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Edinburgh Regional Computing Centre

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Title:

Printers for Microcomputers in the Edinburgh University Environment

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A. Selecting a Printer

1.0 Selection Process

The first stage in selecting a printer is to assess your department's requirements and identify in detail who might require to use it, the sort of items you will be printing and also some idea of the throughput for such a machine.

The type of document to be listed plays an important role in the choice of printer. People who require only program listings can usually get by with a fairly low quality type-face. On the other hand for documents that have to be circulated to a wide number of people the quality of the type-face becomes essential and such things as multi-font printing become desirable.

Whether graphics facilities are required should also be considered as many printers have graphics facilities either as standard or as optional extras. Here again the quality of the picture needed must be assessed.

2.0 Types of Printers

Printers fall firstly into two main groups depending on how the characters are formed, namely impact and non-impact. Non-impact printers such as electrostatic and thermal devices require special paper which usually makes them fairly unattractive and in the long run can be expensive. Impact printers are the main ones investigated in this survey.

This Note deals with two categories of impact printer - the daisy wheel type and the dot matrix variety.

2.1 Daisy Wheel Printers

Daisy wheels, as their name suggests, are bicycle wheel shaped and have a fully formed character at the end of each spoke. The end of a spoke is known as a 'petal' hence the name daisy wheel. When a character is to be printed the wheel is rotated so as to correctly line up the character with the hammer head and the wheel is then struck. Daisy wheels are limited to a maximum of 96 characters; however certain specialized printers can use daisy wheels with 192 characters.

To obtain alternative fonts or special characters embedded within a document, printing of the document must be halted and the daisy wheel replaced where necessary. These printers usually have maximum speeds of between 30 and 55 c.p.s.

2.2 Dot Matrix Printers

The other class of printer investigated, the dot matrix type, forms each character by columns. The print head usually consists of a vertical column of pins or needles that are 'fired' at the ribbon. The actual number of needles fired depends on the character being formed, the print head then moves one column along and fires the next section, this process continuing until the whole character has been produced. Because

of this flexible method of producing characters, this type of printer can also handle raster scan graphics. The quality of the type-face is thus dependent on the number of needles and the number of columns used.

2.2.1 High quality type-face

Dot matrix printers are now appearing on the market that can produce a 'letter correspondence' quality of type-face. This is achieved by having a large array of needles (e.g. 18) or by also making a number of print passes on a single line – on each pass the dots are slightly offset to produce an enhanced image. Therefore, this type of printer gives you the option of fast draft quality printing at speeds of approximately 300 c.p.s., or letter quality at speeds of approximately 80 c.p.s.

One of the advantages of this type of printer is the number of character sets and type-faces that are available. Once installed within the printer they can be accessed in an automatic manner via your microcomputer, rather than you having to perform the laborious and often impractical manual exchange of daisy wheels.

Another advantage is that it is sometimes possible for you to design any special characters or symbols that may be of specific relevance to your work and download them into the printer's memory for future printing.

2.2.2 Low quality, cheap printers

Even with cheap printers people tend to want at least a reasonable quality of type-face.

At least five or seven needles are needed to make the printing legible, and at least nine needles are definitely needed for true descenders. The number of columns used to form a character varies greatly depending on the quality of the printer, usually 7 is assumed to be the low end of the market, and at the top end the number can be a variable under program control. Typical speeds of these printers are of the order of 100 c.p.s. As with the high quality printers, it is sometimes possible to download user-defined symbols into the printer's memory.

3.0 Paper Handling

Manufacturers usually class paper handling mechanisms as optional extras, so it is important to determine what you are getting for the standard price quoted. There are four possibilities: friction-feed, pin-feed, tractor-feed and single-sheet feed. Friction-feed is the normal typewriter platen method of securing the paper and is usually standard on most printers. Pin-feed, the usual standard on low cost printers is where paper with sprocket holes along each edge must be used and then the pins latch into these holes. Unfortunately the pin-feeds on the right and left of the printer tend to be set at a fixed width apart or can be adjusted only a very short distance thus restricting the width of paper that can be used. Tractor-feeds again require paper with sprocket holes but give you the option of securing different widths of paper ranging from very narrow paper to the maximum width your printer will allow. For printing long draft documents, mailing labels and for

graphics a tractor-feed mechanism is essential. Single-sheet feeders
allow for the automatic insertion of single sheets of typewriter quality
paper. They have cassettes which usually hold up to 200 sheets of
paper. This is by far the most expensive option but it is essential for
an office environment.

