USING MICROSOFT WORD

WITH YOUR HP LASERJET SERIES II PRINTER
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INTRODUCTION

Availability of laser printers has brought a high quality, speedy and powerful printing capability to many computer users. One of the popular laser printers available today is the HP Laserjet Series II. Its popularity is based on a reasonable price, full set of operational features and the capability for integration with equally powerful applications programs. The purpose of this article is to describe some aspects of the extensive support Microsoft Word provides for font usage in the Laserjet Series II printer. Emphasis is placed on how soft fonts are used and how you can develop printer drivers for public domain and other soft fonts.

PRINTER CONCEPTS

Laser printers are basically a raster-scan hard-copy display device analogous to the raster-scan visual display that is used on virtually all personal computers. The monochrome visual display will typically have a resolution of 720 elements horizontally by 350 vertically. A complete frame of information is produced in 1/60th of a second and repeated continuously with available data changes implemented as each new frame is displayed.

Resolution available on laser printers is typically 300 dots per inch in both directions giving about 2400 elements horizontally and 3000 elements vertically for a letter size sheet in the normal or "portrait" orientation. A complete page of information is produced in 8 to 10 seconds plus processing time for the computers involved, the one sending the data to the printer and the one inside the printer.

Usually a discussion of laser printer operation is divided into the topics of text and graphics. In this article the emphasis will be on text. It is important to understand that the individual characters which make up the text in a laser printer output are actually very small raster-scan graphics just as on the visual display. Text information sent to the printer and its treatment in terms of printer commands is merely a way to describe a very complex operation in more manageable terms similar to programming in basic instead of assembly language. It is the ability to define and print characters with a wide variety of attributes

that makes laser printers so versatile.

Definition of Terms

FONTS are a collection of characters with a consistent size and style. Fonts may be INTERNAL to the printer, stored as a Read-only-memory (ROM) in the form of a plug-in CARTRIDGE or be SOFT fonts which are downloaded from the computer to the printer.

ORIENTATION refers to the relation between the character and the physical page. PORTRAIT orientation is with the characters printed for reading along the narrow dimension of the page as per most correspondence, books, etc. LANDSCAPE orientation has the characters printed for reading along the long dimension of the page analogous to a wide-angle landscape picture. Once a particular orientation is chosen the complete page must be printed with the selected orientation.

SYMBOL SET defines a unique sub-group of all the possible characters in a font. Symbol sets are created for a variety of purposes, as an example the US-IBM set will support the extended character set which can seen on IBM compatible visual displays. The Roman-8 symbol set has been chosen by HP for many of their fonts.

US-IBM ABCDefgh1234┤╡╢╖╕╣║╗╝╜╛┐└┴┬├─┼╞╟╚╔╩╦╠

(8URoman-8 ABCDefgh1234┤╡╢╖╕╣║╗╝╜╛┐└┴┬├─┼╞╟╚╔╩╦╠(10U
Note: The roman-8 set will only be seen on the printer output. The (8U and (10U are PCL commands.

SPACING will be either fixed or proportional for a given font. Fixed-spaced fonts are those with a constant character-to-character spacing. Proportional-spaced fonts will have different inter-character spacing varying with the natural shape of the character.

Fixed-spaced ABCDefgjijklmnopqrstuvwxyz

Variable-spaced ABCDefgjijklmnopqrstuvwxyz

PITCH states the number of characters printed in a horizontal inch.

Pitch only applies to fixed-spaced fonts.

POINT SIZE is the height of a font measured in "points" from the bottom of a descender to the top of a capital letter. A point is 1/72nd of an inch.

10 ch/inch, 14 points
ABCDefgjijklmnopqrstuvwxyz

16.66 characters/inch, 8.5 points ABCDefgjijklmnopqrstuvwxyz

STYLE refers to the angularity of the strokes of a character with respect to the edges of the page. UPRIGHT is what you see on your computer display; *ITALIC* is the other available style.

STROKE WEIGHT describes the thickness of the strokes that compose the character. MEDIUM and **BOLD** are the two common weights however a range of 15 weights can be defined.

TYPEFACE is a generic name for the printed designs of characters. An an example, Courier, Helvetica, and Letter Gothic typefaces all print characters of a different design. Some typefaces are registered trade marks of various companies.

PRINTER COMMAND LANGUAGE (PCL) is a standard set of printer commands developed by Hewlett-Packard which define the printing functions of the HP Laserjet Series II and other HP printers. Details of PCL are described in the "Laserjet Series II Technical Reference Manual" available from HP's Direct Marketing Division, phone 800-538-8787.

USING MICROSOFT WORD

Extensive support of the HP Laserjet Series II printer is provided by Microsoft Word making the combination a very powerful word processing package. By understanding how the printer support is implemented you will be able to make full use of the features of the software and the printer. It is possible to modify the driver files supplied with Word to suit different needs and make use of soft fonts other than those supplied by HP. There are now soft fonts available from public domain and shareware sources as well as those that are supplied with other programs that support the HP line of printers, Ventura Publisher is an example. Additional soft fonts are available from third party vendors, such as Bitstream Inc, with support for desk

top publishing applications but not for Microsoft Word. The book "Printer Information for Microsoft Word" which is supplied with the Word program is a required reference for work with the software interface and for a more detailed understanding of the ideas presented in this article.

Interface with the Laser Printer

Word uses two types of files to provide the software interface with the laser printer. Printer Description (PRD) Files are used as part of the communication process for all data sent to the printer regardless of source of the font to be used. PRD files contain information about the printer which is used both to control Word's presentation on the screen and to control the printer so that it will provide the requested text formatting. Data (DAT) files are used for additional information required to download soft fonts to the printer. Understanding the capabilities and organization of these files is key to getting the most from the software-printer combination.

There are eleven PRD files supplied with Word to support fonts available in cartridges. There are an additional twelve PRD/DAT file pairs to support downloadable soft fonts. Since portrait and landscape orientations are mutually exclusive on a single page there is a further subdivision of these files for application to the two different orientations. Refer to the Word Printer Information book for the names of all the applicable files.

With the large number of cartridges and soft fonts available you will have to make some decisions regarding the best ones for your application. Cartridges provide the fastest access to a reasonable number of fonts but at a somewhat premium cost. Soft fonts provide a wider variety, particularly in the larger point sizes, but downloading does take time. A maximum of 32 soft fonts can be stored in the printer at one time provided there is enough memory. To illustrate the examples in this article two soft font sets will be used, set AD (TimesRoman and Helvetica family) and set DA (Letter Gothic family). Many of the examples are applicable to cartridge fonts as well except where soft font characteristics are specifically considered.

One PRD File Fits All

Having purchased two families of soft fonts it is desirable to make use of a mixture of fonts on one page. Its good practice to limit the number of fonts used on a page, however, it may well be that the two or three fonts you wish to use are spread among the two families. Microsoft supplies a utility, MERGEPRD, which provides the facility for selecting fonts from more than one PRD file and producing a new PRD file. Since portrait and landscape orientations require separate PRD files it will be necessary to make a different PRD file for each orientation. The trick here is to look at what is available in the fonts purchased, what is supported by the PRD files, and make a reasonable selection. Don't forget, the internal printer fonts are available and supported by these PRD files as well.

