

Tektronix  
4050 Series

Applications Library  
Program Documentation

<b>Applications</b>	<b>Library</b>
<b>Applications</b>	<b>Library</b>
<b>Applications</b>	<b>Library</b>
<b>Applications</b>	<b>Library</b>
<b>Applications</b>	<b>Library</b>
<b>Applications</b>	<b>Library</b>
<b>Applications</b>	<b>Library</b>
<b>Applications</b>	<b>Library</b>
<b>Applications</b>	<b>Library</b>
<b>Applications</b>	<b>Library</b>
<b>Applications</b>	<b>Library</b>

CAD D1

The program material contained herein is supplied without warranty or representation of any kind. Tektronix, Inc., assumes no responsibility and shall have no liability, consequential or otherwise, of any kind arising from the use of this program material or any part thereof.

Duplication of this documentation or program material for further distribution is restricted to Tektronix, Inc., its subsidiaries and distributors.

Prepared by the 4050 Series Applications Library. The 4050 Series Applications Library is maintained as a service for our customers by the Information Display Division of Tektronix, Inc., Group 451, P.O. Box 500, Beaverton, Oregon 97077 U.S.A.



CAD D1

062-5977-01

DOCUMENTATION

Applications Library  
Group 451  
Tektronix, Inc.  
P.O. Box 500  
Beaverton, Oregon 97007



# DESKTOP COMPUTER APPLICATIONS LIBRARY PROGRAM

TITLE		PART NUMBER  062-5977-01
CAD D1 (disk)		
ORIGINAL DATE June, 1981	REVISION DATE	

## ABSTRACT

Six programs contained on CAD D1 (disk) help you design an infinite variety of structures or draft complicated layouts. You could incorporate the transformation algorithm into your own programs. And one program will even predict the performance of any sail craft you may have on your drawing board. The individual abstracts describe the programs.

If you have only one disk unit, you may want to transfer the Telephone Cable Layout program to its own disk. This will allow plenty of room on that disk as well as the CAD D1 disk for data files. See the documentation for further instructions on transferring.

Be sure to read the documentation before running the programs.

OLD "\$DIRECTORY" and choose your program.

<u>Title/ Previous Abstract #</u>	<u>Disk File Name</u>	<u>Documentation Page #</u>
Directory	\$DIRECTORY OLD "\$DIRECTORY"	
4052/4 Drafting Program 52/07-9538/0	@DRAFTING/PROGRAM @DRAFTING/COMPRESS @TEXT @DEMO/PDB @PUMP/PDB @BARLV/PDB @DEVELOP/PDB @HOUSE/PDB @TREE/PDB	1
Telephone Cable Layout 51/07-3302/0	@AUTOLOAD/MASTER @AUTOLOAD/BACKUP @DIGIT/MASTER @DIGIT/BACKUP @ENTRY/MASTER @ENTRY/BACKUP	39

The program material contained herein is supplied without warranty or representation of any kind. Tektronix, Inc., assumes no responsibility and shall have no liability, consequential or otherwise, of any kind arising from the use of this program material or any part thereof.

TITLE		PART NUMBER
CAD D1 (disk)		062-5977-01
Title/ Previous Abstract #	Disk File Name	Documentation Page #
Telephone Cable Layout (continued)		
51/07-3302/0	@REPORT/MASTER	
	@REPORT/BACKUP	
	@EDT/MASTER	
	@EDT/BACKUP	
	@SUB/AIK	
	@SUB/ARROW	
	@SUB/BAS	
	@SUB/CHGLAB	
	@SUB/CHGROAD	
	@SUB/CHGSYM	
	@SUB/CHAR	
	@SUB/COMPASS	
	@SUB/CONFIRM	
	@SUB/CONFIRMADD	
	@SUB/DASHSEL	
	@SUB/DELITEMNUM	
	@SUB/DIGITIZE	
	@SUB/DISBRIST	
	@SUB/DISBRMORE	
	@SUB/DISSIDE	
	@SUB/EIGHTPT	
	@SUB/FIRST	
	@SUB/FRAME	
	@SUB/HELP	
	@SUB/INIT	
	@SUB/LOGO	
	@SUB/MENU	
	@SUB/PLUS	
	@SUB/RANGEN	
	@SUB/SKEW	
	@SUB/SKMETER	
	@SUB/SKSTR	
	@SUB/SORT	
	@SUB/SRCHGIN	
	@SUB/STORE	
	@SUB/SYMBLPLT	
	@SUB/SYSTAT	
	@SUB/TABGIN	
	@SUB/TITLEIN	
	@SUB/TOL	
	@SUB/XYLMS	
	@SUB/XYLMSRCH	
Drafting Digitizer		
51/00-9543/0	@DRAFTING/MENU	97
	@DRAFTING/DIGITIZE	

TITLE		PART NUMBER
CAD D1 (disk)		062-5977-01
<u>Title/ Previous Abstract #</u>	<u>Disk File Name</u>	<u>Documentation Page #</u>
POINT Mode Digitize 52/07-9547/0	@DIGITIZE/POINT	116
3-D Transformation using Homogeneous Coordinates 51/00-9527/0	@TRANSFORM	122
Performance Prediction of Sailcraft 51/00-1606/0	@SAILCRAFT	128





# DESKTOP COMPUTER APPLICATIONS LIBRARY PROGRAM

TITLE		
4052/4 Drafting Program		
ORIGINAL DATE	REVISION DATE	EQUIPMENT AND OPTIONS REQUIRED
February, 1980		64K 4052 with 4952 Joystick, Opt. 2 or 64K 4054
AUTHOR	Tektronix, Inc.	PERIPHERALS
Connie Breithaupt	Rockville, MD	4907 File Manager
ABSTRACT		Optional - 4662/4663 Plotter 4956 Graphics Tablet
<p>Files: 2 Binary Program 1 Binary Data (Text) 6 Binary Data (Examples)</p> <p>Statements: 2321</p> <p>The program allows a drawing to be defined by creating, modifying and/or deleting its elements.</p> <p>The elements may be arrows, circles, lines, text, cross-hatching, and sub-drawings.</p> <p>The created drawing is called a Picture Data Base (PDB) and is stored on the 4907 File Manager. Each PDB may contain 100 different layers of display. For example, Layer 1 (the default layer) may show the PDB outline, Layer 2 the dimensions, Layer 3 the linework, etc. A frequently used symbol may be created as a PDB and then used as a Sub-PDB in other PDB's.</p>		
<p>The program material contained herein is supplied without warranty or representation of any kind. Tektronix, Inc., assumes no responsibility and shall have no liability, consequential or otherwise, of any kind arising from the use of this program material or any part thereof.</p>		

TITLE

4052/4 Drafting Program

OPERATING INSTRUCTIONS

The program consists of the following files:

DRAFTING/PROGRAM	- Binary Program - Main program
DRAFTING/COMPRESS	- Binary Program - Appended by main program
TEXT	- Binary Data - Text
DEMO/PDB	- Binary Data - Example
PUMP/PDB	- Binary Data - Example
BARLV/PDB	- Binary Data - Example
DEVELOP/PDB	- Binary Data - Example
HOUSE/PDB	- Binary Data - Example
TREE/PDB	- Binary Data - Example

To run the program mount the disk and

OLD "@DRAFTING/PROGRAM"

RUN

Respond to the questions as they are asked.

An existing PDB may be entered by entering its name; it will be opened for editing.

A new PDB may be created by entering a new name; a new file will be created and opened.

The working disk should always be in drive #0.



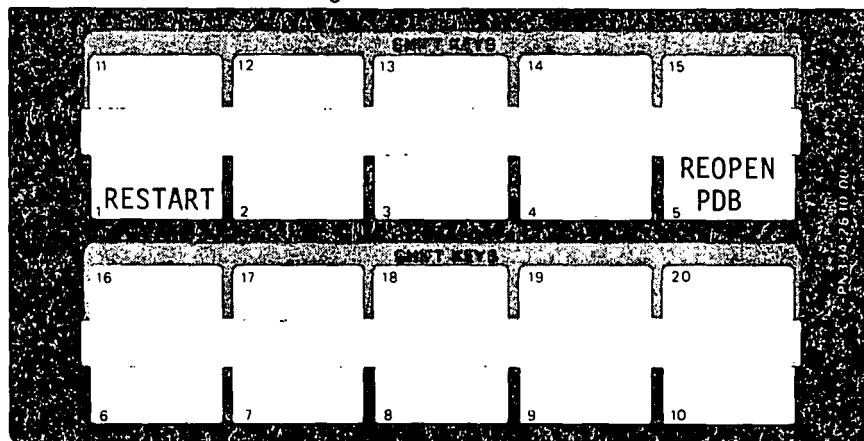
TITLE

4052/4 Drafting Program

TITLE 4052/4 Drafting

TAPE #

FILE #

UDK #Function

- |   |                              |
|---|------------------------------|
| 1 | Restarts the program         |
| 5 | Reopens the current PDB file |

TITLE

4052/4 Drafting Program

Definitions

## Picture Data Base (PDB)

A drawing exists as a Picture Data Base (PDB) on the 4907 disk. The disk file may be of any size required by the job (within the limits of free disk storage space). PDB's can be named and accessed by a name that consists of a maximum of 13 alphanumeric characters; the first character must be alphabetic and no special characters or blanks are allowed. By using the 405X and 4907 system commands, the PDB may be renamed, copied, or deleted.

## Layer

Each drawing or PDB may have 100 different layers of display (1 thru 100). For example, Layer 1 (the default layer) may show the PDB outline, Layer 2 may show dimensions, Layer 3 may show linework, etc.

## Entity

Entities are geometric forms or text that make up a drawing or a PDB. Lines, texts, circles, x-hatching, sub-PDB's, and arrows are entities.

## Sub-PDB

When a saved PDB is included as an entity in the current PDB, it is called a sub-PDB. The current PDB may contain many sub-PDB's. For example, the operator may create a PDB representing a frequently used symbol; this symbol PDB may then be used in other PDB's as a sub-PDB. If the PDB represented as a sub-PDB in the current PDB is entered and modified, the sub-PDB will reflect these modifications when the current PDB is redisplayed.

## Working Disk

The disk on which the current PDB will be stored. The working disk need not contain the drafting program. The working disk should always be in drive #0.

## Window

Portion of drawing to be displayed on the screen.

## TITLE

4052/4 Drafting Program

## PDB Layout

The PDB file is a binary, random access file with 410 byte records. The first record contains the number of entities in the PDB. The remaining records contain entity information as follows:

## Line

1, layer, dash font, X start, Y start, X end, Y end

## Text

2, layer, X position, Y position, angle, height, italics, text string

## X-hatching

3, layer, no. of lines, angle, displacement, array of line end points

## Figure

4, layer, X position, Y position, rotation, scale, figure file name

## Arrow

5, layer, X start, Y start, X end, Y end, ver or hor, arrow head size

## Circle

6, layer, X center, Y center, radius, beg angle, end angle

When an entity is erased, it is "zeroed-out" in the PDB by replacing the layer number with a Ø.

## Screen Display Format

The 405X display screen is divided into two areas. Positioned to the right is the PDB window which displays the PDB entities. This area represents a plane coordinate system for the two-dimensional entities. Position (0,0) is marked with an "X". The area to the left displays typed commands and program messages. When this area is full the screen erases and the current PDB window is automatically redrawn.

