# Atari-type joystick interface for the System 80

This simple add-on interface attaches to the System 80 expansion connector and permits attachment of an Atari-type joystick for graphics or games control.

Geoff Nicholls

SOME OF THE popular cassette-based software suitable for the System 80, such as that by Big Five and Adventure International, calls for an Atari-type joystick input for controlling on-screen objects. This type of joystick has four switches arranged orthogonally and activated by a vertical shaft which is kept in the upright, or 'neutral', position by a rubber boot. You grasp the shaft with one hand and the base of the unit, containing the switches, with the other. Angling the shaft in any direction then activates a switch or combination of switches to indicate the direction of shaft movement. Eight directions can be indicated:
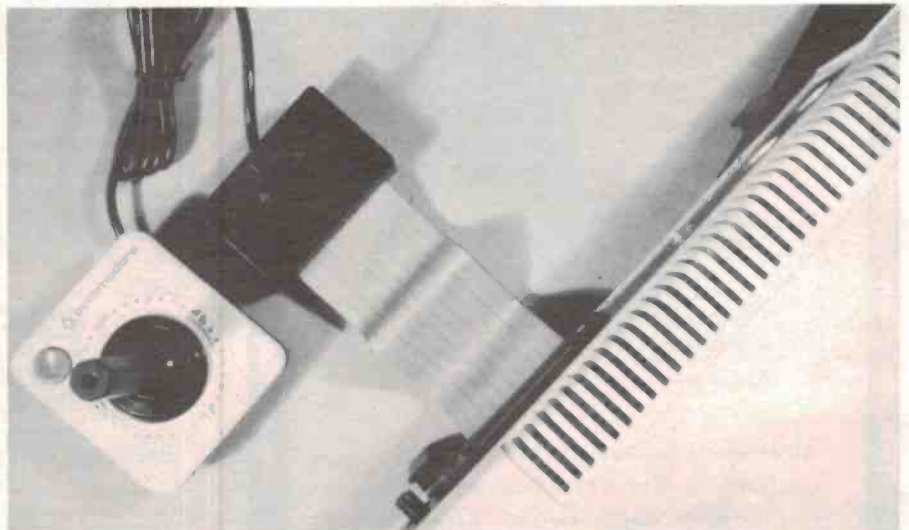
The interface simply attaches to the System 80's expansion connector at the rear of the machine.
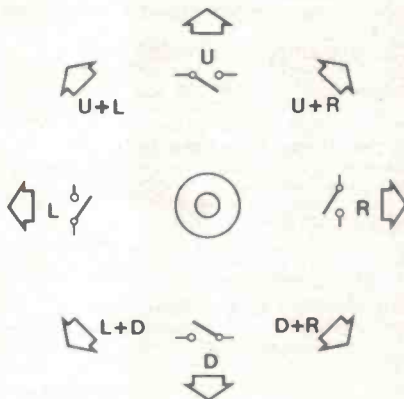
The 'directions' indicated by movement of the joystick shaft.

A button in the joystick base can be activated by the thumb to give another function — usually a 'write' or 'fire' function (as in games involving missiles, etc).

These joysticks first appeared with Atari TV games and latterly their home computers. The same type of joystick is available, under the Commodore label, for the Commodore VIC-20 home computer. Dick Smith lists the latter in his catalogue, No. X-2020, for $19.95.

As it stands, the joystick is a '5-bit' device — four 'direction' bits and one 'fire' bit. Some joystick software requires '4-bit' input. In this instance, the U and D switches are paralleled by the fire button. A slide switch provides for both 4-bit and 5-bit modes of operation.

The interface is powered from the System 80.

Construction

We recommend you use our pc board design as it simplifies construction and reduces the possibility of wiring errors. We fitted the pc board into a 28 x 54 x 83 mm jiffy box (Dick Smith catalogue No. H-2755). The 9-way chassis-mount plug for the joystick connector and the 5-bit/4-bit slide switch mount on the plastic base of the box (which now becomes the 'top'). Connection to the System 80 expansion interface is via a 50-way edge connector and a length of 50-way ribbon cable that passes through a slot cut in the side of the jiffy box to the pc board mounted inside.

Construction should commence with drilling and cutting the various holes in the jiffy box. Take your 'empty' pc board and, using it as a template, copper side down, mark the approximate position of the 9-way chassis-mount DB plug on the outside of the jiffy box bottom. Mark out the required hole for it and its two mounting screw holes, then mark out a suitable position for the slide switch slot, on the side opposite the 9-way plug. Drill out all of these and carefully file the 9-way plug hole and slide switch slot to shape so that both components fit nearly — *from inside the jiffy box*. A slot for the ribbon cable is cut in one side of the box. Drill a line of small holes and file the slot edges flat.

