DRAW

A Higher-Level Language for Technical Documentation

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1. Introduction

In response to a growing need for better graphical documentation, a higher level graphics language, DRAW, was developed in the summer of 1973 at the Computation Center. DRAW is a natural medium for generating systems or program flowcharts, linked-list or tree structure diagrams, table or file structure layouts, and management charts and graphs. It also fills a gap by providing non-interactive graphics capability to the user of any of several languages (BASIC, COBOL, LISP, etc.) supported by the Center which cannot interface directly to the low-level FORTRAN-callable Calcomp plotting package, PLT.

Using DRAW, the user can:

(a) produce most familiar geometric and programming-template figures merely by specifying the figure name, the location of its geometric center on the plotting medium, and its size (and possible proportions);

(b) join two such figures by a straight solid or dashed line (with or without arrowheads) which extends only to the edges of the two figures merely by referring to the name of the figures;

(c) produce automatically centered and balanced multiple line text within figures or alongside joining lines;

(d) Specify figure coordinates in such a way that any figure may be positioned relative to any previously-drawn figures, thus simplifying the subsequent addition or deletion of graphics and facilitating page layout.

At the University, DRAW has been used for a variety of applications, representative examples of which are given at the end of this paper. It should be noted that most of the examples shown have been altered several times in the past year, to keep up with changes made in the developmental systems which they describe.

The DRAW compiler, written primarily in FORTRAN, occupies about 30000 octal words of CDC 6600 memory and requires about 0.1 CP seconds per directive. Extensive interlinear diagnostics facilitate error correction, providing a pointer to the offending directive element in most cases. As much graphical output as possible is always produced.

The following description of the language is taken from the DRAW user's manual.

2.0 Nomenclature and Conventions

In order to simplify and condense the explanation of the various DRAW directives, the following convention is used in this publication: a pair of angular brackets enclosing a word will be used to represent all of the possible specific character strings which the word defines. For example, the expression "<integer>" is to be read "any sequence of characters which satisfies the rules for representing an integer." Such definitions are common to several directives. They are

2.1 <name>

A name is a single letter or a letter followed by not more than eight letters or digits. Examples:

A TEST1 C3353B

2.2 <coordinate>

The position of a geometric figure produced by DRAW is determined by a pair of x and y coordinates. Here x refers to the horizontal and y to the vertical displacement. Displacements are measured in inches relative to the origin (point of reference) established initially (lower left-hand corner) or by a PAGE directive (see Section 3.3 for details). Positive x displacement is interpreted as "to the right" and positive y displacement as "above". A coordinate may be:

(a) a signed or unsigned integer, decimal, or scientific notation number. Examples:

0 +25 -3.4 0.01 1.0E-1 -0.2E+2

(b) an equal sign (=) followed by a <name>; or an equal sign followed by a <name> followed by a plus or minus followed by an integer, decimal, or scientific notation number. Examples:

=A =CENTER-0.5 =TEST2+3 =X+5E-1

It is often convenient to position a figure relative to another figure already drawn. To facilitate this, DRAW allows the user to "name" a figure, and form (b) is interpreted as follows. If figures A and B are to be at the same height on the page and figure A has already been drawn, then the y coordinate of B may be expressed as "=A".

Similarly, "=A+0.5" is interpreted as "one-half inch higher than A".

(c) an asterisk or an asterisk followed by a plus or minus followed by an integer, decimal, or scientific notation number, Examples:
* *+5 *-1.2 *+1.2E-1

The coordinates of the previous figure formed are always available for reference, regardless of whether the figure is named or not. An asterisk is used to refer to the previous x or y coordinate. For example, the location (*, *-1) identifies the point one inch directly below the last figure formed.

2.3 <text>

Text is a sequence of not more than five strings of characters; each string must be delimited by a pair of slashes (/). The slash may not occur within a character string. Delimited strings may be separated by any number of blanks for clarity. Two examples of text:

/ONE LINE/

/FIVE LINES://LINE 2////LINE 4/ /LAST LINE/

Note that in the second example above, five strings are specified; the third string is a "null" string and will produce a blank line.

The character "↑" has a special meaning. It is an "escape" character, and signifies that the "special" character in Appendix 1 which corresponds to the "normal" character immediately following the "↑" is to be used. For example, the graphic sequence "abc" may be generated using the sequence "/↑A↑B↑C/".

Note especially in this regard that the two-character sequence "↑↑" may be used to generate "/", which may not otherwise be included within a delimited string.

