Press File Format

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This report describes the format of Press files, a standard file format used to encode documents for printing and editing. This report and associated references cover all the information needed to generate Press files.

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This memorandum describes the Press file format, an attempt at defining a "universal" format for describing documents. The format permits easy printing on a number of different devices and cooperative editing of documents by various editing and illustrating programs. For an introduction to Press, the reader is invited to consult [1].

This description is in four parts. Part 1 is an explanation of the basic ideas embodied in the Press file format. Part 2 describes the format in detail. Part 3 describes the management of character width information. Part 4 describes current conventions, entity types and the like.

Part 1: Basic organization

The Press file format has been designed to meet the following requirements:

(a) it should permit documents to contain text, computer graphics and scanned images, arranged freely on the page;

(b) it should permit straightforward text formatting and page layout by editing programs;

(c) single-pass generation of files should be possible (e.g. file directory information should be at the end of the file) so that files can be transmitted directly to the printing facility as they are being created;

(d) the format should permit printing and display on various devices such as the Alto display, a Slot/7000, a Slot/3100, or a Diablo printer;

(e) it should permit the inclusion of high-level formatting information in addition to the information required specifically for printing and display.

The last of these requirements is an important one, and has had a profound influence on the design. Our intention is to make it possible for Press files to be the *only* representation of documents generated by editors and illustration programs. Files in this format will then be suitable not only for printing, but also for use as input files for later editing or re-formatting. This approach solves the problem of converting files generated by one editor for use by another.

The general organization of Press files is therefore as follows:

1. The document is divided into *parts*. The most common type of part is a *printed page*; special parts define such things as fonts used in the document, cross-reference tables, etc.

2. The information for each printed page is divided into two lists: a *data list* followed by an *entity list*. The data list may be thought of as the basic text and graphics to appear on the page, while the entity list contains page layout information together with pointers into the data list.

3. Following the information for the last page is a *part directory* giving the file address and length of each part. The file is terminated by a *document directory*.

The entity list consists of a number of *entities*; the layout of each entity is described in terms of its x-y coordinates, using 10-micron (1/2540 inch) units named *micas*. Each entity has an absolute position on the page, and within the entity all coordinates are relative to this position. Thus the entity may be readily repositioned on the page without the need for examination of the entity’s contents by the page layout program. Entities may include instructions to skip over parts of the data list; this permits inclusion in the data list of high-level formatting instructions for use by text editors.

The page information may include graphical items, or *objects*. These are geometrical shapes, curved and rectilinear, defined by their outlines and by the shade of gray to be used to fill them in. Objects are opaque, and may overlay each other on the page. The order of overlaying is determined by the order in which the objects occur in the entity list: objects that occur late overlay objects that occur early.

The overall effect is to enable printing or display devices to generate page images by examining the entity lists and following the data pointers within each entity. Editing and formatting programs, on the other hand, may rely largely on the high-level information contained in the data lists: for these programs, the entity lists will serve mainly to distinguish the different classes of data (e.g. pure text, illustrations, etc.) so that specialized editors can process some of the data and ignore the rest.

Part 2: Description of the Press file format

In the description that follows, names that are in bold face refer to abstractions that are defined by this memo. Thus **part** refers to a formal object that is defined below.

A **byte** is 8 bits; data bytes in the file are numbered starting at 0. A **word** is two bytes aligned so that the first byte of the word has an even byte address. A **record** is 512 bytes or 256 words. Records are numbered from the beginning of the file (the first record is numbered 0). A **Bcpl string** is formatted as follows: the first byte contains the number of characters in the string (e.g. 3 for the string "the"), and the following bytes contain the ASCII codes for the characters in the string.

Numbers are decimal unless followed by a "b," in which case they are octal. Brackets (<...>) are used to delimit **commands** that appear in the **entity list** (**EL**). Double brackets (<<...>>) delimit formats of things that appear in the **data list** (**DL**). Commands may have arguments: [*value* n] means that *value* is specified in n bytes.

The coordinate system for a **printed page** is as follows: the origin is at the lower left-hand corner of the page (assuming a portrait-oriented page, i.e., with the shorter edges horizontal). The *x* direction extends to the right, the *y* direction up. The unit of measurement is a *mica* (equivalent to 10 microns = 1/2540 inches); this means that each of the coordinates of any point on the page can be represented by a 16-bit number.

Overall file organization

A Press file will typically consist of its **parts**, its **part directory** and its **document directory**, in that order, with the parts arranged in order of ascending page number and terminated by a **font directory part**. It is not obligatory to follow this order; the only mandatory rules for arranging the information within the file are:

1. The **document-directory** must be at the end of the file;

2. **Parts**, **part directory** and **document directory** must each occupy an integral number of **records**.

2.1 The printed page

A **printed page** is a specific type of **part**, and consists of two lists: first comes the **data list**, followed by the **entity list**. Below, these are abbreviated as **DL** and **EL** respectively. The order of information in the data list as referenced by pointers in the entity list must be sequential to avoid the need to back up during printing or display.