Available Fonts: (both orientations)

SET	TYPEFACE	POINTS	SYMBOL SETS
AD	TimesRoman	6/8/10/12/14/18/24/30	Roman-8
AD	Helvetica	6/8/10/12/14/18/24/30	Roman-8
DA	LetterGothic	9.5/12/14	Roman-8, USASCII
DA	LetterGothic	9.5/12/14	Roman-ext, Legal
DA	LetterGothic	12	Math-7, PiFont
DA	LetterGothic	9.5/12	Math-8
DA	Presentations	14/16/18/24/30	USASCII, Legal
DA	PC Line	9.5/12/14/16/18	PC Line
DA	LineDraw	9.5/12/14/16/18	LineDraw
Int	Courier	12	Many including IBM
Int	LinePrinter	8.5	Many including IBM

Supported Fonts:

A review of the supported fonts in the Printer Information book indicates that all fonts are supported in the portrait orientation. As you will discover by looking at the PRD files with MERGEPRD or reading the README file on the Word setup disk, landscape orientation is supported as well. What isn't clear is which symbol sets are supported. This is where there is a limitation and an opportunity for useful change.

Using MERGEPRD:

Instructions in the Printer Information book, Section 4, are quite clear and won't be reviewed here. Be sure that the associated DAT files are also in the same directory as the PRD files so the program can make the new DAT file. It will beep and give an error message if one is missing. Note: The PRD file for the AD set includes support for point sizes 7, 9, and 11 which are not available as fonts in the AD set, these should not be included in the new PRD file. When you are ready to use the new PRD file, make sure all the soft font files, the PRD files and the DAT files are in the same directory. Use the "Print Options printer" command to select the desired PRD. If they are in a different directory than the program files, enter that information the first time and Word will remember to look there for the needed files in the future.

Some important notes about MERGEPRD:

1. There is on occasional bug in MERGEPRD regarding downloading of soft fonts. See the description of DownloadFlag in the Header section of the PRD file description later in this article.

2. Although the intent of MERGEPRD is to combine PRD files there is a bug in the formation of DAT files for soft fonts which prevents the use of some combinations of typefaces and sizes. This is explained in the section of this article on making PRD and DAT files.

3. MERGEPRD will not merge PRD files with different sizes of the same typeface. If you develop a new PRD file for a soft font it must include all the sizes to be used for a given typeface.

Limitations and Opportunities

Word's support of soft fonts is keyed to the fonts supplied by HP with excellent coverage of the various typefaces, orientations, sizes, weights and style. There are limitations in accessing all the available symbol sets and you must write your own printer drivers for non-supported fonts. This article, and the associated program SOFTREAD, will help you overcome these limitations and provide printer driver support for any properly structured soft font. Further power for development of printer drivers can be obtained using the program PRD-MAKER which is available from   JP Enterprises (a description of the program is in Appendix 1).

The limitation in use of different symbol sets holds for internal fonts as

well. Unfortunately, the support for the internal fonts assumes that everyone likes the Roman-8 symbol set. One of the best new features of Word 4.0 is the line draw function activated by control-F5. This uses the IBM extended character set to draw lines on the screen with a selection of linedraw characters, single and double lines being the most useful. Because these characters are not in the Roman-8 symbol set, beautiful lines on the screen are printed as some funny looking characters on the page. The good news it that the US-IBM symbol set is available in the printer; the bad news is that the PRD files supplied with Word 4.0 will not support the US-IBM symbol set. It is possible to modify the PRD file to call for the US-IBM symbol set and that modification will be used here as an example. Alternately, a disk titled "Word 4.0 Series II Drivers" is available from Microsoft Support Services with the modified PRD files.

PRD File Structure

Rather than just present the "patch" to make Word's linedraw print correctly a detailed analysis of the PRD file is given. This information will be needed for the more complex problem of incorporating additional soft fonts.

Another Microsoft supplied utility, MAKEPRD, is used to translate the binary PRD file into a text file that can be edited to provide the desired variations. The form of the command is,

MAKEPRD /T prdfile.PRD prdfile.DOC

After the changes to the text file have been made, use the same basic command with the /T changed a /P is used to produce the new binary PRD file. Be sure to save the file in ASCII format after you have modified it with a word processor. Use the unformatted option in the "Transfer Save" command with Word 4.0.

Major subdivisions of the PRD file are described below in the level of detail needed for the type of changes to be made for incorporating additional soft fonts. A complete description is in Section 5 of the Printer Information book.

1. The HEADER describes the type of printer, type of interface and other global data. A typical header for a PRD file to be used with the Laserjet Series II printer is shown in Table 1.

dxaMin:300 is the minimum horizontal printer movement, for the laser

printer 1/300th of an inch which is also equal to one DOT.

PrinterType:5 signifies a laser printer.

WidthTSwap:1 indicates that width tables can be swapped in and out of memory as needed. If you make a PRD file that causes the Word error message "insufficient memory" when you use the "Print Options printer command", try changing the value of this flag.

DownloadFlag:1 indicates that downloading is required for one or more of the fonts in the PRD file. There is a bug in MERGEPED which sometimes sets this flag to 0 in error. Its value must be 1 so Word will do the downloading.

LineDraw:64 tells Word which font to use for drawing lines with the "Format Border" command, not with the linedraw "control-F5" command. A value of 64 indicates use of vertical bars and hyphens.

2. FONT DESCRIPTION defines the fonts and sizes supported by this PRD file. This is the section that requires the most attention in order to make the desired changes to the PRD file. A portion of a sample PRD file defining one type face with three point sizes plus bold and italics is shown in Table 2.

{F4 indicates the start of the font description and states the PRD font number (not to be confused with a printer font number assignment or PCL typeface number). The font number an internal housekeeping function of the PRD file and is an important link to the associated DAT file. Microsoft uses a broader definition of font which includes all the fonts with a particular typeface such as TimesRoman. Microsoft assigns an additional generic font name to each font number. These appear in parenthesis after the typeface name when you select a font (Microsoft definition) using the "Format Character font name F1" command. An example from the menu would be;

TNSRMN (roman a)

  Font descriptions appear in their font number order in the PRD file, only 64 values are allowed. Microsoft makes the following assignments of generic font (really typeface) names;

0 - 15	Modern a - Modern p
16 - 31	Roman a - Roman p
32 - 39	Script a - Script h
40 - 47	Foreign a - Foreign h

48 - 55   Decor a - Decor h
56 - 63   Symbol a - Symbol h

CTP:T1 is a pointer to the character translation table to be used for the font. This maps the non-alpha numeric characters into a printable character defined for that font. Use CTP:NIL to eliminate use of the translation table where it is not needed.

cPSDs:3 indicates that there are three different point sizes included in this font description table.

FontSize:19 defines the font height in half points. This is the first entry in the table section for one of the three sizes. 19 indicates a font with a height of 8.5 points.

