

Z88 USER'S CLUB

NOTES ON PRINTING

David Stewart



Notes on Printing		Page
One	Types of Printer and general printer set up	1
Two	The Z88 Printer Editor	7
Three	Understanding Character Sets and Printer Codes	13
Four	Page Layout (The <>O Command) and Print Test	23
Five	The <i>PRINT</i> menu	27
Six	Enhanced Printing Techniques	33
Seven	Further Reading, Books and Z88 Eprom references.	35

Appendices

One	Printer drivers:	
	1 Epson FX series	37
	(revised default driver for dot matrix printers)	
	2 Ricoh RP1600S	38
	(Diablo 630 daisy wheel printer emulation)	
	3 Canon Bubble Jet BJ-10e	39
	(IBM Proprinter Emulation)	
	4 Hewlett Packard IIP	40
	(Hewlett Packard series II emulation)	
	5 Hewlett Packard IIP	41
	(Alternative version mainly for 10 c/in.)	
	6 Star SR-10/15	42
	(Star 9 pin dot matrix printer circa 1984)	

Supplements

One	Further Notes on the PrinterEd Bug	S 1
Two	Microspacing and Horizontal Motion Index [HMI]	S 2

Nota bene: Good practise requires that computer files are backed-up on a regular basis. This is especially so prior to altering a printer driver file. All suspended activities should be saved to file and all files should be saved as a back-up to EPROM, tape or disk.

Printing history: Text typed on a Z88 (version 2.2) into PipeDream and printed on a Hewlett-Packard LaserJet IIP. Code Square prepared on a PC in PipeDream for the PC.

Where Copyright or Registered names are used in these notes such use is descriptive only. The protection subsisting in such names is acknowledged.

Copyright © David Stewart
44 Margetts
Hemingford Grey
Huntingdon Cambs

One Types of Printer and general printer set up

Printers for home computers are developing all the time, they range from the domestic typewriter fitted with an interface to the high speed laser printer costing several thousand pounds. As time goes by printers are dropping in price and occasionally a good bargain may be found in an auction or through a small-add. Some care needs to be taken in choosing a printer. I hope that these notes will help in their choice and use.

Points to consider

Besides price, value for money and build quality some other points to bear in mind are:

- 1 The size and weight of the printer, i.e. desk top or portable.
- 2 Power requirements, only important for portable printing.
- 3 Number of copies required, multiple [carbon] copies are only available from impact printers (with non-impact printers two or more top copies have to be made).
- 4 Maximum width or size of paper. Many printers are described as 80 or 132 column printers. This is the number of characters per line at 10 characters per inch. Thus 80, 96 or 120 characters per line (10, 12, or 15 c/in) can be printed on the standard narrow machine.
- 5 Ease of positioning the paper and ease of changing from one type of paper to another.
- 6 Type of paper required e.g. tractor paper, plain or heat sensitive paper. Most tractor paper is 11 inches long, this giving 66 lines per page at the standard 6 lines per inch. An A4 approximate paper 11.66 inches long is also available, this gives 70 lines per page. Heat sensitive paper is expensive.
- 7 Print speed, With impact printers quoted speeds are often only achieved when a single character is printed repeatedly. During normal printing speed may be 20-30% slower. With page printers the first page has to be taken into memory before printing can commence. This may take 15 seconds or more. Pages will then be printed at the quoted speed.
- 8 Ease of printing special items e.g. envelopes.
- 9 Cost and availability of any options e.g. sheet feeders or extra font cartridges.
- 10 Costs in use, these are best considered as a cost per page.
- 11 If purchasing second hand, is the Instruction Book still complete? The usefulness of a printer without its handbook is likely to be limited.

- 12 If you have any special requirements it is unlikely that sales literature will be sufficiently detailed to answer your queries. It will be necessary to ask searching questions and preferably see the required result prior to purchase.

Printers are categorised in several ways, the main ones being:

- 1 Character, line or page printers
- 2 Impact or non-impact printers
- 3 Draft, letter or laser quality printers.
- 4 Single sheet, sheet feed or tractor feed printers.
- 5 Mono or Colour printers
- 6 Plotters

The Main Types of Printer

Daisywheel Printers

Daisywheel printers are effectively typewriters without a keyboard. They are character, impact, letter quality, single sheet printers and print at about 30 to 40 characters / second [c/s]. As with typewriters the best quality comes from using a 'single strike' carbon film ribbon, but these are expensive. A re-usable fabric ribbon will give very good results to commence with but quality falls-off with use. The daisy wheel can be changed so the typestyle, as well as the pitch, can be varied.

Dot Matrix Printers

Dot Matrix machines are character, impact printers. The impression is formed by a series of close grouped pins which are projected forward to strike the ribbon. The quality of the print is very dependant on the number of pins and the pattern they make to form the character. Entry level printers use 9 pins but nowadays 18, 24 or even 48 pin printers are made. The more pins the better the quality which is described as Near Letter Quality [NLQ] in a 9 pin machine. The best quality from 24 pin printers is usually described as Letter Quality.

Speeds vary from about 30 c/s in NLQ to 100 c/s in LQ. A much faster Draft Mode is usually offered and speeds for this vary from 100 to 300 c/s. Ribbons are usually multi-strike fabric but multi-strike carbon film ribbons are also available. Several to many different type styles and pitch spacings will be offered, either already in the machine or available on a cartridge to be slotted in. Dot matrix printers normally have tractor feed for fan-fold (continuous) stationery and friction feed for single sheets. Sheet feeders are often available as an extra.

Without doubt most computer printers are dot matrix machines. Fair quality is available for a reasonable price and cost in use is low.

Ink Jet Printers also Bubble Jet Printers

Ink Jet and Bubble Jet printers are non-impact, character, single sheet or sheet feed printers. The quality is dependent on the density of the pattern formed by the individual dots of ink and is often 360 x 360 dots per inch, i.e. similar to laser printers. The ink is wet and some moments must pass before the print is touch dry. When dry some inks can still smudge, even from a damp finger.

Given this limitation the printers are quiet, offer about 60 c/s and good quality with a range of fonts and pitch spacings. Another major advantage, especially for Z88 users, is that some of these printers are truly portable, as they are designed to run off re-chargeable battery packs as well as via a mains transformer.

The printers come mid way in cost between dot matrix and laser printers. Costs in use are higher than dot matrix or laser printers, expect about 3 to 5 pence per page.

Laser Printers also Light Emitting Diode and Liquid Crystal Shutter Printers

The newest type of printer for home use is the laser printer, they are non-impact page printers working along the lines of a photocopier. The printer takes in information from the computer until a whole page has been assembled in memory and then prints it out. Assuming text only a 'slow' printer gives four pages per minute in continuous printing, say 300 c/s. Top end printers can produce more than 10 pages per minute.

Prices start at about £750 with a page cost of about two pence. Some machines offer toner replacement only but the drum will then cost more when it does need to be changed. More common is the complete replacement system where toner and drum are replaced together as a package. This is one way in which the continuous good quality is maintained.

The range of effects is wide and varies from printer to printer. The printer control language may be complex and not all effects will be available in one Z88 Printer Driver. However, the machines are quiet and the quality and permanence of the print put laser printers at the top of the tree.

Other Types of Printer

Typewriter fitted with an interface.

In the early and mid 1980's several typewriters were marketed complete with a computer interface, others had an interface available as an option. Today only a few machines at the top end offer an interface. Their main advantage is that they are both typewriter and computer printer. Printing speeds are low, from 7 c/s to 20 c/s. Two or three pitch settings are normally available, 10, 12 and 15 characters /inch.

Beware of purchasing a second hand machine without an interface, they may no longer be available and in any case are likely to cost as much as the machine.

Thermal printers

Some inexpensive printers use thermal technology, i.e. special paper is heated to form an image. The process is similar to fax machines. Running costs are high and the special paper is discoloured by light.

Thermal transfer printers direct heat at special ribbons to form the image on normal paper. Quality can be very good but the ribbons are expensive and cost per sheet may be 10 pence or more.

Line printers

Line printers print a whole line at one time through a series of print heads, they are very high speed machines and not intended for home use even if some are now offered through the remainder shops.

Colour Printers

Dot matrix and ink jet colour printers offer fair if not outstanding performance. Colour thermal transfer printers are available but are very expensive. Colour laser printers are rumoured for the future.

Plotters

As well as dot matrix, ink jet, laser and thermal printers which often offer graphics, special plotters are made which move a pen over a flat bed on which the paper is positioned. In an alternative design the paper is positioned over a long roller and the pen moves along the top of the roller. Most plotters are designed to use several pens so as to offer a range of line thickness and colour of ink. These machines are intended for use with suitable software which exploits their capabilities. I am not aware of any such software for the Z88.

Other Matters

Emulations

Some printer manufacturers lead, others follow! The leaders have developed their own printer control languages and these have become standards, to be emulated by other manufacturers. But not all emulations are true to the original. However, the main requirement for the Z88 user is sufficient information in the handbook so as to allow a specific printer driver to be prepared.

Character Sets and Fonts

As a general rule the followers offer more character sets and font styles as standard than the leading manufacturers do. As extra font cards and cartridges are expensive, and downloading fonts is not very practical on a Z88, care should be taken to ensure that the standard printer has all the fonts and characters that are likely to be needed.

Spares and Consumables

The cost and availability of spares and, particularly, consumables needs to be considered. Clearly, consumables for a popular and widely available printer are going to be more easily available; as well as being competitively priced compared with those for an obscure printer.