## GIN Devices

The GIN device allows you to move a graphic cursor about the display area. Once the cursor is positioned you must send the X-Y coordinate by "terminating" the GIN device.

## Joystick

Pushing the Joystick causes the graphic cursor to move in the direction pushed. The 4052 displays a graphic arrow. The 4054 displays full screen crosshairs which can be moved by the Joystick if its select button is pushed in, or by manipulating the thumb-wheels on the right side of the keyboard. Movement is terminated by pressing a keyboard character.

TITLE

4052/4 Drafting Program

### Graphic Tablet

Moving the button cursor across the tablet surface moves the graphic cursor on the screen in the same direction. Movement is terminated by pressing the correct button on the button cursor.

The tablet returns coordinates within the range X:0 to 4000 and Y:0 to 4000.

IMPORTANT: The STREAM button must be the only button pressed in on the tablet controller and the STREAM frequency indicator must be set to HIGH.

### Entity Identification

For some commands (CHG, ERA, INS XHA) it is necessary to tell the program which entity or entities to use. This is done by positioning the cursor over the desired entity and terminating the GIN device. An entity indicator, a small box, is displayed on an entity which lies within the selected tolerance range of the position indicated with the GIN device. This action shows which entity the program recognizes as the chosen one. If the entity indicator appears over the correct entity, answer "Y" to the CONFIRM question. If the entity indicator appears over the wrong entity, answer "N" to the CONFIRM question; another entity which lies within the tolerance range will be found. This action will continue until the CONFIRM question is answered with "Y" or until no more entities are found within the tolerance range.

### Errors

A system error may occur during keyboard input. (The program does not check for everything!) Press UDK #1 to restart.

If you want to stop a process after the GIN device is already activated, press BREAK once, press CR, then press UDK #1 to restart. Do not press the BREAK twice; BREAK twice will close the PDB file on the disk. If this happens, press UDK #5 to reopen the PDB file, then press UDK #1 to restart.

A bell will sound when you enter an illegal command or response.

NOTE: Keep the working disk containing the current PDB in drive #0 at all times.

TITLE

4052/4 Drafting Program

Command Format

The program's command prompt is a ">".

All entity coordinates needed for the insert commands (INS) can be entered either explicitly or implicitly.

Explicit

The command must be followed immediately (that is, with no space) by a ":" and then the keyboard typed coordinates. For example:

```
INS LIN: 100, 100, 300, 100, 200, 200, 100, 100
```

Implicit

The command is terminated by a carriage return and the coordinates indicated by the current GIN device. For example:

```
INS LIN ↵
```

use tablet or joystick to indicate coordinates

The following pages detail all commands available in the 4052/4 Drafting Program.

All words must be 3 characters long. The exceptions are the words "ON" and "UP" as in SEL GRD ON, SEL ITL ON, ZOM UP, and PAG UP.

Coordinates are indicated by (1), (2), etc. For example:

```
INS LIN (1), (2), (3), ...
```

can be entered explicitly as

```
INS LIN: 100, 100, 300, 100, 200, 200, 100, 100
          (1)      (2)      (3)      (4)
```

or implicitly as

```
INS LIN ↵
```

(1), (2), (3), ... entered thru GIN

Coordinates or values indicated within square brackets are optional. For example:

```
INS TXT (1), [(2), (3)] or PAG RGT [n]
```

TITLE

4052/4 Drafting Program

CHANGE

CHG DSH n (1)

 $0 \leq n \leq 5, \text{ int}$ 

changes the dash code of the indicated line (1) to code n

<u>n</u>	<u>Code</u>
0	_____
1	- - - - -
2	.....
3	- - - - -
4	- . - . - . - . - . - .
5	- - - - -

CHG HGT n (1)

 $0 < n \leq 1000$ 

changes the height of the indicated text (1) to height n

TITLE

4052/4 Drafting Program

COMPRESS

COM

compresses the PDB by overwriting the zeroed-out entities

it is not necessary to use COM, but it will help speed up display time and PDB search time

compress should be used immediately after erasing a group of entities; waiting too long will cause the process to take 5 to 10 minutes depending on the size of the PDB



TITLE

4052/4 Drafting Program

DISPLAY

DIS ALL

displays drawing within the current window

DIS GRD

displays grid points with the X,Y interval indicated by the parameters of SEL GRD

the grid can be displayed without being activated and vice versa

DIS LAY n

 $0 \leq n \leq 100$ 

displays only entities associated with layer n within the current window

the screen is not erased

TITLE

4052/4 Drafting Program

END

ends the program

if the SAV command was not entered before the END command,  
the current PDB can be accessed by the name entered at the  
start of the program

## TITLE

4052/4 Drafting Program

ERASE

During the creation of a PDB an entity may be defined that the operator may later wish to erase. Entities are "zeroed" from the PDB and will not be displayed when the PDB is re-drawn. Refer to the section on Entity Identification.

ERS ARW (1), [(2), ...]

erases indicated arrow(s)

(1), (2), ... must be near the arrowhead

tablet GIN is terminated by pressing the cursor "8" button;  
joystick GIN is terminated by pressing the "S" keyboard  
character

ERS CIR (1), [(2), ...]

erases indicated circle(s)

(1), (2), ... must be near the circle's center

tablet GIN is terminated by pressing the cursor "8" button;  
joystick GIN is terminated by pressing the "S" keyboard  
character

ERS LIN (1), [(2), ...]

erases indicated line(s)

(1), (2), ... must be near either end of the line

tablet GIN is terminated by pressing the cursor "8" button;  
joystick GIN is terminated by pressing the "S" keyboard  
character

TITLE

4052/4 Drafting Program

ERS PDB (1), [(2), ...]

erases indicated sub-PDB(S)

(1), (2), ... must be near the sub-PDB origin

tablet GIN is terminated by pressing the cursor "8" button;  
joystick GIN is terminated by pressing the "S" keyboard  
character

ERS TXT (1), [(2), ...]

erases indicated text

(1), (2), ... must be near the text origin

tablet GIN is terminated by pressing the cursor "8" button;  
joystick GIN is terminated by pressing the "S" keyboard  
character

ERS XHA (1), [(2), ...]

erases indicated cross-hatching(s)

(1), (2), ... must be near the cross-hatching origin

tablet GIN is terminated by pressing the cursor "8" button;  
joystick GIN is terminated by pressing the "S" keyboard  
character

TITLE

4052/4 Drafting Program

INSERT

Entities can be inserted into the PDB at the indicated position.

INS ARW HOR (1), (2), [(3), ...]

inserts a horizontal arrow with arrowhead at position (1) and tail at position (2), arrowhead at position (3), tail at position (4), etc...

the size of the arrowhead is determined by the parameter of  
SEL ARW

if the tablet is the GIN device, arrows are inserted when the "1" button is pressed; pressing the "8" button terminates GIN

if the joystick is the GIN device, arrows are inserted when any keyboard character is struck; striking the "S" character terminates GIN

active grid affects all coordinates

INS ARW VER (1), (2), [(3), ...]

inserts a vertical arrow with arrowhead at position (1) and tail at position (2), arrowhead at position (3), tail at position (4), etc...

the size of the arrowhead is determined by the parameter of  
SEL ARW

if the tablet is the GIN device, arrows are inserted when the "1" button is pressed; pressing the "8" button terminates GIN

if the joystick is the GIN device, arrows are inserted when any keyboard character is struck; striking the "S" character terminates GIN

active grid affects all coordinates

TITLE

4052/4 Drafting Program

INS CIR r (1), (2), (3)

inserts a circle of radius r at center (1); (2) and (3) indicate the beginning and ending angles

keyboard entry is not available

active grid affects only coordinate (1)

INS LIN (1), (2), [(3), ...]

inserts lines (1)-(2), (2)-(3), etc...

if the tablet is the GIN device, lines are inserted when the "1" button is pressed; if the "4" button is pressed, a move is indicated; pressing the "8" button terminates GIN

if the joystick is the GIN device, lines are inserted when a keyboard character is truck; striking the "M" character indicates a move; striking the "S" character terminates GIN

active grid affects all coordinates

INS PDB file name (1)

inserts the indicated sub-PDB at position (1)

the rotation and scale of the sub-PDB is determined by the parameters of SEL PDB

a message prints to give time to insert the disk containing the sub-PDB in drive #1 if it doesn't already exist in drive #0

the disk in drive #1, then the disk in drive #0 is searched to find the indicated PDB; if the PDB does not exist, an error message prints, and the program continues

active grid affects coordinate

TITLE

4052/4 Drafting Program

INS TXT text (1), [(2), (3)]

inserts text at position (1)

coordinates (2) and (3), if indicated, determine the angle at which the text is displayed; if coordinates (2) and (3) are not indicated, the angle is determined by the parameter of SEL ANG

text height is determined by the parameter of SEL HGT

italics is determined by the parameter of SEL ITL

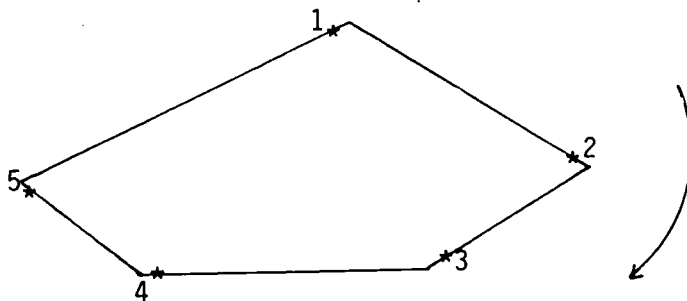
input can be terminated after (1) by pressing the "8" button if the tablet is the GIN device or the "S" keyboard character if the joystick is the GIN device

active grid affects only coordinate (1)

INS XHA (1), (2), [(3), ....., (10)]

inserts cross-hatching in a region created by contiguous lines (1), (2), ....

when specifying the boundary of the region, indicate the lines consistently clockwise or counter-clockwise



the cross-hatching angle and displacement are determined by the parameters of SEL XHA

tablet input is terminated by pressing the "8" button on the cursor; joystick input is terminated by striking the "S" keyboard character



TITLE

4052/4 Drafting Program

LIST

## LIS PAR

list the selectable parameters

real values are rounded to the nearest hundredths

## LIS PDB

lists the contents of the PDB files (see PDB file Layout)

real values are rounded to the nearest hundredths

TITLE

4052/4 Drafting Program

PAGE

## PAG DWN [n]

pages the display downward by n% of the current window

all layers are displayed

if n is not indicated, the display is paged downward 50%

## PAG LFT [n]

pages the display to the left by n% of the current window

all layers are displayed

if n is not indicated, the display is paged 50% to the left

## PAG RGT [n]

pages the display to the right by n% of the current window

all layers are displayed

if n is not indicated, the display is paged 50% to the right

## PAG UP [n]

pages the display upward by n% of the current window

all layers are displayed

if n is not indicated, the display is paged upward 50%

TITLE

4052/4 Drafting Program

PAUSE

PAU

pauses or stops the program and enters 405X calculator mode

BASIC mode can be re-entered by pressing UDK #1

TITLE

4052/4 Drafting Program

RESTART

RES

restarts the program and asks for a new PDB name

TITLE

4052/4 Drafting Program

SAVE

SAV filename n

n = 0 or n = 1

saves the PDB with the indicated filename on drive n

the filename must be 9 or less alphanumeric characters,  
begin with an alphabetic character, and contain no  
special characters or blanks

if the filename is the same as the PDB name given at  
the start of the program, it can only be stored on  
drive #1

TITLE

4052/4 Drafting Program

SELECT

The display appearance and operation function parameters can be selected by the operator to affect subsequent operations or inserted entities. For example, the operator can select a dash code so that subsequent lines will be dashed instead of solid (default).

