, the component leads are pushed through from the non-copper side of the board, and their leads soldered where they pass through the copper on the other side. Excess lead lengths are then snipped off using a pair of sidecutters.

When mounting components such as resistors, capacitors, diodes and wire links, the leads generally have to be bent at right angles to the axis of the components body. The leads must be bent at the correct points, so that the component will span the space between the allotted holes.

When should you use a PCB? In short, whenever one is available for the project you wish to build, or when the circuit is to be built in such numbers that the effort to create a new PCB is justified. It will not only make the job easier, but will also give the finished article a professional appearance.

And because the wiring connections are automatically taken care of by the copper tracks, you'll be far less likely to make mistakes!

What if a PCB isn't available?

One way around the problem of not being able to get a PCB is to design your own. However, where only one or two units are to be made, the effort may not be worthwhile. What's more, you may be in a hurry to get the circuit built, or you might not feel too confident about designing a board of your own.

Don't think that you've come to a dead end in these circumstances. There are many alternatives to the PCB that will allow you to get on with the job.

These alternatives may be thought of as general purpose wiring aids. As with the PCB, they serve to hold and support the various components. But unlike the PCB, the builder must work out component placement and wiring details for himself.
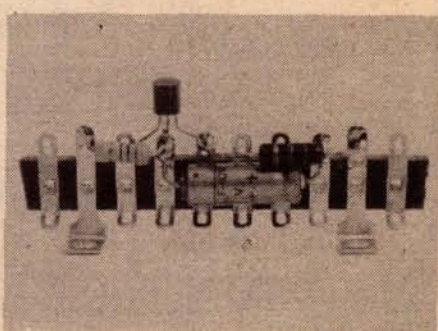
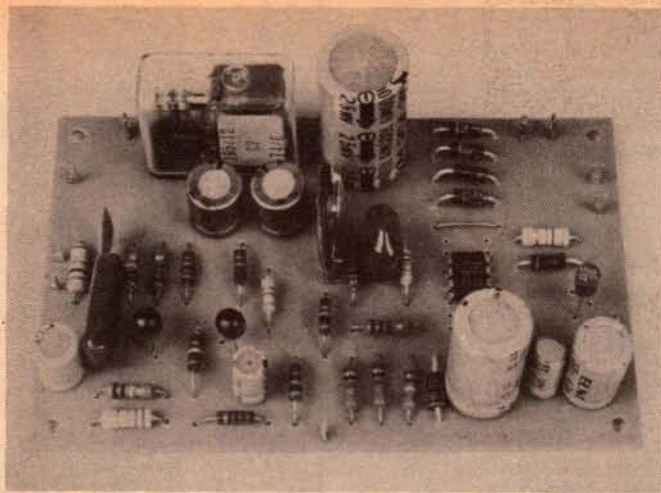Let's take a closer look at some of the more common general purpose
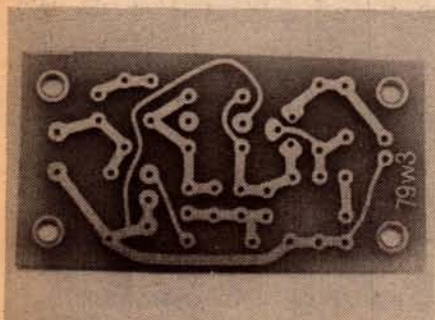
A printed circuit board. The copper tracks form the wiring connections.
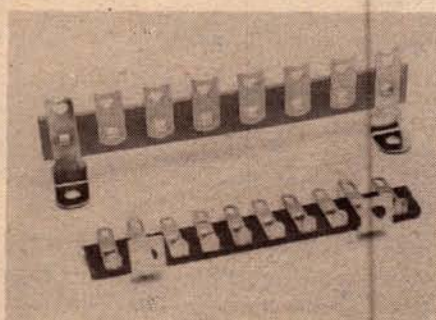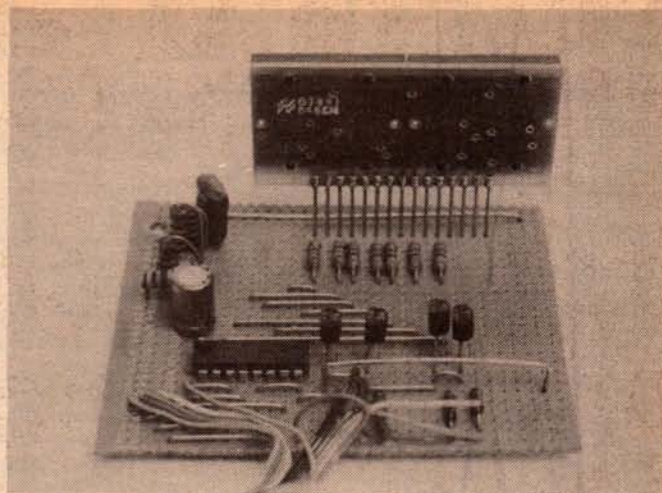
Two versions of tagstrip. The feet allow screw fixing to a chassis or case.

