SOCKET TO ME

Making up leads and connectors is just the first step in basic electronics assembly work. The next stage is de-soldering and component replacement. Our exercise this time involves removing a ROM chip and replacing it with a Zero Insertion Force socket, into which the memory chip will fit.

Now that we have learned how to solder, the next step is to find out how to undo soldered connections, neatly and without mess. If we are dealing only with cables and connectors, then we need not worry too much — it is probably simpler to cut back the cable, throw away the plug and start afresh with new components. But what happens when we come to replace or re-locate a chip? Even simple transistors have three pins or terminals. In order to free a transistor from its printed circuit board, we need to heat all three simultaneously to the melting point of solder, so that the transistor can be pulled clear; or we must clear each pin of solder in turn. And if the notion of releasing three pins at once is daunting, how about the 40 pins of the average eight-bit microprocessor?

REPLACING THE CHIP

Rather than simply choosing a chip at random to be replaced, or just adding RAM chips to expand a machine's capacity, we're going to take on a slightly more ambitious project: replacing a ZX81's BASIC ROM with a socket, leading a ribbon cable outside the case to a piece of Veroboard or a Veroblock, and installing a Zero Insertion Force socket to take either the ROM we have extracted, or any other. The reason for choosing the ZX81 as the subject for this particular exercise is that FORTH is available as a replacement resident language. In addition to the new language, the ROM also incorporates a multi-task operating system, allowing more than one program to operate simultaneously, and each entirely independently of the others. This is a remarkable achievement in so small a machine, though it does need a minimum of two Kbytes of RAM, which might necessitate the addition of an extra memory module.

As well as being an exercise in the skills we have so far examined, a small project like this also gives practice in component handling and shows you how necessary it is to be neat and accurate . In the next instalment of the series we shall look at ways of testing the finished article, using a multimeter. This device measures current, voltage and resistance, and is an invaluable tool for checking and testing circuits and components.

Recipe

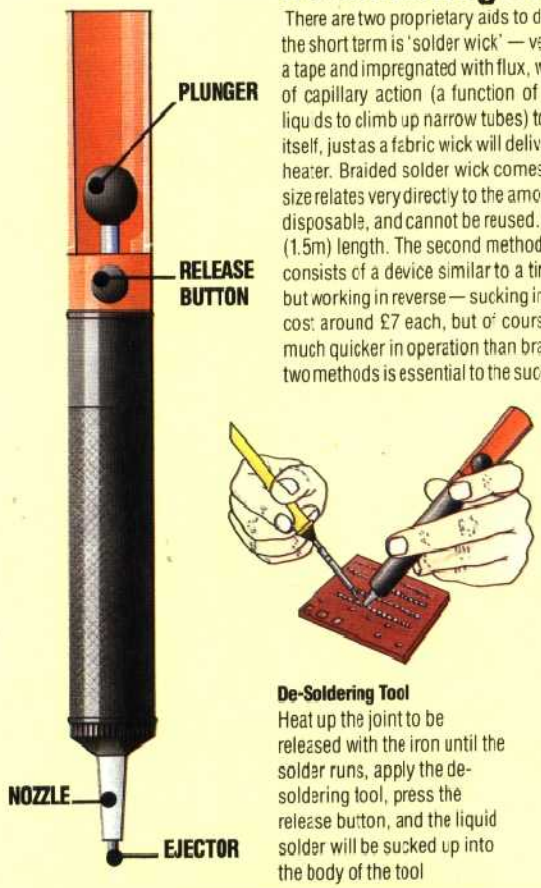
If ever a chip in your home computer is to be replaced, or, as in our example, simply relocated, or if a new one is to be added, it is an excellent practice to install a chip socket to carry it. Socketed chips can be replaced in a few moments; and if replacements are going to be fairly frequent, there are sophisticated chip holders available, called ZIF (Zero Insertion Force) sockets, which minimise the risk of bending a pin. In addition to the tools we described earlier (see page 44), you will need either a reel of de-soldering braid or a de-soldering tool. The exercise we have chosen calls for the removal of the BASIC ROM from a ZX81, and replacing it with a standard socket from which a ribbon cable will be led outside the machine to a ZIF socket. The objective is to replace ZX81's BASIC with David Husband's multi-tasking FORTH-in-ROM — while giving the user the option of returning to BASIC at a future date. If you wish to work through this example you will also need a piece of Veroboard and a length of 28-way ribbon cable, both of which are available from any electronics component supplier, and a piece of polystyrene

Locating The ROM

The first step is to open the ZX81's case and locate the BASIC ROM. The case is held together by five self-tapping screws, three of which are located under the stick-on rubber 'feet' on the underside. The pad that does not conceal a screw is the one closest to the EAR and MIC sockets. Peel the other three pads off carefully and remove the three cross-head screws underneath, and then the other two similar screws in plain sight. Lift off the underside of the case to reveal the bottom of the printed circuit board (PCB). This can then be released from the case by means of the three visible cross-head screws, two adjacent to the edge connector, the other near the heat sink (the aluminium plate beneath the keyboard). Turn the PCB over. The ROM chip we're looking for is located above and slightly to the left of the keyboard connectors

De-Soldering Tools

There are two proprietary aids to de-soldering. Least expensive in the short term is 'solder wick' — very fine copper wire braided into a tape and impregnated with flux, which relies on the phenomenon of capillary action (a function of surface tension which causes liquids to climb up narrow tubes) to draw the melted solder up into itself, just as a fabric wick will deliver fuel to the burner of a lamp or heater. Braided solder wick comes in a variety of widths, and the size relates very directly to the amount of solder to be removed. It is disposable, and cannot be reused. It costs around £1 for a five foot (1.5m) length. The second method is much more satisfactory, and consists of a device similar to a tiny spring-loaded bicycle pump, but working in reverse — sucking instead of blowing at the tip. They cost around £7 each, but of course have a very long life, and are much quicker in operation than braid. As you will see, one of these two methods is essential to the successful removal of components.



De-Soldering Tool

Heat up the joint to be released with the iron until the solder runs, apply the de-soldering tool, press the release button, and the liquid solder will be sucked up into the body of the tool