All display appearance and operation functions have default values.

SEL ANG n

 $0 \leq n \leq 360$ 

selects text angle

affected command: INS TXT

default:  $n = \emptyset$ 

SEL ARW n

 $0 \leq n \leq 1000$ 

selects arrowhead size

if  $n = \emptyset$ , a straight line with no arrowhead will be drawn

affected commands: INS ARW HOR, INS ARW VER

default:  $n = 10$





## TITLE

4052/4 Drafting Program

## SEL GRD OFF

all subsequent coordinates are read exactly as input  
default

## SEL GRD ON

certain subsequent coordinates are read as the coordinate  
of the nearest grid point

SEL GRD ON does not display the grid; use DIS GRD to  
view grid

## SEL HGT N

 $0 < n \leq 1000$ 

selects text height

affected command: INS TXT

default:  $n = 25$

## SEL INP n

 $0 \leq n \leq 64, \text{int}$ 

selects the input device address when implicit input is  
required by a command

if  $n = \emptyset$ , the joystick (4052) or crosshair (4054) is  
indicated

if  $n = \#$ ,  $n$  is the tablet address

default:  $n = \emptyset$

TITLE

4052/4 Drafting Program

SEL ITL OFF

selects non-italic text

affected command: INS TXT

default

SEL ITL ON

selects italic text

affected command: INS TXT

SEL TOL n

 $0 \leq n \leq 1000$ 

selects the tolerance range to be used when existing entities are to be found

if  $n = \emptyset$ , n is calculated to be 1% of the current windowdefault:  $n = \emptyset$ 

SEL TRA n, m

 $-1000 \leq n, m \leq 1000$ 

selects the X (n) and Y (m) amount of translation

affected command: TRA LIN

defaults:  $n = 100, m = 100$

TITLE

4052/4 Drafting Program

SEL WIN (1), (2)

displays a window with lower left coordinate (1) and upper right coordinate (2)

coordinate (2) will be adjusted to maintain the correct aspect ratio

ZOM WIN (1), (2) is identical to SEL WIN (1), (2)

active grid affects both coordinates

SEL XHA n, m

$0 \leq n \leq 360, 0 < m \leq 100$

selects the angle (n) and line displacement (m) of cross-hatching

affected command: INS XHA

defaults:  $n = 45, m = 20$

SEL LAY n

$0 \leq n \leq 100$

selects layer number to which subsequent entities are associated

affected command: DIS LAY

default:  $n = 1$

TITLE

4052/4 Drafting Program

SEL OUT n

 $1 \leq n \leq 64$ , int

selects the output device address on which to display, page,  
window, or zoom the drawing

if  $n \neq 32$ , n is maintained for only one output; after the  
output, n reverts to 32

affected commands: DIS, PAG, ZOM, SEL WIN

## TITLE

4052/4 Drafting Program

TRANSLATE

TRA LIN n (1), [(2), (3)]

 $0 < n \leq 100$ , int

translates and copies the indicated line (1), n times, by an increment of  $X(3)-X(2)$  in the X direction and  $Y(3)-Y(2)$  in the Y direction

if (2) and (3) are not indicated, the increment amount is determined by the parameters of SEL TRA

to stop input after (1), press the "8" button if the GIN device is the tablet, or strike the "S" character if the GIN device is the joystick

active grid affects only coordinates (2) and (3)

TITLE

4052/4 Drafting Program

ZOOM

## ZOM ALL

displays a window with lower left coordinate (0,0) and upper right coordinate (4000,4000)

if entities are outside this range, the desired window can be displayed using the ZOM WIN (1) (2) or SEL WIN (1) (2) commands

## ZOM DWN [n]

 $0 < n \leq 1000$ 

shrinks the current window by n%

if n is not indicated, the window is zoomed down by 50%

## ZOM UP [n]

 $0 < n < 100$ 

magnifies the current window by n%

if n is not indicated, the window is zoomed up by 50%

## ZOM WIN (1), (2)

displays a window with lower left coordinate (1) and upper right coordinate (2)

coordinate (2) will be adjusted to maintain the correct aspect ratio

ZOM WIN (1), (2) is identical to SEL WIN (1), (2)

active grid affects both coordinates

# 4052/4 DRAFTING PROGRAM REFERENCE CARD

## CHG

DSH line font (1)  
(1) - line selection  
HGT text height (1)  
(1) - text selection

## COM

## DIS

ALL  
GRD  
LAY layer number

## END

## ERS

ARW (1), [(2), ...]  
CIR (1), [(2), ...]  
PDB (1), [(2), ...]  
LIN (1), [(2), ...]  
TXT (1), [(2), ...]  
XHA (1), [(2), ...]  
(1), (2), ... entity selection

## INS

ARW  
HOR (1), (2), [(3), (4), ...]  
VER (1), (2), [(3), (4), ...]  
(1), (3), ... arrowhead position  
(2), (4), ... tail position

## INS

CIR radius (1), (2), (3)  
(1) - center  
(2) - start position  
(3) - end position  
PDB (1)  
(1) sub-PDB position  
LIN (1), (2), [(3), (4), ...]  
(1), (2), ... line end points  
TXT (1), [(2), (3)]  
(1) - text position  
(2) & (3) - indicates text angle  
XHA (1), (2), [(3), ..., (10)]  
(1), ..., (10) line selections

## LIS

PAR  
PDB

## PAG

DWN [n]  
LFT [n]  
RGT [n]  
UP [n]  
n - % of window

## PAU

## RES

SAV file name, drive number

## SEL

ANG text angle  
ARW arrowhead size  
DSH dash code  
PDB figure rotation, figure scale  
GRD X grid interval, Y grid interval  
GRD OFF/ON  
HGT text height  
INP input device address  
if Ø, joystick  
ITL OFF/ON  
LAY layer number  
OUT output device address  
TOL tolerance range  
if Ø, calculated to 1% of window  
TRA X amount, Y amount  
WIN (1), (2)  
(1) - lower left  
(2) - upper right  
XHA x-hatch angle, x-hatch displacement

## TRA

LIN no. of translations (1), [(2), (3)]  
(1) - line selection  
(2) & (3) - indicates amount of translation displacement

## ZOM

ALL  
DWN [n]  
UP [n]  
n - % of window  
WIN (1), (2)  
(1) - lower left  
(2) - upper right

4052/4 Drafting Program .

TITLE

PAGE NO: 29



TITLE

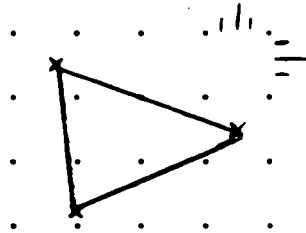
4052/4 Drafting Program

## Hints on Creating a PDB

STREAM mode must be used in order to track the tablet's cursor position on the screen. It is necessary to press CLEAR before indicating a coordinate.

A displayed and activated grid helps indicate exact coordinate positions, but too fine a grid can clutter the screen. A suggestion is to display a large grid then activate a smaller one. For example:

```
SEL GRD 100
DIS GRD
SEL GRD 25
SEL GRD ON
```



Although points at 25 unit intervals are not displayed, they are activated and can easily be sighted using either tablet cursor or crosshair.

The PDB can be set up for multi-colored plots by selecting a layer using SEL LAY n, then inserting entities (INS LIN, INS CIR, etc.).

When sending the drawing to the plotter use the default plotter window (that of power-up) or a plotter window of a similar aspect ratio.

The program can be stopped at anytime by pressing the BREAK key twice, and restarted by pressing UDK #1. For example, displaying drawing or grid can be stopped without any ill effect (and can save time).

Sometimes SEL GRD n will give an ? error. Simply enter SEL GRD n, n to correct.

TITLE

4052/4 Drafting Program

EXAMPLES

PDB name: DEMO

Enter PDB DEMO, ZOOM the window you want to plot using ZOM WIN or SEL WIN, specify plotter output using SEL OUT 1 (or the plotter device number), and plot drawing using DIS ALL.

It is recommended that you use the default plotter window (that of power up) or a window of the same aspect ratio.

D

TITLE

4052/4 Drafting Program

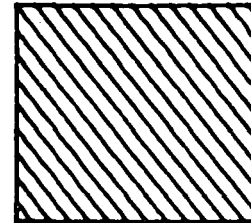
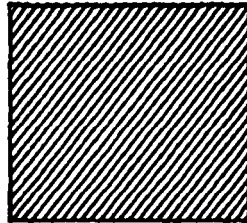
## TEXT FEATURES

DIFFERENT SIZES

*ITALICS*

ANGLED

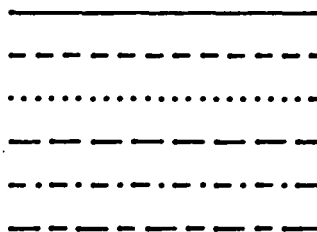
## CROSS HATCHING



## CIRCLES



## DASH LINES



## DIMENSION ARROWS

Horizontal Vertical 

## OTHER DRAFTING FEATURES

Insert rotated and scaled sub-PDB's

Translate lines

Change line dash and text height

Select and activate grid

Zoom, window, and page PDB

100 different layers

Erasure of all inserted entities

Save PDB with selected name

Output PDB to plotter

TITLE

4052/4 Drafting Program

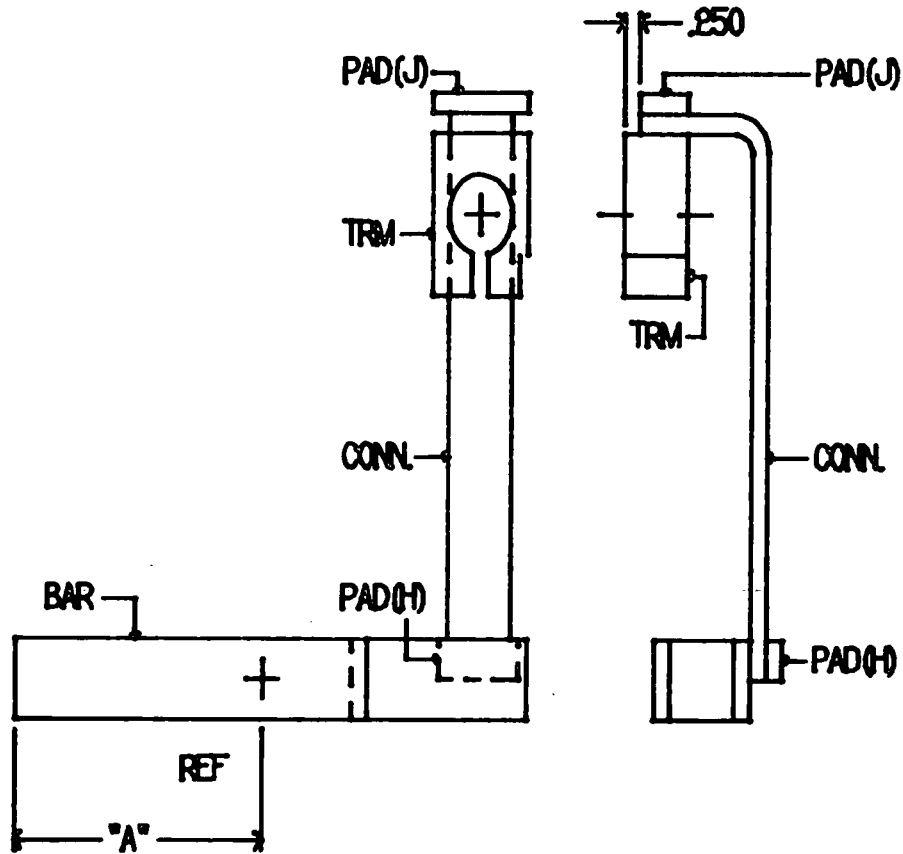
ABSTRACT NO:

PDB name: PUMP

Enter the PDB PUMP, ZOOM the window you want to plot using ZOM  
WIN or SEL WIN, specify plotter output using SEL OUT 1 (or the  
plotter device number), and plot drawing using DIS ALL.