Before mounting the 9-way plug, solder 50 mm lengths of 22 gauge tinned copper wire to pins 1, 2, 3, 4, 6 and 8. These should drop straight down from the plug pins. Next solder a 75 mm length of three-way ribbon cable to the pins of the slide switch. Now both the 9-way plug and the slide switch may be mounted in the box. Bolt the 9-way plug in place. We glued the slide switch in —
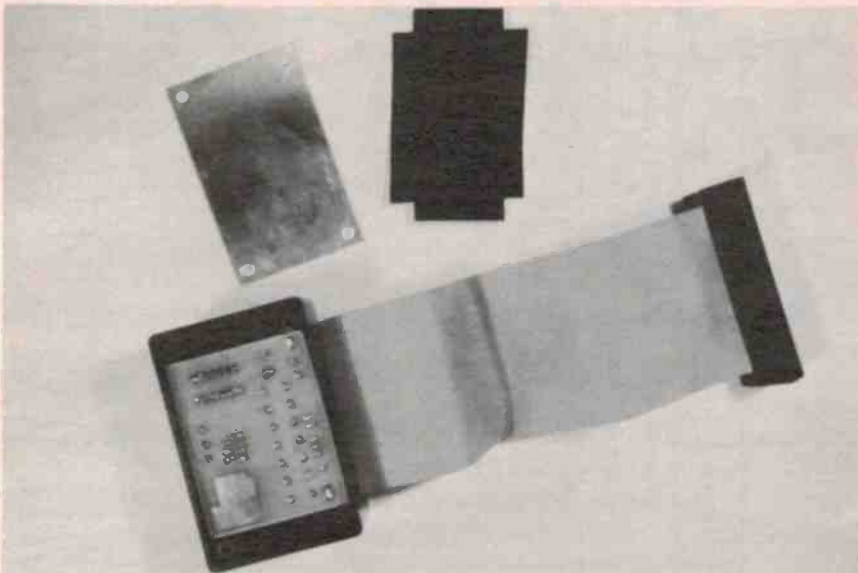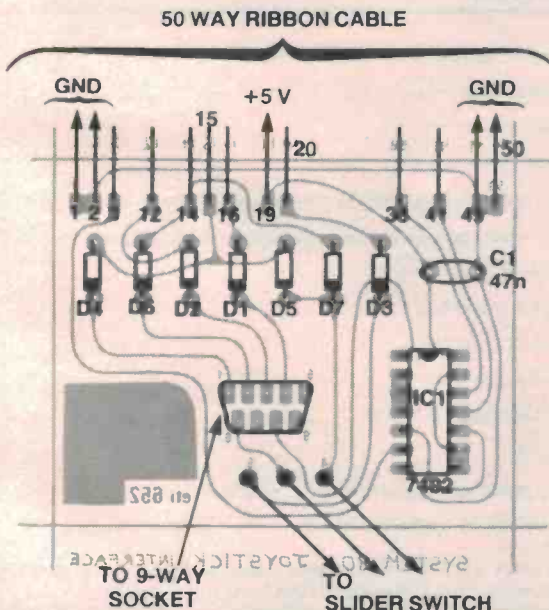
The pc board is held inside the jiffy box by the metal panel. Note the piece of insulating material that goes over the back of the board to prevent shorts.
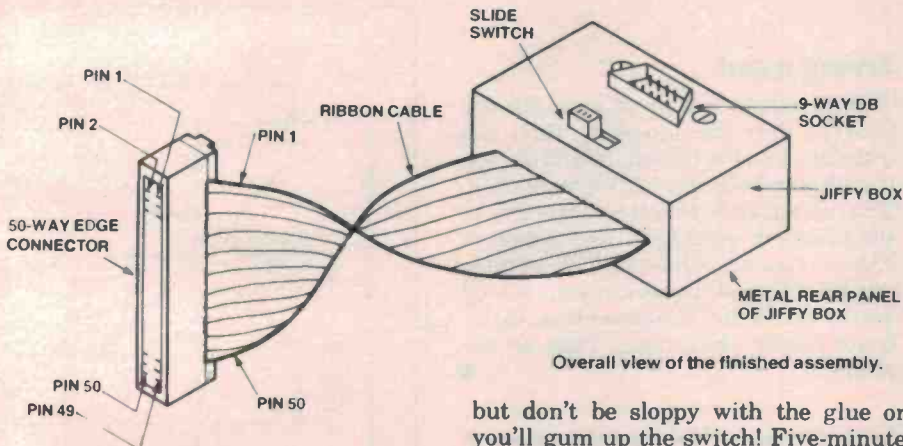
Make up the ribbon cable and edge connector now. We used a 50-way edge connector that 'crimps' on the end of the cable, making contact to the wires without the necessity of stripping the insulation by means of special pins on the connectors. The other end of the ribbon cable is fed through the slot in the jiffy box for 50 mm or so. Identify the wires to be soldered — 1, 2, 3, 12, 14, 15, 16, 19, 20, 38, 41, 49, 50 — and cut back the unused wires about 25 mm. Strip the ends of the remaining wires about 5 mm and tin them. Put the box assembly aside for the moment.