The **entity list** is constructed as follows: a word that contains zero comes first, followed by the **entities**. Following the last entity, there may be some **entity list padding** required to fill out the last

record of the part. Each **entity** has two pieces: a set of **entity commands**, described below, followed by an **entity trailer**. The format of the **entity trailer** is:

[*type* 1] [*font-set* 1] [*begin-byte* 4] [*byte-length* 4] [*Xe* 2] [*Ye* 2] [*left* 2]
[*bottom* 2] [*width* 2] [*height* 2] [*entity-length* 2]

An **entity** describes a region of **DL**, from *begin-byte* to (*begin-byte*)+(*byte-length*)-1. The *type* indicates what kind of editing or illustrating program has generated the entity. The *font-set* byte tells which set of up to 16 fonts should be used to print the entity. The values *Xe* and *Ye* define the origin of the coordinate system used for all coordinates in this entity. The four values *left*, *bottom*, *width* and *height* define the bottom left corner position (relative to this origin) and dimensions of the bounding box that surrounds the image of the entity on the page. The *entity-length* specifies the number of words of **EL** occupied by this entity (including the trailer itself).

The **entity trailer** is preceded, in **EL**, by entity commands that indicate how to interpret the data to which the entity refers.

Example: In a text editor, an entity could correspond to a paragraph. The begin-byte pointer and byte-length would describe where in **DL** the text for the paragraph lies. Formatting information recorded by the editor for the paragraph may also lie in **DL**.

The *type* of the entity does not affect how a printing facility prints the page, but is included to permit various editing and formatting programs to distinguish entities that they created or can re-format. Entity types will be assigned to software projects on application to the authors of this memo. Current entity type definitions are listed in section 4.

Several rules should be kept in mind when building entities and corresponding commands:

1. The commands in **EL** are processed sequentially, from beginning to end. Thus, characters and objects overwrite each other in that order. A gray character appearing near the end of the **EL** information may overwrite a black one near the beginning.

2. The entity and entity trailer must begin on a word boundary. This convention permits **EL** to be rearranged easily by copying a word at a time. <**Nop**> may be used to fill out an odd byte before the entity trailer. Note that a word containing zero must precede the first entity in **EL**; printing programs will normally determine the positions of entities in the file by scanning back from the end of **EL**, and this word may then be used to terminate the search.

3. The <**Set-brightness**>, <**Set-saturation**>, and <**Set-hue**> settings apply to all characters displayed with <**Show-characters**> and <**Show-character-immediate**>, to objects displayed with <**Show-object**>, and to rectangles displayed with <**Show-rectangle**>. The settings do *not* apply to information described by <**Show-dots**>.

4. Each entity commences by establishing the following defaults: <**Set-brightness**> 0; <**Set-saturation**> 377b; <**Set-hue**> black; <**Font**> 0; <**Reset-space**>; <**Set-x**> 0; <**Set-y**> 0; <**Only-on-copy**> 0.

The commands in an entity are comprised of:

<**Set-x**> [*x* 2]
The current *x* position is set to *x*+*Xe* (*Xe* and *x* are signed numbers).

<**Set-y**> [*y* 2]
The current *y* position is set to *y*+*Ye* (*Ye* and *y* are signed numbers).

<**Show-characters**> [*n* 1]

The next *n* characters in **DL** are displayed at the current position (*x*,*y*). As each character is displayed, the current position is updated by adding the *x*- and *y*-components of the width of the character to the current position (see section 3 for **Width information**). When a character is displayed, its "(0,0) point" is made coincident with the current (*x*,*y*) position. Fonts are usually designed so that (0,0) points of characters lie on the baseline at the left edge of the character.

<**Show-character-immediate**> [*char* 1]

This command is similar to <**Show-characters**>, but it displays the single character specified as the parameter. This command is intended to be used to add visible characters to the page when doing formatting. An example might be a hyphen at the end of a line, which the programmer may find inconvenient to include in the **DL**.

<**Skip-characters**> [*n* 1]

The next *n* bytes in **DL** are ignored. This command may be used to skip over carriage-returns, tabs and other characters that may have no meaning to the printing device.

<**Skip-control-bytes**> [*n* 2] [*type* 1]

This has the same effect as <**Skip-characters**> *n*. Editor and illustrator programs should use this feature to hide special information in **DL** that is not to be displayed when the document is printed. The writer of the control information is identified by the registered *type*, treated like the entity type.

<**Skip-control-bytes-immediate**> [*n* 1]

This command is also provided for skipping control information that is recorded in the Press file. This command causes the *n* bytes following this command in the **EL** to be skipped.

<**Font**>+[*font* 1]

This command, one byte long with the font number is the low order four bits, changes the current **font**. Characters displayed subsequently (e.g. with <**Show-characters**>) will use the specified **font**. At the beginning of an entity, the **font** is set to font 0 of the specified **font-set**.

<**Set-space-x**> [*s* 2]

This command sets the value of the spacing in *x*. In all subsequent <**Show-characters**> and <**Show-character-immediate**> commands, if a space character (40b) is encountered, the font pattern for that character (normally blank) will be printed, but *s* will be used as the width of the character in determining where the next character will appear.

Example: When displaying a line of justified text, it is sufficient to say <**Set-space-x**> 140 <**Show-characters**> 72; the actual space width should, of course, be calculated so that the displayed line will have the correct length.

<**Set-space-y**> [*s* 2]

Similar to <**Set-space-x**>.