Printer Cables

Your printer will require either of two types of connection socket for the lead from the 9 pin serial port on the Z88. The socket needs to be either a serial (RS 232) or a parallel (Centronics) interface. Leads for both types are offered by Cambridge Computer. A serial lead costing about £10 and a parallel one £30. If a choice can be made choose the parallel lead as the Panel (S) set up is easier and more printers offer parallel connections than serial.

[Parallel connections usually provide quicker transfer of data as a byte of data is transmitted at one time down a set of cables. Cable lengths are limited to a few metres. For long cable lengths serial cables have to be used. Here the data is transmitted in a series of single bits, one at a time. In the case of the Z88 its port is serial. The box of tricks at the printer end of the parallel cable translates the signals from serial to parallel but the speed is that of the serial port. But this should not be noticeable as the speed is still sufficient to keep up with all but the fastest of printers.]

Z88 Panel Settings

The Panel is entered from the Index or by typing S.

<u>PANEL</u> CURSOR	CONTROL PANEL	Transmit baud rate 9600 Receive baud rate 9600 Parity None Xon/Xoff No	OZ
ENTER to update			

For printing via a **parallel cable** the Serial Port Parameters shown should be used. The baud rate (9,600) and parity (None) are default settings but Xon/Xoff [Handshake] should be set to **No** as recommended by Cambridge Computer.

Printing via a **serial cable** may not be so simple as the parameters have to be set to match the printer. Some trial and error may be required. Worse is the fact that ODD and EVEN parity settings do not result in correct behaviour in Operating Systems 3.0 or lower.

The baud rates have to be set to match the printer. If the printer works but does not, consistently, give correct characters try adjusting the Parity setting. If whole chunks of text are missing alter the Xon/Xoff setting.

Dip Switch and Printer Panel Settings

The more modern designs of printer tend to allow the setting of options from a panel on the front of the printer. This is a very convenient method. Older designs use "Dip Switches"; a bank of switches each with an 'on' and 'off' position. These switches are very small and it may be difficult to see the settings, let alone alter them. Additionally, there may well be two or more sets of dip switches. Care should be taken to note the original settings prior to making any changes. These are made by sliding the switch across. For safety, and to ensure that the new settings are activated straight away, turn the printer off before making any alterations.

With panel settings the printer will often be made so as a) to accept new settings only until the printer is reset or turned off or b) the required settings can be made into the default settings, i.e. the printer will adopt these settings when reset or turned on. Some printers also offer two types of reset, a) reset to your default settings or b) reset to the original factory settings.

In most printers the software, i.e. the PrinterEd, overrides the dip switch or panel settings. *[Other printers can be set to disregard software settings.]* If particular aspects of the printer do not return to normal either reset the printer or seek to revise the PrinterEd to return the settings to normal.

Enhanced Printing Techniques

In common with the great majority of software, PipeDream produces printed output in a mono spaced format, i.e. each letter is given the same amount of space and spaces between words are formed of one or more such mono spaces. When text is to be justified on both sides (as this text is) PipeDream offers **Microspace Pitch** which enables equal spaces between each word on a line. However, not all printers support this facility, and often the Z88 Printer Editor will not provide the correct information to the printer.

Proportional Spacing is a different facility where a typeface is designed with each character taking up as much, or as little, space as is required. The print is considered to have a better appearance and more characters will fit onto a line than with mono spaced text of the same size.

Mono spaced PipeDream text is suitable for transfer to a **Desk Top Publishing** package such as Ventura [via a cable link to WordStar etc]. Ensure that all text is in column A and that there are no text Highlights. It is also advisable to transfer an example of the keyboard in order to check that all characters are correctly transferred.

Some printer control languages include simple **graphics**, e.g. shading or hatching a rectangle or drawing lines. The versatility of the Z88 Printer Editor allows limited use to be made of this facility but it is probably of more use when used from within a BASIC program.

Further information is given on some of these techniques in Note 6.

Two The Z88 Printer Editor

The **Z88 Printer Editor** [PrinterEd] is an **Application** within the Z88. It is provided with a default **Printer Driver** for the most popular type of dot matrix printer, the Epson. The default **Printer Driver** file can be altered in the **PrinterEd**. Once altered and saved the file is shown in the list of files in the **Filer**. This Note describes the **PrinterEd** and the method of creating, or altering, and installing a **Printer Driver**.

There are three stages to developing a new printer editor:

- 1 Enter the Printer Editor
- 2 Make the necessary alterations and save the file
- 3 Update the Printer Editor to use the new file

1 Enter the Printer Editor

In time you will want to save the **Printer Driver** file so ensure that you are using your normal memory device. I use :RAM.1 .

The printer editor can be selected either by pressing the **index** key and moving the cursor down the left hand **Applications** list to **PrinterEd** and pressing **Enter** or alternatively by pressing **□ E**.

The editor consists of two pages of printer codes and two pages of menus. Move between the code pages with **Shift** and the down and up cursor arrows and call the menu pages in the normal way with the **Menu** key.

PRINTERED CURSOR FILES	PRINTER CODE	1	ON Underline 27,45,1	OFF 27,45,0	Off Yes	OZ
	EDITOR	2	String Bold 27,69	String 27,70	at Yes	
		3	Ext. sequence		CR Yes	
		4	Italics 27,52	27,53	Yes	
	PRINTER	5	Subscript 27,83,1	27,84	Yes	
	Epson	6	Superscript 27,83,0	27,84	Yes	
	Page 1	7	Alt. Font 15	18	No	
	Page 2: SHIFT v	8	User defined 27,120,1	27,120,0	No	

The Z88 has an Epson printer driver as standard and (on the assumption that the **PrinterEd** has not previously been altered) the single word **Epson** will appear under the title 'Printer' on the left hand side of the screen. On page one to the right are 8 rows of printer highlight descriptions followed by three columns, the first being 'On Strings', the second 'Off Strings' and the right most column being the 'Yes' or 'No' commands for 'Off at Carriage Return', i.e. whether or not the highlight is automatically turned off at the end of each row (or slot).

PRINTED CURSOR FILES	PRINTER CODE	Printer on 27,64	Translations A	B	C	OZ	
	EDITOR	Printer Off	Character 163				
		End of page 12	Changes to 27,82,3				
		Allow line feed Yes	Character				
	PRINTER	HMI: Prefix	Changes to				
	Epson	Suffix	Character				
	Page 2	Offset	Changes to				
	Page 1: SHIFT A						

Use **Shift** and the down arrow to move to Page 2. This consists of more codes together with the character **Translations**, i.e. the codes needed to alter certain keys to print a desired symbol, rather than the printer manufacturer's original settings.

The **Printer on** code can either be used as a code to set the required printer defaults [most useful with printers offering many settings] or as a reset to return the printer to its default settings. The **Printer off** code is normally used to reset the printer. **End of page** defines the action to be taken by the printer at the end of the page and **Allow line feed** defines the action to be taken at the end of each line. It can be set to **Yes** or **No** but note that **No** results in the wrong code being sent to the printer from Z88s version 3.0 or lower.

The **HMI: Prefix**, **Suffix** and **Offset** codes are used to set **Microspacing**. [For more information see Note 6].

Return to Page 1 with **Shift** and the up arrow.

2 Make the necessary alterations and save the file

Make whatever changes are necessary, these are detailed on a separate sheet. Delete out any characters remaining from the previous file so that there are no spaces (or characters) left at the end of a new code.

The **Error Message Bad code string** will be called, together with sound, to tell you that an error has been made in the code string just entered. The necessary correction has to be made before the cursor can be moved off the code. [Note that the error message is called in response to a code not complying with the Z88 Printer Editor Code Requirements, (see Note 3). It is not called in response to a code that fails to comply with the requirements of the intended printer.]

A bug which causes a soft reset to be required has troubled some users but seems to be controlled once a simple change is made to the file. Move the cursor to the third **Yes** in the list of **Off at CR**, i.e. the one for Ext. Sequence. Type **Y**. This forces the saved file to reserve a code for the **Off at CR** function, which otherwise is not the case.

The altered printer driver has to be saved to a file and will then appear in the list of files in the Filer. To save the file press the **Menu** key twice and cursor to **Save** (or press **<FS**). Type in a short file name (say **HPLJ**) and press **Enter**. The screen will return to the **PrinterEd** and the file name will now be entered as, say, **HPLJ**. If the file is loaded from memory then the file name will include the memory device: e.g. **:RAM.1/HPLJ**.

continued on page 10

Page 1

	On Strings	Off Strings	Off at Carriage Return
Underline		(	0
Bold	!	)	1
Extended Sequence	"	*	2
Italics	#	+	3
Subscript	\$	,	4
Superscript	%	-	5
Alternate Font	&	.	6
User defined	'	/	7

Page 2

		Translations	A	B	C
Printer On	!	Character	'!	-!	3!
Printer Off	!!	Changes to	(!	.!	4!
End of Page	"!	Character	)!	/!	5!
Allow Line Feed	#!	Changes to	*!	0!	6!
HMI: Prefix	\$!	Character	+!	1!	7!
Suffix	%!	Changes to	,!	2!	8!
Offset	&!				

The Z88 PrinterEd File Constructs

The constructs can be examined in a Printer Driver file that has been loaded into PipeDream as plain text. The file is entirely in column A with each row commencing with a two digit construct. To assist the examination of the plain text file the constructs are shown against their respective code descriptions.