TITLE

4052/4 Drafting Program



GR.NO	BAR	CONN	TRM	PAD(I)	PAD(J)	"A"
G56	46	87	51	35	84	7.50
G64	46	92	51	35	84	7.50

TITLE

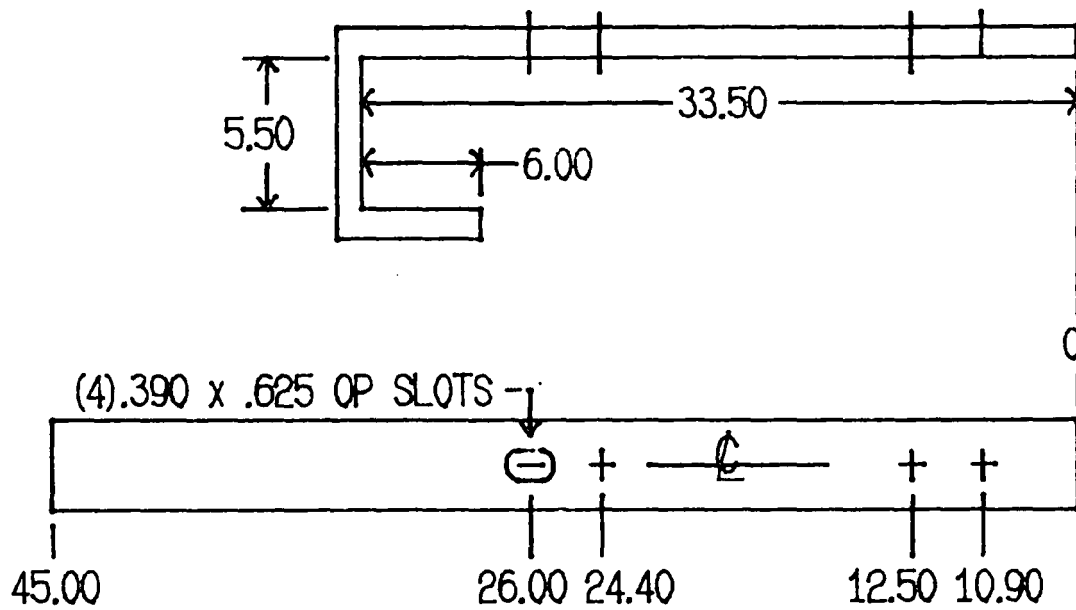
4052/4 Drafting Program

PDB name: BARLV

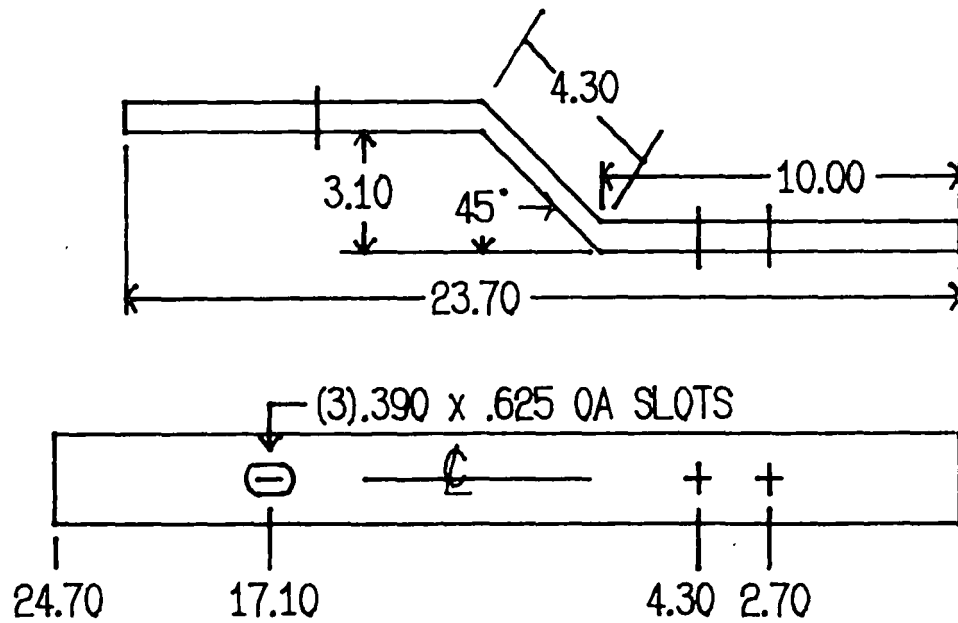
All linework is stored on layer 1 and all text is stored on layer 2. Thus, by using DIS LAY 1 and DIS LAY 2, pen changes can be made.

TITLE

4052/4 Drafting Program



29 AL B12H60D2  
.250 x 2.00 x 45.00



31 AL B12H60D2  
.250 x 2.00 x 24.00

TITLE

4052/4 Drafting Program

PDB name: DEVELOP

This drawing is made up of two sub-PDB's, HOUSE and TREE. The origin of each is the lower left corner. Both were inserted at their original scale and at half scale (using the SEL PDB command).

The houses are stored on layer 1, and the trees and ground lines are stored on layer 2. Thus, by using DIS LAY 1 and DIS LAY 2 pen changes can be made.

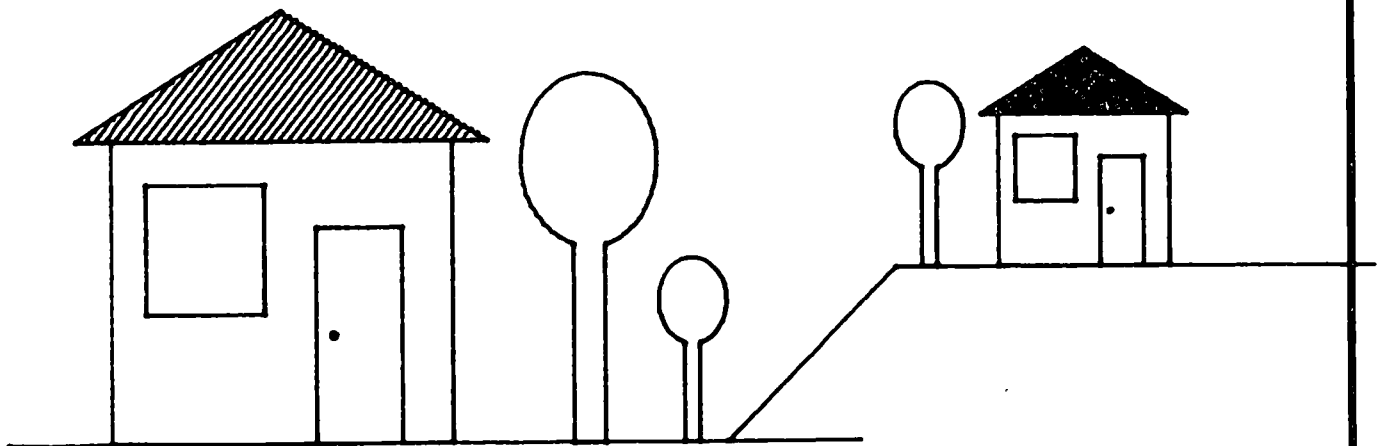
Create a PDB of your own and use INS PDB HOUSE and INS PDB TREE to create your own drawing.



TITLE

4052/4 Drafting Program

DEVELOPMENT XYZ





# DESKTOP COMPUTER APPLICATIONS LIBRARY PROGRAM

TITLE		
Telephone Cable Layout		
ORIGINAL DATE	REVISION DATE	EQUIPMENT AND OPTIONS REQUIRED
May, 1979		32K
AUTHOR	Tektronix, Inc.	PERIPHERALS
Len Olson	Rockville, MD	see below
ABSTRACT		
<p>4907 File Manager  4956 Graphic Tablet  4663 Plotter  4641 Printer  Optional - 4631 Hard Copy Unit</p>		
Files: 48		
Statements: 4500		
<p>A unique package allows the user to 1) draft telephone cable staking sheets, and 2) inventory parts for the resulting cable network.</p> <p>The staking sheets are composed and edited by adding or deleting discrete elements rather than inserting or deleting moves and draws within the plot. A Basic Road Library and Symbol Library constructed by the user provide a reservoir of standard road segments and constant symbols. Meter location details, variable symbols, cable layout and annotations complete the staking sheet elements.</p> <p>The graphic input may come from the 4956 Tablet or the 4663 Plotter. Graphic output may be sent to the 4050 Series graphic screen or 4663 Plotter. The user may choose one of four colors for each element. The parts inventory list is sent to the 4641 Printer.</p> <p>Four programs help the user do the job. The Digitizer Program initiates the 4956 Tablet and helps the user construct the Basic Road Library and Symbol Library. The Basic Road Library is a collection of basic roads digitized in centerline format (alternating arcs using three points) and straight line segments. The program calculates the curb lines and rights-of-way lines which are stored along with the road sections in the Library.</p>		
<p>The program material contained herein is supplied without warranty or representation of any kind. Tektronix, Inc., assumes no responsibility and shall have no liability, consequential or otherwise, of any kind arising from the use of this program material or any part thereof.</p>		

TITLE

## TELEPHONE CABLE LAYOUT

The Symbol Library contains digitized and named relocatable symbols or subpictures. They are stored as sequences of relative moves and draws. The basic road segments or symbols may be deleted as well as added to their respective libraries.

Once the two Libraries are set up, through 48 commands the user interacts with the Edit Program to compose, edit and display staking sheets. The user chooses a basic road section and locates it on the plotter/screen. The program will prompt for meter-location information.

## side roads

- meter location of intersection of center lines
- intersection angle
- whether road is above only, below only, or both

## symbols

- meter location
- "Y" location
- symbol name
- angle w.r.t. center line

## pedestals

- meter location
- pedestal symbol type
- location relative to right-of-way lines

## variable symbols

- start and end (fences, etc.)

These four types of entries may be deleted or moved during this phase.

The compass symbol with orientation is displayed, and curb lines for side roads are drawn. Editing may be done at this point.

Cable layout and nonsymmetric landmarks such as rivers are digitized from the 4956. When annotation is keyed in, the information is complete. A final editing may be done and the plot completed on the 4663 along with the title block. Partially completed staking sheets may be edited also.

Each job has a Master Parts List and a Master Cable List. The Information Entry Program allows the user to add part names, cable type, and construction units. Information for individual staking sheets such as Designation Standards, Meter Reading of Pedestals, and construction units and lengths of cables may be input also.