<**Reset-space**>

This command cancels the settings of *space-x* and *space-y*. Subsequently when a space character (40b) is printed, it is treated like any other character: the character (normally blank) is printed, and the width of the character in the current font is used to update the *x* and *y* positions.

<**Space**>

Insert a space by adding the values of *space-x* and *space-y* to the current position. If no values have been defined, or if there has been a <**Reset-space**>, use the width and height values of the 40b character in the current font.

<**Set-brightness**> [*b* 1]

This sets the brightness of all subsequent graphical items to be displayed. Black is 0; white is 377b. The scale is intended to correspond to the Munsell *value* parameter (see [5] for more information): *b* = 25**value*.

<**Set-hue**> [*h* 1] (unimplemented)

This command sets the hue of all subsequent objects. The scale is intended to correspond to the Munsell *hue* parameter: there are 100 divisions of the Munsell hue circle, starting at 0R, and moving counter-clockwise through YR, Y, GY, G, BG, B, PB, P, and RP. The *h* value is simply twice the index of the division. Thus 6.5YR has *h*=33.

<**Set-saturation**> [*s* 1] (unimplemented)

This command sets the saturation of the current hue. Lowest saturation is 0; highest is 377b. The scale is intended to correspond to the Munsell *chroma* parameter: *s* = 10**chroma*.

<**Show-object**> [*n* 2]

The next *n* words of **DL** are interpreted as a graphical **object** (see below for a description of the format of **object**s).

<**Show-rectangle**> [*width* 2] [*height* 2]

This causes a rectangle to be drawn on the page with lower left corner at the current (*x*,*y*) position. The parameters specify the size of the rectangle: *width* (in *x*) and *height* (in *y*).

<**Show-dots**> [*n* 4]

This command points to *n* words in **DL** that are to be interpreted as an image sampled according to one of various coding formats, and to be displayed on the page (see below for a specification of **dots**). The image on the page is a rectangle with its lower left corner at the current (*x*,*y*) position.

An image described with <**Show-dots**> will only *add* marks to the page, and will never cause marks previously generated for other graphical items to be erased.

<**Show-dots-opaque**> [*n* 4]

This command is similar to the <**Show-dots**> command, but the entire rectangular area of the page is *replaced* with the pattern specified by the image. This may cause marks previously generated for other graphical items to be erased.

<**Alternative**> [*EL-types* 2] [*EL-bytes* 4] [*DL-bytes* 4]

Press permits a graphical effect to be represented in a number of ways. For example, a character "A" could be placed in a document by an appropriate <**Show-characters**> command, by a <**Show-object**> command with corresponding object descriptions, or by a <**Show-dots**> command with an appropriate image description. In some cases, it is useful to include several descriptions in the Press file. Then a printing or display program may select the one it is best able to handle.

The <**Alternative**> command marks such multiple representations in the **EL**. Alternatives that appear early in the **EL** are assumed to be preferred to those that appear late. Each alternative has three arguments: *EL-types*, which is a bit mask describing what sorts of **EL** commands appear in the fragment of the **EL** used to describe the alternative; *EL-bytes*, the number of bytes of **EL** commands used to describe the fragment; and *DL-bytes*, the

number of bytes of **DL** used by commands within the alternative. Following the last alternative is an <**Alternative**> command, with arguments 0. Alternatives may *not* nest. Example:

<**Alternative**> 4000b 3 286
<**Show-object**> 143 (A spline representation)
<**Alternative**> 1000b 5 26080
<**Show-dots**> 13040 (A bit matrix representation)
<**Alternative**> 0 0 0

The intention is that a program reading the Press file will parse only *one* of the alternative **EL** fragments, the first one whose *EL-types* argument assures the program it can deal with the alternative. Consequently, entity commands before and after the alternatives must be arranged to make sure that parsing any *one* of the alternatives will produce correct results.

The bits of *EL-types* are defined as follows (16-bit word):

100000b	**EL** fragment contains <**Show-characters**>, <**Show-character-immediate**>, <**Show-characters-short**> or <**Show-characters-and-skip**> commands.
040000b	**EL** fragment contains <**Font**> command.
020000b	**EL** fragment contains <**Set-brightness**> command.
010000b	**EL** fragment contains <**Set-hue**> or <**Set-saturation**> commands.
004000b	**EL** fragment contains <**Show-object**> command.
002000b	**EL** fragment contains <**Show-rectangle**> command.
001000b	**EL** fragment contains <**Show-dots**> or <**Show-dots-opaque**> commands, with coding type 0.
000400b	**EL** fragment contains <**Show-dots**> or <**Show-dots-opaque**> commands, with coding type non-zero.

<**Only-on-copy**> [*n* 1]
This command is included to permit information to be included selectively on certain copies of the document. Following an <**Only-on-copy**> command, entity commands will be ignored unless copy number *n* is being printed. If *n*=0, the subsequent entity commands apply to all copies.

<**Nop**>
A null operation.

<**..available..**>
These command codes are not assigned an interpretation by Press. They may be used by application programs to insert one-byte information into the **EL**. If more than one byte is required, use <**Skip-control-bytes-immediate**>.

<**..spare..**>
These command codes are presently unused by Press, but are reserved for future expansion.

Various short forms of the above commands are available to permit tighter coding:

<**Show-characters-short**>+*n-1*
A command to show *n* characters; 1 $\leq n \leq$ 32.