Two digits are reserved for constructs: The order of the constructs is that of the Z88 Character Set and uses a character (decimal 32 - 55) plus a space (decimal 32) for page 1 constructs and a character (decimal 32 - 56) plus a hyphen (decimal 33) for page 2 constructs. The printer code then follows immediately.

3 Update the Printer Editor to use the new file

Altering a Printer Driver and saving it does not mean that the file is now in use to drive the chosen printer. The file has to be installed into the computer so press the **Menu** key twice and cursor to **Update Driver**, (or press **◁FU**). The cursor will stop blinking for about 10 seconds (it seems to be an age) but once the cursor has returned you can test the PrinterEd. At this stage leave by pressing the **Index** key so as to keep the file as a suspended activity. If further alterations are required the file can be re-entered through the index.

Printer Drivers created in ASCII code format [see Note Three] are changed into Decimal codes if:

- A) The file is saved
- B) The file is retained as a suspended activity and
- C) the file is **◁KILLED** from the **Index**

Upon reloading the file into the PrinterEd the file format is decimal. Note that if the PrinterEd is finally left by using, say, **□P** then the file remains in ASCII format.

Return to the default Epson driver

The default Epson driver is called back by **◁FNEW** from the PrinterEd Files Menu. In this case **◁FU** is not required.

Off at Carriage Return

Off at CR has been referred to several times in this note. This is more usually set to **Yes**. The print highlight is then turned off at the end of the row, i.e. at Carriage Return. In fact, the highlight is turned on for the current slot only and thus is turned off at the end of the slot. This can be disconcerting when working in columns. Alternatively, the command can be set to **No** and the effect will continue until turned off by repeating the print highlight code.

Codes 1 - 4 are shown on the Z88 screen with an altered text pattern in the one row (or slot) into which the highlight has been entered. The effect is not repeated in the next row (or slot). If *Off at CR* is set to **No** for any of these highlights remember that the effect will print out until turned off, even though it is not shown on the screen.

Codes 5 - 8 do not show on the screen other than by the number in a reverse block. These latter four codes are more suitable for setting *Off at CR* to **No**.

User Manual Information

The second edition of the Z88 User Guide (the silver covered version) contains some help on the Printer Editor at Appendix E, pages 202 - 208. The third edition (the blue covered version, now called the Z88

User Manual) contains very similar information in Section Nine, pages 187 - 193 but also contains a useful list of the Z88 Character Set at Appendix D, pages 237 - 238.

Printer Driver File Import and Export

Printer Driver files are saved as *Plain Text* files in PipeDream, they can be saved to EPROM, tape or disk as well as to the normal ROM device. They can also be exported or imported via a MODEM. Thus it is a simple matter of making a copy of the PrinterEd file to enable you to exchange a file with other Z88 users.

Some users have provided copies of their PrinterEd files to the **Z88 Users' Club Software Library**. Such files are quite small but the explanation with the file may run to several pages.

Three Understanding Character Sets and Printer Codes

Character Sets are used both by the Z88 and the printer in transferring the key stroke message from the computer to the printed paper. However, the character sets will not be the same and an understanding of how they operate is required in order to obtain the most from the Z88/printer combination. Printer codes are the instructions required by the printer so that the output may be controlled as desired.

To make matters more complicated the following points have to be grappled with:

- 1 There are four (if not more) ways of defining the graphic characters that are printed on a keyboard. The graphic (or ASCII) characters can also be represented by Decimal, Hexadecimal or Octal numbers and by Binary digits.
- 2 The parameters that have to be met, so that the software can interpret the codes, prior to sending them as electric pulses [representing binary digits] to the printer, vary from software to software.
- 3 The methods used in printer manuals to detail the codes required vary from manufacturer to manufacturer, as well as from time to time from the same manufacturer.
- 4 As printers become more accomplished the range of characters that they can print becomes more extensive. The characters are formed into 'Character sets' (or 'Symbol Sets'). Each set consists of up to 256 characters. However, the Z88 keyboard has keys for only decimal codes 32 - 127, 160 and 163; a total of 98 characters. In addition codes 0 - 31 are used to send instructions to the printer. Consequently 130 out of the 256 codes are available for use directly. If any remaining symbol is required then a character translation will have to be used.

One way to establish the type of code used in a particular manual is to look at the first part of the code. If this is 27 or 027 then Decimal codes are being used, ESC indicates ASCII. Less common is 1B (or 1BH, \$1B or &1B) for Hexadecimal. BASIC codes start with CHR\$(27). Only rarely will 033 for Octal be found. This test works because the majority of codes require the Escape code prefix to be sent first in order to distinguish the control sequence from normal, printable, characters.

Compare the above symbols in the Code Square on page 14; they all represent the same feature. However, Decimal and Hexadecimal codes may be shown in different ways as indicated above. Decimal codes are one two or three digit numbers and any leading zero is not required by the Z88 PrinterEd. Hexadecimal codes usually consist of two digits and any third digit (a leading \$ or &, or a trailing H) is used to indicate that the number is Hexadecimal. [For Hex codes the Z88 PrinterEd requires a leading \$ (see below).]

		F i r s t H e x a d e c i m a l C o d e															
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
S e c o n d H e x a d e c i m a l C o d e	0	NUL 0	DLE 16	SP 32	0 48	a 64	P 80	<> 96	p 112	128	144	<>SP 160	176	192	208	224	240
	1	SOH 1	DC1 17	! 33	1 49	A 65	Q 81	a 97	q 113	129	145	161	177	193	209	225	241
	2	STX 2	DC2 18	" 34	2 50	B 66	R 82	b 98	r 114	130	146	162	178	194	210	226	242
	3	ETX 3	DC3 19	# 35	3 51	C 67	S 83	c 99	s 115	131	147	£ 163	179	195	211	227	243
	4	EOT 4	DC4 20	\$ 36	4 52	D 68	T 84	d 100	t 116	132	148	164	180	196	212	228	244
	5	ENQ 5	NAK 21	% 37	5 53	E 69	U 85	e 101	u 117	133	149	165	181	197	213	229	245
	6	ACK 6	SYN 22	& 38	6 54	F 70	V 86	f 102	v 118	134	150	166	182	198	214	230	246
	7	BEL 7	ETB 23	' 39	7 55	G 71	W 87	g 103	w 119	135	151	167	183	199	215	231	247
	8	BS 8	CAN 24	(40	8 56	H 72	X 88	h 104	x 120	136	152	168	184	200	216	232	248
	9	HT 9	EM 25	) 41	9 57	I 73	Y 89	i 105	y 121	137	153	169	185	201	217	233	249
	A	LF 10	SUB 26	* 42	: 58	J 74	Z 90	j 106	z 122	138	154	170	186	202	218	234	250
	B	VT 11	ESC 27	+ 43	; 59	K 75	[91	k 107	{ 123	139	155	171	187	203	219	235	251
	C	FF 12	FS 28	, 44	< 60	L 76	\ 92	l 108	| 124	140	156	172	188	204	220	236	252
	D	CR 13	GS 29	- 45	= 61	M 77	] 93	m 109	} 125	141	157	173	189	205	221	237	253
	E	SO 14	RS 30	. 46	> 62	N 78	^ 94	n 110	~ 126	142	158	174	190	206	222	238	254
	F	SI 15	US 31	/ 47	? 63	O 79	_ 95	o 111	DEL 127	143	159	175	191	207	223	239	255

The Z88 Character Set

The Z88 Graphic Characters and control codes are displayed in the top half of each location. The order and location of these characters and codes is generally as set out in the ASCII Standard. They are therefore often referred to as ASCII Characters and Codes.

The decimal equivalent code is shown directly underneath.

To find the hexadecimal equivalent code a) read up the grid to find the first digit or letter and b) read left across the grid to find the second one.

Z88 Printer Editor Code Requirements

Codes can be entered as Decimal or Hexadecimal numbers or as ASCII characters and symbols. Only ASCII characters and symbols from the Z88 character set, and not any variations from another set, can be used. Similarly, Hexadecimal numbers in the range 00 to FF only are valid. An unusual feature is that codes must be separated, one from another, with commas. Other unusual features are that A) ASCII characters must be entered between double quotation marks and B) Hex codes must be entered with a \$ prefix. Different types of codes can be mixed in one string.

The default Epson Printer Driver is entered as decimal characters. Where number strings are required to define parameters [as in Hewlett Packard printer drivers] Cambridge Computer Ltd have recommended the use of ASCII characters. The following examples are the equivalent parts of a code to define printing at 16.67 characters per inch:

```
ASCII  "16.67"
Hex    $31,$36,$2E,$36,$37
Dec    49,54,46,54,55
```

Using Printer Control Codes from Printer Handbooks

The following examples are from various handbooks detailing Hewlett Packard codes. A good handbook gave the following information:

Start automatic underlining

ASCII	ESC	&	d	D
Hex	1B	26	64	44
Dec	27	38	100	68

Poorer handbooks gave either:

ESC&dD or ESC+&+d+D

and another detailed the code partly in BASIC:

```
LPRINT CHR$(27)+"&dD"
```

Care must be taken to distinguish capital O from figure 0 and also lower case l from figure 1.

Another frustration is that some printer languages use a similar code, e.g. both for 'on' and 'off', where a variable is shown as 'n'. Some explanation of n may be given e.g. (n=1 ON, n=0 OFF) or (n= 0-7). Usually n is an ASCII character but it can be a decimal number.

