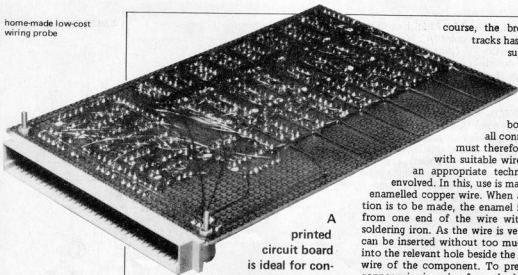


home-made low-cost wiring probe



A printed circuit board is ideal for constructing reliable circuits. Not everyone,

however, has the necessary material and tools to produce such boards. Apart from that, it is often not worth the trouble and expense to design, photograph and etch a print layout for one printed circuit board. There are however more ways which lead to Rome.

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time-saving device for the wiring of circuit boards

from a contribution by H. Meßmer

There are two main alternative prototyping circuit boards which differ principally in the method of wiring. The first is one with continuous copper tracks: when this is used, only a few additional connections have to be made – provided, of course, that the component layout has been so well thought out that the final product has as few wire connections as possible. Readers who like solving puzzles are well away with these boards! However, particularly in the case of digital circuits, these boards can give problems: depending on the position of IC's, it is often necessary to break the copper track between the connecting pins. Even with the right tools this can prove to be a tiresome and time-consuming job. The second alternative is better suited to such circuits: boards containing only solder pads. Because no account needs to be taken of copper tracks, components can be placed rather more freely on such boards and, of

course, the breaking of tracks has become superfluous. When

this type of board is used, all connections must therefore be made with suitable wire for which an appropriate technique has evolved. In this, use is made of thin enamelled copper wire. When a connection is to be made, the enamel is removed from one end of the wire with a hot soldering iron. As the wire is very thin, it can be inserted without too much trouble into the relevant hole beside the connecting wire of the component. To prevent the copper wire jumping from the hole, it is wound several times round the component terminal. In this way it is possible to make multiple connections before they are soldered. The insertion can, of course, be done very well by hand, but there is a simpler way: with a wiring probe. How to make this practical aid is described below.

How to make it

A propelling pencil with a lead diameter of 0.5 mm, a cotton reel and a strip of aluminium (about 90 x 20 mm) are required. If a propelling pencil is not available, take a ball-pen and hypodermic needle (also with an opening of 0.5 mm). Remove the top of the propelling pencil so that it becomes open-ended. When a ball-pen is used, remove the ink reservoir and operating pin or button; the hypodermic needle is then placed in the pen such that it protrudes about 5 mm from the normal writing end. At the centre of the strip of aluminium drill a hole of suitable diameter into which the top end of the pencil or ball-pen is to be inserted.

Two smaller holes are then drilled at either side of, and equidistant to, the centre hole. The aluminium is then bent into a U-shape so that the cotton reel fits between the two vertical sides as shown in figure 1. To ensure that the reel can rotate freely, use a 2 BA screw and nut as spindle. All that remains to be done is to wind a suitable length of enamelled copper wire onto the reel.

Home-constructed circuits should present no problems

Material

Prototyping circuit boards are usually available from an electronics retailer in so-called Eurocard sizes. The most suitable material is epoxy board which is appreciably more stable than pertinax. The wire to be used is common enamelled copper wire of 0.25...0.35 mm diameter. A special type of wire is available which, although it is a little dearer, is more easily tinned and soldered. Moreover, it is available in different colours, which is useful for complicated circuits. Whatever wire is used, however, there is one golden rule: tin first, solder

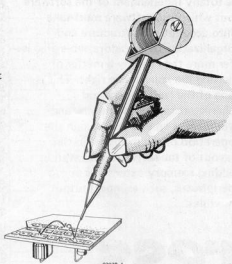
afterwards!

Readers who are thinking of using the wire of a transformer or choke will find that the enamel on such wire is very difficult to remove. A further disadvantage is that the enamel has often become so hard that it crumbles during removal of the wire from the transformer or during rewinding onto the cotton reel: the possibility of a short then becomes very real! The most important tool, the soldering iron, is required to have a tip temperature of 350...400 degrees centigrade, otherwise it will not be possible to remove the enamel with it. An iron with adjustable temperature is ideal, but if this is not available, try to remove the enamel with the one that is to hand. More tools are not really required, although a pair of small pliers and a pair of tweezers are very useful.

Preparation and construction

It is advisable at all times (and not just with this method of construction) to use IC sockets, as soldering direct onto IC pins often ruins the component. It may also be worthwhile, especially for beginners, to take sufficient time to consider the best

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Figure 1. The ready-made wiring probe. It can be seen clearly how the wiring is carried out with this tool.

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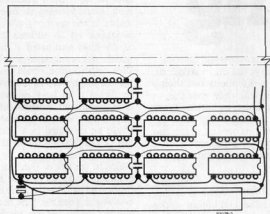


Figure 2. The supply lines should be fitted first. The heavy lines are the 0 V (earth) lines. The thin lines are the connections with the + supply line. The various capacitors between the supply lines are for decoupling.

location for the IC's. A mirror image sketch or drawing of the IC connections obviates a lot of turning over of the board.

First place the socket onto the board and solder the diagonally opposite pins (for instance, the + and - of the IC) to the board. After all other components, screws, pins, and so on, have been placed in their respective positions on the board, a start can be made with the wiring. The supply lines should be done first (see figure 2).

The 0 V (earth) line is best done in bare copper wire and the + line in insulated copper wire, somewhat thicker than is used for the remainder of the connections. In most digital circuits a diameter of 0.4 mm for the supply lines is adequate. A hint: mark pin 1 of all IC's on both sides of the board: this will simplify finding one's way in the tangle of wires appreciably!

With careful work, it is possible to construct even a 16 or 64 k RAM-card in this way, which shows that prototyping circuit boards are not necessarily inferior to printed circuit boards!