2.4 <detail spec.>

A detail spec. (specification) is a sequence of one or more characters enclosed in parentheses, which provides additional versatility to certain directives, e.g. LINE and JOIN. The characters which correspond to the various options are listed below. Wherever indicated, initial point and final point signify the first end-point and last end-point, respectively, of the line being formed by the directive in which the <detail spec.> is to be used. Characters may be specified in any relative order.

character	significance	notes
<	draw an arrowhead at the initial point	
>	draw an arrowhead at the final point	1
- or D	dashed line instead of solid	
= or B	bold-face line instead of solid	
I	invisible line	2
T	tick-marked line instead of solid	
1	draw any associated text parallel	
2	to the X-axis instead of parallel	
C	to the line being formed. Code 1, 2, or C signifies the test is to be located, respectively, near the first end-point, second end-point, or center of the line.	

Notes: 1) If both options are selected, arrowheads will be drawn at both ends.

2) These options are mutually exclusive if more than one is specified, a diagnostic will be issued.

Examples: (->) specifies a dashed line with an arrowhead at the final point.

(<> C) specifies a solid line with arrowheads at both ends and with associated text parallel to the X-axis and near the center of the line.

3.0 Directives

Directives for DRAW are in the form of 72-column card images, one directive per card. Each directive takes the form

<directive name> <parameter list>

The entire directive is free-field; i.e., the directive may appear anywhere on the card, and one or more blanks may be used to separate the directive name from the first parameter and to separate subsequent parameters. However, blanks may not be used within the name or any parameter (except within quoted text, where a blank is considered a "character"). The <directive name> may be truncated as desired; therefore, for example, MEDIUM may be abbreviated to M.

3.1 MEDIUM

This directive is optional, but must be the first directive if used. Its format is

MEDIUM<medium>

where medium specifies the medium onto which the graphical output is to be produced. Available media are:

Medium	Meaning	Max. X	Max. Y
PLOT	ballpoint ink on paper	100 in.	11 in.
PLOTI	india ink on paper	100 in.	11 in.
PLOTW	ballpoint ink on paper	100 in.	29 in.
PLOTWI	india ink on paper	100 in.	29 in.
PLOTC	remote plotter	10 in.	10 in.

Here, Max. Y and Max. X refer to the maximum height and width of the generated output for a sequence of directives. For more information, refer to the section on the Graphical Output Package of the Computation Center User's Manual. If the directive is omitted, the medium PLOT is assumed.

3.2 COMMENT

This directive may be used as desired to clarify other directives. It generates no graphical output. Its format is

COMMENT<comment>

where <comment> may be any sequence of characters.

3.3 PAGE

This directive is used to begin a new page of

graphical output. At all times, absolute figure coordinates are assumed to be relative to the page origin defined by the last PAGE directive. Initially, this origin is assumed to be the lower left-hand corner of the first page. The directive

PAGE <x> <y>

defines the next page origin to be <x> inches to the right and <y> inches above the present origin. Either <y> or both <x> and <y> may be omitted; default values are then <x> = 8.5 and <y> =0. Use of the PAGE directive eliminates all recollections of previously-defined figures (see Section 3.5).

Instead of coordinates, the next page origin may be specified to be four inches beyond the rightmost point thus far produced by using the directive

PAGE NEW

3.4 DEFAULT

To reduce the amount of invariant information which the user must specify in his directives, a few "global" dimensions have been established, to which initial default values are assigned. The user may change these global dimensions with the DEFAULT directive.

The general form is

DEFAULT <option list>

where <option list> consists of one or more pairs of dimension specifications. Options are:

a) TEXT <size>

In drawing text, two criteria are used in determining the resulting character size. First, if unconstrained by space consideration, characters will be drawn at the default <size> , which is initially 0.14 inches (i.e., each character is drawn within a 0.14 x 0.14 inch grid). Second, if necessary, text will be scaled down to fit within a figure or alongside a line.

b) FORM <width>

In drawing figures with the FORM directive, either the width and height of the figure may be explicitly specified or the default width and proportions may be used. The default <width> is initially 0.9 inches (to facilitate drawing on a one-inch grid). Default proportions are defined in Section 3.5.

c) BOX <height>

In drawing with BOX, the box height is initially 0.3 inches, but may be changed with this directive to a more appropriate value. Example:

DEFAULT TEXT .5 BOX .2

3.5 FORM

This directive is used to form a figure, centered at a specified location on the page, with a specified size and shape, and with (optional) text centered within the figure. The directive format is

FORM <figure> <name> <x> <y> <width> <height> <text>

where <figure> must be the name, or an unambiguous truncation of the name, of one of the figures listed in the table below.

If the optional parameter <name> is specified, then that <name> will be associated with the figure for purposes of subsequent relative positioning of other figures and lines.

Both of the parameters <x> and <y> must always be specified; these define the location of the geometric center of the figure on the page. Each must take the form of a <coordinate>, defined in Section 2.2.

Figures are classified as one- or two-dimensioned (see list below). If the figure to be formed is one-dimensioned, <height> is ignored and may be omitted if the default width is desired, <width> may also be omitted. If the figure is two-dimensioned and the default proportions are desired then <height> may be omitted; furthermore, if the default size is desired then <width> may also be omitted.