4.0 Acoustic Hoods

When the printer is to be located in a busy office environment you must
consider the acceptable noise level. Although generally printers are
comparable in noise to an ordinary typewriter, the way they are used,
i.e. in long bursts of activity, tends to increase one's sensitivity to
the noise.

Acoustic hoods are available for most high quality printers but they do
come in different sizes depending on both the type of printer and the
paper handling mechanism.

5.0 Cables

Printers which support an RS 232C serial interface are favoured in this
Note.

Since the speed of the printer is often less than the speed at which the
computer can send characters to the printer, it is usually necessary to
either have a specific cable which electronically controls the output
speed or to employ software to pace the printing process so that
characters are not lost by the printer. There are various electrical
connections and software controlled mechanisms to do this; one commonly
employed software method, now available on most printers, is the use of
X-ON and X-OFF control codes to control the flow of characters, whilst
one often used electrical connection is RDY/BUSY.

B.   Small Systems Group Recommendation

1.0 Introduction

The Small Systems Group has studied in detail a large number of
printers. Technical specifications for all these printers are available
from User Liaison, ERCC, The King's Buildings (031-667 1081 ext. 2641).
The object of the study was to assess the technical capabilities of each
and to find a range of high quality type-face printers and low quality
type-face printers with graphics and multi-font options to recommend to
users for which this Group would have software available.

The Group has attempted to aim its printer software at a large general user area, basing its driver software on X-ON/X-OFF flow control. The Group has already spent considerable time in writing printing utilities for raster scan graphics and so any software compatibility that could be achieved here was an advantage. The Group has also investigated the different characters and special symbols that are required in both Art and Science documents in the University. To this end software has been written to give users the capability of creating their own special symbols and character sets and downline loading these to the recommended printers.

N.B. Prices are very approximate as they are subject to the dollar exchange rate and University bulk ordering schemes in operation when the printer is ordered.

2.0 Daisy wheel Printers

EXAMPLE OF THE PRINTOUT FROM A DIASY WHEEL PRINTER

The character set on the Sirius microcomputer contains 256 characters, 224 of which can be entered directly from the keyboard. The character set comprises the standard ASCII codes plus characters/symbols that are of general applicability to the University. As it is impossible to include all the characters required by all departments, a character set editor for the Sirius is provided on the release disks for UCSD Version 4.13. In this way users will be able to define (i.e. construct the exact dot matrix pattern for) their specific characters and symbols in a flexible manner.

It is important to note, however, that all these special characters could NOT be printed in a straightforward manner with present daisy wheel printers in use in the University. For the latest information and details of the specification suitable for use with the Sirius microcomputer, users should contact the Microcomputer Support Unit.

2.1 High Quality Type-Face

Recommendations:

a)   TEC Starwriter Executive 40
       Approximate Cost: £1200

b)   Diablo 630
       (Recommended only where stencils form a high proportion of
       the work)

3.0 Dot Matrix Printers

3.1 High quality printers

Many of our users are now requesting advice on printers with downloadable font capabilities. The character set on the Sirius microcomputer contains 256 characters which are the standard US ASCII codes plus characters/symbols that are of general applicability to the University. As it is impossible to define exactly the characters required by all departments, a character set editor is included on the release discs for UCSD Version 4.1. Therefore users require a printer that can handle the general University character set and also have the flexibility to handle other symbols that may be required.

Recommendations:

The Philips GP300 printer is a high quality dot matrix printer which allows the user to download fonts into its memory. The Small Systems Group has produced a character set editor for the GP300 similar to that available on the Sirius. In this way users can define and print their special subject-related symbols and characters in a flexible manner.