## TITLE

## TELEPHONE CABLE LAYOUT

The Summary Report Program generates a report of the part names and quantities, the cable types and lengths, for all sheet numbers or a given sheet number of a given job. Output may be to the graphic screen or the 4641 Printer.

The basic idea of this software (a skeleton road to which are added symbols, text, side roads, etc.) could be extended in a straightforward way to any layout or utility type problem. For example, a factory layout which would have a basic column grid replacing the basic road, an office layout, airplane seating layout, TV cable or any utility layout, etc.

PRELIMINARY OPERATING INSTRUCTIONS

If you have just one disk unit, you may wish to transfer all the files comprising the Telephone Cable Layout program to its own disk to allow more room for data files.

To transfer these files to disk, use the following steps.

Check pages i and ii of the documentation for the file names of the Telephone Cable Layout files.

STEP 1. Insert the CAD D1 disk into your disk unit.

CALL "MOUNT",0,A\$

OLD "@AUTOLOAD/MASTER"

STEP 2. Insert the Telephone Cable Layout disk (which has already been formatted) into your disk unit.

CALL "MOUNT",0,A\$

SAVE "@AUTOLOAD/MASTER"

Repeat steps 1 and 2 changing the file name for OLD and SAVE until you work your way through the 48 files.

TITLE

TELEPHONE CABLE LAYOUT

METHODGeneral Criteria

## 1. Device Independence

- a. Graphic input shall be available from the 4956 tablet or 4663 plotter.
- b. Graphic display shall be on 4051 screen or the 4663 plotter.

## 2. Editing

Rather than editing within objects, (that is, deleting or inserting moves and draws), editing of staking sheets will be in terms of adding/deleting and/or moving discrete elements (symbols, side roads, etc.).

## 3. Coordinates

- a. The Y direction (perpendicular to the main road center line) is approximate only, for example, 3 distances on either side will be sufficient for symbol location (near, middle, far). However, Y dimensions can be identified by phrases, (see below).
- b. The X direction is along the center line (the path taken by the metering truck).

Utilities

The following 6 utility programs will be provided (two or more may be options in a single program):

1. Directory/Status: Indicates number of staking sheets begun for a given job and their status.
2. Basic road entry: Digitizes a basic road centerline, and adds file to basic road library. The curb lines and right-of-way lines are calculated and stored as well. This program can also delete basic roads from the library.
3. Symbol Entry: This program allows naming and digitizing of relocatable symbols, or sub pictures, which can then be inserted at an arbitrary location on any staking sheet. This program can also delete symbols from the library.

TITLE

TELEPHONE CABLE LAYOUT

4. Format a disc for a new job, using customer name.
5. Edit staking sheet already composed, if desired, then plot on 4663 or 4051. Editing will allow moving, adding, or deleting of any element of the sheet.
6. Produce a sum, for each category of material, for two or more staking sheets of a given job (e.g., numbers 1, 3, 15 out of 1-20). Print this summary on the 4641 printer.

#### Main Program

##### Phase A: Basic Road and Meter-Located Elements

1. Request operator name and date. Request customer name and see if correct disc is mounted. Request "Title Block" e.g., Sheet 4 of 5, Route No. 23, Page 11. Store title block in file; display or plot.
2. Operator chooses a standard road section and locates it on the plotter/screen viewport. It is drawn (together with curb lines and right-of-ways, if desired for later reference).
3. Enter a loop requesting meter-located information:
  - a. For side roads, request meter location of intersection of center lines, intersection angle, and whether road is above only, below only, or both. Center line only is shown. (Also, request whether side road requires right-of-way).
  - b. For symbols, request meter location, "Y" location (near, middle, etc.), symbol name in library, and angle w.r.t. center line, if applicable.
  - c. For pedestals, request meter location, pedestal symbol type and location with respect to the two right-of-way lines.
  - d. For fences and other "variable symbols", for example, request start and end of fence, then draw parallel to road, together with perpendicular fences away from road, at approximate Y distance.

Note: These four types of entries can be deleted or moved at any time, during this phase.

4. The orientation angle of the plot is requested, and the compass symbol is displayed, with correct orientation.

## TITLE

## TELEPHONE CABLE LAYOUT

5. The curb lines (and right-of-way where requested) are drawn for the side roads.

Notes: a. At this point, editing may be performed and the display redrawn. If this is done, curb lines will be drawn to reflect side road locations.

b. If the plotter is being used, and the partially completed staking sheet is used for digitizing cable layouts, etc.\* it is removed from the 4663 and taped to the 4956 at this point. Skew corrections are then made, and the menu located.

Phase B: Non-Symmetric Items and Cable Layout

1. The operator sketches cable layout on the partially completed staking sheet and then digitizes these, or he digitizes using the 4956 as GIN with output on the 4051 screen. The same operation is performed with non-symmetric landmarks, e.g., rivers.
2. Phrases are entered in a similar manner; the string, size and angle from the keyboard, and GIN from the 4956 or plotter.

At this point the graphic information is complete, and after editing a final plot can be done on the 4663.

Phase C: Bill of Material and Cable Length Calculation

1. For each pedestal, and each between-pedestal segment,
  - a. parts and quantities are entered.
  - b. cable length is calculated (in-line trenching length is requested).
2. File parts are totaled, and the complete bill of materials for the staking sheet is printed on the 4641.

\* This will normally be the case.

TITLE

TELEPHONE CABLE LAYOUT

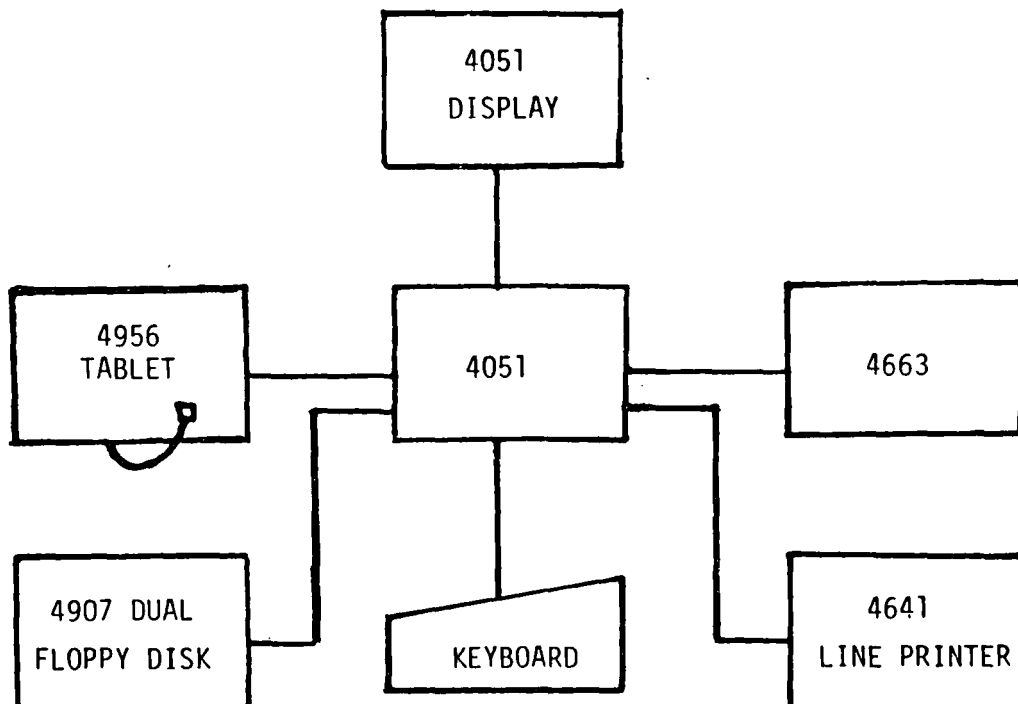
GENERAL CHARACTERISTICS

## Hardware Configuration

A block diagram of the total hardware configuration of this system is shown below. The system includes the 4051 with its keyboard and display, a 4663 Plotter, a 4641 Printer, a 4907 Dual Floppy Disc Drive, and a 4956 Graphics Tablet.

There are two possible disc configurations for the Cable Layout Program:

- One Disc Unit: All programs and storage space for the job(s) are on one floppy disc.
- Two Disc Unit: The programs are on one floppy disc (System Disc) and the storage space for the job(s) is on another floppy disc (Job Disc). The two floppies may be inserted in either of the disc units.





TITLE

TELEPHONE CABLE LAYOUT

### Location of Programs

The programs are provided as separate files on a floppy disc stored under their program names together with supporting subroutines.

### Pen Color

Provision is made in the staking sheet composition for specifying one of four colors for each element. Moreover, all elements of a given color can be plotted or omitted as a whole. This gives the ability for "layers" of different kinds of information.

TITLE

TELEPHONE CABLE LAYOUT

File Structure on the Library and Job Discs

## Basic Road

1. The library BASIC ROAD contains files with the names Rnnn/CL. The center line format was designed to allow specification of nearly any basic road shape while simultaneously permitting relatively simple graphical calculations. Each center line is an alternating sequence of arcs (each determined by 3 points) and straight line segments.

window window window window

#1: code, X min, X max, Y min, Y max

All following records will have (1) code = move or draw  
or  
(2) code = arc

#N: code = move/draw, X coord, Y coord

#N: code = arc, radius, X center, Y center, beg <, end <, arc  
coord coord of arc of arc orientation  
1 = CCW  
-1 = CW

2. The BASIC ROAD center line calculations are stored in @jobcode/Ssheet#/XYLM. This permits a rapid redraw of the center line.

Disc records will be in one of two formats:

record #; X , Y , length , corresp. , code = prev. , slope of, 0,0,0  
coord coord to this meter segment road  
point reading was a  
after draw  
calibration

record #: X , Y , length , corr., cod = prev , radius, X , Y , arc  
coord coord to this meter seg. ctr ctr orient  
point read. was an coord coord  
after arc  
calib.

TITLE

TELEPHONE CABLE LAYOUT

3. The BASIC ROAD curb line and right-of-way line calculations are stored in @jobcode/Ssheet#/PLINES. This permits a rapid redraw of curb and right-of-way lines.

For each record in BASIC ROAD 2 there will be 4 records in @jobcode/Ssheet#/PLINES 'associated' with it.

Record #1: X coord, Y coord (curb line above Basic Road)

Record #2: X coord, Y coord (curb line below)

Record #3: X coord, Y coord (right-of-way above)

Record #4: X coord, Y coord (right-of-way below)

### Symbols

Symbols are relative graphic objects composed of sequences of relative moves and draws stored in the library SYMBOL, e.g., SYMBOL/BOX. See page 14.

### Non-Symmetric Information

Non-symmetric elements are composed of sequences of relative moves and draws stored in library NONSYM, e.g., NONSYM/LINE. See page 14.

### Display List

The display list contains information detailing all elements (BASIC ROAD, side roads, symbols, labels and non-symmetric information) on a staking sheet, stored as @jobcode/Ssheet#/LIST. See page 15.

### Side Roads

Side roads are composed of 8 X.Y coordinate pairs describing the side road-basic road intersection, and are stored as @jobcode/Ssheet#/EIGHTPT. See page 16.

### Master Parts List

A Master Parts List exists for each job; it contains Part Names, which can be used as Designation Standards for Pedestals. See page 12.

