SUM OF THE PARTS

In this series of Workshop we have developed a buffered electronic system that can be used with the BBC Micro and the Commodore 64 to monitor and control external devices. In future instalments we shall build a small robot. Now we review the ground we have covered so far.

The BBC and Commodore 64 micros have a similar input/output arrangement that allows communication with the outside world through a user port, consisting essentially of eight data pins and an earth connection. These eight data pins map directly into a particular location in memory, called the data register, each pin corresponding to a bit in the register. A second location, the data direction register (DDR), controls the direction of data flow from or to each pin. If any pin is set to output (DDR bit=1) then a voltage of +5v is induced at the pin whenever the corresponding bit is set high (to one). If the data bit is set low then a zero voltage is induced at the corresponding pin. Although the current supplied from the user port data pins cannot directly drive external devices, it can be used to trigger a relay system that allows larger voltage and/or current systems to be switched on or off.

When a pin is set for input (DDR bit=0) then the method of operation is rather different. In this case the corresponding bit in the data register is held high, only going low if the pin is connected to earth. This fact can be used to monitor events in the outside world by connecting one side of a simple switch to a data pin and the other side to the user port earth. When the switch is thrown, the data pin connects with earth and the corresponding bit in the data register undergoes a transition from high to low. This change in the data register can be easily detected by software that monitors the state of the data register and so the flow of program control can be altered externally.

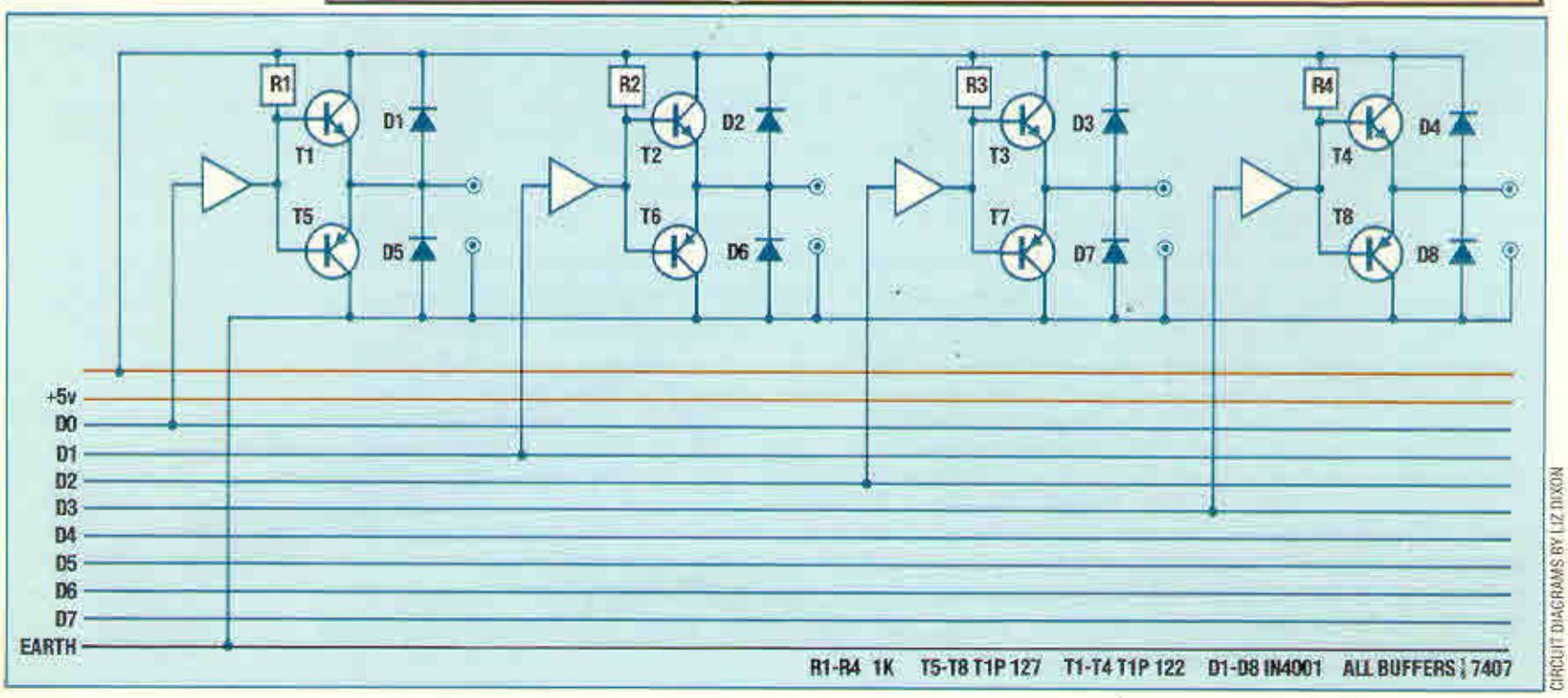
The eight data lines and the earth must be connected in some way to each device in the user port system and so the entire system is designed around a common nine-line bus, each device tapping into the appropriate lines for its particular needs. This common bus is fed to each device by a 12-way 'minicon' connector. By wiring a male connector on the 'in' side and a female on the 'out' side of each device we can 'daisy-chain' any combination of system parts together.

In this instalment the operation of each module in the system is summarised and a circuit diagram given. For full constructional details and parts lists refer to the original articles.

IAN McKINNELL

The Output Box

The low voltage output box connects to the system bus via a 12-way minicon male connector, which plugs into its female equivalent in the buffer box. The current provided by a high data pin is of the order of a few milliamps – not sufficient to drive a device such as an electric motor, but enough to act as a switching current via a transistor. Data lines 0 to 3 are used by the low voltage box. Setting one of these lines high causes the transformer voltage to be switched through a transistor to the corresponding red socket on this box. Four devices can thus be simultaneously supplied with the input voltage. Up to 1 amp can be drawn from each line, depending on the transformer used. (See page 574.)



CIRCUIT DIAGRAMS BY LIZ DIXON