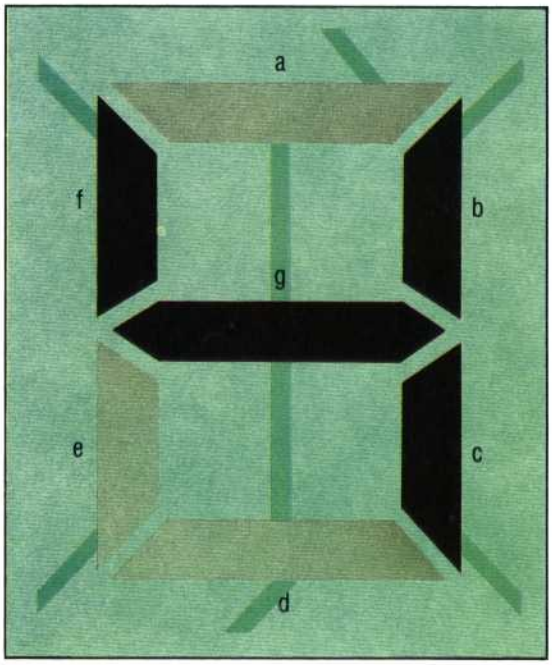
```
1499 :
1500 DEF PROCinput
1510 ?DDR=254
1515 flag=0
1520 IF(?DATREG AND 1)=0 THEN flag=1
1525 REPEAT UNTIL (?DATREG AND 1)=1
1530 ENDPROC
1999 :
2000 DEF PROCdisplay
2010 ?DDR=255
2030 ?DATREG=count
2040 ENDPROC

10 REM CBM 64 COUNTER
30 DDR=56579:DATREG=56577
40 CC=0:REM INIT COUNT
50 :
60 GOSUB1000:REM INPUT
70 GOSUB2000:REM ADD
80 FOR I=1TO20
90 GOSUB3000:REM DISPLAY
100 NEXT I
110 IF CC<255 THEN60
120 END
999 :
1000 REM INPUT S/R
1010 POKEDDR,254
1020 FL=0
1030 IF(PEEK(DATREG)AND 1)=0 THEN FL=1
1040 IF(PEEK(DATREG)AND 1)<>1 THEN 1040
1050 RETURN
1999 :
2000 REM ADD S/R
2010 IF FL=1 THEN CC=CC+1
2020 RETURN
2999 :
3000 REM DISPLAY S/R
3010 POKEDDR,255
3020 POKEDATREG,CC
3030 RETURN
```

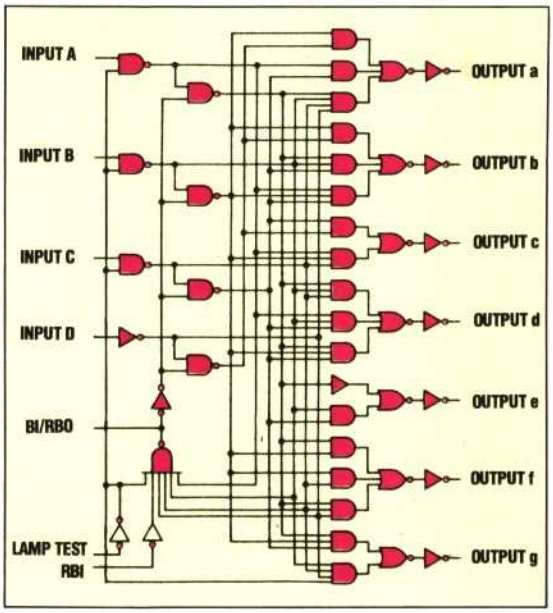
In each cycle of the program, a FOR . . . NEXT loop is used to repeat many times the routine where all lines are set to output, for each routine where line 0 is set for input. For the Commodore 64 version, 20 display routines are executed for each input routine. This ratio is increased to 40 for the BBC version due to the increased speed of execution of the BBC Micro. With these ratios, a flicker is still detectable, but if the ratio is increased still further to produce a smoother display, then it is possible that the amount of time spent looking for an input is reduced so much that inputs may be missed altogether. In 'real-time' electronics such compromises between conflicting demands of parts of a system have to be made.

All Boxed Up
Since each digital display needs a four-bit input code, two displays can be driven from the user port. They are boxed in one unit compatible with our previously-built interfaces and devices

Decimal	Binary D3 D2 D1 D0	Output a b c d e f g	Display
0	0 0 0 0	0000001	0
1	0 0 0 1	1001111	1
2	0 0 1 0	0010010	2
3	0 0 1 0	0000110	3
4	0 1 0 0	1001100	4
5	0 1 0 1	0100100	5
6	0 1 1 0	1100000	6
7	0 1 1 1	0001111	7
8	1 0 0 0	0000000	8
9	1 0 0 1	0001100	9
10	1 0 1 0	1110010	c
11	1 0 1 1	1100110	ɔ
12	1 1 0 0	1011100	u
13	1 1 0 1	0110100	ς
14	1 1 1 0	1110000	ε
15	1 1 1 1	1111111	

Figure It Out
The input to the digital display from the user port is a four-bit binary number. Associated with each of the numbers 0000 to 1111 is a unique seven-bit number, each bit of which signals the state of one of the seven segments of the display. In this display code a zero bit means that the corresponding segment is to be lit, and a one indicates an unlit segment





7447A BCD To 7-Segment Decoder/Driver
The internal circuitry of the chip shows the essential simplicity of its logic — the four-bit input is decoded into the seven segment outputs by the logic gates. The lamp test input switches all segments on simultaneously to test the chip