View showing how electronic components are wired to tagstrip.

An assembled PC board. Component leads are pushed through holes and soldered to the copper tracks on the reverse side.

A circuit assembled on Veroboard. Note use of wire links to make wiring connections across the board.

wiring aids. These are:
● Tagstrip and tagboard
● Perforated board
● Laminated stripboard
● Breadboards & IC boards
● Prototyping aids

Tagstrip & tagboard

One of the oldest (and most popular) wiring aids is tagstrip. This is still found in many old radio and TV sets, particularly those employing valves.

Physically, it consists of a strip of SRBP fitted at regular intervals with metal tags. Component leads and interconnection wires are soldered directly to the metal tags, which serve as multiple connecting points. Some of the tags are extended with feet to allow screw fixing to a chassis or case, and these provide convenient earthing points.

Various versions of tagstrip exist, and long strips can be cut to size with a small hacksaw. Advantages of tagstrip include low cost, ease of component placement, and the accessibility of the connection points.

A variation of tagstrip is tagboard. This may be thought of as a double row of tagstrips on a single piece of SRBP. Components are usually mounted across the board and connections between components made by wiring between the tags.

Another variation is printed mounted strip. This is like tagboard except that it uses copper pads in place of the metal tags.

Perforated board

Perforated board, often called matrix board, is a thin sheet of fibreglass or SRBP with a regular pattern of holes. It is available with the holes on either 2.54mm or 3.8mm centres, and in a range of standard sizes. Non-standard sizes can be obtained easily by cutting with a hacksaw.

Components can be mounted on either or both sides of the board, and connections between the components made by means of the component leads and other wiring. Plastic sleeving can be used to insulate the component leads to stop them from touching each other.

The main advantage of perforated board is that it is re-usable.
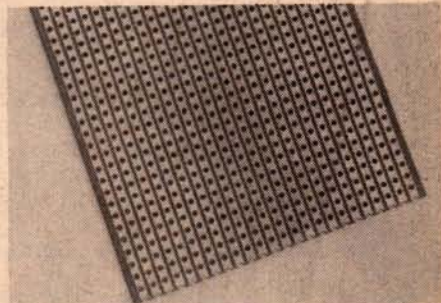
Laminated stripboard

Stripboard is similar to perforated board, but with parallel strips of copper bonded to one side of the board. The holes are drilled along the copper strips, and are on either 2.54mm or 3.8mm centres. The 2.54mm pattern will directly accept integrated circuits.

As with a PCB, the components are mounted on the non-copper side of the board. The component leads are passed through the holes and soldered to the copper strips. The strips can be joined with wire links and/or cut to suit the required circuit configuration.

Cuts along the copper strips can be made with a drill bit. The drill bit is placed in the hole closest to the required break point and twisted so as to cut away the copper.