Wtps: 18 18 18 18 indicates the width of normal, italic, bold and bold-italic characters in terms of dxaMin. For a laser printer these are dots or 1/300th on an inch. This is information for Word so the word-wrap will be in the correct location. The printer will space the characters correctly with respect to each other based on font data. When numeric values are shown, as in this example, the font is fixed-spaced. In the case of a variable-spaced font, the values would be replaced with Wtps:W0 W1 W2 W0 which indicates the width translation table to be used for each of the four cases.

beginmod:0 "^[(8U^[(s6t9.5vpsb16.66H" defines the information to be sent to the printer for the normal, upright characters to be printed. The part within the quotes " " is what will actually be sent to the printer. A detailed description of the printer commands of interest will be given later.

endmod:0 "^[(8U^[(s3t12vpsb10H" defines the information to be sent at the end of the use of the normal, upright characters.

beginItalicmod:0
endItalicmod:0
beginBoldmod:0
endBoldmod:0
beginItalBoldmod:0
endItalBoldmod:0 each show that default printer commands from the Printer Control Sequence Description of the PRD file will provide the necessary changes. It is required for the appropriate soft fonts to be downloaded and that will be handled by using information from the DAT file.

DLF:15 indicates which fonts of the four style/weight combinations are available for download.
$\qquad$ 1 = normal 2 = italic
$\qquad$ 4 = bold $\qquad$ 8 = bold-italic
  The value of DLF is the sum of all the available fonts, in this case all four of them. Most, if not all, are set to 15 in PRD files for the HP Laserjet printers. This is done so the nearest equivalent of the same typeface will be printed if the exact soft font is not available.

FontName:LetterGothic this is the name that will appear in the menu called by the command "Format Character font name F1". It appears only at the end of the last point size in the font description.

}F indicates the end of the font description, in this case for PRD font number 4.

3. CHARACTER WIDTH TABLE defines the width of each character for those fonts that use proportional spacing. The form of each entry in the table is cc:ww, where cc is the ASCII character value in decimal and ww is the width in units of dxaMin or DOTS for the Laserjet. When installing a new soft font a reasonably correct width table must be used or wordwrap will occur incorrectly in Word, hence on the printed output. A pascal program to create width tables is included with this article. Alternately it is possible to copy the width table for a similar font and get reasonable results.

4. CHARACTER TRANSLATION TABLE replaces or creates characters not normally available in the font being used. This table is not required if you are only going to enter characters that are actually available.

5. PRINTER CONTROL SEQUENCE DESCRIPTION contains all the other printer commands needed for general operation. As an example the commands for bold and italic are included. Having downloaded the bold font for a particular point size, Word first gives the command for the normal weight character then the additional command for bold. The laser printer modifies that part of the original command that is superseded by the bold command.

<u>MODIFICATIONS FOR WORD LINEDRAW</u>

In order to have the printer reproduce the IBM extended character set seen on the display screen it is necessary to use the US-IBM symbol set. This set is available with the internal Courier 12 and Line Printer 8.5 fonts in the HP Laserjet Series II printer. The US-IBM symbol set is available in only one cartridge and none of the soft fonts in HP's catalog dated March 1987. The PRD files all call for the Roman-8 symbol set for the internal fonts but using the MAKEPRD utility this can be changed. Table 3 shows an example of the command structure used to call a particular font and Table 4 shows the font description of the two internal fonts that are to be modified. These two fonts should appear in all PRD files. Notice that DLF:0 indicates downloading is not required, hence they are internal fonts.

The command for specifying the font begins with ^[(followed by a PCL value and a PCL terminator character, some examples are;

SYMBOL SET	PCL VALUE	TERMINATOR CHARACTER
HP Roman-8	8	U
PC-8 (IBM-US)	10	U
HP Math-7	0	A
ISO 25 French	0	F
ISO 10 Spanish	3	S

The following steps will make the modification for, and test, the correct printing of the Word linedraw characters:

a. Change CTP:TO to CTP:NIL to eliminate use of the character translation table.

b. Change the 8U to 10U in the beginmod statement for both fonts.

c. Use the MAKEPRD utility (/p option) to produce the new PRD binary file. If the change is being made on a PRD file with soft fonts, make

sure the new PRD file has the same filename (except for extension PRD) as the DAT file.

d. Select the double line as the linedraw character using the command "Options linedraw F1". Start and stop the linedraw function by pressing control-F5.

e. Format one box with Courier 12 and the other with Line Printer 8.5. The boxes will look as shown below.

```
╔══════════════════════════════════════════════════════════╗
║                                                          ║
║   Characters formatted as Courier 12, 10U symbol set   ║
║                                                          ║
╚══════════════════════════════════════════════════════════╝
```

```
╔══════════════════════════════════════════════════════════╗
║                                                          ║
║   Characters formatted as Line Printer 8.5 with 10U symbol set  ║
║                                                          ║
╚══════════════════════════════════════════════════════════╝
```

Good but not great, the vertical lines in the box don't connect from text line to text line. Word does not use the pitch value of the font as a continuous variable to increment the vertical paper motion. All vertical line spacings are in increments of the "line" value specified by the paragraph format. Correct spacing can be obtained by using the "Format Paragraph line spacing" command. For the area to be printed using the Line Printer 8.5 characters use a line spacing of 8.5/12 or 0.71 lines, alternately type the word "auto" in place of a line value. The result looks much better and a whole page like this will give you 84 lines.

```
╔══════════════════════════════════════════════════════════╗
║                                                          ║
║   Characters formatted as Line Printer 8.5 with 10U symbol set and 0.71 line spacing  ║
║                                                          ║
╚══════════════════════════════════════════════════════════╝
```

PROVIDING SUPPORT FOR ADDITIONAL SOFT FONTS

This is a fairly complicated procedure and may require the use of an editor than can make changes in a binary file. The editor in Q-DOS II from Gazelle Systems is the one used for the changes described here. Actions to be taken to provide the new soft font support are:

a. Analyze the Font Descriptor Data contained in the binary file for the soft font to determine the characteristics of the font so the proper printer command can be defined.

b. If necessary, change some of the Font Descriptor Data to fit with the philosophy of the PRD file. Information about typeface and symbol set may be missing or erroneous if the designer of the font intended to use it with software that does not fully support all the HP Laserjet Series II printer commands.

c. Modify a dummy PRD file to call the new soft font based on data obtained in steps 1 and 2. If the new PRD file is to be merged with others supplied with Microsoft Word then, it will be necessary to change the font number as well as the printer commands so as not to conflict with other typefaces.

d. Change bytes in the binary DAT file to specify the correct soft font file and correlate with any font number changes that were done in step 3.

e. Merge the PRD file for the new soft font with the PRD file containing the support for other fonts.

Analysis and Change of Font Descriptor Data

At the start of every soft font for the HP Laserjet Series II printer is the Font Descriptor Data. Details of the format of the data are found in Section 10 of the "Laserjet Series II Technical Reference Manual". Table 5 shows the analysis of the descriptor for a 12 point, 12 pitch, bold, upright, Letter Gothic font. In order to see this data in a soft font file you can use debug, an editor that will display binary data, the program SOFTREAD supplied with this article, or the program PRD-MAKER described in Appendix 1.

The first binary data in the file is the PCL command defining the length of the font descriptor. Although the descriptor itself is only 64 bytes, the additional bytes can be used for a message such as a copyright notice. It is not necessary for the descriptor to be the full 64 bytes; some are as short as 40 bytes. Only certain bytes are of interest in providing information for the PRD file.