<**Skip-characters-short**>+*n-1*
A command to skip *n* characters; 1 $\leq n \leq$ 32.

<**Show-characters-and-skip**>+*n-1*
Equivalent to <**Show-characters**> *n*, <**Skip-characters**> 1. 1 $\leq n \leq$ 32. Useful for displaying short strings separated by spaces.

<**Set-space-x-short**>+[*x* 2]
A short form of <**Set-space-x**>; 0 $\leq x \leq$ 2047.

<**Set-space-y-short**>+[*y* 2]
A short form of <**Set-space-y**>; 0 $\leq y \leq$ 2047.

Objects

Graphical objects can be described by information contained in **DL**, and identified by the <**Show-object**> command in **EL**. The information in **DL** records the outlines of the objects to be shown, in a fashion similar to PICO [2]. As mentioned earlier, objects may overlay each other, and the order of overlaying is determined by the order of pointers to objects from **EL**: the last object is always visible. All objects are described by outlines: there are no lines as such. The area enclosed by an object's outline is filled in with the color specified in <**Set-brightness**>, <**Set-hue**> and <**Set-saturation**> commands. A single object may consist of a number of separate closed outlines; in this way, holes may be defined within objects. Further details of the semantics of the operators may be found in the PICO manual.

<<**Moveto**>> [*x* 2] [*y* 2]
This command specifies the first point on one of the outlines of an object. The *x* and *y* coordinates are relative to *Xe* and *Ye* of the controlling entity. This command is equivalent to the PICO function call MOVETO(*x+Xe,y+Ye*).

<<**Drawto**>> [*x* 2] [*y* 2]
This command extends the outline by drawing a straight line from the point defined by the previous command to (*x+Xe,y+Ye*). It is therefore equivalent to DRAWTO(*x+Xe,y+Ye*) in PICO.

<<**Drawcurve**>> [*Cx* 4] [*Cy* 4] [*Bx* 4] [*By* 4] [*Ax* 4] [*Ay* 4]
This command draws a curved outline. It is similar to the PICO DRAWCURVE command, but the arguments are the coefficients of the parametric cubic equation for *x* and *y*. The equation for *x*, for example, is $X=Ax*t^3 + Bx*t^2 + Cx*t +$ *current-x-position*. The coefficients are floating-point numbers (2 words; [4]).

Dots

This section describes how dots referred to by the <**Show-dots**> or <**Show-dots-opaque**> commands may be organized. The <**Show-dots**> or <**Show-dots-opaque**> commands point to a region of **DL** that describes a scanned image or some other form of bit-oriented data that is to be displayed in a rectangular region on the page. The lower-left hand corner of the region is the current (*x*,*y*) position at the point the <**Show-dots**> or <**Show-dots-opaque**> command is encountered in the **EL**. The region of **DL** cited by the **EL** commands contains commands that together describe the bits to be displayed.

<<**Set-coding**>> [*code* 1] [*dots* 2] [*lines* 2]
This command describes the coding form used, and also indicates where the scan-line breaks occur in the information. In all forms of coding, words are read sequentially as dots or runs, starting with the high-order bit of the first word. *Dots* defines the number of dots

per scan line; *lines* indicates the number of scan lines. The following interpretations are assigned to the *code* byte:

> 0. Bit map. The **DL** words specify a bit map. The interpretation of "0" bits in the data varies: a <**Show-dots**> command interprets such a dot as transparent; a <Show-dots-opaque> command interprets such a dot as white. "1" bits are interpreted as black.
>
> 1-16. Intensity samples. The data stream is interpreted as a sequence of n-bit bytes (n=*code*) defining intensity samples (0=black, 2^*n*-1=white). Half-tone techniques may be used to print such an image. (If so, zero bits after halftoning will be transparent or opaque according to whether the dots were described by <**Show-dots**> or <**Show-dots-opaque**> commands.)
>
> ...additional types will be defined as needed...

<<**Set-sampling-properties**>> [*n* 2] [*data* 2*n*]

This command is provided for careful control of printing parameters of continuous-tone images. The parameter *n* specifies how many data words of properties are given. At present, three properties are defined:

> <<**SSP-input-intensity**>> [*min* 2] [*max* 2]. Set input intensity range. This property gives a range of sample values in the input image; the range will usually be mapped so that a value of *min* corresponds to black (<**Set-brightness**> 0); and *max* to white (<**Set-brightness**> 377b).
>
> <<**SSP-output-intensity**>> [*min-brightness* 1] [*min-hue* 1] [*min-saturation* 1] [*max-brightness* 1] [*max-hue* 1] [*max-saturation* 1]. This property gives the output intensity range into which the input range should be mapped. The coding is the same as for <**Set-brightness**>, <**Set-hue**> and <**Set-saturation**>.
>
> <<**SSP-screen**>> [*angle* 2] [*amplitude* 2] [*frequency* 2]. This property sets parameters to be used when half-toning the image. The *angle* is the angle of inclination of the main axis of the halftone screen. *Amplitude*, expressed as a percentage of the image amplitude, controls the amount of screen signal that will be used. And *frequency*, expressed in halftone dots per inch, controls the screen frequency.