The optional parameter <text>, is specified, must agree in format to the convention described on Section 2.3. The text will be centered within the figure and will be scaled down in size if necessary to fit within the figure.

Available figures (where W is default size and defined initially or by the previous DEFAULT directive) are:

Figure Name	No. of Dimensions	Width	Default Height
POINT	1	W*	W
CIRCLE	1	W	W
TAPE	1	W	W
PRINT	1	W	W
RECTANGLE	2	W	W/2
DIAMOND	2	W	W/2
ELLIPSE	2	W	W/2
CARD	2	W	W/2
DISK	2	W	W

Notes: *The "width" of a POINT is relevant only for purposes of text size, as the "point" is not actually drawn.

For special graphic effects, another type of FORM directive is permitted:

FORM - figure <name><x><y><width><height><text>

The minus sign (-) signifies that an "invisible" figure is formed. No figure is actually drawn, but the form of the figure will influence the size of the <text> and will be used if a subsequent line is to be joined to the edge of the figure.

3.6 LINE

This directive is used to produce a line consisting of one or more segments, with arrowheads at either or both ends, and with optional text printed near any segment. The format is

LINE <detail spec.> <name> <xi> <yi> <segment list>

where <segment list> consists of one or more of the following triplets

<xs> <ys> <text>

The coordinates <xi> <yi> define the initial point of the line. Each <xs> and <ys> pair in the <segment list> defines the location of a subsequent segment end point in the line. All <xs> and <ys> coordinates may take the form "*+n", which then refers to the respective coordinate of the previous point defined in the line. For example,

LINE 1 1 *+1 * * *+1 *-1 * * *-1

will draw a square.

If text is specified for any segment, it will

be drawn alongside the segment. Position and orientation will depend upon the <detail spec.> . If the <detail spec.> is omitted, a solid line without arrowheads will be produced, and text (if any) will be drawn parallel to and near the center of the respective line segment. Permissible detail options are described in Section 2.4. If "<" is specified, an arrowhead is drawn at <xi> <yi>. If ">" is specified, an arrowhead is drawn at the last <xs><ys> point in the <segment list>.

The optional <name>, if specified, applies only to the last segment in the list, for purposes of subsequent JOIN-ing. A coordinate in a subsequent directive, of the form "=<name>", will refer to the last segment in the list. Examples may be found in the appendix.

3.7 JOIN

This directive is used to join two figures by a line, The format is

JOIN<figure 1><figure 2><edge 2><detail spec.><text>

An invisible line is projected through the centers of <figure 1> and<figure 2> . The points at which this line intersects the two figures are determined and a line connecting these two edge points is drawn. Both <figure 1> and <figure 2> must be the names of figures previously formed (by FORM, LINE, BOX, etc.) and thus satisfy the rules for <name>. Either, but not both, <figure 1> or <figure 2> may be a line. In such a case, the invisible projected line will be perpendicular to the LINE if possible; if not, then the end point nearest the other figure will be chosen.

The parameter <edge 2> , if specified, must satisfy the rules for a <name> This parameter will cause a POINT named <edge 2> to be defined (as in the FORM directive) at the point where the line connecting the two figures intersects the edge of <figure 2>.

The optional parameter <detail spec.> controls the locations and orientation of the optional <text>, defines the presence of arrowheads at either or both ends of the joining line, and specifies the nature of the joining line. The options for the <detail spec.> are described in Section 2.4. If omitted, a solid line without arrowheads will be drawn, and the text (if any) will be drawn parallel to the line near its center, If, for special effects it is desired to force the joining line to project to the center rather than the edge of a figure, then that figure name should be prefixed by "=". For example,

```
J  A  =B
```

3.8 NOTE

This directive is used to produce left-justified text. Its format is

NOTE <x> <y> <text>

where the point (<x> ,<y>) will be the lower left-hand corner of the first character in the text. Text size will always be the default *see Section 3.4). <x> and <y> must have the form of a <coordinate>. If <y> is omitted, then the line of text will be appropriately spaced below the last graphics produced by a NOTE or BOX directive (if the previous directive was neither, then results are unpredictable). If <x> and <y> are both omitted, then the previous <x> value will be assumed.

Notice that the examples

```
D TEXT .1            D TEXT .1
N 5 6 /LINE 1/  and  N 5 6 /LINE 1/
N /    INDENTED/     N 5.4 /INDENTED/
```

both produce the same result because the width of the four leading blanks is 0.4 inches.

