Breadboard survey — 1

A look at solderless circuit construction aids

EVER SINCE electronic circuits have not behaved as designers intended, "breadboards" or patchpanels have been built to quickly assemble, modify and dismantle circuitry. Over the years various commercial types have appeared varying in style from a bare board sprouting with leads and "croc-clips," to a panel two foot long and littered with enough readouts, switches and controls to confuse even the most seasoned engineer. In the last few years several breadboard systems have been designed which are simple to use and can quickly pay their way in a workshop. Although any system which allows components to be temporarily connected together can be called a breadboard, the more popular types have a number of standard features. The most important of these is the method of interconnection. A socket based system where components are plugged in is essential for good breadboarding because the components can be quickly changed and used repeatedly. Flexibility is also important so that different component types and sizes can be used on the same board. A third facility which makes for a good breadboard is the inclusion of power supply points or rails.

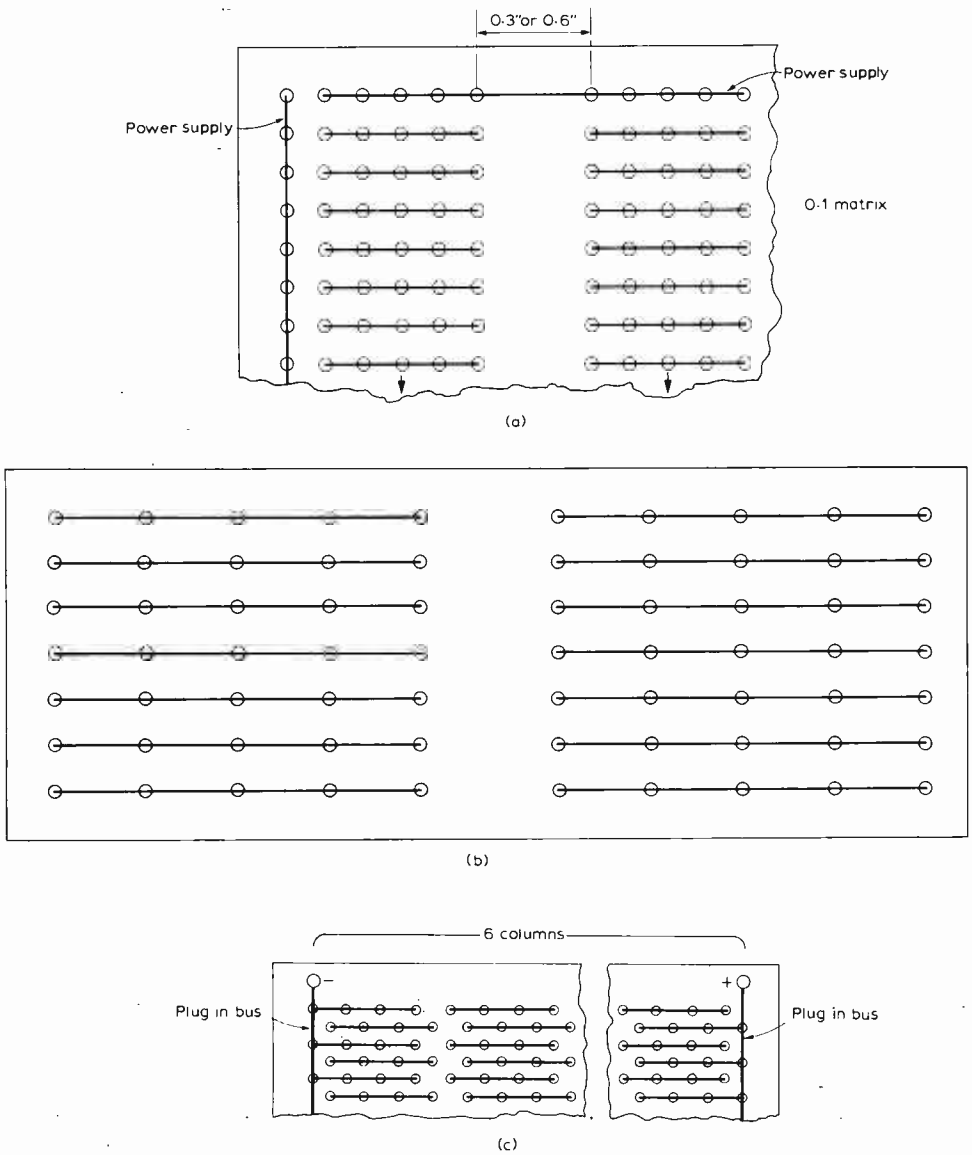

Fig. 1. Breadboard socket systems.