TITLE

TELEPHONE CABLE LAYOUT

### Master Cable List

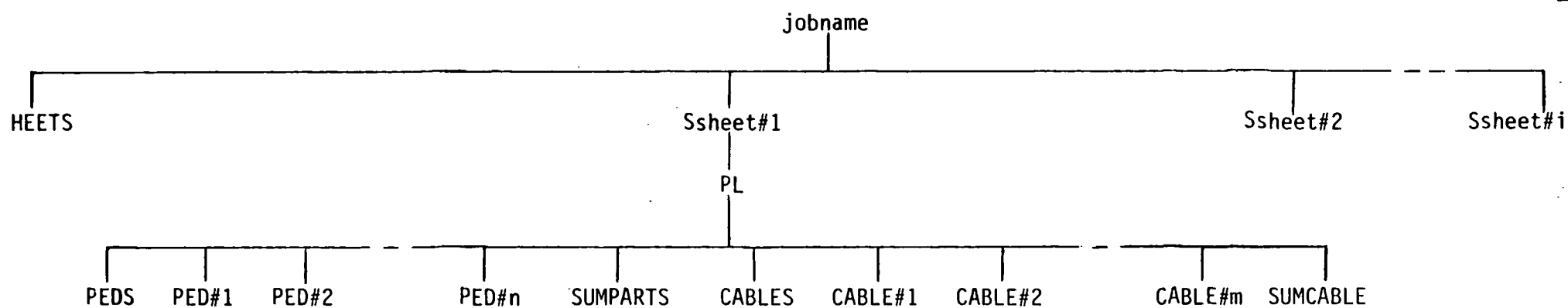
A Master Cable List exists for each job; it contains Cable Types and Construction Units which can be used at the Pedestals. See page 12.

### Staking Sheet Library

This Library is created by the ENTRY Program and is defined by a Customer Code (or Job name), as Sheet Number, a set of Pedestals and a series of Cable Names. For complete file layout see pages 11 through 14.

The Job disc contains files specific for each sheet. These are stored in the library under the customer name within that library under the sheet number. The files stored in these libraries include the display list, LIST; the title block information, TITLE; special files of assymetric information, e.g., CUST/S100/LIST, CUST/S100/TITLE.

## ENTRY Program File Layout



NOTE: Only the characters in Capital Letters are the actual characters in the File Names.

TITLE

TELEPHONE CABLE LAYOUT

## MASTER LIST (LU3)

1	Part Name #1
2	Part Name #2
	.
	.
	.
80	# of Part Names

## CABLE LIST (LU4)

1	Cable Type or Construction Unit #1
2	Cable Type or Construction Unit #2
	.
	.
	.
80	# of Cable Types and Construction Units

## jobname/SHEETS

1	# of Sheet Numbers
2	Sheet #1
3	Sheet #2
	.
	.
	.
80	

NOTE: Only the characters in capital letters are the actual characters in the file names.

TITLE

TELEPHONE CABLE LAYOUT

jobname/Ssheet#/PL/PEDS (LU5)	
1	# of Pedestal Numbers
2	Pedestal #1
3	Pedestal #2
	.
	.
	.
80	

jobname/Ssheet#/PL/PED# (LU2)	
1	quantity of Part Name from Rec. 1 in MASTERLIST
2	quantity of Part Name from Rec. 2 in MASTERLIST
	.
	.
	.
79	meter reading
80	

jobname/Ssheet#/PL/SUMPARTS (LU7)	
1	total quantity for Part Name from Rec. 1 in MASTERLIST, totaled from the 1st Rec.'s of all PED # files
2	total quantity for Part Name from Rec. 2 in MASTERLIST, totaled from the 2nd Rec.'s of all PED # files
	.
	.
	.
80	

NOTE: Only the characters in capital letters are the actual characters in the file names.

TITLE

## TELEPHONE CABLE LAYOUT

jobname/Ssheet#/PL/CABLES (LU6)

1	# of Cable Name
2	Cable Name #1
3	Cable Name #2
	.
	.
	.
80	

jobname/Ssheet#/PL/CABLE# (LU1)

1	calculated cable length of Cable Type from Rec. 1 in CABLELIST	length of Construction Unit from Rec. 1 in CABLELIST
2	calculated cable length of Cable Type from Rec. 2 in CABLELIST	length of Construction Unit from Rec. 2 in CABLELIST
	.	
	.	
	.	
77	adjoining Pedestal	
78	adjoining Pedestal	
79	in-line trenching	
80		

jobname/Ssheet#/PL/SUMCABLE (LU8)

1	total calculated cable length of Cable Type from Rec. 1 in CABLELIST, totaled from the 1st Rec., 1st value of all CABLE # files	total length of Construction Unit from Rec. 1 in CABLELIST, totaled from the 1st Rec., 2nd value of all CABLE # files
2	total calculated cable length of Cable Type from Rec. 2 in CABLELIST totaled from the 2nd Rec., 1 value of all CABLE # files	total length of Construction Unit from Rec. 2 in CABLELIST totaled from the 2nd Rec., 2nd value of all CABLE # files
	.	
	.	
	.	
79	total in-line trenchings, totaled from 79th Rec. of all CABLE # files	
80		

NOTE: Only the characters in capital letters are the actual characters in the file names.



TITLE

TELEPHONE CABLE LAYOUT

Record #1:  $X_1, Y_1, X_2, Y_2$ Record #2:  $X_3, Y_3$ Record #N:  $X_n, Y_n$ 

Disc record layout for symbols and non-symmetric information.

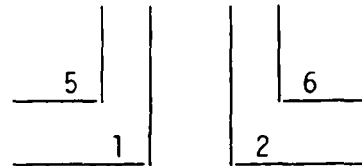
- - \* - -

Record #:	Type of,	pen	,	meter	,	X-coord,	Y-coord,	scale,	code,	rotation,	file
	element	color	location	of	of	element	element				name or
				element	element	origin	origin				label

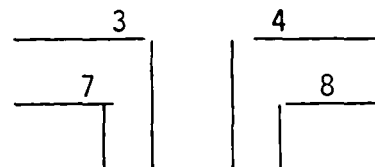
Disc record layout for display list.

TITLE

TELEPHONE CABLE LAYOUT

#1:  $X_1, Y_1$ #2:  $X_2, Y_2$ #3:  $X_3, Y_3$ #4:  $X_4, Y_4$ #5:  $X_5, Y_5$ #6:  $X_6, Y_6$ #7:  $X_7, Y_7$ #8:  $X_8, Y_8$ 

Basic Road



Disc record layout for side road.

TITLE

TELEPHONE CABLE LAYOUT

Creating and Editing a Staking Sheet

## A. Basic Road and Meter-Located Elements

1. The program requests the operator name and date. It then requests customer name and abbreviation (job code) and sees if correct disc is mounted. "Title Block" information is input, e.g., Sheet 4 of 5, Route No. 23, Page 11. This stored in a file.
2. The operator chooses a standard road section and locates it on the Plotter/Screen viewport. It is drawn (together with curb lines and right-of-ways, if desired for later reference). The sheet is calibrated from the keyboard.
3. Enter a loop requesting meter-located information:
  - a. For side roads, request meter location of intersection of center lines, intersection angle, and whether road is above only, below only, or both. Center line only is shown.
  - b. For symbols, request meter location, "Y" location (near, middle, etc.), symbol name in library, and angle w.r.t. center line, of applicable.
  - c. For pedestals, request meter location, pedestal symbol type and location with respect to the two right-of-way lines.
  - d. For fences and other "variable symbols," for example, request start and end of fence, then draw parallel to road, together with perpendicular fences away from road, at approximate Y distance. (Note: These four types of entries can be deleted or moved at any time, during during this phase.) Meter locations are added to the sheet.
4. The orientation angle of the plot is requested, and the compass symbol is displayed, with correct orientation.
5. The curb lines (and right-of-way where requested) are drawn for the side roads.

Notes: a. At this point, editing may be performed and the display redrawn. If this is done, curb lines will be drawn to reflect side road locations.

TITLE

## TELEPHONE CABLE LAYOUT

- b. If the plotter is being used, and the partially completed staking sheet is used for digitizing cable layouts, etc.,\* it is removed from the 4663 and taped to the 4956 at this point. Skew corrections are then made.

B. Non-Symmetric Items and Cable Layout

1. The operator sketches cable alyout on the partially completed staking sheet and then digitizes these, or he digitizes using the 4956 as GIN with output on the 4051 screen. The same operation is performed with non-symmetric landmarks, e.g., rivers.
2. Phrases are entered in a similar manner; the string, size and angle from the keyboard, and location from the 4956.

At this point, the graphic information is complete, and after editing a final plot can be done on the 4663.

\* This will normally be the case.

TITLE

## TELEPHONE CABLE LAYOUT

Entry Program

This program allows Part Names to be added to a Master Parts List and Cable Types and Construction Units to be added to a Master Cable List. It also allows input of information for individual Staking Sheets.

The Master Parts List contains the Part Names which can be used as Designation Standards for Pedestals. The Part Names must be less than 30 characters and are limited to 76 in number. Part Name BM70 is automatically stored in the Master Parts List. When a Part Name is added to the Master Parts List, a check is made to make sure the Part Name is not a duplicate. The opportunity to modify the Part Names when they are input is provided.

The Master Cable List contains the Cable Types or Construction Units which can be used between Pedestals. The Cable Types or Construction Unit must be less than 30 characters and are limited to 76 in number. When a Cable Type or Construction Unit is added to the Master Cable List, a check is made to make sure it is not a duplicate. The opportunity to modify the Cable Types or Construction Units when they are input is provided.

A Staking Sheet is referenced with a Customer Code and a Sheet Number. Once defined, the Customer Code (or Job name) and the Sheet Number are constant throughout the Task; i.e., if a different Customer Code and/or Sheet Number is to be referenced, the Task must be reinitiated.

The Customer Code defines the Job. It must be less than 12 characters long and must begin with an Alphabetic character. One Job can have many Sheets, each referenced by a Sheet Number. A list of existing Sheet Number is listed. The selected Sheet Number may be a new one or an old one. The Sheet Number must be 3 numeric digits. A Sheet Number like 24 must be entered as 024.

Each Sheet can have many Pedestals, each referenced by a 3 character Pedestal Number. The Pedestal Number must begin with a numeric digit. The following information is required for each Pedestal:

Meter Reading

Designation Standards - must be a Part Name from the Master Parts List; each Pedestal must contain BM70 as a Designation Standard

Designation Standard Quantities - BM70 quantity must be non-zero

Before the selection of a Pedestal Number, all existing Pedestal Numbers are listed. The selected Pedestal Number may be a new one

TITLE

## TELEPHONE CABLE LAYOUT

or an already existing one. By indicating a Pedestal Number which already exists, the Meter Reading, Designation Standard, and Quantity information is listed and the option to modify it is provided.

Adjoining Pedestals - must be an existing Pedestal; the Pedestals cannot be the same; no check is made to determine if all Pedestals are referenced or how many Cable Names reference the same Pedestal - this is the operator's responsibility.

Cable Types - must be a Cable Type from the Master Cable List; the calculated Cable Length is associated with the Cable Types.

In-line Trenching

Construction Units and Length - must be a Construction Unit from the Master Cable List; cannot be a Cable Type.

Before the selection of a Cable Name, all existing Cable Names are listed. The selected Cable Name may be a new one or an already existing one. By indicating a Cable Name which already exists, the Adjoining Pedestals, Main Cable Type, In-Line Trenching, and Construction Unit information is listed and the option of modification is provided.