Where n is an ASCII character the following conversions hold:

	ASCII character	Hex	Dec	
n = 0	"0"	\$30	48	
n = 1	"1"	\$31	49	etc.

Where n is a decimal number the following conversions hold:

	ASCII symbol	Hex	Dec	
n = 0	NUL	\$00	0	
n = 1	SOH	\$01	1	etc.

Codes can be entered in any one of the three ways as explained above but the Z88 requirements have to be met. The underlining code could be entered as either:

ESC,"&","d","D" (ASCII characters only are entered in " " marks.)

or \$1B,\$26,\$64,\$44 (Hex codes are entered with a \$ prefix.)

or 27,38,100,68

The codes for the eight print highlights are entered into their respective slots on page 1 of the Printer Code Editor. Off Strings will also be required.

Note that as only 18 digits can be seen in the window; a long entry will scroll across and spring back again when you re-enter the slot.

Information from Code Tables and Squares

The information required to perform specific control functions (e.g. start underlining) will have been detailed in the printer handbook as described above. But if a particular key stroke is not providing the desired result then the code table or square will have to be consulted and a 'Character Translation' used.

Code tables are fairly easy to use. Code squares come in several different forms. The important point with both is that only the ASCII codes and symbols will alter from printer to printer as well as from character set to character set. In code squares the decimal code is often shown under the ASCII code or symbol.

Examine the information and find the desired character that you wish to print, make a note of the equivalent code and its 'Character Set'. The keyboard character that you intend to use can be entered directly into the PrinterEd (as an ASCII character between quotation marks).

Valid Translations

Modern printers, and the Z88, utilize a byte consisting of 8 bits. Some older designs utilize 7 bits per byte. These older machines can directly address only the lower 128 characters of a character set. Any character having a decimal code of 128 or higher will have its code reduced by 128 in order to be read by the printer. *[The Z88 character set has been designed to overcome this problem; deduct 128 from the Exact Space code (160) and the result is the space code of 32.]*

Similarly deduct 128 from the £ sign code (163) and the result is the English code for the £ sign of 35. See the character set on page 14.]

Character translations into the upper half of a character set will not work with a 7 bit printer. Instead the Extended Sequence code will have to be used to obtain the desired result. [See page 18.]

With an 8 bit printer, and Parity set to None, character translations can be made into the upper half of a character set. In addition the Extended Sequence code may also be available on the printer.

Principle Character Set Translations

The principle (or current) character set is either the set instructed by the Printer Driver or the printer's default set. In the case of a daisy wheel printer, it is the daisy wheel. [A few have extra characters.]

The most common problem requiring a translation concerns the £ and # signs as the printer prints one of the signs for both key strokes. For example, if the printer prints the £ sign at both the £ and the #, then the # key requires to be translated so as to print the # sign. The following change is required:

Key # = "#" (ASCII) = 23 (Hex) = 35 (Dec) [from Z88 Character Set]

Character to print # = 5C (Hex) = 92 (Dec) [from Printer Code Table]

On page 2 of the PrinterEd move the cursor down once and right once and enter "#", \$23 or 35 against the word *Character*. Then cursor down once and enter either \$5C or 92 against *Changes to*.

Secondary Character Set Translations

If the desired character is in a secondary set (or is a daisy wheel extra character) then both the code to change to that set and the code to get back again to the principle set are required. Examine the printer's code list to find the code for changing to the secondary character set with the required symbol and also the code to get back to the principle character set. In this example Ricoh 1600 (Diablo 630 emulation) codes are shown:

	Hex	Dec
Change to secondary character set	0E	14
Change to principal character set	0F	15

Using the example of the £ and the # signs then the entries would be:

Character "#" or \$23 or 35

Changes to \$0E,\$5C,\$0F or 14,92,15

Note that as only 8 digits can be seen in the window a long entry will scroll across and spring back again when you re-enter the slot.

A total of nine character translations may be saved with each Printer Driver; three pairs of rows and A, B & C columns. This facility can be used to replace an unwanted symbol on the keyboard (which may or may not print correctly) for a desired symbol which falls outside the normal keyboard symbols.

When all the necessary changes have been made do not forget to save the file and then update the Printer Editor. (See Notes on Printing 2, section 3)

Test the result as described in Notes on Printing 4.

Extended Sequence Printer Code

The printer highlight code number 3 is undefined in the Epson PrinterEd, even though some Epson printers support the Extended Sequence. The code is called by $\langle \text{PX} \rangle$. *[The code is displayed on the screen by grey characters. This effect is used, presumably, as the characters shown on-screen will not be the characters printed.]*

Alternative names for the Extended Sequence code are:

High Order Bit Code or High Bit Code

Eighth Bit Code

Most Significant Bit Code (MSB)

Some printers use the code to print an Italic font, if so the code would be used for printer highlight code number 4, $\langle \text{PI} \rangle$. Another use is to print specific characters as required, maybe the IBM box drawing characters, mathematics symbols or foreign characters.

The Epson codes are:

	ASCII	Hex	Dec
High order bit on	ESC, "^"	\$1B, \$3C	27, 60
High order bit off	ESC, "="	\$1B, \$3D	27, 61
High order bit normal	ESC, "#"	\$1B, \$23	27, 35

The codes allow jumps in to and out of the upper half of a printer's character set, so as to print out the required character even though the screen character is as typed at the keyboard. In simple terms 128 is added to the decimal number of the screen symbol and the symbol equivalent to the resultant decimal number printed. In more complex terms the eighth bit of the binary code is stripped off and replaced by 1. When the code is turned off the eighth bit is stripped off and replaced by 0. As this would cancel the use of some translations the preferred Off Code is to allow the normal eighth bit to be sent by the PrinterEd.

NUL 0	DLE 16	SP 32	0 48	@ 64	P 80	` 96	p 112			° 160	À 176	Ð 192	à 208	ö 224	õ 240
SOH 1	DC1 17	! 33	1 49	A 65	Q 81	a 97	q 113			ı 161	± 177	Á 193	Ñ 209	á 225	ñ 241
STX 2	DC2 18	" 34	2 50	B 66	R 82	b 98	r 114			ç 162	² 178	Â 194	Ò 210	â 226	ò 242
ETX 3	DC3 19	# 35	3 51	C 67	S 83	c 99	s 115			£ 163	³ 179	Ã 195	Ó 211	ã 227	ó 243
EOT 4	DC4 20	\$ 36	4 52	D 68	T 84	d 100	t 116			¤ 164	´ 180	Ä 196	Ô 212	ä 228	ô 244
ENQ 5	NAK 21	% 37	5 53	E 69	U 85	e 101	u 117			¥ 165	µ 181	Å 197	Õ 213	å 229	õ 245
ACK 6	SYN 22	& 38	6 54	F 70	V 86	f 102	v 118			| 166	¶ 182	Æ 198	Ö 214	æ 230	ö 246
BEL 7	ETB 23	' 39	7 55	G 71	W 87	g 103	w 119			§ 167	· 183	Ç 199	× 215	ç 231	÷ 247
BS 8	CAN 24	(40	8 56	H 72	X 88	h 104	x 120			¨ 168	¸ 184	È 200	Ø 216	è 232	ø 248
HT 9	EM 25	) 41	9 57	I 73	Y 89	i 105	y 121			© 169	¹ 185	É 201	Ù 217	é 233	ù 249
LF 10	SUB 26	* 42	: 58	J 74	Z 90	j 106	z 122			ª 170	º 186	Ê 202	Ú 218	ê 234	ú 250
VT 11	ECS 27	+ 43	; 59	K 75	[91	k 107	{ 123			« 171	» 187	Ë 203	Û 219	ë 235	û 251
FF 12	FS 28	, 44	< 60	L 76	\ 92	l 108	| 124			¬ 172	¼ 188	Ì 204	Ü 220	ì 236	ü 252
CR 13	GS 29	- 45	= 61	M 77	] 93	m 109	} 125			¬ 173	½ 189	Í 205	Ý 221	í 237	ý 253
SO 14	RS 30	. 46	> 62	N 78	^ 94	n 110	~ 126			® 174	¾ 190	Î 206	Þ 222	î 238	þ 254
SI 15	US 31	/ 47	? 63	O 79	_ 95	o 111	⌘ 127			¯ 175	¿ 191	Ï 207	ß 223	ï 239	ÿ 255

ECMA-94 Latin Alphabet 1 Character Set

The choice of the character set is important. Use the one that contains as many as possible of the desired characters.

The ECMA-94 Latin Alphabet 1 is shown on page 19. [ECMA = European Computer Manufacturers Assoc.] Using Extended sequence and ECMA-94 some 187 characters can be printed directly. Although only the 95 characters from the Z88 set will show on the screen.

With a printer that supports these codes all printable Z88 characters except the Exact Space and the £ sign can be translated using this one print command. However, the translations are limited to the automatic addition of 128 to each decimal code. The ASCII symbols will also be translated. Some character sets repeat the symbols in the extended section, this enables the normal printer codes to be used, otherwise the code may require *Off* at CR set to *Yes*.

Printing Foreign Characters

There are several methods of printing foreign characters from the Z88. If the printer has a suitable character set, either extended or national ISO, there is no great problem. Failing either of these the only other option is to use a 'key, backspace, special key' method.

The 'key, backspace, special key' methods were described in the April 1991 edition of Z88 EPROM.

With an extended or national ISO CS certain keyboard characters may be used in translations for the foreign characters. Translations have been described earlier in this Note.