Apart from these main features, there are several other points to consider before choosing a system. Size is important and this will depend on the flexibility of the breadboard, and whether it can be extended. Compatibility must also be considered together with any accessories which can or have to be purchased.

In general there are three types of breadboard currently available. The simplest types are breadboard blocks which are normally based on a matrix of sockets. These blocks will accept individual components which are then interconnected by the sockets and supplementary wiring on the block. When the circuit has been completed, the components and wires are unplugged and can be used again.

The second group of breadboards are more elaborate assemblies, often composed of several blocks mounted on a base board, with the provision of power supply terminals and several supply rails. These systems often have accessory kits such as jumper leads which can save more time. The most elaborate breadboards systems are normally housed in a purpose built case, and offer built-in power supplies, oscillators and other general purpose outputs which simplify circuit evaluation even further. Again, these complete systems are often based on individual breadboard blocks and can be used in the same way.

The main problem with all solderless breadboards is the socket connection. Unlike i.c. sockets, which are only used a few times, the conductive contacts have to be robust enough to survive many operations, and always provide a reliable low resistance contact. To overcome this potential problem, several types have strips of contacts which can be replaced if a socket is damaged. This facility is very useful because a damaged or intermittent connection can waste more time than the breadboard will save.

Breadboard blocks

Euro Bread Board, see Fig. 2, measures 92 × 82mm and follows the socket connection system of Fig 1(a). A single panel will accept 0.3 and 0.6in i.cs as well as most discrete components with leads of up to 0,85mm dia. A total of 500

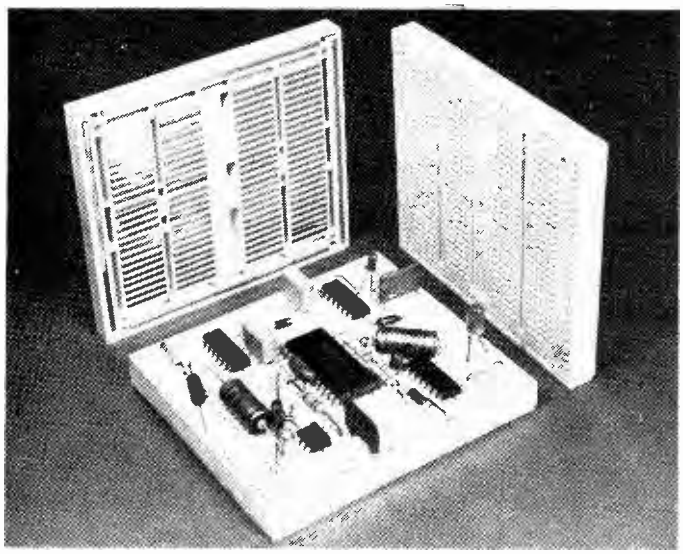

Fig. 2

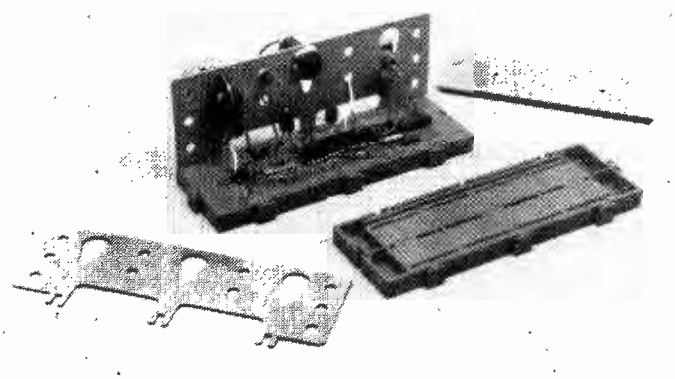

Fig. 3

sockets are provided based on a 0.1in matrix with four columns of 25 separate rows each containing five interconnected sockets. Four extra rows, each of 25 sockets, surround the matrix and are used as power supply rails. The layout is designed to accept two rows of 0.3in i.cs and one row of 0.6in i.cs. All of the socket strips, which are replaceable, are double sided types made from nickel silver alloy and rated at 1A. Contact resistance is specified as below 10mΩ and the life is quoted as above 10,000 insertions.