3.9 BOX

This directive is used to produce a rectangular box subdivided into cells and with (optional) text centered within each cell. The format is

BOX <x> <y> <label> <cell definitions>

where each <cell definition> is of the form

<name> <width> <text>

Similar to NOTE, <x> specifies the lower left-hand corner of the first cell of the box. The height of the box is nominally 0.3 inches but may be changed by a DEFAULT directive (see Section 3.4). If <x> and <y> are omitted, the left edge of the box will be directly below the left edge of the previous box. The <label> is optional. If specified, it must take the form of <text> and will result in the <text> being printed, right-justified, just to the left of the first cell and adjusted in size to the height of the box.

Each subsequent cell will join the previous cell at the right and will be <width> inches wide. The <name> and <text> parameters are both optional. <text>, if specified, will be centered within the cell. Example of two contiguous boxes with a total of 7 cells:

```
BOX 2 7 /BOX1/ CELL1 1/CELL1/C2 2.5/2/1 1.5
B CELL5 2 /BOX2//CELL5/ 2 2/CELL 7/
```

3.10 SCALE

This directive, whose format is

SCALE <factor>

causes all subsequent graphics to be scaled by the <factor>, which must be a positive number. If <factor> is greater than one, enlargement will take place.

3.11 AXIS

This directive, whose format is

AXIS<x_1> <y_1> <x_2> <y_2> <first> <increment> <decimals> <text>

defines a linear coordinate axis to be drawn from point (x_1,y_1) to point (x_2,y_2) and with "tick" marks at one-inch intervals beginning at (x_1,y_1). All four of <x_1>, <y_1>, <x_2>, and <y_2> must take the form of a <coordinate>. The optional parameter <first> specifies the number to be plotted adjacent to point (x_1,y_1); if omitted, zero is assumed. The optional parameter <increment> specifies the numeric increment to be added to the previous "tick" value to determine the number to be plotted adjacent to the next "tick" mark; if omitted, one (1) is assumed. The optional integer parameter <decimals> specifies the number of decimal places to be plotted in the "tick" values; if omitted or specified zero, then integer values will be plotted.

To avoid ambiguity, if <increment> is specified then <first> must also be specified; likewise, if <decimals> is specified then both

<first> and <increment> must also be specified.

The optional paramater <text> is the axis title, which will be plotted parallel to the axis and centered along it. Character size will be appropriate to the length of the axis but never greater than the default text size (see Section 3.4). Tick value character size will always be three-quarters the title character size. The title will always be only one line but may have the general form specified in Section 2.3.

3.12 GRAPHICS

If desired, the 8 special characters in the CDC graphics set,

≡ ≠ → ∨ ∧ ↓ ≤ ≥

may be replaced by their ASCII equivalents,

" # ' % & ! @ ?

by using the GRAPHICS directive,

```
GRAPHICS ASCII
```

At present, the effect of this directive is non-reversible.

APPENDIX 1

EXTENDED CHARACTER SET

(Generated with the "escape" character "↑")

Normal	Special	Normal	Special	Normal	Special
A	a	V	v	$	∂
B	b	W	w	=	δ
C	c	X	x		ε
D	d	Y	y	,	⊞
E	e	Z	z	.	Ψ
F	f	0	₀ (subscripts)	≡	+
G	g	1	₁ (subscripts)	[	π
H	h	2	₂ (subscripts)	]	∿
I	i	3	₃ (subscripts)	:	β
J	j	4	ψ	≠	∑
K	k	5	ρ	↱	⧋
L	l	6	γ	∨	∫
M	m	7	φ	^	⧊
N	n	8	ω	↑	/
O	o	9	∝	↓	—
P	p	+	Θ	<	λ
Q	q	-	±	>	√
R	r	*	° superscript ("degrees")	≤	σ
S	s	/	↖	≥	'
T	t	(	⊕	¬	∞
U	u	)	"	;	?

- ACCOUNTS RECEIVABLE -

26 AUGUST 1973

- COMPANY DIRECTORY -

COMPANY		RELATIVE WORD	RELATIVE SECTOR

- ACCOUNTS RECEIVABLE ENTRY -

COMPANY					
EXP. YEAR	EXP. BATCH	CODE NO.	LAST NO.	NO. CHARGES	NO. PLANTS

EXPIRED
SUPPLY CHARGES EXHAUSTED
SERVICES CHARGES EXHAUSTED
INACTIVE

CHARGE (OR OUTSTANDING CHARGE):

1	2	3			•	BATCH	ACCOUNT
AMOUNT BILLED							CHARGE

PLANT:

