MICRO ELECTRONICS

In the last instalment of Workshop, we completed the first phase of assembly of our robot and tested this by writing a short program to bring it under keyboard control. Now we mount four microswitch sensors on the robot and write a simple program to test their operation.

Bi-directional control of the stepper motors requires four of the eight user port data lines available to us. This leaves four lines that can be used to carry information from the sensors back to the computer. To give our robot more flexibility in its operation, we will use a 'patching system' to allow the connection of different permutations of the sensors to the four available input lines. For the moment, we will connect four microswitch sensors and in the future we will instal two light sensors. So that we can select any combination of these sensors — for example, two microswitch sensors and two light sensors — we will wire each sensor to a socket on the lid of the robot. Four sockets will also be connected to the data lines — D4 to D7 — on the D plug. We can therefore connect the appropriate sensor to any of the four data lines by using a short patch lead, which plugs into the sensor socket at one end and one of the data line sockets at the other.

To test the construction and wiring of the four microswitches we can write a very simple program that scans the upper four bits of the data register and displays the decimal values of the bits sent low. Run the program with all four sensors connected, via the patch socket system, to the data lines, D4 to D7. Closing any of the microswitches will cause the screen display to change.

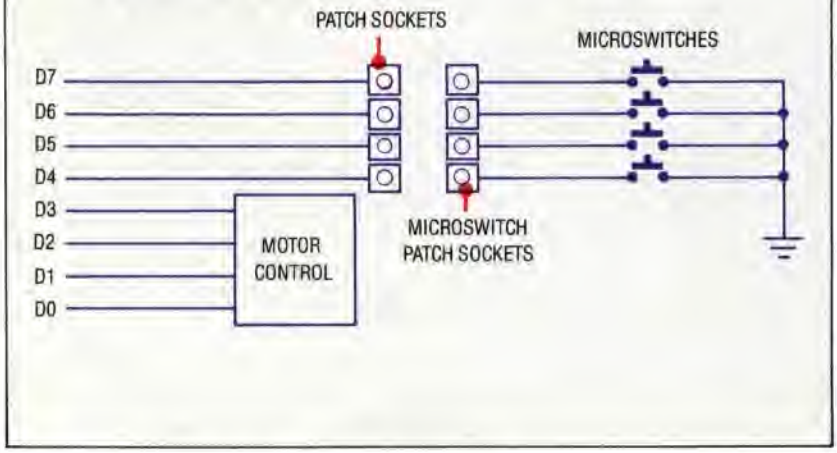
Fitting The Microswitches

Maplins do not stock suitable microswitches for our needs, but the sort mentioned in the parts list are available from many other component stockists. First, make the cut-outs required in the robot case lid. The eight slits should be cut so that the plate connectors under each microswitch can just fit through. The 10 5mm-diameter holes accommodate the patch sockets, and these may be fitted at this stage — the four red sockets being mounted in a line closest to the D plug. The microswitches have to be adapted slightly for this project. The long microswitch lever must be carefully bent, using a pair of pliers, so that a right-angle bend is made. Care should be taken to ensure that the bend is not made so close to the microswitch housing that the lever will not close the microswitch when mounted on the lid. Two plate connectors protrude from the back of the microswitch. The upper of these is the NC, or 'normally-closed', connector. As this will not be used in our project, you may wish to remove it, either by breaking it off or sawing it through with a small hacksaw. The lower NO, or 'normally-open', connector is used, and this should be bent, at right-angles, close to the switch case. This will ensure that it will fit, together with the COM, or 'common-connector', through the slots cut for it in the robot case lid. When these adaptations have been made to each of the four microswitches, they can be mounted at each corner of the lid, as shown. The switches should be mounted so that the activating levers hang over the front and rear of the robot case, and they should be glued in place using a suitable adhesive. Cyanoacrylate or 'super glue'-type glues are probably the best to use

```
10 REM **** BBC SENSOR TEST ****
20 MODE 7:OP=-1:DDR=&FE62:DATREG=&FE60:?DDR=15
30 PE=240-(?DATREG AND 240):IF PE=OP THEN 30
40 CLS:PRINT PE:OP=PE:GOTO 30
```

```
10 REM **** CBM SENSOR TEST ****
20 OP=-1:DDR=56579:DATREG=56577:POKE DDR,15
30 PE=240-(PEEK(DATREG) AND 240):IF PE=OP THEN 30
40 PRINT CHR$(147):PRINT PE:OP=PE:GOTO 30
```

Microswitch Circuit



Microswitch Circuit

The circuit that connects the microswitch sensors into the robot system is very simple. Data lines D4 to D7 connect to four sockets mounted on the lid of the robot; data lines D0 to D3 are used for motor control. One side of each microswitch connects to a similar group of four sockets; the other side connecting to a common earth. If all four microswitches are required, then they can be patched into the data lines by four patch cords. If the upper four bits of the user port data register are set to input then they are normally held high (to one). Closing any microswitch patched into the system will connect the relevant data line to earth, bringing the corresponding bit in the data register low (to zero)