The Main Cable Type length is calculated as follows:

16 + BM70 length for each adjoining pedestal  
 + Difference in the meter readings of the adjoining pedestals  
 + In-line trenching

Considerations:

Only one In-line Trenching length is allowed per Cable Name. If two Cable Types have different In-line trenching amounts, there is a simple solution. As no check is made on the connections between the Pedestals, two different Cable Names can be defined to connect the same two Pedestals. Each Cable Name would have different Cable Types and different In-line Trenching length.

The utmost caution should be exercised when defining Pedestal Numbers and Cable Names. Once entered, they will be difficult to rename or delete.

The same caution is suggested when defining the Part Names for the Master Part List and Cable Types for the Master Cable List.

TITLE

TELEPHONE CABLE LAYOUT

Summary Report

This program generates a Summary Report for a set of Sheet Numbers of a given Job. The Report can be generated for all Sheets for the given Job or for one selected Sheet.

The files created by the Entry Program are scanned for printout to the Screen or to the Line Printer. If the screen is selected output device, then a bell will ring and the <CR> must be pressed between each new Sheet listing; this is to allow time for a hard copy.

Consideration:

The Report is presently generated as a list. This can be changed to the required format by changing the PRINT statements.

TITLE

TELEPHONE CABLE LAYOUT

Digitizing Operation

This program is operated as follows:

1. Select the picture type (basic road or symbol).
2. Perform a skew operation. A reference line on the drawing is digitized so that any rotation of the paper with respect to the tablet's axes can be taken into account.
3. Select a symbol or road name.
4. Digitize a rectangle around the basic road, or symbol, called the window, which will be used later for scale calculations.
5. Enter point mode digitizing. Each point in the symbol or basic road is digitized separately. The following User Definable Keys control the operation:

No keys: Draw to the point digitized.

UDK #1: Delete last point in buffer.

UDK #2: Next point is a move.

UDK #3: Digitizing ended. Next point is a dummy to include a tablet input.

UDK #10: Next point to be digitized is the center point of an arc (actually any point between the end points of the arc). More accuracy is given by selecting a point near the center. UDK #10 is used for basic roads only (not valid in symbols).

6. After UDK #3 is pressed and the final (dummy) point is entered, the graphic information is stored to disc. In the case of a symbol, this is stored as SYMBOL/NAME. In the case of a basic road, this is stored as BASIC ROAD/Rnnn/RAW, where nnn is the sheet number.
7. In the case of the basic road, another step is performed in which the RAW file is transformed into the special center line format and is stored in the basic road library.

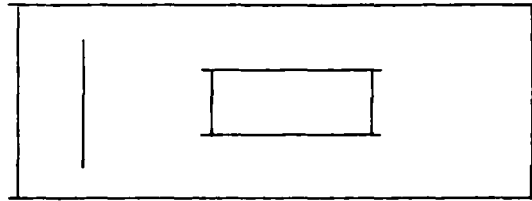


TITLE

TELEPHONE CABLE LAYOUT

In practice, this is carried out as follows:

For symbols: Draw the symbol accurately, at any scale convenient to do this. Draw a vertical line on the sheet at the left, and a rectangle (window) enclosing the symbol with its left edge to the right of the vertical line:



Mount the drawing on the tablet, and follow the instructions given by the program. When digitizing, press the cursor button to enter the point shown under the transparent crosshair.

After the last point, the information will be stored.

For Basic Roads, the procedure is identical except for two items:

1. The first point is a move, but no other moves are allowed. That is, the road must be continuous. Digitize from left to right.
2. Line segments must alternate with arcs. Each arc is assumed to begin at the end of the previous line, so it is necessary only to digitize the intermediate point and the final point. The intermediate point can be anywhere on the arc; accuracy is slightly higher near the midpoint, however. The intermediate point must be flagged by pressing UDK #10 to tell the program that it is an arc. It's not necessary to flag the third arc point. The reason that the sequence must consist of alternating lines and arcs is to allow the program to use pre-established formula to draw curb and right-of-way lines.

A sequence of points will therefore always have the same form; namely:

TITLE

## TELEPHONE CABLE LAYOUT

- move (UDK #2)
- line (no UDK)
- arc center (UDK #10)
- arc end (no UDK)
- line (no UDK)
- arc center (UDK #10)
- line end (no UDK)
- .
- .
- .
- until last point done
- then UDK #3 and any point (this point is not kept;  
it is merely to clear the tablet)

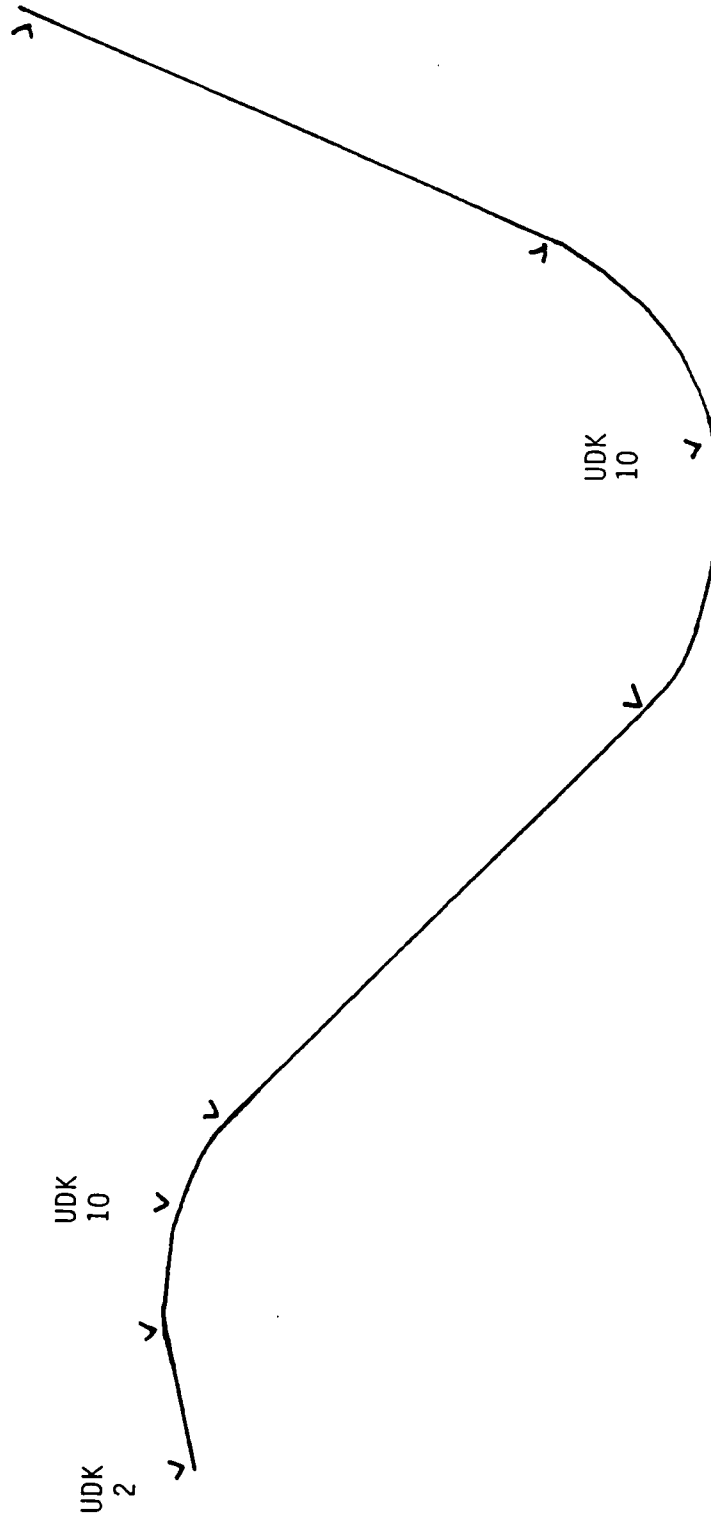
Following digitizing, the data is stored in a raw file, then converted to centerline format.

#### Consideration:

When creating symbols, it is best to have the origin at the lower left corner of the symbol; i.e., no long move before digitizing the symbol. This origin point is the point displayed for symbol verification in commands like CSG and KSN.

TITLE

TELEPHONE CABLE LAYOUT



Points (and UDK pressed) actually digitized for example road.

TITLE

TELEPHONE CABLE LAYOUT

Editing

- A. A total of 48 editing commands are available. In addition to various utility commands, the bulk of these are used to combine side roads, labels, non-symmetric information, symbols with one previously digitized Basic Road to make a staking sheet. The editor prompts with a '\$' when ready for the next command and provides a list of all commands (HLP).

Each staking sheet has a display list associated with it. As the above elements are selected for a staking sheet, information describing them is placed in the sheet's display list as follows:

Item #	type of pen	meter	X-coor	Y-coor		file
on list:	element, color,	location, of	of	of	scale,	rotation, name
.	.	.	element	element	.	or
.	.	.	origin	origin	.	label
.	.	.	.	.	.	.
1 = Basic Road						
2 = Symbol						
3 = Non-sym info						
4 = Side road					dash pattern	
5 = Label					road #	
					italic flag	

Thus when a staking sheet is displayed on the screen or plotter, all elements in its current display list are drawn. A user can print the entire display list (PFI), kill a display list and its associated element files (KFI) or delete a single item from the list (DI#).

## B. Starting the Editing Session

During the terminal session a user can create a new staking sheet or edit an existing sheet.

## 1. New Sheet

The user will be asked to provide title block information and the job code - page number used to identify the sheet. The BAS command is then used to associate a Basic Road with the sheet.

TITLE

TELEPHONE CABLE LAYOUT

## 2. Existing Sheet

The user will be asked for the job code - page number used to identify the sheet.

### C. Adding Elements to the Sheet

Elements such as side roads, label, non-symmetric information and previously digitized symbols can now be added to the staking sheet. Elements can be added at meter locations (ASM, ARM) or by using the 4956 Tablet as GIN device (ASG, ALG, ARG, ANG). The AIK command can be used to add an element from the keyboard if its location on the sheet is known.

The pen color (CL1, CL2, CL3, CL4) and dash style (DSH) parameters for the element should be set before the element is added, as this information is contained in the display list.

### D. Changing/Killing Elements on the Sheet

Once on the staking sheet, individual elements can be referenced by meter location (CSM, CRM, KSM, KRM), using the 4956 Tablet as GIN (CSG, CRG, CLG, KSG, KLG, KRG) or by its name/text string (CLT, KLT, CSN, KSN). In these commands, those beginning with "C" are Change command, while those beginning with "K" are Kill commands.

At any point, the display environment of the staking sheet can be created. This environment is not stored with the sheet.

### E. Selecting Output Device

The current sheet can be displayed on the screen (SH0) or plotter at any time during the editing session. Before plotting, it is necessary to select the output device - 4662 Plotter (P62), 4663 Plotter (P63) or 4051 simulating plotter (P51), and the color control of the pens on the plotter. The PLT command begins the plotting action.

The user can ask to be prompted (!EC) for pen color changes, as selected by color commands for sheet elements, or can ask that the plot be drawn (!CC) in one color. When using the 4663, the user can request all 4 colors (E63) or can compress the 4 pen colors into 2 colors (C63), in which case the two 4663 pens will be automatically selected as needed.