Now the pc board can be assembled. The diodes, capacitor and IC can be assembled in any order — just watch the orientation of the semiconductors.

Having completed that, the ribbon cable can be soldered to the board — make sure the wires are in their correct places, though. It's worth a double check. The pc board has been laid out to make this part of the job relatively easy, however. Now wire in the slide switch. Adjust the ribbon cable such that the full 50 wires (i.e: the uncut section) protrude through the inside of the box about 15 mm or so. Run a bead of five-minute epoxy along the cable right at the slot and let it set.

After the epoxy has set, put 10 mm lengths of spaghetti insulation over the tinned copper wires on the 9-way plug. Feed the wires through the correct holes in the pc board (which should be pretty well beneath the socket when lined up to go in the box) and push the board into the box. Straighten the wires by pulling them gently with pliers and solder each of them. Cut a piece of thin cardboard or plastic to fit over the rear (copper side) of the pc board to stop the metal lid from possibly shorting the tracks. Put this in place and secure the lid. ▶

Overall view of the finished assembly.

but don't be sloppy with the glue or you'll gum up the switch! Five-minute epoxy is very handy here, and is used later, as you shall soon see.

PARTS LIST — ETI-652

Capacitors
C1 . . . . .47n greencap

Semiconductors
D1-D7 . . . . 1N4148, 1N914 etc
IC1 7402

Miscellaneous
ETI-652 pc board; UB5 jiffy box (28 x 54 x 83 mm) or similar; 50-way edge connector socket; 300 mm length of 50-way ribbon cable; 9-way DB plug, chassis-mount, to suit joystick line socket connector; SPDT slider switch; nuts, bolts, glue etc.
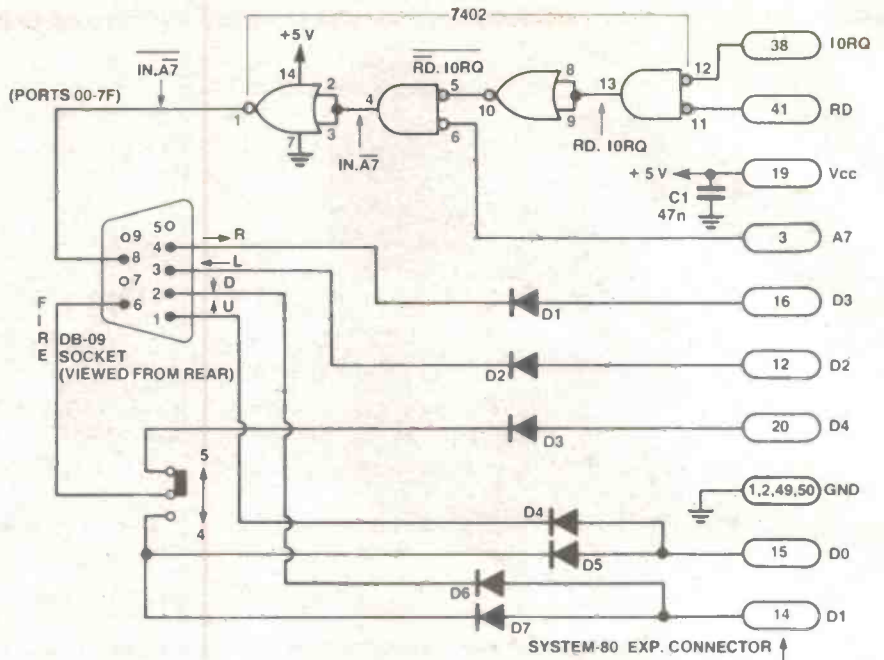
Price estimate
$35 — $40
(includes joystick)