Alternatively the national ISO CS may be used continuously or the following special method may be used as required to print out the ISO substitution characters,

The ISO substitution characters are shown on page 21. The standard ASCII CS contained within a printer is either varied for the intended country of the printer or two or more of the variations are contained within the printer and the particular one required can be set, either by DIP switches or controlled by the software, i.e. the Printer Driver. By this second method between 2 and 11 characters can be changed, dependant on the international set.

If software control is possible the code to switch to the alternate ISO CS can be set in a Printer Driver On String and the code to return to the normal CS set in the Off String. To use a foreign character insert the appropriate highlight code, type the normal character [from the ISO UK line] and finally type the highlight code again to turn off the alternate ISO CS. In this way all the normal are keys available as well as the international characters and normal formatting remains correct.

Z88 export versions

Export versions of the Z88 have 28 translation locations in the PrinterEd. [Contained on a third page of the PrinterEd.] They also have additional <key commands [Using non-alpha keys.]

ISO Name	DECIMAL CHARACTER EQUIVALENTS											
	35	36	64	91	92	93	94	96	123	124	125	126
6 ASCII	#	\$	@	|	|	|	^	'	{	|	}	~
2 ISO IRV *	#	¤	@	|	|	|	˘	˙	{	|	}	˘
4 ISO United Kingdom	£	\$	@	|	|	|	˘	˙	{	|	}	˘
25 ISO French *	£	\$	à	°	ç	§	˘	˙	é	ù	è	˘
69 ISO French	£	\$	à	°	ç	§	˘	μ	é	ù	è	˘
German *	£	\$	§	À	ö	ü	˘	˙	ä	ö	ü	ß
21 ISO German	#	\$	§	À	ö	ü	˘	˙	ä	ö	ü	ß
15 ISO Italian	£	\$	§	°	ç	é	˘	ù	à	ò	è	ì
14 JIS ASCII *	#	\$	@	|	¥	|	˘	˙	{	|	}	˘
57 ISO Chinese *	#	¥	@	|	|	|	˘	˙	{	|	}	˘
10 ISO Swedish *	#	¤	@	Ä	ö	Å	˘	˙	ä	ö	å	˘
11 ISO Swedish:	#	¤	É	Ä	ö	Å	Ü	é	ä	ö	å	ü
Spanish *	#	\$	@	¡	Ñ	¿	˘	˙	{	ñ	}	˘
17 ISO Spanish	£	\$	§	¡	Ñ	¿	˘	˙	˘	ñ	ç	˘
85 ISO Spanish: *	#	\$	·	¡	Ñ	¿	¿	˘	˘	ñ	ç	˘
16 ISO Portuguese *	#	\$	§	À	Ç	õ	˘	˙	ã	ç	õ	˘
84 ISO Portuguese: *	#	\$	·	À	Ç	õ	˘	˙	ã	ç	õ	˘
60 ISO Norwegian v1	#	\$	@	Æ	Ø	Å	˘	˙	æ	ø	å	˘
61 ISO Norwegian v2 *	§	\$	@	Æ	Ø	Å	˘	˙	æ	ø	å	|

ISO Substitution Characters

* Not recommended for future use.

Line Spacing 1

This command can be varied to give a wide spacing to the lines of print. Normally set at 1, double spacing is set with 2 and so on. Allowable line spaces lie in the range 0 to 255, but what use 0 is I do not know! Whole numbers only are valid

Start Page

Normally left blank and thus the first page will be page 1. Allowable start page numbers lie in the range 0 to 255. This option is used when automatic page numbering is being used in either headers or footers. Use 0 when the first page is required without headers or footers. The next, and following, pages will have headers and footers in the normal way. The second page will be numbered 1 if the @P@ field is used. Note that if a block is printed any page numbers will always commence at 1.

Leading Characters

This option allows text in front of a number in an expression slot. Called by <LCL it is used when the characters set on the Options page are required to precede the number. However, the main reason for drawing attention to this option in these notes is that print highlights can be set before or replace the leading character. The cell will then be highlighted. With Off at CR set to Yes for the highlight it will be turned off at the end of the slot.

Margins

The first four margins, i.e. Top, Header, Footer, and Bottom control the special lines at the top and bottom of a page that create the space between one page and the next as well as create the layout of the page. Additionally, inserting text into the header or footer will take up one more line each. Each line reserved for use in one of these six categories is a line that is not available for normal text on the page. If required, all four margin settings can be set to Zero, and if neither headers or footers are in use, the number of lines per page will equal Page Length. The page break line moves automatically to show, on screen, the changing number of lines available for text on each page.

Margin Top 0

This controls the number of clear lines above the optional header.

Margin Header 2

This controls the number of clear lines under the optional header but above the main body of text.

Thus the total margin above the top of text is made up of three components, top margin, header text line and header margin.

Margin Footer 2

This controls the number of clear lines below the main body of text but above the optional footer.

Margin Bottom 8

This controls the number of clear lines under the optional footer.

Thus the total margin below the text is made up of three components, footer margin, footer text line and bottom margin.

Left Margin 0

The final margin setting is for the left margin. Normally 0, it can be set so as to offset the text from the left hand side of the page if the paper can not be set to provide the margin in the printer. This option is most likely to be required with laser, ink jet or similar printers.

Headers and Footers

The bottom line of these notes is set as a footer. The line is not typed in on each page of text, but entered once in the Options page. Pipe-Dream then adjusts the coded footer to print out the text as required. Headers can be treated in a similar way.

The codes consist of compulsory separators and optional @ field identifiers, viz:

@P@ inserts the correct **page number**

@D@ inserts the **current date** as set by the Z88 clock

@T@ inserts the title as set in the **Title Option**

These identifiers can also be used in PipeDream text where additional @ characters may be needed to define the maximum text length required. Because all headers and footers are displayed |left|centre|right| with, hopefully, spaces between each section additional @ characters are not required.

PipeDream is unusual in giving you complete freedom to use any character in the header or footer text; however, this freedom is obtained at a cost! The first character typed in on each of the lines is the **separator** for that line. It becomes PipeDream's chosen separator that controls the |left|centre|right| layout. In other spreadsheets the most usual separator is the vertical bar, and that is the one I use.

PipeDream adjusts the right margin of any header or footer to the far side of the right hand column. If the right margin for text is set inside the column then text and headers/footers will not line up when printed. If a limited range of columns is printed the right margin of the headers/footers will adjust to suit.

Text is not required in each part of the |left|centre|right| layout. For example ||centre|| will print **centre** in the centre of the line and |||right| will print **right** at the right margin.

Microspace

The final option that appears on this page, underneath *Insert* or *Overtyp*e is the word *Microspace*. This is so only when the <>PM command has been called and set to Yes. [See Note 6 and Supplement 2.]

The Print Test

A test is required to ensure that the printer is responding to the Z88 as required. This should consist of whatever is required to suit your needs. As a start I suggest the characters of the keyboard with an end of line marker, viz:

! @ # \$ % ^ & * () _ +		
1 2 3 4 5 6 7 8 9 0 - = \	|	
Q W E R T Y U I O P { }	|	
q w e r t y u i o p [ ]	|	
A S D F G H J K L : " ©	|	
a s d f g h j k l ; ' ` |	|	< £ sign missing!
Z X C V B N M < > ?	|	
z x c v b n m , . /	|	

The end of line marker will move left if any key is not being printed at all. Check that all keys are doing what is requested of them.

Once the keyboard is being printed as desired other matters can be checked. The following are my checks:

1. Highlight control, both on and off.

Bold print.

Underline.

10 characters per inch

Italic print

Subscript H₂O

Superscript e = mc²

Alternate font

Bold and 10 Characters per inch

2. Lines per page.
3. Consistency of line positioning from page to page.

For the last two more than one page of test is required, to save time in the printer a header and a footer may be all that is required. So to keep the file small insert one or two page breaks underneath the first page with <>EIP. Use the default **No** to the question *Specify no. of unbroken lines.*

Five The PRINT menu

The reader of these Notes will by now have used the print command <>PO, if the printer works correctly all well and good. If not the search to identify the problem will hopefully prove fruitfull. Once the printer is behaving then the highlight commands and the partial print commands can be investigated. This note works through the commands available from the Print Menu.

The *Print* menu is called by pressing the **MENU** key to move the cursor down to the *PRINT* menu. The cursor block may then be moved to the individual commands shown or they may be called directly by pressing their Diamond Key combination. Confirm any choice by pressing **ENTER**. Leave the Print Menu or any command by pressing **ESC**.

PIPEDREAM	Print	<>PO	Underline	<>PU	Insert Highlights	<>PHI	MENU	OZ
BLOCKS	Microspace	<>PM	Bold	<>PB	Remove Highlights	<>PHR		
CURSOR			Ext.Sequence	<>PX	Highlight Block	<>PHB		
EDIT			Italic	<>PI				
FILES			Subscript	<>PL				
LAYOUT			Superscript	<>PR				
OPTIONS			Alt.Font	<>PA				
PRINT			User Defined	<>PE				

The Print Menu

Four print commands operate via a secondary menu and eight operate directly. In order the commands are:

Print <>PO

A secondary menu is called:

PIPEDREAM A1					OZ
BLOCKS	.....	Print only range of columns	No	....F	
CURSOR	1	Select rows to print	No		
EDIT	2	Wait between pages	No		
FILES	3				
LAYOUT	4				
OPTIONS	5				
PRINT	6				

If all the file is required to be printed the **ENTER** key can be pressed and the file will be sent to the printer. All headers and footers and margins as set will be printed. Any @ field identifiers will be inserted into the printed output.