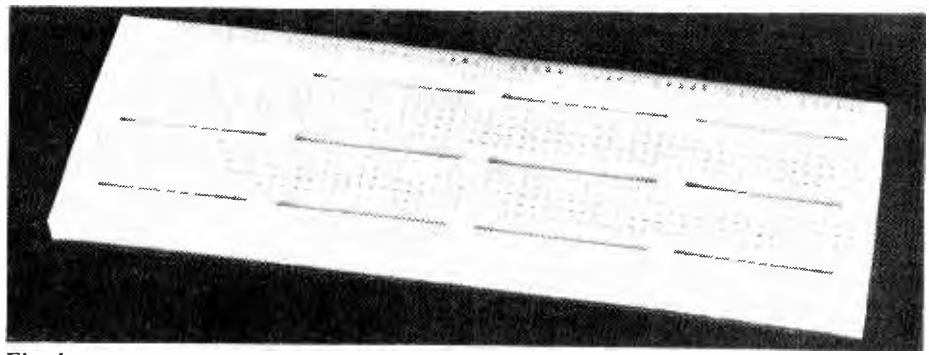

Fig. 4

Bim Board 1, see Fig. 3, measures 150 × 50mm and follows the socket connection system in Fig. 1(a). The layout will accept 0.3in i.cs, or 0.6in types by sacrificing some potential connection points. Most other discrete components can be accommodated with lead diameters up to 0.85mm. The block has 470 main sockets in a 0.1in matrix organised in two columns, each of 47 rows containing five interconnected sockets. Two extra rows, each of 40 interconnected sockets, serve as power supply rails. The strips of sockets, which are replaceable, are double-sided types constructed from nickel silver with a contact resistance rating at 1A of 10mΩ. On the top of the board the matrix area has the columns and rows numbered and lettered for easier circuit construction. The plastic moulding is provided with male and female connectors so that several boards can be locked together in an expanded system. A plug-in vertical panel is also provided for mounting external components.

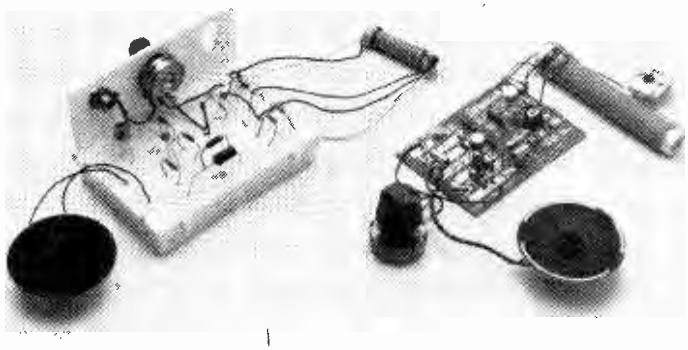

Fig. 5

Super Strip, see Fig. 4, measures 165 × 57mm and follows the pin connection system in Fig. 1(a). The layout will accept 0.3in i.cs, or 0.6in types by sacrificing some potential connection points. Most other discrete components can be accommodated with lead diameters up to 0.81mm. The layout has 640 main sockets in a 0.1in matrix which is arranged as two columns, each of 64 rows containing five interconnected sockets. Four extra rows, each with two strips of 25 linked sockets, provide eight power supply rails. The double-sided strips of sockets are available in nickel silver or with a gold plated finish. The blocks are supplied with a self adhesive backing compound for instant and semi permanent mounting. This backing can be peeled off to expose the socket strips which can then be removed. However, this is a sticky procedure and normally destroys the backing. Alternatively, the block may be mounted with self-tapping screws which are supplied.

S Dec, see Fig. 5, measures 114 × 76mm and follows the socket connection system in Fig. 1(b). The board is designed to accept only discrete components with lead diameter up to 1mm. The layout has 70 sockets arranged in seven rows each with two strips of five linked sockets. The double-sided sockets are constructed from brass, and are rated at 5A. Each hole is numbered from 1 through to 70 on the top of the board.