<<**Set-window**>> [*pd* 2] [*dd* 2] [*pl* 2] [*dl* 2]

This command sets a window into the *definition* dots that is actually to be displayed. Of the lines in the encoding, *pl* lines are passed up, and then *dl* lines are displayed. On each *line* of the encoding, *pd* dots are passed up, then *dd* dots are displayed.

<<**Set-mode**>> [*m* 1]

This command describes how the lines and dots of the encoding are to relate to the screen on which we are drawing. The value in *m* is *dot-direction-description**4 + *line-direction-description*. A *direction-description* is:

> 0= to the right on the page
> 1= to the left on the page
> 2= to the top on the page
> 3= to the bottom on the page

Thus, if the *dot-direction-description* is 2, the dots in the input stream are to be windowed, and then placed starting at the bottom of the destination rectangle and proceeding successively up the page; if the *line-direction-description* is 0, the successive lines in the

input stream are to be placed at the left of the destination and successive positions to the right. In effect, the input stream can be rotated by any multiple of 90 degrees and mirrored, etc.

<<**Set-size**>> [*width* 2] [*height* 2]
This command sets the size, on the page, of the image of the "windowed" dots. Width and height are measured in micas. The lower-left corner of the image on the page is determined by the current (*x*,*y*) coordinate at the time the <**Show-dots**> or <**Show-dots-opaque**> command appeared in the **EL**. Note that this command may imply scaling the dots so that some number of dots, not unity, is printed for each dot specified in the file.

<<**Dots-follow**>>
The following words in **DL** contain the encoding.

<<**Get-dots-from-file**>> [*fn* arb] (unimplemented)
The dots are recorded on the file named by *fn*, a **Bcpl string**. The contents of this file will be treated exactly as if they had been referenced in **DL**, using the <<**Dots-follow**>> command.

<<**Get-dots-from-Press-file**>> [*page* 2] [*fn* arb] (unimplemented)
This command is similar to the <<**Get-dots-from-file**>> command, but the file is assumed to be a Press format file. The dots are assumed to be contained in the **DL** for the specified page. As a result, the **DL** of the referenced file may contain commands such as those given immediately above which specify the coding. A <<**Dots-follow**>> command should appear in that **DL**.

Note that all necessary window, mode and size settings should be made before the <<**Dots-follow**>> or <<**Get-dots-from-file**>> command. (In the case of <<**Get-dots-from-Press-file**>>, commands may appear either in the original Press file or in the referenced **DL**. For example, the size command might be in the original file and the window command in the referenced file.) Default values will be assumed if commands are omitted: these are (*pl*=0, *dl=lines*, *pd*=0, *dd=dots*) for window, and 8 for mode.

Command definitions

This section assigns numbers to all commands mentioned above. Each assignment is followed by "b" if it is one byte long, and by "w" if it is one word long.

Entity list commands:

<**Show-characters-short**>	0b	b
<**Skip-characters-short**>	40b	b
<**Show-characters-and-skip**>	100b	b
<**Set-space-x-short**>	140b	b (in first byte)
<**Set-space-y-short**>	150b	b (in first byte)
<**Font**>	160b	b
<**..available..**>	200b-237b	b
<**..spare..**>	240b-352b	b
<**Skip-control-bytes-immediate**>	353b	b
<**Alternative**>	354b	b
<**Only-on-copy**>	355b	b
<**Set-x**>	356b	b
<**Set-y**>	357b	b
<**Show-characters**>	360b	b
<**Skip-characters**>	361b	b

<**Skip-control-bytes**>	362b	b
<**Show-character-immediate**>	363b	b
<**Set-space-x**>	364b	b
<**Set-space-y**>	365b	b
<**Reset-space**>	366b	b
<**Space**>	367b	b
<**Set-brightness**>	370b	b
<**Set-hue**>	371b	b
<**Set-saturation**>	372b	b
<**Show-object**>	373b	b
<**Show-dots**>	374b	b
<**Show-dots-opaque**>	375b	b
<**Show-rectangle**>	376b	b
<**Nop**>	377b	b

Data list commands:

<<**Moveto**>>	0	w
<<**Drawto**>>	1	w
<<**Drawcurve**>>	2	w
<<**Set-coding**>>	1	b
<<**Set-window**>>	1	w
<<**Set-mode**>>	2	b
<<**Set-size**>>	2	w
<<**Dots-follow**>>	3	w
<<**Get-dots-from-file**>>	4	w
<<**Get-dots-from-Press-file**>>	5	w
<<**Set-sampling-properties**>>	6	w
<<**SSP-input-intensity**>>	0	w
<<**SSP-output-intensity**>>	1	w
<<**SSP-screen**>>	2	w

2.2 The font directory part

The **font directory part** consists of a number of **entries**, each entry containing instructions to the printing or display program for selection of fonts. These fonts may be drawn from standard source descriptions (see reference 4); some printing facilities will be capable of scaling and rotating such source descriptions by arbitrary amounts prior to printing. Fonts that are not available in source form, such as special symbols, may be defined graphically within the font directory. An entry in the font directory will typically define an entire font within one font set; it may, however, define only certain characters within the font, in which case a number of entries will be needed to specify the whole font.