Bytes 0 and 1 define the actual descriptor length of binary data to be interpreted by the printer, in this case 64.

Byte 12 defines the orientation, 0=portrait, 1=landscape.

Byte 13 defines the spacing, 0=fixed, 1=variable

Bytes 14 and 15 define the symbol set. It is necessary to use the Technical Reference Manual to decode this. There must be a meaningful value in this location for the command in the PRD file to call the font. If the value doesn't make sense, change it to one that does. Any one will do as there are other parameters that will make the font unique in your PRD file.

Bytes 16 and 17 define the pitch in ¼dot units. A dot is one laser printer element of 1/300 inch. In this case
  64H = 100, (300 dots/in)/(25 dots) = 12 characters/in. This value is only important for fixed spacing fonts.

Bytes 18 and 19 define the character height in ¼dot units.
  C7H = 199 ¼dots,
  (50 dots)/(300 dots/in)/(1/72 in/point) = 12 points

Byte 23 defines the style, 0=upright, 1=italic

Byte 24 defines the stroke weight, 0=normal, 3=bold

Byte 25 this is the PCL typeface number, not to be confused with the PRD font number or the printer font number. (The relation between these three numbers is discussed in Appendix 2.) Since the PCL typeface number is a byte there can be up to 256 possible values. These values are registered with HP so this is where the unregistered public domain soft font can be made unique. If necessary, assign a number not used by any other font in the PRD file.

Bytes 48 to 63 contain the font name in ASCII. This area or an area following byte 63 (if bytes 0 and 1 indicate a header of greater than 64 bytes) may contain a copyright notice.

In order to provide PRD support for the new soft font, all of the bytes listed must have meaningful values except that pitch is not important with a variable spaced font.

It may be necessary to be a little creative. As an example, a script typeface soft font (file name OE18R#US.SFP) found on a local BBS had the following descriptor;

Byte 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Data 00 40 00 00 00 00 00 3C 00 32 00 50 00 01 00 **00**
     00 8C 01 2C 00 00 00 00 00 **C8**

Orientation = portrait   Spacing = variable
Symbol set = ?   Height = 18 points
Style = upright   Stroke weight = normal
Typeface = ?

In order to make it work, byte number 15 was changed to 15H = 21 which gives a PCL value of 0 and terminator character U. Byte 25 was changed to 0FH = 15 an unregistered type face value. The changed file was named OE180R15.SFP, both are included with this article.

Making the New PRD File

Using the example given above, a dummy PRD file for one font of variable spacing and 18 point character height is needed. Using MERGEPRD and the PRD file HPDWNR8P.PRD, a single Times Roman font is placed in a new PRD file. Applying the MAKEPRD utility gives the header and font description shown in Table 6. Two comments about the result so far. First, this PRD file has the DownLoad Flag problem, the 0 must be changed to a 1. Second, the PRD also contains a font

description for Courier 12 which is a printer internal font and can be ignored.

The following steps will modify the font description to support the new soft font;

a. Change the DownloadFlag from 0 to 1.

b. Change font number 16 to 15 so it will not conflict with the Times Roman type face in the final PRD file.

c. Change CTP:T0 to CTP:NIL so the character translation table will not be used and all of the available characters in the new soft font will print.

d. FontSize is okay at 36 half-points = 18 points.

e. Keep the character width W0 W1 W2 W0 pointers to translation tables for now. These tables tell word how long a group or characters will be when printed, therefore, where to apply word-wrap. Use the width table for the dummy font for your first experiments. Later you can replace them with the tables produced by the pascal program SOFTREAD.

f. Modify beginmod:0 to reflect the unique properties of the new soft font. 8U becomes 0U to specify the assumed symbol set and 5t becomes 15t to specify the assumed typeface (the most unique part of the font description). The rest of the command remains unchanged. Note: The printer command does not specify pitch and ends in 1P signifying a variable spaced font.

g. Make the same changes to beginItalBoldmod:0 so the normal font will be called in case characters are formatted italic bold which is not available.

h. Since there is only one, normal weight, font DLF:15 could be changed to DLF:1. By leaving it at 15 the one available font will be printed regardles of weight or style requested. Also for this single-font example it makes a more instructive case when modifying the DAT file.

i. Change the fontname to OldEnglish. (note: no spaces in the name)

Table 7 shows the resulting header and font description. Next use the MAKEPRD utility to produce the binary PRD file. To keep a trail of the changes it is advisable to name a new PRD file so the command would

be:

MAKEPRD /P SCRIPT.PRD DUMMY.DOC

There needs to be a DAT file to go with the PRD file so make a copy of the DAT file:

COPY DUMMY.DAT SCRIPT.DAT

Modifying the DAT File

Binary data in the file SCRIPT.DAT must be changed to correspond with the file SCRIPT.PRD. This is where an editor that will work with binary files is required. Table 8 is the hex dump and analysis of the DAT file. Note: PRD font numbers are different than printer font numbers, MERGEPRD makes the assignment of the latter. The changes needed in the DAT file are:

Byte 09 change the 10H to 0Fh, the new PRD font #15.

Change the name of each file to the new soft font file.

By placing the new PRD file, DAT file and soft font file in the same directory, it is possible to use the new font. With the command "Format Character font name F1" select OldeEnglish (modern-p) then font size 18. The results should look like this:

This is the new script soft font.

If you are using this procedure to add support for more than one soft font there will be some additional data and further changes to be made to the DAT file. The information in bytes 11 and 12 (PRD font number and PRD font size) will be repeated just before the first assignment of each printer font number. An analysis of part of such a DAT file is shown in Table 9. The important point is that if the extra bytes are present a 40 Hex is added to the PRD font number preceding the italic assignment and an 80 Hex is added to the PRD font number preceding the bold assignment.

Making the Final PRD and DAT Files

Now that the new files have been shown to work correctly and if a new PRD font number was assigned in the process, it is possible to combine the new files with the master working PRD file. Just use the MERGEPRD utility in the normal manner. There is, however, a problem. When MERGEPRD creates the DAT file for the new PRD file, it doesn't bother to assign each possible font a unique printer font number as required by the Laserjet. Therefore if two fonts that you might want to use happen to have the same number, the second font file overlays the first in the printer and you no longer have use of the first font.

There are three solutions to the problem:

a. The DAT file can be changed with a binary editor so that unique numbers are used for each soft font. This is time consuming for a large DAT file and the bytes that indicate "number of command bytes follow" will have to be changed where the new number is a different amount of characters.

b. The program PRD-MAKER, described in Appendix 1, assigns unique printer font numbers to each soft font for PRD files that it generates. If

you make all your own PRD and DAT files using PRD-MAKER you will avoid the problem.

c. There is a share-ware program called FIXDAT which is available on CompuServe in the MicroSoft applications area, GO MSAPP. Also it is included with this disk or ARC file with the kind permission of the author. This seems to do the job right and is the recommended method.

SOFT FONT ANALYSIS

The pascal source code for the program SOFTREAD.PAS is shown in Listing 1. This program, written for Turbo Pascal 4.0, will analyze a valid soft font file for HP Laserjet Printers. If the font has variable spacing it will also write a Width Table to be used in Microsoft Word PRD files. Typical results of the header analysis are shown in Table 10.

