

A to F for the numbers 10 to 15. Each memory location comprises eight binary digits (bits) and these may be represented by a pair of 'hex' digits.

For example, the binary pattern 01011101 would first be split into two halves: 0101 and 1101. These would be translated into the decimal numbers 5 and 13 — which equate to 5 and D in 'hex'. Thus 01011101 is referred to as 5D when programming in machine code. This is the slowest way to develop programs, but probably produces them with the fastest execution times. The following are some extracts from typical programs:

```
BASIC
100 INPUT "Enter hours worked"; HOURS
200 PAY = HOURS * RATE
```

The first line displays a message on the screen inviting the user to enter the hours worked. It accepts the input, then in the second line, multiplies it by a rate of pay (entered earlier in the program) to give a gross pay figure.

```
Assembly Language
MVL C, 01
CALL 05
```

The first instruction above moves the value '1' into a part of the microprocessor's memory called the 'C register'. The second instruction asks the operating system to take control. The operating system then passes control back to your program. Here is a direct translation of the assembler lines above:

```
Machine Code
0E01
CD0500
```

A machine code translation of the two BASIC statements would comprise many commands. It is clearly preferable to allow a compiler or an interpreter to do this work rather than to write in assembly language or machine code.

Some operating system commands are almost cryptic as assembly language programs. Here are some examples from CP/M (Control Program for Microcomputers):

```
DIR *.BAS
```

The above means 'list all the files on the current disk drive whose suffix is BAS'. DIR is an abbreviation of Directory.

Despite this rather odd approach to its commands, CP/M is installed on more than a million machines. It has massive advantages for professional software writers. Programs can be easily transported from one machine to another, provided they are written in such a way that they pass control to CP/M to handle the disks, keyboard, printer, and the screen.

Manufacturers who introduce a new machine can benefit from an existing base of software, and would-be purchasers can buy machines, confident that their software requirements are likely to be met.