Project 652

The joystick unit itself comprises four direction switches and a fire switch in a square, shallow case, operated by the stick which you grasp in your hand. A cable and 9-way plug provides connections. When a switch is activated, it connects one of the pins 1, 2, 3, 4 or 6 in the plug to the common line — pin 8. The five switches are encoded into either four or five data bits according to the position of switch S1. The five-bit mode connects each switch to a separate data line. The four-bit mode indicates the fire switch by activating the UP and DOWN line simultaneously, via diodes D5 and D7. The four-bit mode is provided to ensure compatibility with early joystick software.

The System 80 data buss is pulled high by internal resistors. The joystick therefore uses an active low to indicate a key closure. IC1, a quad NOR gate, decodes the control signals IORQ, RD and address buss bit 7 to make the interface appear to the computer as an I/O device occupying input ports 00 to 7F. This leaves 128 input ports free for other purposes. When the computer executes an INPut instruction within the range 00 to 7F, pin 1 of IC1 goes low and allows the data buss lines to be selectively pulled down via the joystick switches and the diodes, which prevent the buss from being affected when the joystick interface is not selected.

Circuit of the interface.

View of the completed interface. Note orientation of the 9-way DB plug and location of the slide switch.

Trying it out

This is only a matter of plugging the joystick into the interface, then the interface into the System 80 and testing it with some suitable software running. You can try a cassette program or key in the program listed here. Any problems encountered are almost certainly due to wiring errors. A re-check of your wiring and orientation of components on the pc board should throw some light on the problem. ●

Circuit of the joystick showing pin connections on the 9-way line socket.
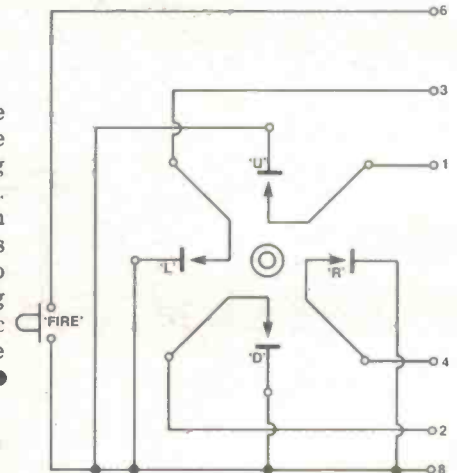
JOYSTICK DEMONSTRATION PROGRAM

```
5     REM: POSITION CURSOR IN CENTRE
10    CLS: X=63 : Y=23
15    REM: READ AND INVERT JOYSTICK.
20    A=255 - INP(0)
22    REM: SET POINT UNLESS FIRE BUTTON ON
25    SET(X,Y)
30    IF A > 15 THEN RESET(X,Y) : A=A-16
35    REM: FLASH CURSOR ONCE , BUT LEAVE IT THE SAME
40    C=POINT(X,Y)
50    IF C=0 THEN SET(X,Y) : GOSUB300 : RESET(X,Y) : GOTO 70
60    RESET(X,Y) : GOSUB300 : SET(X,Y)
65    REM: THIS SECTION UPDATES CURSOR POSITION ACCORDING TO JOYSTICK
66    REM: DIRECTION. IF JOYSTICK IS IN CENTRE A=0 AND IT FALLS THROUGH
70    IF A > 7 THEN X=X+1 : A=A-8
80    IF A > 3 THEN X=X-1 : A=A-4
90    IF A=2 THEN Y=Y+1
100   IF A=1 THEN Y=Y-1
105   REM : THIS SECTION WRAPS THE SCREEN AREA AROUND TO AVOID AN
106   REM : ERROR MESSAGE CAUSED BY AN OUT OF RANGE PLOT INSTRUCTION
110   IF X > 127 THEN X=0
120   IF X < 0 THEN X=127
130   IF Y > 47 THEN Y=0
140   IF Y < 0 THEN Y=47
145   REM: LOOP BACK TO START
150   GOTO 20
295   REM : DELAY ROUTINE FOR FLASHING CURSOR
300   FOR N=1 TO 20 : NEXT N : RETURN
```

This program puts up a flashing cursor in the middle of the screen. When you move the joystick the cursor 'writes' according to the direction in which you move the joystick shaft. You can move the cursor without writing by holding down the 'fire' button. Now try writing your name! Have fun with your joystick.