For fonts with variable character spacing the program will ask if you would like write a width table. If you ask for a width table be sure to give it a valid file name. (Note: the program will overwrite any file of the same name.) Each character in the soft font file is read for its width. Entries in the table have the form "ASCII value : width in dots". The width table produced, as shown in Table 11, includes all information needed for use in a PRD file. Characters that are not included in the soft font file have been given widths equal to the height.

APPENDIX 1   Description of PRD-MAKER

PRD-MAKER is a utility program that creates printer driver (PRD) and data (DAT) files for MicroSoft Word based on the data contained in a selected list of soft font files. Each list may contain up to 32 soft font files with different or similar characteristics. PRD-MAKER provides list management facilities to insure the soft fonts chosen are appropriate for a PRD file.

There are many commercial, shareware and public domian software products available that help you download and access soft fonts from a variety of word processors. Few are specifically designed to work with MicroSoft Word with the full convenience afforded by the use of PRD and DAT files.

Soft font files are available from a number of sources including; Bitstream Inc., Swfte International Ltd., Hewlett Packard Co., SoftCraft Inc., and VS Software. Public domain soft fonts are available on many electronic bulletin boards including; Cooperworks, MicroBBS, and Publisher Information Service. (See appendix 3 for addresses and phone numbers.)

PRD-MAKER examines the headers of each of the soft font files in a list supplied by the user. There are two restrictions for the list. First, all soft fonts must have the same orientation either landscape or portrait. Second, for a each size font of a given typeface there may be only one

file each for regular weight, bold weight and italic style. An optional display of soft font header information is available on a file-by-file bases. Once the headers of the soft fonts on the list have been reviewed by the program and found acceptable the PRD and DAT files may be written. Based on data from each soft font file the information for the (PSD) Printer Sequence Descriptions are written, then, for each proportional spaced font all characters of the soft font file are examined and a width table is added to complete the PRD file. Next a DAT file is written providing download information for each soft font file.

Processing by PRD-MAKER is then complete having produced an ASCII text PRD file and a binary DAT file. To make the binary PRD file required by Word the user processes the text PRD file using the utility MAKEPRD. The PRD file and DAT file are now usable by Word to access all the fonts in the file list. MERGEPRD can be used to merge the new PRD and DAT with others to provide more complete soft font access.

PRD-MAKER can be purchased from JP Enterprises for $25.00. Source code in Turbo Pascal 4.0 is available for $50.00. The program includes complete documentation as a disk file. An order form is available as Table 12 and in the file ORDERFRM.DOC for your convenience.

APPENDIX 2 Printer, PRD and PCL Font Numbers Explained

FONTS are a collection of characters with a consistent size and style. Fonts may be INTERNAL to the printer, stored as a Read-only-memory (ROM) in the form of a plug-in CARTRIDGE or be SOFT fonts which are downloaded from the computer to the printer.

TYPEFACE is a generic name for the printed designs of characters. An an example, Courier, Helvetica, and Letter Gothic typefaces all print characters of a different design.

The HP Laserjet printer requires that each soft font loaded into memory have a "Font ID" number assigned by the downloading process. Although there can be no more than 16 fonts used on one page, there are 32,768 possible font ID numbers. These numbers have no significance other than to keep track of which font is to be printed at any given time. The soft font is one downloaded file having one typeface, one size, one weight and one style. It is important that each soft font to be used for printing a page have different number so it can be accessed and will be properly stored in the printer memory.

In the generation of a MicroSoft Word PRD file each typeface has an associated "Font Number". One font number is used to identify that part of the PRD file representing the driver for all soft fonts with the same typeface. That is, one font number is assigned to soft fonts of different sizes, weights and styles that all have the same typeface. There are 64 possible font numbers many of which have been assigned to specific typefaces. Also each font number has a generic name which appears in parenthesis after the typeface name when you use the Format Character Fontname command in Word. The generic names associated with the 64 font numbers are:

0 - 15   Modern a - Modern p
16 - 31   Roman a - Roman p
32 - 39   Script a - Script h
40 - 47   Foreign a - Foreign h
48 - 55   Decor a - Decor h
56 - 63   Symbol a - Symbol h

Byte 25 in the soft font descriptor (or file header) is the PCL number for typeface, some of which have been assigned by HP. As the number is a byte there are 256 possible values which causes some confusion in writing a PRD file when used with the 64 value limit of the PRD font number. One convention (used by PRD-MAKER) for PCL values greater than 63 is to subtract n * 63 from the PCL value, where n is 1, 2 or 3 as required to bring the result into the range 0 to 63. Alternately, just assign a PRD font number that does not conflict with others contained in the same PRD file.

APPENDIX 3 Sources of Soft Fonts for HP Laserjet Printers

COMMERCIAL SOFT FONTS:

Adobe Systems
1585 Charleston Road
P.O. Box 7900
Mountain View, CA, 94039
415/961-4400

Alcatel Queme
500 Yosemite Drive
Milpitas, CA, 95035
480/920-2500

Bitstream Inc.

Athenaeum House
215 First Street
Cambridge, MA, 02142

Computer Editype Systems

509 Cathedral Parkway #10A
New York, NY, 10025
800/251-2223

800-223-3176

Conographic   The Font Factory
16802 Aston Street   P.O. Box 5429
Irvine, CA, 92714   Kingwood, TX, 77339
714/474-1188   713/358-6954

Hewlett Packard Co.   Janus Associates
Direct Marketing Division   46 Chestnut Street
P.O. Box 3640   Boston, MA, 02108
Sunnyvale, CA, 94088   617/720-5085
800-538-8787
408-738-4133 (Calif)

Lexisoft   Metro Software
P.O. Box 1950   2509 N. Campbell Ave. #214
Davis, CA, 95617   Tuscon, AZ, 85719
916/758-3630   800/621-1137

SoftCraft Inc.   Straightforward
16 N. Carroll Street   3901 Via Oro Ave.
Suite 500   Long Beach, CA, 90810
Madison, WI, 53703   213/830-8773
800-351-0500
608/257-3300

Swfte International Ltd.   VS Software
PO Box 219   PO Box 6158
Rockland, DE, 19732   Little Rock, AR, 72216
302-658-1123   501-376-2083

Weaver Graphics   Wilkes Publishing
Fox Pavilion Box 1132   25251 Paseo de Alicia #229
Jenkintown, PA, 19046   Laguna Hills, CA, 92653
215/884-9286   714/855-0730

PUBLIC DOMAIN SOFT FONTS:

Cooperworks
608-271-3685 (modem)

MicroBBS
415-969-7710 (modem)

Publisher Information Service
312-342-6919 (modem)
312-342-8669 (voice)

This is a list of computer bulletin boards that specialize in or carry some information and/or programs related to desktop publishing. Phone numbers are modem lines.