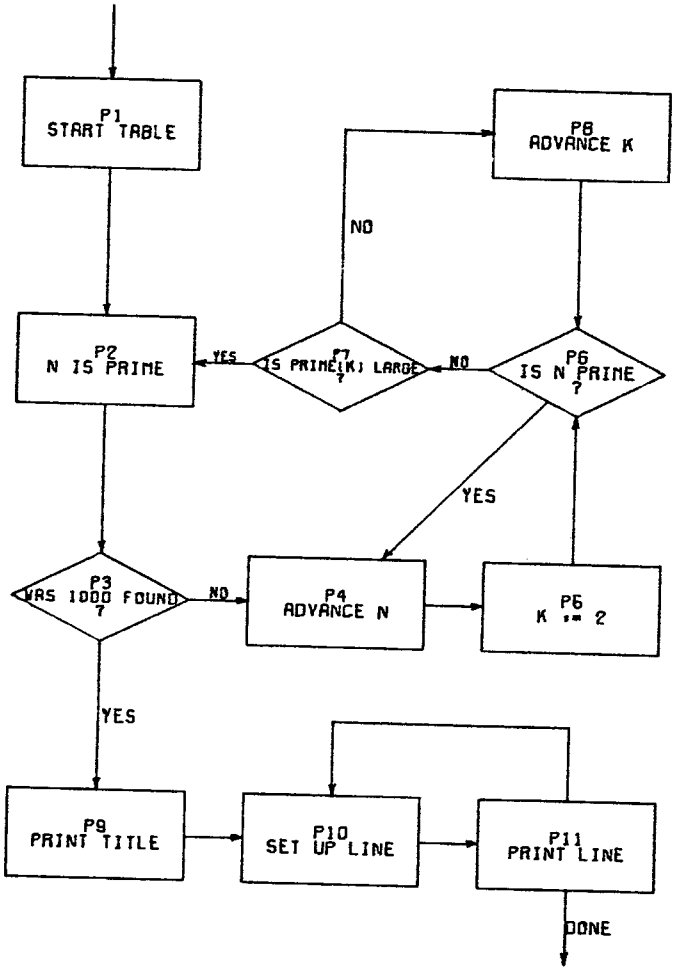
1	PLANT NO.			
ORDERS YTD		ORDERS SLB	NO. TYPES	NO. ITEMS
PLANT NAME				
SERVICES - PREVIOUS BILLINGS		SUPPLIES - PREVIOUS BILLINGS		

ITEM:

CODE	TALLY - SINCE LAST BILLING

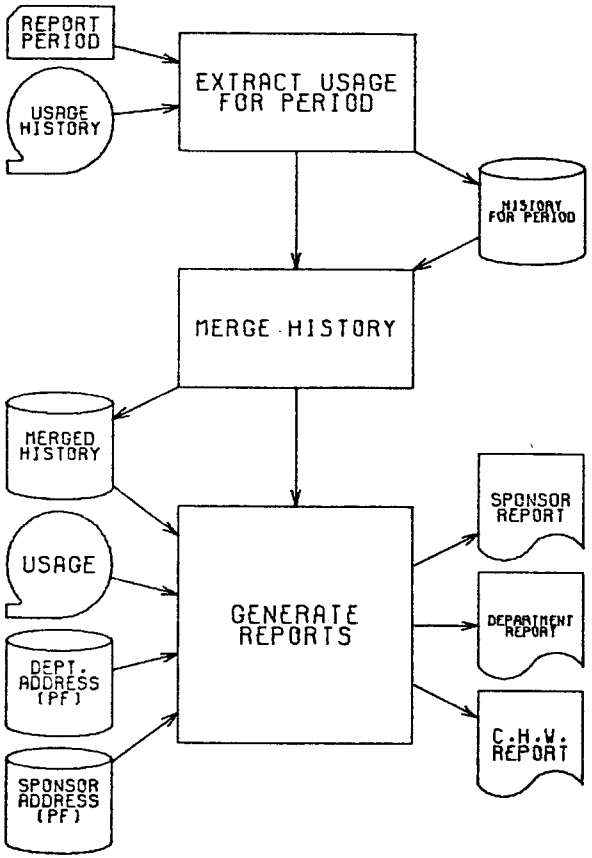

```
C ***** ACCOUNTS RECEIVABLE *****
F P 4.5 10 6/- ACCOUNTS RECEIVABLE -/
F P * *-.5 /25 AUGUST 1973/
F P * *-.5 6/- COMPANY DIRECTORY -/
B 1.5 *-.5 2.4/COMPANY/ 1.5// .6/RELATIVE//WORD/ 1.5/RELATIVE SECTOR/
F P 4.5 *-.5 6/- ACCOUNTS RECEIVABLE ENTRY -/
B 1.5 *-.5 2.4/COMPANY/ 3.6
B I .1 T .1 S .1 C .1 H .2 .9/EXP. YEAR/ .9/EXP. BATCH/L.9/CODE NO./
B =L+.45 * .9/LAST NO./ .9/NO. CHARGES/ .9/NO. PLANTS/
D TEXT .07
N =C+.3 =C-.4 EX /EXPIRED/
N SLE /SUPPLY CHARGES EXHAUSTED/
N TLE /SERVICES CHARGES EXHAUSTED/
N IN /INACTIVE/
L (>) =EX =EX =C * * =C
L (>) =SLE =SLE =S * * =S
L (>) =TLE =TLE =T * * =T
L (>) =IN =IN =I * * =I
D TEXT .14
N 1.5 =T-1 /CHARGE (OR OUTSTANDING CHARGE):/
B * *-.4 .2/I/ .2/T//S/ .2/O//C/ .2 .2 .2/*/ .9/BATCH/ 3.9/ACCOUNT/
B 3/AMOUNT BILLED/ 3/CHARGE/
N 1.5 *-.3 /PLANT:/
B * *-.4 .2/I/ 5.8/PLANT NO./
B 2.1/ORDERS YTD/ 1.5/ORDERS SLB/ 1.2/NO. TYPES/ 1.2/NO. ITEMS/
D BOX .6
B 6 /PLANT//NAME/
D BOX .3
B 3/SERVICES - PREVIOUS BILLINGS/ 3/SUPPLIES - PREVIOUS BILLINGS/
N 1.5 *-.3 /ITEM:/
B * *-.4 .6/CODE/ 5.4/TALLY - SINCE LAST BILLING/
```