An extension of this system, known as T-Dec, contains 208 contacts with alphanumeric labelling for the rows and columns. This board allows one i.c. to be plugged into the block via an adaptor. A further extension, known as μ-Dec has a similar layout, but allows two i.cs to be used either directly or by adaptors.

A useful feature of all three versions is the availability of complementary printed circuit boards which reflect the layout of each board. This allows a breadboard layout to be transferred permanently to a p.c.b.

Experimentor, see Fig. 6, type 300 measures 152 × 53mm, and type 600 measures 152 × 60mm. Both versions follow the connection system in Fig. 1(a), and are designed to accept 0.3in or 0.6in i.cs together with most discrete components. The layout has 470 main sockets in a 0.1in matrix organised as two columns, each of 47 rows containing five interconnected sockets.

Two extra rows, each of 40 interconnected sockets, serve as power supply rails. The strips of sockets, which can be removed by peeling off an insulated backing paper, are a double-sided type constructed from nickel silver alloy. The top of the block has the matrix area numbered and lettered, and the plastic moulding has a male and female locating groove on each side. This allows both types of block to be snapped together either side-by-side or side-to-end. For permanent mounting, the moulding is also provided with four screw holes.

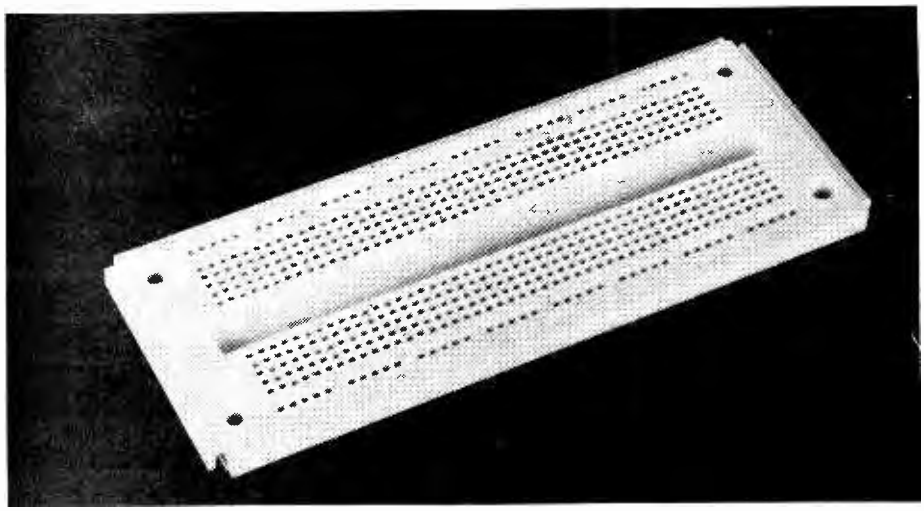

Fig. 6

I.C. breadboards from Cambion are based on i.c. sockets and 0.040in jacks. Type 702 2 105 02 has four 18-pin i.c. sockets which are connected to corresponding jack sockets. By using patch leads, connections are made between the i.c. pins. Power supply and ground terminals accept bare wires or spade connectors. Type 705 0369 01 is a similar system measuring 165 × 159mm, but with 16 0.3in i.c. sockets. Solder turrets are provided for input/output and supply connections, and supply buses travel inbetween the rows of i.cs. Two other boards in this range accommodate 32 and 64 i.c. sockets.

Alternatively, the three boards can be supplied with i.c. jacks instead of sockets.

The Hirschmann Experimental Plate in Fig.7 follows the layout in Fig. 1(c). The board will directly accept most discrete components with lead diameters up to 1.2mm and, via special adaptors, 0.3in i.cs. Interconnection of components is by special patch leads which are supplied in a kit. The plate has 1,128 connection points organised in six columns each with 47 rows of 4 interconnected sockets. The board is supplied with two plug strips which are used as power supply buses, and connect either 23 or 24 rows of sockets together.