The best known version of stripboard is called Veroboard. Another version is called Verostrip, which has the copper tracks divided along the middle. Verostrip is especially useful when working with integrated circuits, as they can be directly mounted on the board without the need to cut tracks.
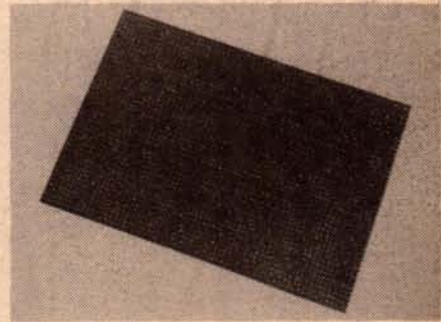

Laminated stripboard with 2.54mm hole spacing.
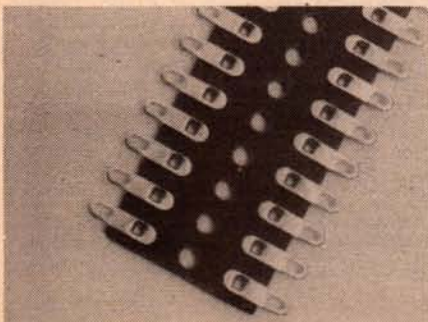
Tagboard has two rows of tags mounted on a single piece of SRBP.
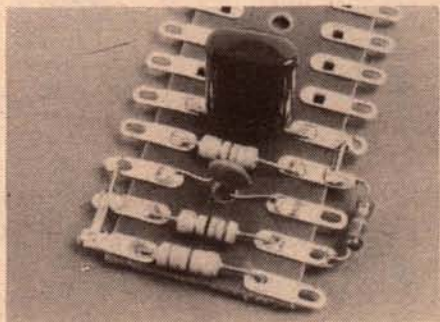
Components on tagboard are usually wired across the board.

A sheet of perforated board. Note regular pattern of holes.

Tagstrips, circuit boards and breadboards etc . . .

If the required size for a particular project is non-standard (as is likely), the required piece may be cut from a larger sheet. Once again, this is best carried out with a small hacksaw, and the edges then filed smooth.

Breadboards & IC boards

Included under this heading are quite a number of general purpose PCBs, designed especially for integrated circuits. They are sold under such trade names as Multi-Dip Board, DIP Board, Blob Board, DIL Board, and Dick Smith Design Beadboard.

Multi-Dip Board was designed by "Electronics Australia", and has positions for eight integrated circuits. Two of these positions can hold 24-pin devices with the wide 15.24mm pin spacing, as well as standard size ICs. The other six positions are for devices with 16 pins (or less), and using the standard 7.62mm pin spacing only.

Other components are added by soldering their leads to the copper pattern. Copper strips running the full length of the board provide convenient power supply rails. The components may be mounted on either side of the board. As sold board is not drilled.

Blob Board, DIL Board and Dick Smith Design Breadboard are used in much the same way as Multi-Dip Board. The DIL Board can hold up to five 8-pin integrated circuits, while the Dick Smith Design Breadboard is especially useful for mounting transistors. The latter two boards come pre-drilled, and components are mounted on the non-copper side of the board.

DIP board is designed to hold a large number of ICs — up to 20 14-pin DIL (dual-in-line) devices in fact. The board has a pattern of shaped copper pads and is perforated with holes on 2.54mm centres. Two power supply rails run between the copper pad format for easy link up to the ICs.

Each of the copper pads covers three holes, allowing other components and lengths of hook-up wire to be added as required. The board is available in a number of basically similar versions, one version being equipped with gold-plated edge pads so that it may be plugged into an edge connector socket.

Prototyping aids

Prototyping aids are used mainly for building and checking a circuit before it is built in more permanent form. They can generally be used with all types of components, including integrated circuits, and consist of a plastic base containing rows of spring contacts.

The most popular prototyping aids have the contacts divided into two lots of five rows. The five contacts within each vertical column are electrically connected together. Integrated circuits may be plugged directly into the contacts, giving four free contacts per IC pin (assuming standard size ICs).

The component leads are simply pushed into the contacts to make the connections. There is no need to solder, and components can be quickly added and removed, as required. Wiring connections are made with single strand wire, preferably insulated.

Three popular prototyping aids are CSC "Experimentor", CSC "Proto Board 6", and "Bimboard". The CSC Experimentor is the cheapest. It comes in several sizes, has a plastic base, and is fitted with tabs to allow individual units to be locked together.