The format of an entry in the font directory is as follows:

[*entry-length* 2] [*font-set* 1] [*font* 1] [*m* 1] [*n* 1] [*fam* 20] [*face* 1]
[*source* 1] [*size* 2] [*rotation* 2]

The length of the entry in words is given in *entry-length* (this includes the length word). The two bytes *font-set* and *font* specify the set and font defined by this entry. The bytes *m* and *n* define the first and last characters to be defined; for example, to define the first 128 characters of a font, *m* should be zero, *n* should be 127, while to define a single character A, both *m* and *n* should be 101b. The 20 *fam* bytes contain an upper-case **Bcpl string** defining the family (METEOR, NONIE, etc.) to be used; unused bytes should contain zero. The *face* byte contains an encoding of the face (bold, italic,

etc.) to be used; this byte should be generated using the EncodeFace routine described below. *Size* and *rotation* define the size and rotation of the font; *size* is interpreted as a point size if positive, and as a size in micas if negative (72 points = 2540 micas). *Rotation* is in minutes of arc, measured anticlockwise (thus fonts should be rotated 90 degrees for landscape). The *source* byte indicates where to start reading characters from the source description; normally this will be the same as *m*.

A second format may be employed for entries that define characters not to be drawn from existing defined fonts, but from information contained within the entry:

[*entry-length* 2] [*font-set* 1] [*font* 1] [*m* 1] [*all-ones* 1] [*zero* 2] (objects)

The shape of character *m* of the font is specified by the (objects) commands, using the same commands as described above under **Objects**. The width of the character is defined by starting and finishing the shape description with <<**Moveto**>> commands. The two *zero* bytes should both contain zero to indicate a graphically defined font. The *all-ones* byte should contain 377b.

The last entry in the font directory is followed by a word containing zero.

2.3 The part directory

Each **part** is described by a four-word entry in the **part directory**:

word 0	Part type, interpreted as follows:	
	0:	Part is a **printed page**.
	1:	Part is the **font directory part**. Every printed document must contain one and only one **font directory part**.
	>1:	...more types to be defined as needed...
	<0:	Part types less than zero may be used by applications programs to include their own information in Press files. See the registry of part types, in section 4.
word 1	**Record** number where the **part** begins.	
word 2	Length in **records** of the information for this **part**	
word 3	Interpretation depends on part type (word 0):	
	0:	Length in words of the **entity list padding** (i.e., the number of unused words at the end of the last record of the **printed page**).
	others	Undefined.

2.4 The document directory

This is a single 256-word **record**, and must be the last **record** of the file.

word 0	General password (27183)
word 1	Total number of **record**s in this file
word 2	Number of **parts**, including the **font directory part**
word 3	**Record** number where **part directory** begins
word 4	Number of **records** occupied by the **part directory**
word 5	Back-pointer to obsolete document directory
word 6	-1 (unused)
word 7	-1 (unused)

word 8 first copy to print
word 9 last copy to print
words 10 to 177b -1 (unused)
(the following entries are used to print the break page)
word 200b+ Up to 26 words of **Bcpl string** specifying file name;
word 232b+ Up to 16 words specifying the creator's name;
word 252b+ Up to 20 words specifying creation date.

Words 8 and 9 of the **document directory** may be used to indicate how many copies are to be printed; thus to print three copies, numbered from copy 1 to copy 3, word 8 should be 1, and word 9 should be 3.

Part 3: Width information

A key aspect of the Press format is that accurate formatting depends on the use of the same character width information by both the formatting and the printing programs. A public file FONTS.WIDTHS defines the widths of all fonts known to Press facilities. Width information will generally be stored in this file in a size- and rotation-independent form, consistent with "dictionary" conventions of the PrePress program [3]. User programs will be able to compute widths in micas for any character in any font at any size and rotation, using the following three Bcpl routines (in FontWidths.Bcpl):

face = EncodeFace(weight, slope, expansion)

The three arguments are ASCII characters: *weight* is M, B or L ($M, $B or $L in Bcpl parlance) according to whether the font weight is medium, bold or light (default is medium); *slope* is R or I for regular or italic (default is regular); expansion is C, R or E for condensed, regular or expanded (default is regular). Arguments that have default values may be omitted or set to zero. This routine returns -1 if no encoding exists for the specified arguments. Otherwise it returns a value suitable for inclusion in the *face* byte of a file directory entry.

p = DecodeFace(face, lv weight, lv slope, lv expansion)

This routine decodes *face* into three ASCII codes defining the weight, slope and expansion, stored in *weight, slope* and *expansion* respectively. It returns TRUE or FALSE depending on whether it can or cannot decode the *face* value.

p = LookupFontName(stream, "family", face, size, rotation,
bufx, bufy, boundbox, [bufferlength, [lvCode]])

This routine requires opening *stream* to read FONTS.WIDTHS in word mode. This routine will look up the font whose family is defined by the **Bcpl string** "family" and whose face is encoded in *face* (as delivered by EncodeFace). *Size* and *rotation* should be specified as in font directory entries.

The width information is returned in two tables: *bufx* and *bufy*. The tables will be assumed to be 256 words long unless the argument *bufferlength* is present and has a different value. The widths in micas of the first *bufferlength* characters of that font, scaled and rotated as required, are stored in *bufx* and *bufy*.