PRINT TABLE OF 1000 PRIMES
(KNUTH, PAGE 144)



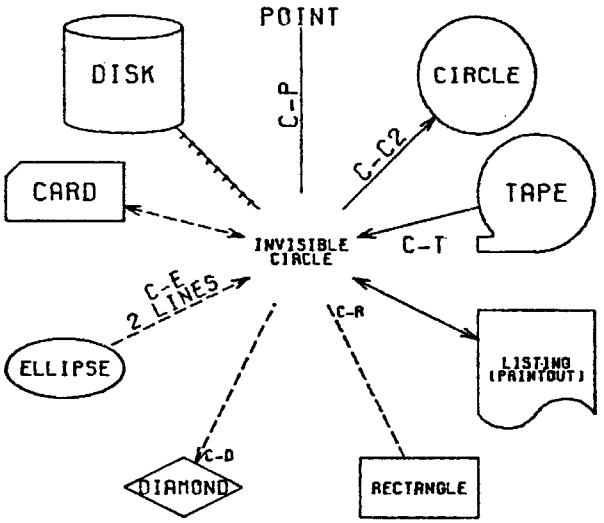

```
F P TITLE 4 10 8 /PRINT TABLE OF 1000 PRIMES//(KNUTH, PAGE 144)/
D FORM 1.5 TEXT *1
G ASCII
F R P1 *-2 *-1.5 /P1//START TABLE/
L (<) * * * *+1
F R P2 * =P1-2 /P2//N IS PRIME/
J P1 P2 (>)
F D P3 * *-2 /P3//WAS 1000 FOUND//?/
J P2 P3 (>)
F R P9 * *-2 /P9//PRINT TITLE/
J P3 P9 (>C)  /YES/
F D P7 =TITLE =P2 /P7//IS PRIME(K) LARGE//?/
J P2 P7 (<) /YES/
F R P4 * *-2 /P4//ADVANCE N/
J P3 P4 (>) /NO/
F R P10 * *-2 /P10//SET UP LINE/
J P9 P10 (>)
F R P8 =TITLE+2 =P1 /P8//ADVANCE K/
L (>C) =P7 =P7 * =P8 /NO/ =P8 *
F D P6 =P8 =P7 /P6//IS N PRIME//?/
J P8 P6 (>)
J P7 P6 (<) /NO/
J P4 P6 (<C) /YES/
F R P5 =P8 =P4 /P5//K := 2/
J P6 P5 (<)
J P4 P5 (>)
F R P11 =P8 =P10 /P11//PRINT LINE/
J P10 P11 (>)
L (>C) * * * *-1 /DONE/
L (>) =P11 =P11 * *+1 =P10 * * =P10
```