However, if a **Marked Block** has been set and not removed then only the marked block, together with headers and footers, will be printed. The page identifier @P@ will always commence at 1, regardless of the *Start Page* set in the **Options Page**. The ability to print only a marked block is a very useful command, e.g. in a letter file the address only can be printed for a label. If all top and bottom margins have been set to 0 then the top line of the block will print at the top line of the label.

Print only range of columns **No**

The default is No when all columns will be printed.

A contiguous range of columns can be printed. To set the range type **Y** at the cursor position. The cursor then moves to the right and the range of columns must be entered with a space between the two: e.g.

Print only range of columns *Yes B D*

Columns B - D inclusive will be printed for their full length unless either or both of the next questions are answered in the affirmative.

Select rows to print **No**

The default is No when all rows will be printed.

Both or either of two tests can be set so that a limited range or selection of rows only will be printed. If required cursor down to **No** and type **Yes**. The cursor moves right so that the test can be entered.

Row Test

A straight forward test that works on any PipeDream file. The Row Number can be tested so that only rows complying with the test will be printed. For example *ROW>3|ROW<7&ROW>49* will result in rows 4 - 6 and 50 onwards being printed. The tests are carried out using PipeDream's **Relational Operators**. To link two or more tests together **Logical Operators** are used. *[To find the HELP screen on these Operators press HELP (whilst in PipeDream), cursor to the Operator and press ENTER.]*

Conditional Test

In a Spreadsheet or Database PipeDream application a more complex test may be set to check a row for a required result; only if the result is found to be positive will the row be printed. Several points need to be borne in mind for this very useful feature:

- 1 The column containing the test criteria need not be within the range of columns to be printed.
- 2 The test works either on:
 - A) characters in a slot, *[the test characters are inserted in quotation marks, even if the characters to be tested are themselves the result of an expression slot]* or
 - B) expressions in a slot. *[the result of an expression slot is tested as a number which is not entered in quotation marks.]*
- 3 Regardless of any other restriction of rows to be printed, i.e. a row test or marked block, the conditional test is set up in Row 1 and each test must only refer to a particular column. See example on Page 23.

A database is shown with information on invoices raised and payments received. Any one row has to contain all the necessary information concerning Client, invoice details and dates of payment for each invoice.

PIPEDREAM A1							OZ
BLOCKS	.....A.....	B.....	C.....	D.....	E.....	F.....	
CURSOR	1						
EDIT	2						Paid
FILES	3	Divison	Amount Due	Client	Inv Nr.	Date	Not Paid
LAYOUT	4						
OPTIONS	5	B	100.00	Andy Ltd	1234	30.6.1991	Not Paid
PRINT	6	A	124.56	Bandy Ltd	2345	30.6.1991	Not Paid
	7	C	234.00	Candy Ltd	3456	30.6.1991	Not Paid
	8	B	89.00	Andy Ltd	4567	30.5.1991	Not Paid
	9	B	189.00	Bandy Ltd	5678	30.5.1991	Not Paid
	10	B	250.00	Candy Ltd	6789	30.5.1991	Paid

[notes: Columns B, E and F are entered as expressions, respectively for cash due, date and status. The status is called in by the expression +F1 or +F2 as required.]

To print rows 3 and 4 enter the following into Select rows to print:

Yes ROW=3|ROW=4

To test for non-payment of all invoices issued:

- by division; 'B' in this case
- for more than £100
- unpaid after 2 months i.e. before 31st May 1991

complete Select rows to print: as follows

Yes ROW=3|ROW=4|A1="B"&B1>=100&E1<1.6.91&F1="Not Paid"

Only one invoice fits the criteria, that to Bandy Ltd for £189.00. The title rows 3 and 4 and the one row will be printed together with any headers and footers.

Some other points to note are:

- The criteria remain in the \diamond PO Print Menu whilst the file remains active or suspended. The No prompt has to be altered to Yes for each further print.
- The criteria also appear in the \diamond FS File Save Menu so having tested the result the required rows can easily be saved to a special file.

Example of Row and Conditional Test for Printing

Wait between pages No

If required, some rather than all, pages may be printed by setting this option to **Yes**. After pressing **ENTER** Page *n.* appears at the centre top of the screen; and thereafter for each page in turn.

Press **ENTER** to confirm the page for printing

[In fact any key press other than M or C or ESC will print the page.]

Press **M** to miss the page or **C** to continue printing the rest of the file or Press **ESC** to discontinue printing.

Microspace Pitch ◊PM

A secondary menu is called:

PIPEDREAM A1				OZ
BLOCKS	...	Microspaced printed output	No	....F
CURSOR	1			
EDIT	2			
FILES	3			
LAYOUT	4			
OPTIONS	5			
PRINT	6			

If the option is altered to **Yes** the cursor moves to the right to allow an alternate pitch spacing to be entered. The (unseen) default number is 12 for 10 characters per inch. *[For more details see Supplement 2.]*

Print Highlights

The Print Highlights commands in the central column of the Print Menu control the insertion, or overtyping, of their respective reverse colour markers into the file at the cursor position. The first marker turns the highlight on, a second turns it off. The recommended use for each highlight is listed here, actual use can be varied in the PrinterEd.

Highlights 1 - 4 are represented on screen by alternative type except when the cursor is in the row or slot.

If the code in the PrinterEd for *Off at CR* has been set to **Yes** the highlight, when printed, will turn off at the end of the row or slot. The highlight on screen does not show on a subsequent row or slot. So if *Off at CR* is set to **No** there is no onscreen record.

All highlight markers can be removed by the **DEL** key or one of the other delete methods.

Underline ◇PU

Print Highlight 1

This code inserts, or overtypes, a reversed 1 marker at the cursor position. The characters will be underlined from the marker. A second marker will limit the underline. If a printer will not underline spaces try using <>SPACE BAR to create an exact space. Underlining should then flow through.

Bold ◇PB

Print Highlight 2

Shown in the row on screen by a reversed colour 2 and by bold print once the cursor is off the line.

Extended Sequence ◇PX

Print Highlight 3

Shown in the row on screen by a reversed colour 3 and by grey print once the cursor is off the line.

Italic ◇PI

Print Highlight 4

Shown in the row on screen by a reversed colour 4 and by small print once the cursor is off the line.

Subscript ◇PL

Print Highlight 5

Shown by a reversed colour 5 marker. The marker is always visible on screen but has nil width when printed. Example H_2O .

Superscript ◇PR

Print Highlight 6

Shown by a reversed colour 6 marker. The marker is always visible on screen but has nil width when printed. Example $e = mc^2$.

Alternate Font ◇PA

Print Highlight 7

Shown by a reversed colour 7 marker. The marker is always visible on screen but has nil width when printed. This option is often set to give either an alternative size of print or an alternative font style.

User defined ◇PE

Print Highlight 8

Shown by a reversed colour 8 marker. The marker is always visible on screen but has nil width when printed. Again often set to give either an alternative size of print or an alternative font style.

Multi-Use Highlight Commands

The three commands in the right hand column share one style of secondary menu.

PIPEDREAM A1				OZ
BLOCKS	...	Highlight number	■	....F
CURSOR	1			
EDIT	2			
FILES	3			
LAYOUT	4			
OPTIONS	5			
PRINT	6			

Insert Highlights ◊PHI

One number in the highlight range 1 - 8 can be inserted at the cursor position. Type the required number and **ENTER**. Any other character calls the error message *Bad Number*.

Remove Highlights ◊PHR

This command works only on a marked block. Lack of a marked block calls the error message *No marked block*. Any highlight in the marked block, corresponding to the number inserted in the menu, will be removed. The cursor need not be in the block prior to giving the command.

Highlight Block ◊PHB

This command inserts the chosen highlight marker both in front of and behind each word within the highlighted block. Thus any rejustification will leave all the text properly highlighted. The text has first to be positioned within a block, then call the command and enter the highlight number. Reformat the paragraph as required.

Six Enhanced Printing Techniques

Microspace Pitch

Whilst Microspacing is offered on the Z88 there seems to be considerable problems in actually getting it to work. Meanwhile what information I have gathered is contained in **Supplement 2**.

Justification of Proportionally Spaced Print

Whereas each character in Microspaced text remains the same distance from its neighbours **proportionally spaced print** allows each character to take up a varying amount of space according to its width. Standard typewriter/printer fonts, typically **Courier** and **Pica**, have been designed to fit a fixed width i.e. narrow characters are drawn wider and wide characters are compressed so as to fit the constant width. Consequently such fonts are not suitable for use as proportionally spaced fonts in a printer. Generally, printers that support PS will either be equipped with proportional fonts or Font Cards or Cartridges can be installed to expand the machine.

Proportionally spaced print may be centred, left or right justified. Fully justified and proportionally spaced print is usually set by the software from a table of character widths. PipeDream for the Z88 does not contain such a table. Consequently text typed into the Z88 using **<O Justify** set to **Yes** will result in a ragged right margin on the printed page as the character widths assumed by the Z88, e.g. 10 or 12 c/in etc., are incorrect.

I doubt that it is possible to control the right margin by a software command and apply microjustification as well to obtain fully justified text. However, I have no hands on experience.