EXAMPLE OF THE PRINTOUT FROM A GP300 PRINTER

The character set on the Sirius microcomputer contains 256 characters, 224 of which can be entered directly from the keyboard. The character set comprises the standard ASCII codes plus characters/symbols that are of general applicability to the University. As it is impossible to include all the characters required by all departments, a character set editor for the Sirius is provided on the release disk for UCSD version 4.1 and the Microcomputer Support Unit has provided a similar character set editor for the GP300 printer. In this way users will be able to define (i.e. construct the exact dot matrix pattern) and print their specific characters and symbols in a flexible manner.

Scientific notation such as the equation below can be created in a reasonabley straightforward way while in eXchange mode in the standard editor.

$$\int_0^\infty \frac{\sin[0]}{} \, dx = \int_0^\infty \left[\int_0^\infty 2\pi y^3 \sin[0] \, dx \right] dy$$

Philips GP300 dot matrix printer (with i) either Gothic Scientific font or Gothic Teletex font. The Gothic Scientific font contains the Greek alphabet and scientific notation, the Teletex font is suitable for many European languages. ii) 32K downloadable RAM for the full Sirius character set. iii) automatic sheet feed.) Approximate cost printer £1692 sheet feed £402

3.2 Low quality printers

Recommendations:

The Epson FX80 and the Epson FX100 printers are cheap low resolution printers that have downloadable font capabilities and graphic facilities. The Small Systems Group can supply a character set editor for the Epson and graphic support units.

EXAMPLE OF THE PRINTOUT FROM AN EPSON FX PRINTER

The character set on the Sirius microcomputer contains 256 characters, 224 of which can be entered directly from the keyboard. The character set comprises the standard ASCII codes plus characters/symbols that are of general applicability to the University. As it is impossible to include all the characters required by all departments, a character set editor for the Sirius is provided on the release disk for UCSD version 4.1 and the Microcomputer Support Unit has provided a similar character set editor for the Epson FX range of printers. In this way users will be able to define (i.e. construct the exact dot matrix pattern) and print their specific characters and symbols in a flexible manner.

Scientific notation such as the equation below can be created in a reasonabley straightforward way while in eXchange mode in the standard editor.

$$\int_0^\infty \frac{\sin[O]}{} \, dx = \int_0^\infty \left[\int_0^\infty 2\pi y^3 \sin[O] \, dx \right] dy$$

    a)   Epson FX100
(Recommended with tractor feed where A4 size paper is required.) Approximate cost: £600

    b)   Epson FX80
(Does not take fan-folded A4 size paper with tear-off sprocket holes)

4.0 Printer Information

The following pages give information about the five recommended printers.

Model:	TEC Starwriter 40

Print Mechanism:	Daisy wheel

Type of Daisy wheel:	Plastic only — Qume or Diablo 96 character wheels

No. of Needles:	N/A

Speed:	~ 40 c.p.s.

Width at 10 c.p.i.:	136 characters

Type of Ribbon:	Ribbon Cartridge — Diablo Hi-Type 2

Graphics:	No

Character Sets:	Dependent on change of daisy wheel

Downline Loading:	No

Paper Handling Options:	1) Friction feed is standard 2) Tractor feed 3) Sheet feed

Communication Interface Options: RS 232C Serial interface configured for X-on/X-off or RDY/Busy.

Dip Switch Settings: C = Closed   0 = Open

For 12 c.p.i. at 1200 baud with X-on/X-off and A4 Sheet Feeder

        Switch 401   Switch 411
    C O O C O C O C   O O C C C O O O O

For 12 c.p.i. at 1200 baud with RDY/Busy and A4 Sheet Feeder

        Switch 401   Switch 411
    C O O C O C C C   O O C C C O O O O

Model:	**Diablo 630 A.P.I.**
Print Mechanism:	Daisy wheel
Type of Daisy wheel:	Plastic or Metal Diablo 96 character wheels
No. of Needles:	N/A
Speed:	Approximately 40 c.p.s.
Width at 10 c.p.i.:	158 characters
Type of Ribbon:	Ribbon Cartridges
Graphics:	No
Character Sets:	Dependent on change of daisy wheel
Downline Loading:	No
Paper Handling Options:	1) Friction feed as standard 2) Tractor feed 3) Sheet feed
Communication Interface Options:	RS 232C Serial interface configured for X-on/X-off and RDY/Busy. (The type of flow control can be easily altered via a dip switch setting.)