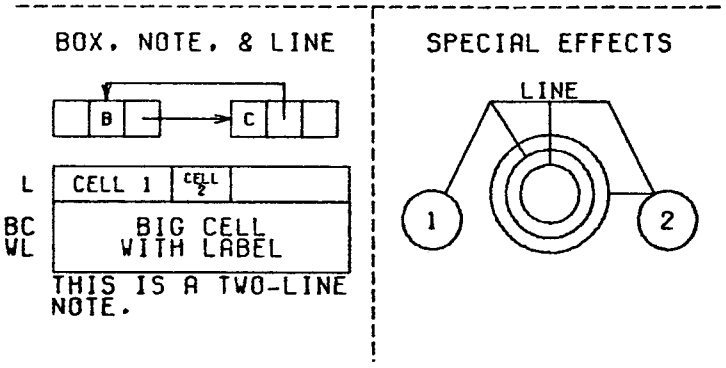
SPONSOR AND DEPARTMENTAL
REPORT GENERATION



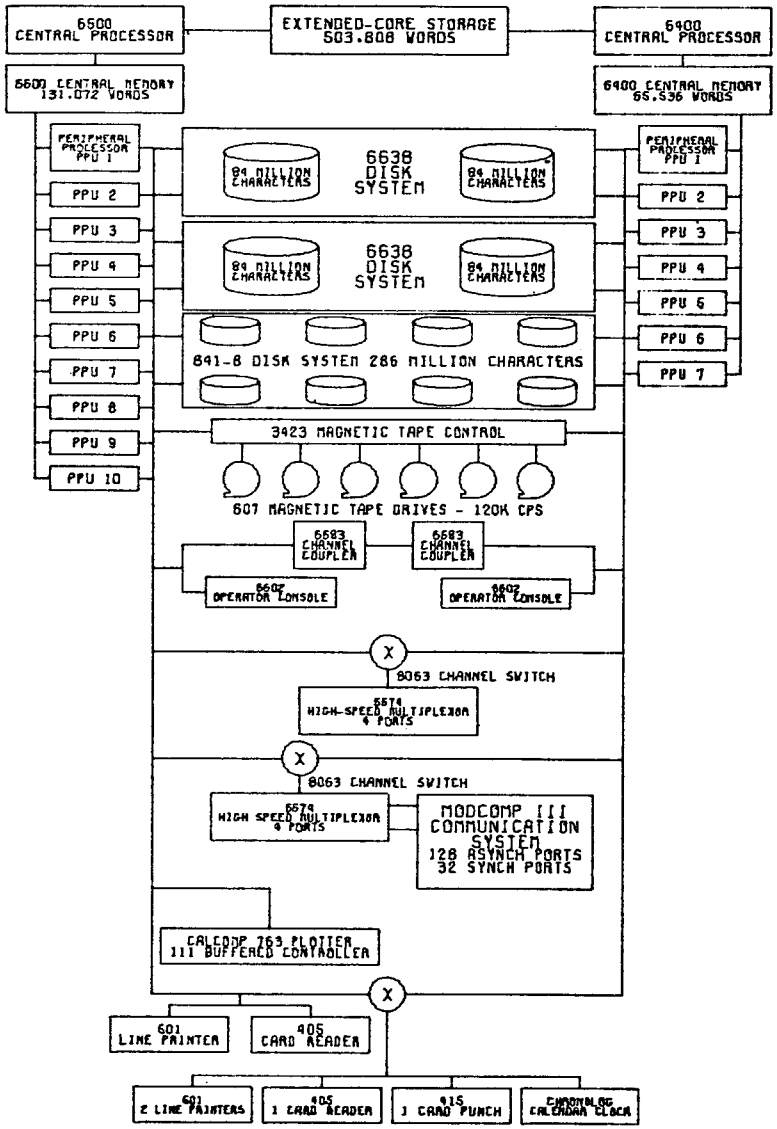

```
F P BEGIN 4 10 8 /SPONSOR AND DEPARTMENTAL//REPORT GENERATION/
F R X * *-1.5 2 /EXTRACT USAGE//FOR PERIOD/
F CARD C *-2 *+.5 /REPORT//PERIOD/
J C X (>)
F T H * *-.75 /USAGE//HISTORY/
J H X (>)
F DISK H2 =X+2 =X-1 /HISTORY//FOR PERIOD/
J X H2 (>)
F R M =X =X-2 2 /MERGE HISTORY/
J X M (>)
J H2 M (>)
F DISK MH *-2 *-1 /MERGED//HISTORY/
J M MH (>)
F T U * *-1 /USAGE/
F DISK D * *-1 /DEPT.//ADDRESS//(PF)/
F DISK S * *-1 /SPONSOR//ADDRESS//(PF)/
F R G =M =M-2.5 2 2 /GENERATE//REPORTS/
J M G (>)
J MH G (>)
J U G (>)
J D G (>)
J S G (>)
F PRINT SR *+2 *+1 /SPONSOR//REPORT/
J G SR (>)
F PRINT DR * *-1 /DEPARTMENT//REPORT/
J G DR (>)
F PRINT WR * *-1 /C.H.W.//REPORT/
J G WR (>)
```

