



TRAFFIC CONTROL

So far in this series we have constructed an input/output system that allows us to control low voltage devices and accept simple switched inputs. We have used this box to control a Lego car with two motors. Now we bring this vehicle under the control of a joystick.

The ways in which joysticks can be used on the Commodore 64 and the BBC Micro are rather different. The Commodore 64 uses a standard Atari-type joystick that operates by way of four directional switches and one fire button. In contrast to this digital arrangement, the BBC Micro uses an analogue joystick, or paddle. This type of joystick does not rely on the simple making or breaking of contacts but uses two potentiometers, one for left/right movement and the other for up/down movement (although a digital-type joystick can be adapted for use with the BBC analogue port). As these methods of operation are so different, we shall talk about each type separately.

COMMODORE 64

The Atari-type joystick used by the Commodore 64 plugs into one of the games ports, located next to the power on/off switch. We shall use port 2 in the following explanation and program, so if you have a joystick available plug it into port 2 (nearer

the on/off switch). If the joystick is moved from the central position towards the top, one of the four internal switches will be closed. Port 2 links directly into memory location 56320 and closing this switch will cause one of the bits in this location to go low, rather in the same way as closing an external switch connected to the buffer box will cause a bit in the user port data register to go low. Type in the following short program that repeatedly displays the value of the data register. With the program running, move the joystick around and press the fire button, noting the various changes that take place in the value displayed on the screen.

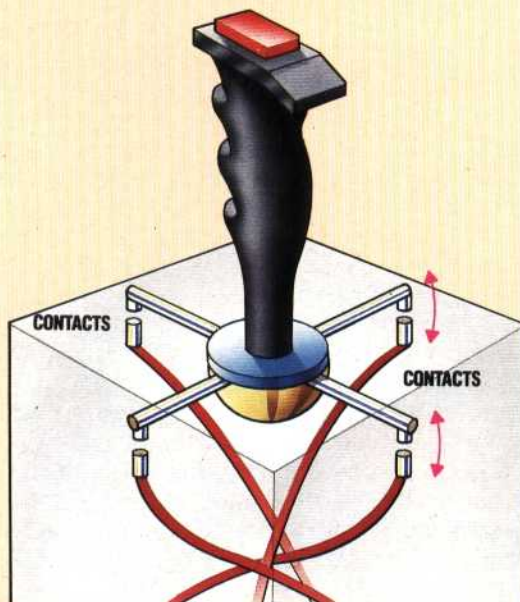
```
10 REM **** CBM 64 READ JOYSTICK ****
20 PORT2=56320
30 JOY=PEEK(PORT2):GOSUB500
40 PRINT CHR$(145);JOY,B#
50 GOTO30
60:
500 REM CONVERT TO BINARY S/R
510 B#="" :N=JOY
520 FOR D=1 TO 8
530 N1=INT(N/2):R=N-2*N1
540 B#=#+STR$(R):N=N1
550 NEXT D
560 RETURN
```

After a few minutes experimentation it should become clear which bits in the joystick location correspond to the four direction switches and fire button. Normally, with the joystick in the central position, the contents of the joystick location are 127, i.e. 01111111. Pushing the joystick causes the value to change to 126 (01111110). Bit 0 is obviously connected to the up direction switch in

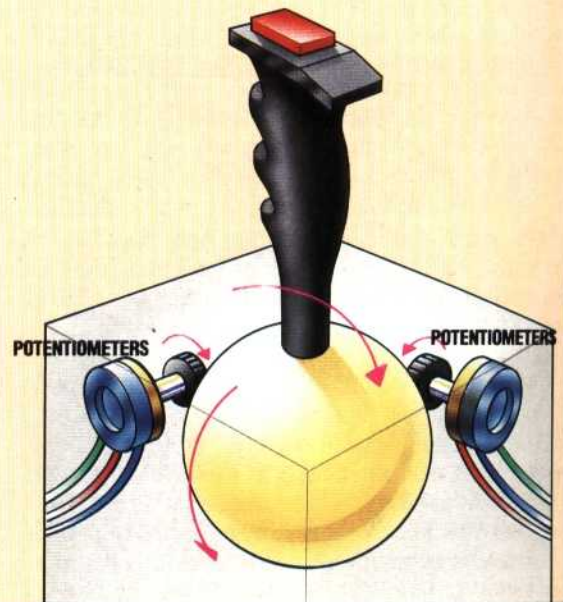
Analogue Vs Digital

The digital, or 'contact', joystick simply registers the stick movement in any two of the four main directions; the amount of movement is not measured. The analogue joystick employs perpendicularly opposed potentiometers to measure the movement of the stick, and communicates the information as two variable voltages. These are then converted into a number by the analogue-to-digital converter

DIGITAL



ANALOGUE



KEVIN JONES