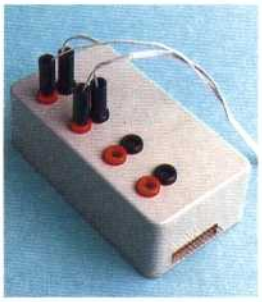
# SWITCHED ON

**Our practical course continues with explanations of how to build an interface device that enables your computer to control small electric motors and light bulbs.**



IAN MCKINNELL

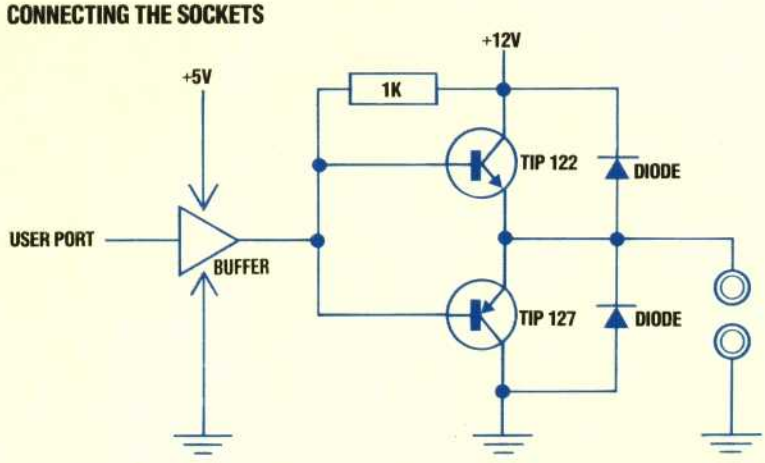
**The Box**
This is the finished box, showing the minicon plug and input/output leads. Care must be taken in cutting the board and the slot in the box so that the board does not move in the box when the plug is inserted into a connector

This interface will enable your home computer to control low voltage devices that take small power loads. The output from each of the four bits of the computer user port is buffered by the same buffer chip that we used in the construction of the buffer box in a previous instalment (see page 523). The output from this is used to switch the transistors, which are capable of controlling higher voltages and power than the buffer can handle. The complementary transistor configuration allows the output to both power a load or to sink current from a load. The two diodes at the output protect the transistors from reverse currents that some inductive loads, such as relays and motors, can create.

The interface can be used as a bi-directional motor controller. To simply switch it on and off, a motor is situated between the output connector and the earth connector. When a one is outputted from the computer, the output is set high and the motor starts. A zero output will turn the motor off.

Connecting the motor between two of the interface's outputs, however, will allow you to control the direction of the motor's movement. If the computer sends the same outputs (both zeros or both ones) then the same voltage will appear on both interface outputs and no current will flow through the motor. A one on one output and a zero on the other will give a difference in voltages that will make the motor turn in one direction. Reversing the logic will cause the current to flow — and the motor to turn — in the opposite direction.

**CONNECTING THE SOCKETS**




LIZ DIXON

## Building The Interface

First of all, build the box that the interface will be cased in. The circuit board will fit exactly into the box specified for the buffer box project. The box must be drilled to accept the sockets and the bus plug (and minicon socket if required).

Once the sockets have been fixed in the box, then we have to make the connections between them. Using a piece of the tinned wire, connect all of the earth (black) sockets together. Then take a six inch piece of nine-way ribbon cable, and attach one strand to the tinned wire connecting the earth sockets. Attach the other eight strands, in twos, to each of the four output (red) sockets.

Now cut the veroboard to the right size (45 holes × 16 strips) and remove the half row of holes at one end. Keep this offcut from the board, as this will be used in constructing the other interface. Now make the track cuts as shown in photograph 'A'.

Solder the passive components in first: the chip socket, the bus socket and the wire links. If you want to fit the bus expansion socket, then fit this now, but leave the cable connecting this and the bus plug until last.

The resistors are soldered on next, followed by the diodes. Check to make sure that these are fitted the correct way round. Solder the eight transistors on next, the correct way round. Finally, solder the connections to the sockets as shown in photograph 'B', and fit the chip in position. You can now assemble the board in the box, and the interface is ready to use.

## Parts List

| Quantity | Item | Maplin No |
|---|---|---|
| 1 | 50 hole x 24 strip veroboard | FL07H |
| 4 | 1 K-ohm resistor | M1K |
| 8 | 1N4001 diode | QL73Q |
| 4 | TIP 122 transistor | WQ73Q |
| 4 | TIP 127 transistor | WQ74R |
| 1 | 7407 | QX76H |
| 1 | 14 pin DIL socket | BL18U |
| 4 | Red 4mm socket | HF73Q |
| 4 | Black 4mm socket | HF69A |
| 4 | Red 4mm plug | HF66W |
| 4 | Black 4mm plug | HF62S |
| 1 | 12-way minicon plug | YW19V |
| 1 | 120x65x40 mm '2004' box | LH60Q |
| 1 | 12-way minicon socket | VW30H* |

*The last item is optional. It extends the system bus beyond this interface so that further interfaces can be plugged in simultaneously.
You should have some plain tinned wire and some ribbon cable left over from the previous project.