Proto Board 6 and Bimboard have some extra features. Proto Board has a metal baseplate fitted with four terminals, while Bimboard has a clip-on plastic backplate which can be used for mounting switches, controls and terminals.

The building aids featured in this article by no means form a complete list. Many other products are available. What it means is that whatever your project, you should have little trouble finding a circuit board to build it on.
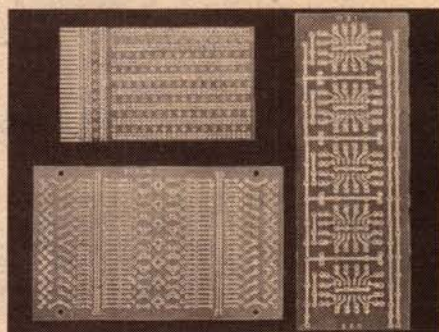
FOOTNOTE: The circuit building aids featured in this article were supplied by Radio Despatch Service, 869 George St, Sydney 2000; and by Dick Smith Electronics Pty Ltd, PO Box 747, Crows Nest 2065.
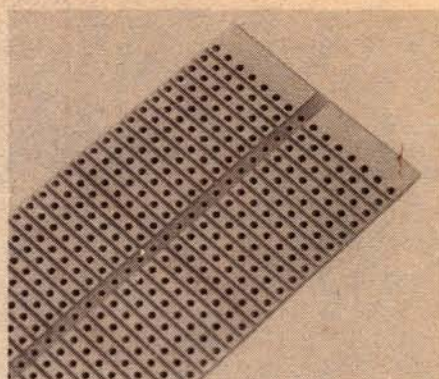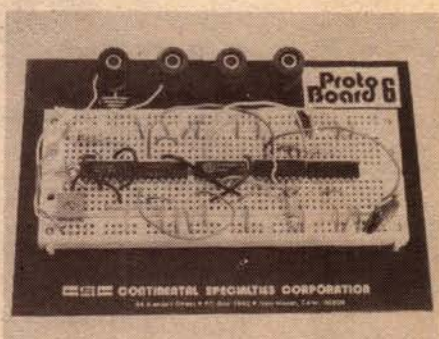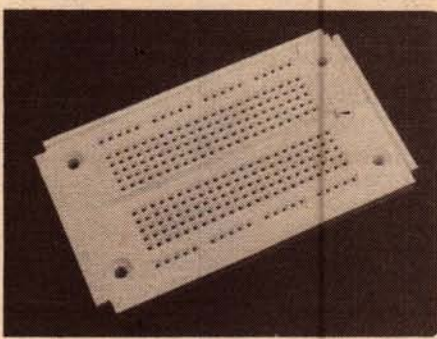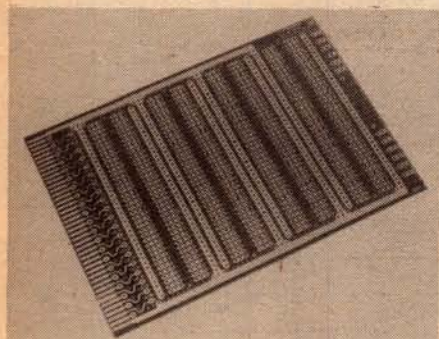

A section of Verostrip. It is useful when working with integrated circuits.
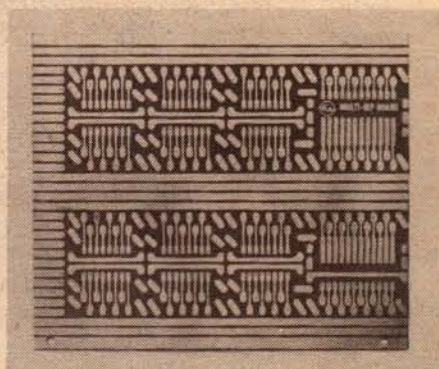
Multi-Dip Board can accept up to eight integrated circuits.

DIL Board (left), Dick Smith Design Broadboard (top right) and Plug-in IC Board.

DIP Board is especially useful when working with large numbers of ICs.

CSC "Experimentor" allows circuit prototyping without soldering.

A prototype electronic circuit made up on Proto Board 6.