In addition, a "bounding box" is computed in micas and stored in the 4-word vector *boundbox*. The bounding box can be viewed as the smallest rectangle that can be drawn around all characters of the font if they were positioned with their (0,0) points coincident. The first word of boundbox is the offset (negative to the left) from the (0,0) point of a character to the left-most visible piece of any character in the font. The second word is the offset (negative down) from the (0,0) point of a character to the bottom-most visible piece of any character (this is therefore the negative of the dimension of the largest descender). The third word is the width of the bounding box; the fourth

word is the height.

If no width information can be computed (e.g. if "family" contains an unknown name), this routine returns FALSE; otherwise it returns TRUE. If the optional parameter lvCode is supplied, it is the address of a variable that will be filled with a unique number that describes the font family name.

The format of FONTS.WIDTHS is described in reference 8.

Part 4: Conventions

By convention, an Alto screen dot measures 32 micas square.

Entity Type Registry

The following type codes have been registered to identify entities and control information:

Type	Use	Registered owners
0	pure	Press. Entities of this type contain no type-dependent control information.
1	Cypress	Tesler. Used for mentioning labels and cross-references.
4	Draw	Baudelaire. Used to label information saved in Press files by Draw.
64-67	OfficeTalk	Newman.

Part Type Registry

The following type codes have been registered to identify special "parts" in a Press file:

Type	Use	Registered owners
0,1	pure	Press. These denote printed pages and font directory parts.
-1	Cypress	Tesler. Used to contain the style sheet, among other things.
-2 to -5	OfficeTalk	Newman. Used to contain information pertinent to the interpretation of the document.

History of Changes

This section lists briefly the changes that have occurred to this document.

Version of April 2, 1975. Original version.

Version of June 15, 1975. Deleted: <**Show-xx-on-copy**> commands. Added: <**Show-character-immediate**>, <**Show-rectangle**>, <**Show-dots-opaque**>, <**Only-on-copy**>, <<**Get-dots-from-Press-file**>>, entity type 3. Changed: order of arguments to <<**Set-window**>> command, lvCode parameter to LookupFontName.

Version of January 26, 1977. Added: <**Alternative**>, <<**Set-sampling-properties**>>, <<**Set-coding**>> codes 1-16. Changed: entire section 3 (width information).

References

1. R.F. Sproull, "Press Overview," Xerox PARC Internal Memo, December 16, 1975. Filed on

<Gr-Docs>PressOverview.Ears.

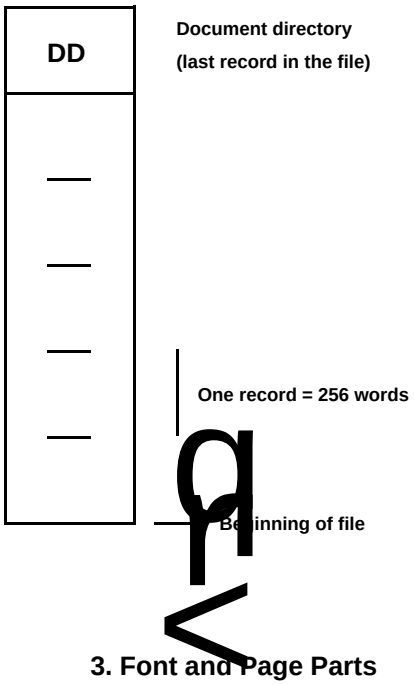
2. W.M. Newman, R.F. Sproull, "PICO Manual", Xerox PARC Internal Memo, July 1974.

3. R.F. Sproull, "PrePress Manual," Xerox PARC Internal Memo, January 1, 1977. Filed on <Gr-Docs>PrePress.Ears.

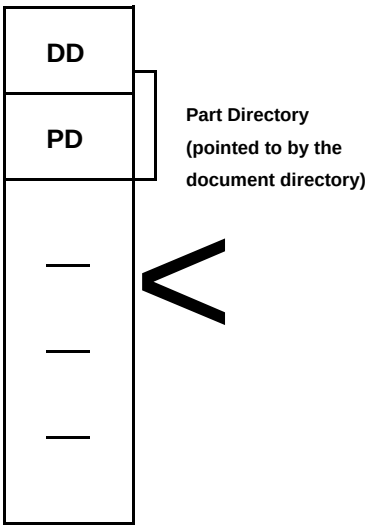
4. R.F. Sproull, "Font Representations and Formats," Xerox PARC Internal Memo, March 5, 1977. Filed on <Gr-Docs>FontFormats.Ears.