Text in columns

PipeDream will present text in columns in a very simple to use way. The only real constraint is that, once set, the right margin for a column is set for the whole document. This can be overcome by using a List File method.

However, another problem is the use of different pitch settings for the different columns.

The problem is shown as a ragged left margin in the right hand column. Maybe not the effect that was desired!

There are several ways of overcoming the problem. The first is to use the default pitch setting for the left most column. Another way is to ensure that all text in the left column is of a standard width e.g. by use of **<>Spacebar** to create Exact Spaces.

Seven Further Reading, Books and Z88 Eprom references.

Further Reading

For detailed and unbiased "Which" style reports on Printers try **What to Buy for Business**, a monthly 'subscription only' publication taken by many main libraries. Impact printers covered in Nr 109, April 1990 and Laser Printers in Nr 120, March 1991.

For further information on the inner workings of computers some GCSE textbooks are helpful. e.g. **Computer Studies A First Course** by John Shelly and Roger Hunt. Second Edition. ISBN 0 273 02052 8. Published by Pitman. Such books are not too expensive and are often available from a library.

For information on the design aspects of the printed page and printers' terminology, e.g fonts, try the recent **Into Print**, by Susan Quilliam and Ian Grove-Stephensen, BBC Books, London, 1990. ISBN 0 563 21505 4

OSI Standards and Acronyms by Dr Adrian V Stokes, Blenheim Online Ltd, Middlesex, lists the Standards Bodies and their Standards that are intended to allow one bit of kit to talk to another. [OSI = Open Standards Interconnection] ISBN 0 86353 150 4

Z88 EPROM References

The references are in the standard form Volume.Number.Page

- BASIC program to list ASCII key codes, 4.6.28
- Brother HR-5 thermal printer - Review, 2.4.22-25
- Canon BJ10e printer - review, 5.3.15-17
- Canon BJ10e printer - sample printing, 5.4.21
- Canon BJ10e printer, lockups, 5.2.9-10, 5.3.7
- Daisywheel typewriters, 4.10.25-31
- Danish Operating System 3.21, 4.3.21-30
- Diconix 150+ printer, Kodak - review & sample printing, 4.5.26-27
- Foreign characters, printing, 5.3.27-29, see also Special Characters
- Foreign Z88 keyboards, 5.7.12
- Form Feed, 2.3.18
- Label Printer - Z112, 4.4.32
- Line Feed bug - Citizen 120D, 2.2.12
- Line Feed bug - PED0001, 3.5.22
- Line Feed solution - Citizen LSP-10 (120D), 2.3.21
- List Files - Printing, 2.2.25, 5.7.26-29

Microspace print - Diablo 630, 2.2.29

Operating System 3.21 - Danish, 4.3.21-30

Parallel printer cable bug with Toshiba 301 Expresswriter, 4.3.6

Parallel Printer Interface - review, 1.2.16-17

Personal 80 mobile printer - review, 4.2.27-29

PipeDream tip, vertical lines, 4.6.16

Print selected lines only, 4.7.12-13

Printer Drivers

Brother EP44, 2.1.11-12 (*file*)

Brother HR10 (Library Nr Z132), 5.3.30

Brother HR10 daisywheel, 4.1.11

Brother HR15 daisywheel, 2.3.20 (*file*)

Canon BJ10e, 5.3.17 (*file*), 5.4.21 (*illus.*), 5.5.3, 5.7.13

Diablo 630 / Ricoh 1600, 1.1.20-21 (*file*)

Digital LN03 laser Printer (Library Nr Z098), 4.2.33

H-P Desk-Jet (Library Nr Z036), 3.1.35

H-P LaserJet (Library Nr Z064), 3.3.41

H-P LaserJet with Font Cartridge (Library Nr Z074), 3.4.31

Juki 6100 - pitch settings, 2.5.13

Olympia Carrera, 4.6.29

Swedish PrinterEd (Library Nr ZD01), 5.3.32

Xerox 4045 laser printer (Library Nr Z113), 4.4.32

Printer Font Designer (Library Nr Z031), 2.6.42

Printer interrupt with ESC, 4.2.11

Printer setup helpline, 5.3.21-24

PrinterEd bug, 3.6.6, 5.7.13

PrinterEd bug - PED0002, 3.5.22

PrinterEd - saved in ASCII format after <>KILLing suspended file, 3.6.7

Printout to Filofax stationery - Z047, 3.2.34

RS232 Connection, 1.1.11-12

alternative, 1.2.8

article, 5.7.6-11

Epson RX80 via Miracle QL parallel interface, 2.3.23

Spectrum (9 way to 9 way), 1.2.6

Z88 to Z88, 4.6.29-30, 5.5.7-9 (correction), 5.7.7

Special Characters - via PrinterEd, 2.4.17-18

Swedish PrinterEd (Library Nr ZD01), 5.3.32

Terminal bug, self re-setting, 3.7.7

Terminal bug - TRM0001, 3.5.22

Toshiba 301 Expresswriter & parallel printer cable bug, 4.3.6

Two column text in PipeDream, Column A condensed (CLI Nr X006), 3.5.33

Underline bug - PED0003, 3.5.22

Underline code not sent in PrinterEd - Bug 0002, 3.1.23

Underline problem - Brother M1509, 3.3.9

Printer Driver for an Epson with Extended Sequence

Page 1

Highlight Code	Function	On String
1 <>PU	Underline	27,45,1
2 <>PB	Bold	27,69
3 <>PX	Extended Sequence	27,62
4 <>PI	Italic	27,52
5 <>PL	Subscript	27,83,1
6 <>PR	Superscript	27,83,0
7 <>PA	Alternative Font	15
8 <>PE	User Defined	27,120,1

Highlight Code	Function	Off String
1 <>PU	Underline	27,45,0
2 <>PB	Bold	27,70
3 <>PX	Extended Sequence	27,35
4 <>PI	Italic	27,53
5 <>PL	Subscript	27,84
6 <>PR	Superscript	27,84
7 <>PA	Alternative Font	18
8 <>PE	User Defined	27,120,0

Set Off at CR as required

Page 2

Printer on
 Printer off 27,"E"
 End of Page 12
 Allow line feed Yes
 HMI: Prefix
 Suffix
 Offset

Translations

Character "£"
 Changes to 27,82,3,35,27,82,0
 Character
 Changes to

Printer Driver for a
Ricoh RP1600S daisy wheel printer (Diablo 630 emulation)

Page 1

Highlight Code	Function	On String	Off String
1 <>PU	Underline	27,69	27,82
2 <>PB	Bold	27,79	27,38
3 <>PX	Extended Sequence	14	15
4 <>PI	Italic (Red/Black)	27,66	27,65
5 <>PL	Subscript		
6 <>PR	Superscript		
7 <>PA	Alternative Font		
8 <>PE	User Defined		

Set Off at CR as required

Page 2

Printer on	27,26,73
Printer off	27,13,80
End of Page	12
Allow line feed	Yes
HMI: Prefix	
Suffix	
Offset	

Translations

Character	163
Changes to	35

Character	160
Changes to	32

Character	
Changes to	

**Printer Driver for a
Canon BJ-10e Bubble Jet printer (IBM Proprinter Emulation)**

Principally for 10 characters per inch

Page 1

Highlight Code	Function	On String	Off String
1	<>PU Underline	27,45,49	27,45,48
2	<>PB Bold [emphasized]	27,69	27,70
or 2	<>PB Bold [double strike]	27,71	27,72
3	<>PX DOUBLE WIDE & HIGH	27,91,64,48,48,48,50,50	27,91,64,48,48,48,49,49
4	<>PI PROPORTIONAL	27,80,49	27,80,48
5	<>PL Subscript	27,83,49	27,84
6	<>PR Superscript	27,83,48	27,84
7	<>PA Alternative Font	15	18
	[sets condensed mode, 17 ch/in]		
8	<>PE User Defined	27,58	18
	[sets prestige mode, 12 ch/in]		

Set Off at CR as required; usually Yes for 1 - 3 & 5 - 6

Page 2

Printer on	17
Printer off	19
End of Page	12
Allow line feed	
HMI: Prefix	27,100
Suffix	48
Offset	244

Translations	
Character	163
Changes to	27,54,156,27,55

Notes Thanks to Dennis Groning for some parts of this printer driver [see Z88 EPROM 5.7.13].