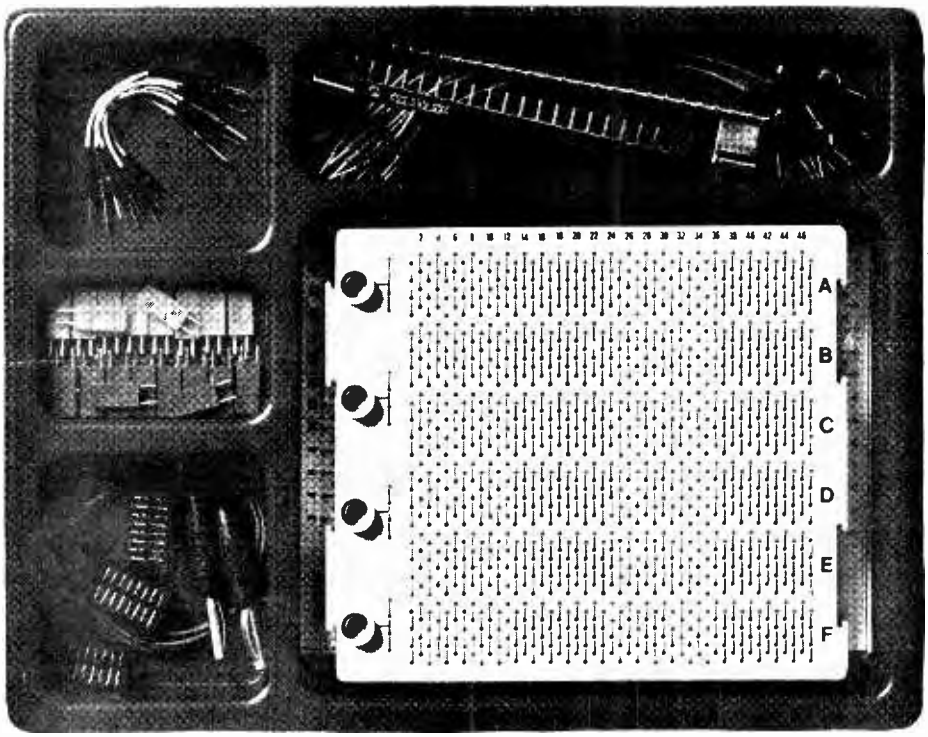

Fig. 7

The socket springs, which are constructed from beryllium copper and can be either nickel plated or gilded, have a contact resistance of around 45mΩ for 5,000 operations, and a current rating of 1A. The moulding has the columns and rows lettered and numbered, and dovetail clips are provided on two sides so that several plates may be joined together. The plate also incorporates four 4mm sockets which can be used for input and output connections.

A screw-fixed vertical panel is also available for mounting switches and potentiometers. Draft sheets are supplied which have a socket layout. This enables the constructor to draw a circuit plan on paper before assembling the breadboard.

Wonderboard is available in two sizes which measure 81 × 35mm and 81 × 140mm. The layout will accept most i.cs and discrete components as shown in Fig. 8. The basic board contains six rows of 31 holes. These rows are spaced at 0.3in and the holes are filled with a conductive elastomer.

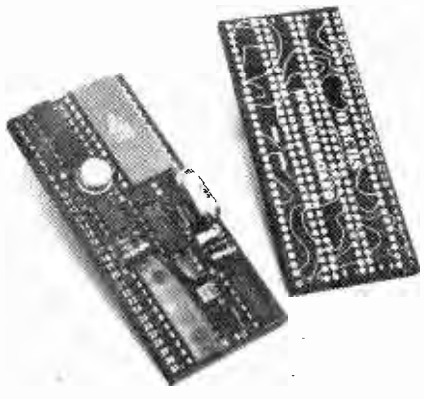

Fig. 8

Components are pushed into these contacts from the top of the board, while interconnection leads are used on the underside. Each contact can accept one component lead and up to six 26 gauge wire contacts. Contact resistance is specified as 10mΩ and the current rating is 7A, with a breakdown voltage of 9kV. Contact life is given as 150 insertions in a temperature range from −55 to +100 deg C. Both sides of the board have the co-ordinates labelled with numbers and letters for easier wiring. The larger board is laid out as four standard boards side-by-side.

The concluding article describes breadboard assemblies, and gives a list of suppliers together with prices.