ST NAME   NUMBER
AK 65' North   907-452-1460
AZ Printer's Devil   602-941-3747
CA BBS Buena Park   714-821-5014
CA Spiv's Fido   408-247-3296
CA Desktop Publisher 415-856-2771
CA DiabloValley PCUG 415-943-6238
CA La Palma   714-739-5150
CA No Name BBS   415-856-4194
CA Other Woman   707-938-3508
CA The Well   415-332-6106
CA Western Pub Exch 707-938-3608
CO Day's End   303-650-5636
CO FireNet Leader   719-591-7415
CO On-Line Consultng 303-449-5251

```
CT  Treasure Island   203-791-8532
CT  Source of Magic   203-431-4687
FL  Datacom SuperSys  813-796-5627
FL  EastPubExchange   813-989-DESK
FL  Smurfit Latin Am  305-932-6903
HA  Computer Station  808-942-2508
IL  Samson            312-394-0071
KY  Ruppel-Set II     606-781-4478
MA  Rogers & Blake    617-373-2204
MD  East Coast PubNet 301-277-5990
MD  Jasmine's Lair    301-740-8598
```

```
MI  The Light Table   517-323-9621
MN  Nick's Nest       612-490-1187
NH  Downeast Roots    603-964-7912
NJ  Form Feed BBS     201-869-1327
NJ  Print Shoppe      201-933-0392
NJ  Tardis BBS        609-448-1361
NY  PC Rockland BBS   914-353-2176
NY  RockawayBeachBBS  718-945-1928
NY  Shockwave Rider   315-673-4894
OH  Electric Publ'shg 216-273-6399
OH  The Life Line     216-398-4043
OK  DTP Forum         918-234-8261
ONT Eastern Graphics  416-286-6191
OR  PC Resource       503-642-1810
PA  Cmptr Connection  814-968-6220
QUE PComm#D3 Montreal 514-989-9450
SAS Regina Fido       306-777-4493
SAS Xerox Service Ctr 306-934-2919
TX  DTP Pub Electrnc  512-250-1316
TX  LostIslandDTCitdl 214-681-4789
TX  PostScript BBS    409-244-4704
WA  SeaEast PC Ex.    206-822-4615
WA  StoryBoard        206-848-5317
WI  FoxValleyTechCol  414-735-2513
```

```
MAKEPRD 1.50
dxaMin:300 dyaMin:30 PrinterType:5
Microspace:0 SpecialFlags:0 SerialInterface:40960
WidthTSwap:1 DownloadFlag:1 LineDraw:64

        Table 1. PRD File Header
```

```
{F4
CTP:T1
cPSDs:3

FontSize:19
Wtps:18 18 18 18
beginmod:0 "^[(8U^[(s6t9.5vpsb16.66H"
endmod:0 "^[(8U^[(s3t12vpsb10H"
beginItalicmod:0
endItalicmod:0
beginBoldmod:0
endBoldmod:0
beginItalBoldmod:0
endItalBoldmod:0
DLF:15

FontSize:24
Wtps:25 25 25 25
beginmod:0 "^[(8U^[(s6t12vpsb12H"
endmod:0 "^[(8U^[(s3t12vpsb10H"
beginItalicmod:0
endItalicmod:0
beginBoldmod:0
endBoldmod:0
beginItalBoldmod:0
endItalBoldmod:0
DLF:15

FontSize:28
Wtps:30 30 30 30
beginmod:0 "^[(8U^[(s6t14vpsb10H"
endmod:0 "^[(8U^[(s3t12vpsb10H"
beginItalicmod:0
endItalicmod:0
beginBoldmod:0
```

```
endBoldmod:0                    |
beginItalBoldmod:0              |
endItalBoldmod:0                |
DLF:15                  |
FontName:LetterGothic           |
}F                      |
                        |
 Table 2. Sample Font Description   |
```

General Form:

```
          ┌─ command group (1 or 2 characters)
          │   ┌─ value, parameter character
          │   │   ┌─ value, parameter char (final one Uppercase)
          │   │   │
  ^[(s3t12vp10H
   │  │  │ │
   │  │  └─ value assumed 0, parameter character
   │  │
   │  └─ value, parameter character
   │
   └─ escape code (27 decimal, 1B hex)
```

Specific Example:

```
          ┌─ ^[=27H, (s=command group, 3t=courier typeface
          │   ┌─ Spacing, fixed, 0p assumed, 1p is variable
          │   │   ┌─ Stroke Weight, 0b assumed, 3b is bold
          │   │   │ │ │
  ^[(8U^[(s3t12vpsb10H
   │  │  │ │ │ │ │
   │  │  │ │ │ │ └─ Pitch, some are decimal values eg. 16.66
   │  │  │ │ │ └─ Style, upright, 0s assumed, 1s is italic
   │  │  │ │
   │  │  │ └─ Points 12, can be decimal value eg. 8.5
   │  │
   └─ ^[=27H, (=command group, symbol set; 8=PCL value,
                        U=PCL terminator
```

Table 3. Examples of Printer Commands

```
{F0                          |
CTP:T0                       |
cPSDs:1                      |
                         |
FontSize:24                  |
Wtps:30 30 30 30             |
beginmod:0 "^[(8U^[(s3t12vpsb10H"     |
endmod:0                     |
beginItalicmod:0              |
endItalicmod:0                |
beginBoldmod:0                |
endBoldmod:0                  |
beginItalBoldmod:0             |
endItalBoldmod:0              |
DLF:0                    |
FontName:Courier              |
}F                      |
                      |
{F7                      |
CTP:T2                    |
cPSDs:1                   |
                     |
FontSize:17                  |
Wtps:18 18 18 18             |
beginmod:1 "^[(8U^[(s0t8.5vpsb16.66H"  |
endmod:0 "^[(8U^[(s3t12vpsb10H"      |
beginItalicmod:0              |
endItalicmod:0                |
beginBoldmod:0                |
endBoldmod:0                  |
beginItalBoldmod:0             |
endItalBoldmod:0              |
DLF:0                    |
FontName:LinePrinter          |
}F                      |
                     |
Table 4. Font Description for       |
       Printer Internal Fonts     |
```
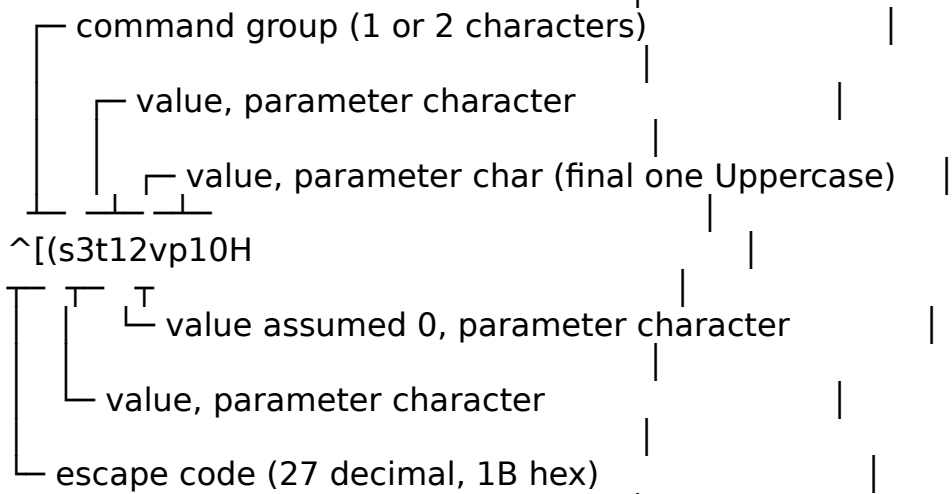
Table 4. Font Description for Printer Internal Fonts

```
PCL command (first 7 bytes of the file)
Binary data                    Meaning
1B 29 73 32 35 37 57      )s257W = Font descriptor
                     257 bytes
Descriptor
Byte Binary  Meaning
00   00 40      Descriptor size 64 bytes
     00   reserved
     00   Font type 0, 7-bit
     00 00      reserved
     00 23      Baseline distance
     00 19      Cell width 25 dots
     00 2F      Cell height 47 dots
12   00   Orientation, portrait
13   00   Spacing, fixed
14   00 35      Symbol set, HP Legal
16   00 64      Pitch 100 ¼dots = 12 ch/in
18   00 C7      Height 199 ¼dots = 12 points
     00 64      xHeight
     00   Weidth type, 0 = normal
23   00   Style, 0 = upright
24   03         Stroke weight, 3 = bold
25   06   Typeface, 6 = letter gothic
26   00   reserved
     00   Serif style, 0 = sans serif square
   00 00  reserved
     F6   Underline distance
     02   Underline height
     00 EF      Text height
     00 64      Text width
     00 20      reserved
     00 7F      reserved
     00         Pitch extended
     41   Height extended
     00 00      reserved
     00 00      reserved
     00 00      reserved

48   4C 47 4F 54 48 49 43 20 20      LGOTHIC
     20 20 20 20 20 20 20
```