FORM & JOIN






```
GRAPHICS ASCII
DEFAULT FORM 1
C
C FORM STAR FIGURE
FORM POINT 4.5 10 6 /FORM ^ JOIN/
FORM -CIRCLE C * *-3 /INVISIBLE//CIRCLE/
F POINT P * *+2 /POINT/
JOIN C P /C-P/
F C C2 *+1.5 *-.5 /CIRCLE/
J C C2 (>) /C-C2/
F TAPE T *+.5 *-1 /TAPE/
J C T (<C) /C-T/
F PRINT P * *-1.5 /LISTING//(PRINTOUT)/
J C P (<>)
F RECTANGLE R *-1 *-1 /RECTANGLE/
J C R (-1) /C-R/
F DIAMOND D *-2 * /DIAMOND/
J C D (->2) /C-D/
F ELLIPSE E *-1 *+1 /ELLIPSE/
J C E (<-) /C-E/ /2 LINES/
F CARD CARD * *+1.5 /CARD/
J C CARD (<->)
F DISK D *+.5 *+1 /DISK/
J C D (T)
LINE (-) L =C-3 =C-3 *+6 *
L (-) =C =L * 1
C
C
F P P =C-1.5 =L-.3 3 /BOX, NOTE, ^ LINE/
BOX *-1.2 *-.8 C1 .3 // C2 .3 /B/ C3 .3
B *+1.5 * C4 .3 /C/ C5 .3 .3
J =C3 C4 (>)
LINE (>) =C5 =C5+.001   * *+.3   =C2 *   * =C2
B =P-1.2 =C1-.7 /L/ 1 /CELL 1/ .5 /CELL//2/ 1
D BOX .6
B /BC//WL/ 2.5 /BIG CELL//WITH LABEL/
NOTE /THIS IS A TWO-LINE/
N /NOTE./
C
C
F P P =C+1.5 =L-.3 3 /SPECIAL EFFECTS/
L L1 =P-.5 *-.5 =P+.5 * /LINE/
F C C1 =p-1 *-1 .5 /1/
F C C2 =p+1 * .5 /2/
J C1 L1 P1
J L1 C2 P2
F C C3 =P * .5
F C C4 * * .75
F C C5 * * 1
J C3 L1
J C4 P1
J C5 P2
```




```
F P TITLE 4.25 10.7 8 /THE UNIVERSITY OF TEXAS AT AUSTIN/
F P * *-.2 8 /CDC 6600-6400 CONFIGURATION/
D TEXT V.1
F R ECS * *-.5 2 .4 /EXTENDED-CORE STORAGE//503,808 WORDS/
C
C 6600 CP, PP-S, AND CHANNELS
F R CP66 *-2.5 * 1.5 .4 /6600//CENTRAL PROCESSOR/
J CP66 ECS
F R CM66 * *-.5 1.5 .4 /6600 CENTRAL MEMORY//131,072 WORDS/
J CM66 CP66
F R PP1 * *-.5 .75 .4 /PERIPHERAL//PROCESSOR//PPU 1/
F R PP2 * *-.4 .75 .2 /PPU 2/
F R PP3 * *-.3 .75 .2 /PPU 3/
F R PP4 * *-.3 .75 .2 /PPU 4/
F R PP5 * *-.3 .75 .2 /PPU 5/
F R PP6 * *-.3 .75 .2 /PPU 6/
F R PP7 * *-.3 .75 .2 /PPU 7/
F R PP8 * *-.3 .75 .2 /PPU 8/
F R PP9 * *-.3 .75 .2 /PPU 9/
F R PP10 * *-.3 .75 .2 /PPU 10/
L (I) CMPP =PP1-.5 =PP1 * *-7
J PP1 CMPP P1
J PP2 CMPP
J PP3 CMPP
J PP4 CMPP
J PP5 CMPP
J PP6 CMPP
J PP7 CMPP
J PP8 CMPP
J PP9 CMPP
J PP10 CMPP P10
J P10 P1
L L =P1 =P1 * *+.3
L (I) C66 =PP1+.5 =PP1-8 =PP1+.5 =PP1
J PP1 C66 C66P1
J PP2 C66
J PP3 C66
J PP4 C66
J PP5 C66
J PP6 C66
J PP7 C66
J PP8 C66
J PP9 C66
J PP10 C66
C
C 808 DISKS
F -R D66380 =ECS =ECS-1 3.5 .4
J D66380 C66
F R D01 * *-.2 3.5 .75 /6638//DISK//SYSTEM/
F DISK D *-1 * .8 .5 ///84 MILLION//CHARACTERS/
F DISK D *+2 * .8 .5 ///84 MILLION//CHARACTERS/
F -R D66381 =D01 =D01-.2 3.5 .4
J D66381 C66
F -R D66382 =D01 =D01-.6 3.5 4
J D66382 C66
F R D02 * *-.2 3.5 .75 /6638//DISK//SYSTEM/
F DISK D *-1 * .8 .5 ///84 MILLION//CHARACTERS/
F DISK D *+2 * .8 .5 ///84 MILLION//CHARACTERS/
F -R D66383 =D02 =D02-.2 3.5 .4
J D66383 C66
C NOTE: THERE ARE 135 MORE DIRECTIVES REQUIRED TO PRODUCE THE DIAGRAM.
```