Dip Switch Settings:

For 12 c.p.i. at 1200 baud, 96 character daisy wheel, and X-on/X-off

Left Hand Switch   Right Hand Switch
Off Off Off Off Off Off Off Off   Off Off On Off Off Off <u>Off</u>

For 12 c.p.i. at 1200 baud, 96 character daisy wheel, and RDY/Busy

Left Hand Switch   Right Hand Switch
Off Off Off Off Off Off Off Off   Off Off On Off Off Off <u>On</u>

Rotary Switch Settings:

Left Hand Rotary = 7   Right Hand Rotary = 2

Model:	**Epson FX100**
Print Mechanism:	Dot Matrix
Type of Daisy wheel:	N/A
No. of Needles:	9
Matrix Size:	11 x 9
Speed:	Approximately 160 c.p.s.
Width at 10 c.p.i.:	~ 132 characters (16 inch wide carriage)
Type of Ribbon:	Nylon, black
Graphics:	Raster scan graphics
Character Sets:	Standard character set, italic character set or downloading option
Downline Loading:	256 characters can be downloaded to ASCII codes 0 to FFH, it is easy to define characters providing adjacent pins are not fired. It is easy to download providing pins in a cell representing 13 and 16 are not loaded.
Paper Handling Options:	1) Pin-feed for wide paper 2) Tractor feed required for fan-folded A4 size paper.
Communication Interface Options:	Standard with a parallel interface. RS 232C buffered interfaces are optional extras. The RS 232C buffered interface is required for X-on/X-off flow control.

Model:	**Epson FX80**
Print Mechanism:	Dot Matrix
Type of Daisy wheel:	N/A
No. of Needles:	9
Matrix Size:	11 x 9
Speed:	Approximately 160 c.p.s.
Width at 10 c.p.i.:	80 characters
Type of Ribbon:	Nylon, black
Graphics:	Raster scan graphics
Character Sets:	Standard character set, italic character set or downloading option
Downline Loading:	256 characters can be downloaded to ASCII codes 0 to FFH, it is easy to define characters providing adjacent pins are not fired. It is easy to download providing pins in a cell representing 13 and 16 are not loaded.
Paper Handling Options:	1) Pin-feed for paper of width 9.5 in to 10 in. 2) Tractor feed is available for paper less than 9 in. (Cannot hold fan-folded A4 paper with sprocket holes).
Communication Interface Options:	Standard with a parallel interface. RS 232C buffered interfaces are optional extras. The RS232 8K buffered interface is required for X-on/X-off flow control.

Model:	**Philips GP300**
Print Mechanism:	Dot Matrix
Type of Daisy wheel:	N/A
No. of Needles:	18
Matrix Size:	18 x 72 is normally used. It can also be 18 x 36 and 9 x 12
Speed:	Approximately 80 c.p.s.
Width at 10 c.p.i.:	80 characters
Type of Ribbon:	Nylon, Black
Graphics:	None with GP300L – Rasterscan Graphics available with GP300L
Character Sets:	Departments are advised to order either the Gothic Scientific font or the Gothic Teletex font. The Gothic Scientific contains the Greek character set and scientific symbols, the Teletex is suitable for European languages. In either case the 32K downloadable RAM should also be ordered in order to be able to print the full Sirius character set.
Downline Loading:	The 32K downloadable RAM allows user-defined symbols to be printed. The character set GP300.CHR, containing half-tone and logical symbols, is supplied by SSG.
Paper Handling Options:	1) Tractor Feed 2) Automatic sheet feed 3) Platen feed
Communication Interface Options:	RS-232C interface User configured for ready/busy or X-on/X-off flow control.