Table 5. Font Descriptor Analysis of
       Soft Font File LG120B12.LGP

```
MAKEPRD 1.50
dxaMin:300 dyaMin:30 PrinterType:5
Microspace:0 SpecialFlags:0 SerialInterface:40960
WidthTSwap:1 DownloadFlag:0 LineDraw:64

{F0
CTP:T0
cPSDs:1

FontSize:24
Wtps:30 30 30 30
beginmod:0 "^[(8U^[(s3t12vpsb10H"
endmod:0
beginItalicmod:0
endItalicmod:0
beginBoldmod:0
endBoldmod:0
beginItalBoldmod:0
endItalBoldmod:0
DLF:0
FontName:Courier
}F

{F16
CTP:T0
cPSDs:1

FontSize:36
Wtps:W0 W1 W2 W0
beginmod:0 "^[(8U^[(s5t18vsb1P"
endmod:0 "^[(8U^[(s3t12vpsb10H"
beginItalicmod:0
endItalicmod:0
beginBoldmod:0
endBoldmod:0
beginItalBoldmod:0 "^[(8U^[(s5t18vsb1P"
endItalBoldmod:0 "^[(8U^[(s3t12vpsb10H"
DLF:15
FontName:TMSRMN
}F
```
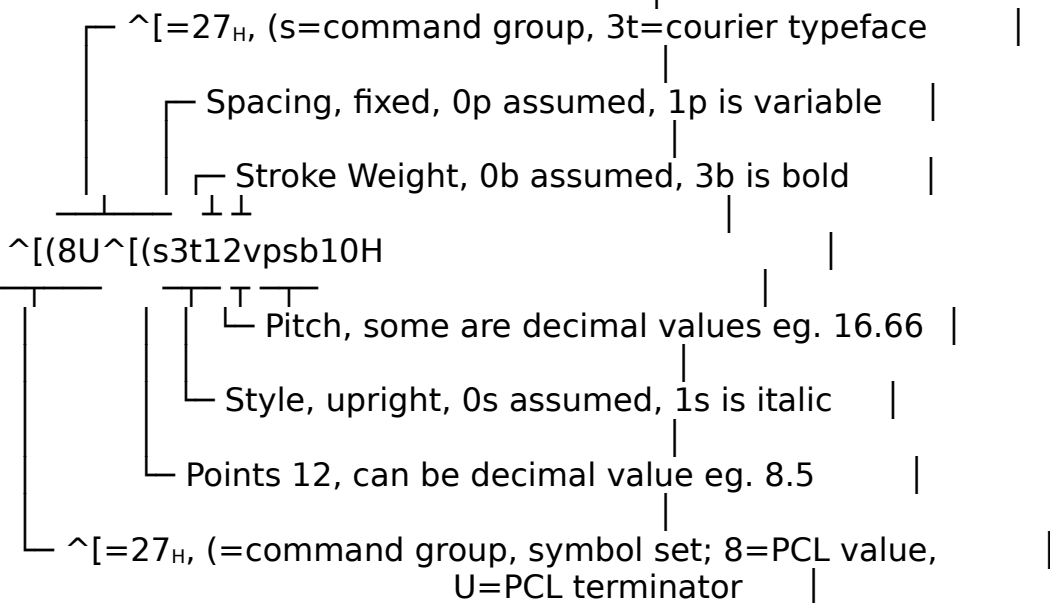
Table 6. Header and Font Descriptions
        For DUMMY.PRD

```
MAKEPRD 1.50
dxaMin:300 dyaMin:30 PrinterType:5
Microspace:0 SpecialFlags:0 SerialInterface:40960
WidthTSwap:1 DownloadFlag:1 LineDraw:64

{F0
CTP:T0
cPSDs:1

FontSize:24
Wtps:30 30 30 30
beginmod:0 "^[(8U^[(s3t12vpsb10H"
endmod:0
beginItalicmod:0
endItalicmod:0
beginBoldmod:0
endBoldmod:0
beginItalBoldmod:0
endItalBoldmod:0
DLF:0
FontName:Courier
}F

{F15
CTP:NIL
cPSDs:1

FontSize:36
Wtps:W0 W1 W2 W0
beginmod:0 "^[(0U^[(s15t18vsb1P"
endmod:0 "^[(8U^[(s3t12vpsb10H"
beginItalicmod:0
endItalicmod:0
beginBoldmod:0
endBoldmod:0
beginItalBoldmod:0 "^[(0U^[(s15t18vsb1P"
endItalBoldmod:0 "^[(8U^[(s3t12vpsb10H"
DLF:15
FontName:OldeEnglish
}F
```