5. J.A.C. Yule, *Principles of Color Reproduction*, Wiley, New York, 1967.

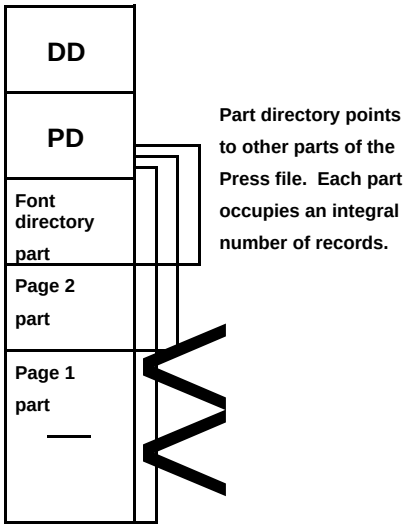
1. Overall Press File Format



2. Part Directory



3. Font and Page Parts



4. Part Directory Entry

3	...depends on part type...	
	Number of records	
	Record start	
0	Part type	

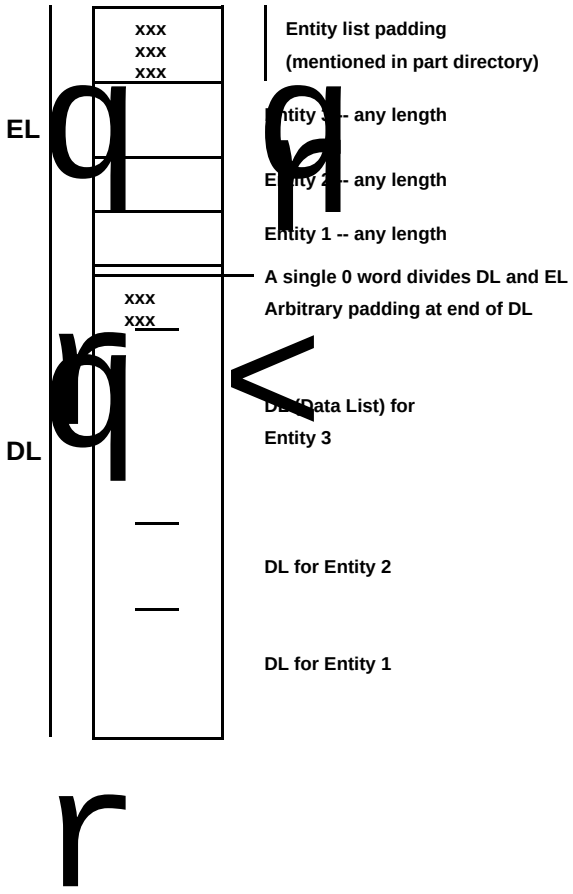
Each entry is 4 words long.
Part type = 0 for a "page part"
Part type = 1 for the font directory part
Part type < 0 for private part types

5. Typical Font Directory Entry

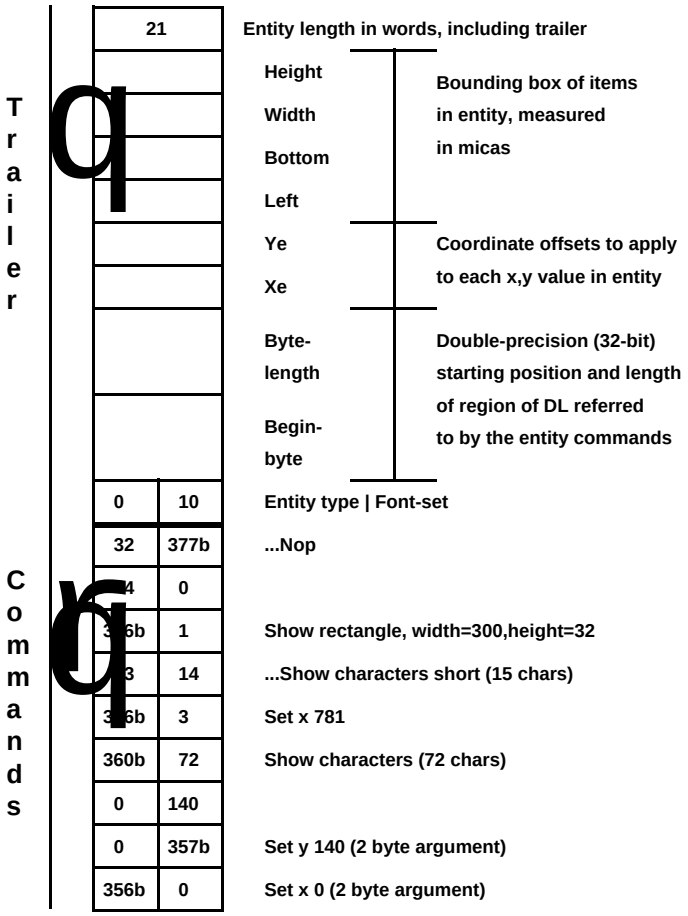
15	0		Rotation (minutes of arc)
	10		Size (points if > 0)
	1	0	Face | source
	xxx	xxx	
	xxx	xxx	
	xxx	xxx	
	xxx	xxx	
	xxx	xxx	
	C	A	
	T	I	
	V	E	
	E	L	
	9	H	Family name (Bcpl string)
	0	127	m | n
	0	1	Font set | font number
0	16		Entry length in words

xxx represents "don't care" value

6. Printed Page Part



7. Typical Entity



Entity commands are parsed from beginning (bottom in this picture). A Nop can be used to fill out odd bytes as needed. Entities are located in the "printed page part" by scanning backwards from the end of the part, using the "entity list padding" information recorded in the part directory to start, and then observing the entity length entries in the trailer.

As the entity commands are processed, the pointer to data in the DL may be advanced. (In the example, Show characters 72 advances the pointer 72 bytes). The pointer is initialized by the "Begin-byte" entry in the trailer.

Entities are intended to be self-contained to facilitate copying entities from page to page or from document to document. It is for this reason that the trailer cites the range of DL used. Note that an entity can be "moved" on the page simply by changing Xe and/or Ye.