**Printer Driver for a
Hewlett Packard LaserJet IIP**

Principally for 12 characters per inch, Portrait (Set FONT NUM = 2)

Page 1

Highlight Code	Function	On String
1 <>PU	Underline	27,"&","d","0","D"
2 <>PB	Bold	27,"(", "s", "3", "B"
3 <>PX	Ext.Sequence (to 10cpi)	27,"(", "s", "10", "h", "12", "V"
4 <>PI	Italic	27,"(", "s", "1", "S"
5 <>PL	Subscript	27,"&","a","+36","V"
6 <>PR	Superscript	27,"&","a","-36","V"
7 <>PA	Alternative Font	27,"(", "s", "16.66", "H"
8 <>PE	User Defined	(see below)
27,"(", "8", "U", 27,"(", "s", "0", "p", "10", "h", "12", "v", "0", "s", "3", "B"		

Highlight Code	Function	Off String
1 <>PU	Underline	27,"&","d","@"
2 <>PB	Bold	27,"(", "s", "0", "B"
3 <>PX	Ext.Sequence (to 12cpi)	27,"(", "s", "12", "h", "10", "V"
4 <>PI	Italic	27,"(", "s", "0", "S"
5 <>PL	Subscript	27,"&","a","-36","V"
6 <>PR	Superscript	27,"&","a","+36","V"
7 <>PA	Alternative Font	27,"(", "s", "12", "H"
8 <>PE	User Defined	(see below)
27,"(", "8", "U", 27,"(", "s", "0", "p", "12", "h", "10", "v", "0", "s", "0", "B"		

Set Off at CR as required

Page 2

Printer on	27,"&","1","6","D"
Printer off	27,"E"
End of Page	12
Allow line feed	Yes
HMI: Prefix	
Suffix	
Offset	

Translations	
Character	163
Changes to	27,"(", "9", "Q", 175, 27,"(", "8", "Q"
Character	126
Changes to	27,"(", "0", "N", 169, 27,"(", "8", "Q"

Notes Differentiate between capital O and figure 0
and also between lower case l and figure 1

Printer Driver for a Hewlett Packard LaserJet IIP

Principally for 10 characters per inch, Portrait (Set FONT NUM = 0)

Page 1

Highlight Code	Function	On String
1 <>PU	Underline	27,"&","d","0","D"
2 <>PB	Bold	27,"(", "s", "3", "B"
3 <>PX	Ext.Sequence (to 12cpi)	27,"(", "s", "12", "h", "10", "v"
4 <>PI	Italic	27,"(", "s", "1", "S"
5 <>PL	Subscript	27,"&","a","+36","v"
6 <>PR	Superscript	27,"&","a",-36","v"
7 <>PA	Alternative Font	27,"(", "s", "16.66", "H"
8 <>PE	User Defined	(see below)
27,"(", "8", "U", 27,"(", "s", "0", "p", "12", "h", "10", "v", "0", "s", "3", "B"		

Highlight Code	Function	Off String
1 <>PU	Underline	27,"&","d","@"
2 <>PB	Bold	27,"(", "s", "0", "B"
3 <>PX	Ext.Sequence (to 10cpi)	27,"(", "s", "10", "h", "12", "v"
4 <>PI	Italic	27,"(", "s", "0", "S"
5 <>PL	Subscript	27,"&","a",-36","v"
6 <>PR	Superscript	27,"&","a","+36","v"
7 <>PA	Alternative Font	27,"(", "s", "10", "H"
8 <>PE	User Defined	(see below)
27,"(", "8", "U", 27,"(", "s", "0", "p", "10", "h", "12", "v", "0", "s", "0", "B"		

Set Off at CR as required

Page 2

Printer on	27,"&","1","6","D"
Printer off	27,"E"
End of Page	12
Allow line feed	Yes
HMI: Prefix	
Suffix	
Offset	

Translations	
Character	163
Changes to	27,"(", "9", "Q", 175, 27,"(", "8", "Q"
Character	126
Changes to	27,"(", "0", "N", 169, 27,"(", "8", "Q"

Notes Differentiate between capital O and figure 0
and also between lower case l and figure 1

Printer Driver for a Star SR-10/15 9 pin Dot Matrix Printer

Working in Star Mode: 10 characters per inch, draft print.

Page 1

Highlight Code	Function	On String	Off String
1 <>PU	Underline	ESC,"-",1	ESC,"-",0
2 <>PB	Bold [Emphasized]	ESC,"E"	ESC,"F"
either 3 <>PX	Extended Sequence [eighth bit]	ESC,">"	ESC,"#"
or 3 <>PX	Extended Sequence [ICS France]	ESC,"7",1	ESC,"7",0
or 3 <>PX	Extended Sequence [ICS Germany]	ESC,"7",2	ESC,"7",0
or 3 <>PX	Extended Sequence [ICS Italy]	ESC,"7",6	ESC,"7",0
4 <>PI	Italic	ESC,4	ESC,5
5 <>PL	Subscript	ESC,"S",1	ESC,"T"
6 <>PR	Superscript	ESC,"S",0	ESC,"T"
either 7 <>PA	Alternative Font [12ch/in]	ESC,"B",2	ESC,"B",1
or 7 <>PA	Alternative Font [17ch/in]	ESC,"B",3	ESC,"B",1
or 7 <>PA	Alternative Font [Expanded]	ESC,"W",1	ESC,"W",0
or 7 <>PA	Alternative Font [Proportional]	ESC,"p",1	ESC,"p",0
8 <>PE	User Defined [NLQ on/off]	ESC,"B",4	ESC,"B",5

Set Off at CR as required [normally 1 - 6 Yes and 7 & 8 No].

Page 2

either	Printer on	ESC,"@"	
or	Printer on	ESC,"\",1	[option to set Zero with a slash]
	Printer off	ESC,"@"	
	End of Page	12	
	Allow line feed	Yes	
	HMI: Prefix		
	Suffix		
	Offset		

Translations

Character "£"
Changes to 195

Character 160
Changes to 32

Notes Differentiate between capital O and figure 0
and also between lower case l and figure 1.

Further Notes on the PrinterEd Bug

Notes on Printing 2 refers to the PrinterEd Bug and repeated a "fix" for it. Since preparing the note I have found that one of my PrinterEd files had become corrupted by some PipeDream file constructs. The file was stored on an EPROM and when loaded into the PrinterEd produced two blank codes. Both codes were required and prior to saving to the EPROM were present. [I re-entered the codes and made some other alterations. A fail message required a soft reset but that may well be a different problem.]

I loaded the file into PipeDream as plain text and found that the two missing codes were in fact present but preceded by some standard PipeDream file constructs viz;

Corrupted Version

```
%CO:A,36,0% 27,"&","d","D"
! 27,"(", "s", "3", "B"
# 27,"(", "s", "1", "S"
$ 27,"&","a", "+36", "V"
%PC% 27,"&","a", "-36", "V"
& 27,"(", "s", "16.66", "H"
```

Correct Version

```
27,"&","d","D"
! 27,"(", "s", "3", "B"
# 27,"(", "s", "1", "S"
$ 27,"&","a", "+36", "V"
% 27,"&","a", "-36", "V"
& 27,"(", "s", "16.66", "H"
```

The two constructs are surrounded by a pair of percent signs and clearly should not be present.

Proposals

I now intend to check each file in PipeDream prior to ◊FU in the PrinterEd. The method will be as follows:

- 1 After altering the file in the PrinterEd save the file with ◊FS name.
- 2 Press INDEX and enter PipeDream, load the file ◊FL name as Plain Text.
- 3 If the file is a new one alter as described in Note 2. Otherwise just check the file for any erroneous constructs. If any problems are found make a printed copy if possible, otherwise make a detailed note of the problem.
- 4 If the file is correct and it has not been altered return to the INDEX. If the file was altered or corrected [by deleting the erroneous constructs] save the file ◊FS name as Plain Text, then return to the INDEX.
- 5 Now re-enter the suspended PrinterEd file, if no changes were made in PipeDream simply update the PrinterEd with ◊FU, otherwise load the altered file, ◊FL name and then update the PrinterEd.
- 6 Whilst this may be an isolated incident it is only by investigating PrinterEd problems that the cause of the bug will be found. If you have any problems and are able to provide a copy of the PipeDream Plain text file please send me a copy. I have written to Cambridge Computer with the details of this problem and will do so again if any other problems come to light.

Microspacing and Horizontal Motion Index [HMI]

Microspaced text is commented upon in Notes on Printing 1 under Enhanced Printing Techniques. Some printers support Microspacing which is set via some or all of the three settings for HMI in the PrinterEd. Microspaced, justified text is still mono spaced but the space between each word is adjusted so that all spaces on one line are nearly equal.

Compared with normal [mono spaced] justified text, which has varying widths of word spaces, microspacing presents a more 'typeset' appearance.

I have spent some time in research on microspacing and my inconclusive findings are:

- 1 With PipeDream any one file must be either microspaced or not. There is no option to set part of the file to Yes and other parts to No. Thus a table with vertical lines may be printed out with misplaced lines. If so microspace must be set to No for the whole file. *[List files could be used to overcome this problem.]*
- 2 Printers which support microspacing vary in the speed with which they carry out the necessary calculations. Some result in a much slower rate of printing.
- 3 I have not yet been able to obtain microspaced print from either PipeDream on the Z88 or a PC through a printer that, when WordStar is used, prints microspaced text with no trouble at all.

The key to micro spaced text is **Horizontal Motion Increment** or **HMI**. It is commonly measured in 120th parts of an inch, thus 10 characters per inch = an HMI of 12 [$120/10 = 12$] and 12 c/in = an HMI of 10 [$120/12 = 10$] and 15 c/in = an HMI of 8.

Some printers require the result of a formula $c/in = ((n-1) \times (1/120))$ where $n = HMI$: thus for 10 c/in let $n = 13$ and for 12 c/in let $n = 11$.

This formula value has to be split between two locations:

- a) The value of HMI is set in the <>PM secondary menu, the (unseen) default is 12 but this can be altered. *[see page 24]*
- b) The value of $n-HMI$ is set as an Offset variable in the PrinterEd. For $n=HMI$ the offset variable is zero and left as a blank. For $n-1=HMI$ the offset variable is 1

Printers which use a control code followed by the HMI variable require the control code to be set in the PrinterEd *Prefix* with the offset variable replacing the HMI variable.

Other printers have a HMI Control Code in which the variable is contained within the code. The part of the code preceding the variable is set as the *Prefix* and the end part of the code is set as the *Suffix*. Again the HMI variable is replaced by the *Offset* variable in the PrinterEd.