Table 7. Modified Header and Font
Descriptions For DUMMY.PRD

```
┌─────────────────────────────────────────────────────
│ ───────────────────┐
│ HEX DUMP OF SCRIPT.DAT                              │
│ 00:  03 02 05 1B 2A 63 30 46 00 10 24 06 1B 2A 63 35     *c0F  $ *c5 │
│ 10:  38 44 0C 54 52 31 38 30 52 50 4E 2E 52 38 50 0B   8D TR180RPN.R8P │
│ 20:  1B 2A 63 35 38 44 1B 2A 63 34 46 50 24 06 1B 2A   *c58D *c4FP$ * │
│ 30:  63 35 39 44 0C 54 52 31 38 30 49 50 4E 2E 52 38   c59D TR180IPN.R8 │
│ 40:  50 0B 1B 2A 63 35 39 44 1B 2A 63 34 46 90 24 06   P *c59D *c4F $ │
│ 50:  1B 2A 63 36 30 44 0C 54 52 31 38 30 42 50 4E 2E   *c60D TR180BPN. │
│ 60:  52 38 50 0B 1B 2A 63 36 30 44 1B 2A 63 34 46      R8P *c60D *c4F │
│                                                    │
│ ANALYSIS OF SCRIPT.DAT                                 │
│ DATA                            PCL        DESCRIPTION
│                               COMMAND                  │
│ 03                               3 files listed        │
│ 02                               3 escape sequences per font
│
│ 05                               5 command bytes follow
│
│ 1B 2A 63 30 46          *c0F      delete all fonts (1B = escape)
│
│ 00                               no ending sequence
│
│ 10                               PRD font number 16 (10 hex)
│
│ 24                               PRD font size 36 (18 points)
│
│ 06                               6 command bytes follow
│
│ 1B 2A 63 35 38 44        *c58D    assign printer font #58
│
│ 0C                               12 file name bytes follow
│
│ 54 52 31 38 30 52 50 4E 2E 52 38 50   TR180RPN.R8P             │
│ 0B                               11 command bytes follow │
│ 1B 2A 63 35 38 44        *c58D    assign font #58           │
```
Page 40

```
1B 2A 63 34 46 50 24                    *c4F          make font temporary

06                                              6 command bytes follow

1B 2A 63 35 39 44          *c59D         assign font #59
0C                                       12 file bytes follow
54 52 31 38 30 49 50 4E 2E 52 38 50   TR180IPN.R8P
0B                                       11 command bytes follow

1B 2A 63 35 39 44          *c59D         assign font #59
1B 2A 63 34 46 90 24              *c4F   make font temporary

06                                              6 command bytes
follow
1B 2A 63 36 30 44          *c60D         assign font #60
0C                                       12 file bytes follow
54 52 31 38 30 42 50 4E 2E 52 38 50   TR180BPN.R8P
0B                                       11 command bytes follow

1B 2A 63 36 30 44          *c60D         assign font #60
1B 2A 63 34 46             *c4F          make font temporary
```

Table 8. Analysis of Binary Data in SCRIPT.DAT

BINARY DATA	PCL COMMAND	DESCRIPTION
04		PRD font #4
18		Font size 24
05		5 bytes follow
1B 2A 63 32 44	*c2D	assign printer font # 2
0C		12 bytes follow
4C 47 31 32 30 52 31 32 2E 52 38 50	LG120R12.R8P	
0A		10 bytes follow
1B 2A 63 32 44	*c2D	assign printer font # 2
1B 2A 63 34 46	*c4F	make font temporary
44		PRD font #4 + 40H >italic
18		Font size 24
05		5 bytes follow
1B 2A 63 33 44	*c3D	assign font # 3
0C		12 bytes follow
4C 47 31 32 30 49 31 32 2E 52 38 50	LG120I12.R8P	
0A		10 bytes follow
1B 2A 63 33 44	*c3D	assign font # 3
1B 2A 63 34 46	*c4F	make font temporary
84		PRD font #4 + 80H >bold
18		Font size 24
05		5 bytes follow
1B 2A 63 34 44	*c4D	assign font # 4
0C		12 bytes follow
4C 47 31 32 30 42 31 32 2E 52 38 50	LG120B12.R8P	
0A		10 bytes follow
1B 2A 63 34 44	*c4D	assign font # 4
1B 2A 63 34 46	*c4F	make font temporary

Table 9. Analysis of Part of a Multiple Font DAT File

```
Font File              sc180r16.sfp
Font Descriptor Length    26 bytes
Font Descriptor Size      64
Font Type              7-bit
Baseline Distance         60 dots
Cell Width             50 dots
Cell Height            80 dots
Orientation            Portrait
Spacing                Proportional
Symbol Set             ISO 6 ASCII, PCL: 0U
Pitch                  120 ¼dots
Height                 300 ¼dots, 18.00 points
Style                  Upright
Stroke Weight          0 Normal
Typeface               Unknown
Font Name
```

Table 10.   SOFTREAD Analysis of a Soft Font Header

```
FontSize:36 chFirst:0 chLast:255
 1:36    2:36    3:36    4:36    5:36    6:36    7:36    8:36
 9:36   10:36   11:36   12:36   13:36   14:36   15:36   16:36
17:36   18:36   19:36   20:36   21:36   22:36   23:36   24:36
25:36   26:36   27:36   28:36   29:36   30:36   31:36   32:36
33:19   34:27   35:29   36:36   37:34   38:45   39:16   40:26
41:26   42:28   43:39   44:17   45:39   46:17   47:35   48:39
49:39   50:39   51:39   52:39   53:39   54:39   55:39   56:39
57:39   58:12   59:15   60:31   61:39   62:31   63:23   64:37
65:43   66:39   67:39   68:35   69:37   70:43   71:39   72:39
73:35   74:32   75:41   76:37   77:49   78:43   79:41   80:33
81:41   82:41   83:39   84:39   85:41   86:39   87:42   88:41
89:40   90:33   91:17   92:47   93:17   94:29   95:46   96:12
97:27   98:32   99:27  100:27  101:25  102:25  103:31  104:31
105:17  106:17  107:29  108:19  109:43  110:31  111:31  112:31
113:31  114:27  115:25  116:19  117:31  118:29  119:42  120:32
121:31  122:27  123:16  124:10  125:16  126:34  127:36  128:36
129:36  130:36  131:36  132:36  133:36  134:36  135:36  136:36
137:36  138:36  139:36  140:36  141:36  142:36  143:36  144:36
```

```
145:36  146:36  147:36  148:36  149:36  150:36  151:36  152:36
153:36  154:36  155:36  156:36  157:36  158:36  159:36  160:36
161:36  162:36  163:36  164:36  165:36  166:36  167:36  168:36
169:36  170:36  171:36  172:36  173:36  174:36  175:36  176:36
177:36  178:36  179:36  180:36  181:36  182:36  183:36  184:36
185:36  186:36  187:36  188:36  189:36  190:36  191:36  192:36
193:36  194:36  195:36  196:36  197:36  198:36  199:36  200:36
201:36  202:36  203:36  204:36  205:36  206:36  207:36  208:36
209:36  210:36  211:36  212:36  213:36  214:36  215:36  216:36
217:36  218:36  219:36  220:36  221:36  222:36  223:36  224:36
225:36  226:36  227:36  228:36  229:36  230:36  231:36  232:36
233:36  234:36  235:36  236:36  237:36  238:36  239:36  240:36
241:36  242:36  243:36  244:36  245:36  246:36  247:36  248:36
249:36  250:36  251:36  252:36  253:36  254:36  255:36
```

Table 11. Width Table Produced by SOFTREAD

J.P. ENTERPRISES ORDER FORM   Date _____

Name _____

Address _____

City, State , Zip _____

ITEM   PRICE   AMOUNT

PRD-MAKER program, documentation on disk $25.00   _____

 works with Word 4.0 and 5.0

BLACKJACK STRATEGY program $15.00   _____

BLACKJACK STRATEGY source code $25.00   _____

                                              Sub-total   _____

                    California residents add 7% tax   _____

                                              TOTAL   _____

    Make check or money order payable to:
        J.P. ENTERPRISES
        3877 HANCOCK DRIVE
        SANTA CLARA, CA 95051
        408/248-7585

Table 12. Order form for PRD-MAKER and BLACKJACK STRATEGY