



mentioned earlier. These are produced by sending control codes to the printer as well as to the normal text characters.

In addition to having a code for each character on the keyboard, the ASCII character set (see page 77) has a group of 'invisible' characters that do not print anything on the screen or paper. It is these codes that are used to turn on the printer's special effects: in the standard ASCII set there are four codes (17, 18, 19 and 20) that are reserved as device control commands. Unfortunately, the ASCII character set does not have enough reserved control characters for the 70-odd features of an Epson FX-80, and in order to overcome this, most effects are produced by sending 'escape codes' to the printer. These consist of two or more character codes, starting with an ESC character (ASCII code 27). For example, to turn on the proportional spacing feature on an Epson you send ESC-p — i.e. the Escape character followed by the lower-case 'p' character.

In BASIC, this is written as:

```
LPRINT CHR$(27);"p"
```

The ESC character cannot normally be produced by pressing the Escape key on your keyboard, and consequently the CHR\$ function is used.

On the BBC, you would use:

```
VDU2
```

```
VDU1,27,1,112
```

```
VDU3
```

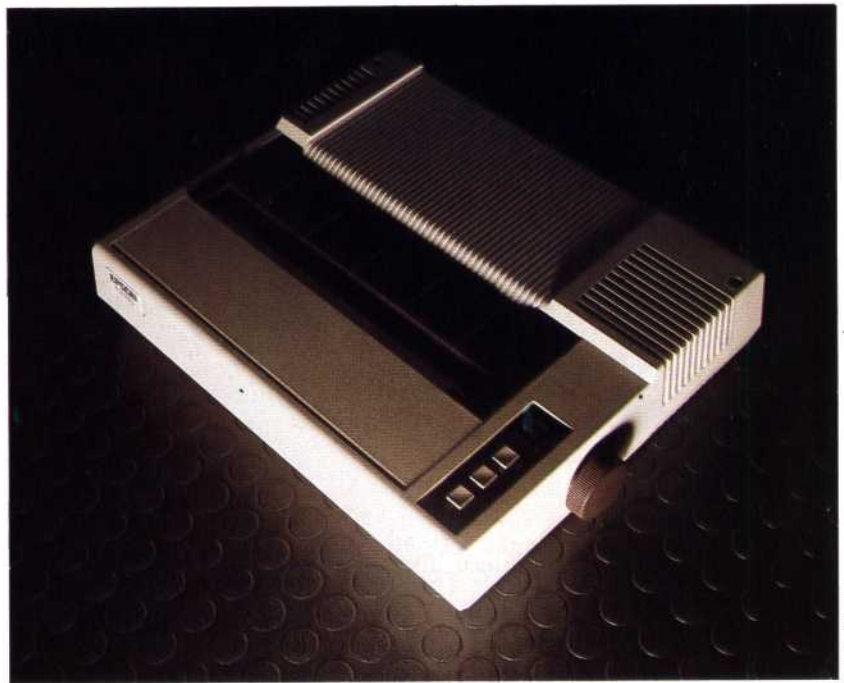
The VDU2 command turns on ('enables') the printer; VDU1 means 'send the following character to the printer only' (PRINT would send the following ESC character to the screen as well, with undesirable results). VDU3 turns off ('disables') the printer.

These command sequences apply only to the Epson FX-80. If you try to send the same code sequence to a different printer, it will either have no effect, do something unexpected, or cause the printer to 'hang up' (i.e. refuse to respond to the computer).

CREATING AN INVOICE

Our second listing demonstrates the use of some of the Epson's features to create an invoice heading, as might be used by a small garage. The codes we have used here are those used by the Epson FX-80. The Epson range of printers is one of the most popular; so much so that other manufacturers make models that are 'Epson-compatible'. If your printer is incompatible with the Epson, however, you must alter the control codes accordingly.

```
999 REM INVOICE HEADING
1000 LPRINT CHR$(12)
1010 LPRINT CHR$(14);TAB(12);"HCAC
MOTORS LTD."
1020 LPRINT CHR$(13);CHR$(13)
1030 LPRINT CHR$(27);"E"
1040 LPRINT TAB(36);
1050 LPRINT CHR$(27);"-";CHR$(1);
1060 LPRINT "INVOICE";
1070 LPRINT CHR$(27);"-";CHR$(6);
1080 LPRINT CHR$(27);"F"
1090 LPRINT CHR$(13);CHR$(13);CHR$(13)
1100 REM INVOICE DETAILS PRINTED
```



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To begin, line 1000 sends the character with code 12 to the printer. This is the 'form feed' character, which instructs the printer to roll the paper to the start of a new sheet. Then we have ASCII code 14; this is called the 'shift out' (SO) character, and on the Epson it causes all subsequent text to be printed in enlarged letters. In our program it is used for the heading, giving the name of the garage in large letters. The TAB function is used to centre the heading.

CHR\$(13) is the carriage return character, which produces a single blank line when printed on its own. Several are used in lines 1020 to 1090 to space out the top of the invoice. ESC-E in line 1030 turns on the emphasised mode, and all subsequent text is printed in darker type (caused by printing the same letters several times over). Line 1050 turns on the 'underlining' feature, and line 1070 turns it off, after printing and underlining the word 'Invoice'. ESC-F disables the emphasising mode. The print-out will look like this:

```
HCAC MOTORS LTD.

INVOICE
```

We have shown only the initial part of the program here; a completed invoice program would include lines to print out customer details — name, make of car, money owed, etc. These details would have been obtained from a series of questions at the beginning of the program, and the answers would have been stored as variables.

The two programs that we have given here are simple examples of the sorts of alternative uses that a dot matrix printer can be put to. Many people are now exploring the use of a printer beyond simply using it to make program listings. In fact, programming your printer can be just as enjoyable as programming the computer itself.

Epson FX-80

A popular printer among business and home micro owners, though expensive at £500. The FX-80 has a nine-pin head, and maximum print speed of 160 characters per second. Most software packages (word processors, for example) support Epson and Epson-type printers.