The user can also request hardware plotter characters (HCR) or software Leroy characters (SCR) for the plotted sheet.

TITLE

## TELEPHONE CABLE LAYOUT

## F. Finishing the Staking Sheet

Metered information and the title block can be added to the sheet for a finished appearance. These additions can be selected for listing by switches, and thus can be on (IM!,IT!) or off (SM!,ST!).

## G. Ending the Editing Session

Type the 'END' command.

- H. It is important to distinguish the two coordinate systems used on the sheet. The X, Y in the display list refers to the (0, 0), (130, 100) rectilinear coordinate system of the sheet. The "meter" in the display list (M9) refers to the distance along the basic road. The relationship between these is established during the BAS command, when the meter reading is a selected point, and the meter (road-length) ratio is requested.

## I. Miscellaneous

1. The "+" and "X" reference points used in digitizing non-symmetric information can be plotted using the "I+X" command. If not needed, "S+X" suppresses them.
2. The following User Definable Keys can be used during editing (type MEN for a list of the keys during editing):

<u>UDK #</u>	<u>Function</u>
1	Delete last point
2	Next point is a move
3	End digitizing, enter dummy point (Note: UDK's #1-3 should be used <u>only</u> in digitizing!)
5	Enter edit mode
6	Print system status of environment and color parameters
7	Display this menu

3. The PTX command can be used to direct the interaction between program and user to a particular location on the screen.

TITLE

TELEPHONE CABLE LAYOUT

**Consideration:**

The commands CSN, KSN, CTL, and KLT search thru the Display List and find the first occurrence of the symbol or label specified by name or text string. If the desired item has the same name or text string but is further down in the Display List, it will never be located with these commands. Other commands, such as CSM or KLG, should be used or CSN, KSN, CLT, and KLT should be modified to allow further searching of the Display List if a found item is not confirmed as the desired one.

TITLE

TELEPHONE CABLE LAYOUT

Editing Commands

AIK      Add an item to the display list by entering all its parameters from the keyboard

ALG      Add a label using the 4956 as graphics input

ANG      Add non-symmetric information using the 4956 as graphics input

ARG      Add a side road using the 4956 as graphic input

ARM      Add a side road specified by its meter location. Add a side road to the display list given the angle and the meter location. The program will also request if the road is above this basic road, below the basic road or both

ASG      Add a symbol using the 4956 as graphic input

ASM      Add a symbol using meter input    Add a symbol to display list specified by the symbol name and the meter location

BAS      Choose the basic road for a staking sheet

C63      Compress 4 colors to automatic use of 2 pens

CC!      Compress color, use one pen only (Do not prompt for pen changes)

CL1      Set the default color to color 1

CL2      Set the default color to color 2

CL3      Set the default color to color 3

CL4      Set the default color to color 4

CLG      Change the parameters of a label identified by its location determined by the 4956 tablet

CLT      Change a label identified by its text string

CRG      Change the parameters of a side road using the 4956 tablet as GIN device

CRM      Change the parameters of a side road identifying the road by its meter location

CSG      Change a symbol's parameters for a symbol identified using the 4956 tablet as a GIN device

CSN      Change the parameters of a symbol identified by its name

CSM      Change a symbol's parameters for a symbol identified by meter location



## TITLE

## TELEPHONE CABLE LAYOUT

CSN Change the parameters of a symbol identified by its name

DI# Delete an item identified by its number in the display list

DSH Define dash line type for plotting non-symmetric information Type 0-5 are allowed

E63 Request 4 pens on 4663 plotter

EC! Expand color Prompt for new pen for each of four colors

END End editing

HCR Hardware characters will be generated by the plotter

HLP Display to the screen a list of editing commands and a brief definition of each

I+X Include the '+' and 'X' reference points on the staking sheet

IM! Include the metered information along the bottom of the staking sheet during its display or plot

IT! Include the title block in the staking sheet when it is displayed or plotted

KFI Kill the display list and associated disc files This command deletes the basic road and all other elements from the display list

KLK Kill a label identified using the 4956 tablet as a GIN device

KLT Kill a label identified by its text string

KRG Kill a side road identified using the 4956 tablet as a GIN device

KRM Kill a side road identified by its meter location

KSG Kill a symbol; that is, delete it from the display list This symbol has been identified by its location using the 4956 tablet

KSN Kill a symbol identified by its name

MEN Print the menu of the User Definable Keys

P51 Simulate plotter output (including pen changes) on the 4051 display

P62 Set the plotter device to the 4662

P63 Set the plotter device to the 4663

TITLE

TELEPHONE CABLE LAYOUT

PFI Print the display list to the screen  
The display list is printed giving the element code, meter location, color, X and Y location, scale, the flag, and the alphanumeric string; for example the symbol name

PLT Plot the display list on the current plotter device

PTX Selection of screen Y coordinate where text will print

S+X Suppress the '+' and 'X' reference points

SCR Leroy software characters will be generated for display on the plotter

SHO Show the current staking sheet on the screen

SM! Suppress the meter information along the bottom of the staking sheet during plotting or display

ST! Suppress the title block during the display of the staking sheet or plotting the staking sheet

TOL Set tolerances used in tests, and road widths

TITLE

TELEPHONE CABLE LAYOUT

Program Files

## A. Main Programs

1. @DIGIT/MASTER - Digitizing program
2. @ENTRY/MASTER - Store parts information from staking sheet
3. @REPORT/MASTER - Reports the information stored by @ENTRY/MASTER
4. @EDT/MASTER - Editing program

## B. Subroutines

The following routines are called by @EDT/MASTER and reside as the library 'SUB'.

1. AIK - (AIK command) Adds item to display list by entering parameters from the keyboard
2. ARROW - Draw north arrow on compass
3. CHGLAB - Change label parameters in display list
4. CHGROAD - Change side road parameters in display list
5. CHGSYM - Change symbol parameters in display list
6. CHAR - Generates Leroy software characters
7. COMPASS - Draws compass above title block
8. CONFIRM - Draws a box around the origin of the element found in SRCHGIN; asks for item verification
9. CONFIRMADD - Draws a box at the position an element is to be added; asks for position verification
10. DIGITIZE - Used to digitize non-symmetric information during editing
11. DISBR1ST - Displays the Basic Road; stores it's XYLM array and saves the file road components for fast display
12. DISBRMORE - Using the fast display files from DISBR1ST, it draws the Basic Road plus side road intersections
13. DISSIDE - Displays a side road
14. EIGHTPT - Calculates intersection of curb and right-of-way lines for side road
15. FIRST - Requests system disc configuration and job code - sheet # information to identify job file
16. FRAME - Draws title block outlines

TITLE

## TELEPHONE CABLE LAYOUT

17. HELP - (HLP command) displays edit commands and their definitions
18. INIT - Initializes global variables
19. LOGO - Draws logo in title block
20. MENU - (MEN command) displays UDK menu on screen
21. PLUS - Draws the '+' and 'X' reference points on the staking sheet
22. RANGEN - Generates the display list file
23. SKEW - Performs skew correction on elements entered from the tablet
24. SKMETER - Searches for a symbol/label by meter location; returns index if called from change command, or kills symbol/label if called from kill command
25. SKSTR - Searches for a symbol/label by name; returns index if called from change command, or kills symbol/label if called from kill command
26. SORT - Sorts display list by pen color for plotter pen color changes
27. SRCHGIN - Locates a label, side-road or symbol using GIN
28. STORE - Saves non-symmetric element in a file
29. SYMBLPLT - Draws symbols
30. SYSTAT - (UDK #6) outputs system status message
31. TABGIN - Accepts input from tablet in stream-bar mode and displays on the screen
32. TITLEIN - Requests title block information for new sheet
33. TOL - (TOL command) set tolerances to be used in SKSTR, SKMETER
34. XYLMS - Establishes the relationship between the X, Y location and the corresponding meter location
35. XYLSRCH - Returns the X and Y coordinates of a given meter location

TITLE

TELEPHONE CABLE LAYOUT

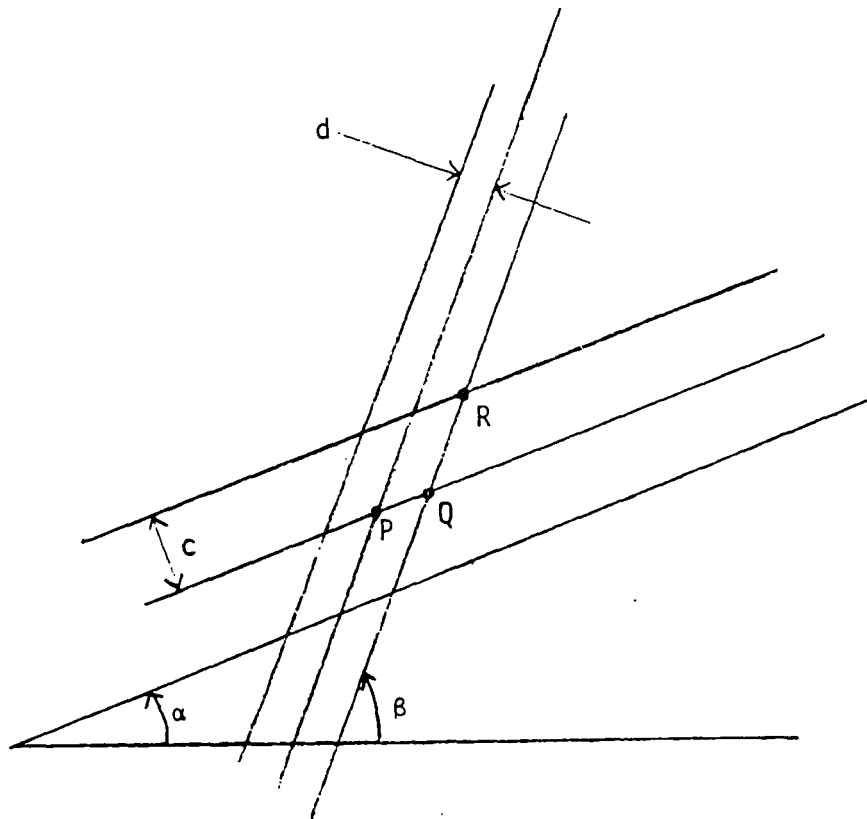
## MATHEMATICAL FORMULA #1: INTERSECTION OF PARALLEL SETS OF LINES

If  $P = (0,0)$ , then, if  $s = \sin(\beta - \alpha)$ ,

$$Q = (c \cos\alpha/s, c \sin\alpha/s),$$

$$R = ((c \cos\alpha + d \cos\beta)/s, (c \sin\alpha + d \sin\beta)/s),$$

$\beta \neq \alpha$  (i.e.,  $s \neq 0$ .)



TITLE

TELEPHONE CABLE LAYOUT

## MATHEMATICAL FORMULA #2: CENTER AND RADIUS OF AN ARC

Given 3 points,

$$P = X(1), Y(1),$$

$$Q = X(2), Y(2),$$

$$T = X(3), Y(3),$$

Find the coordinates of C;X(4),Y(4):

$$\text{Let } S = X(1)^2 + Y(1)^2,$$

$$R = X(2)^2 + Y(2)^2,$$

$$E = X(3)^2 + Y(3)^2,$$

$$D_1 = X(1)Y(2) + X(2)Y(3) + X(3)Y(1),$$

$$D_2 = X(1)Y(3) + X(3)Y(2) + X(2)Y(1),$$

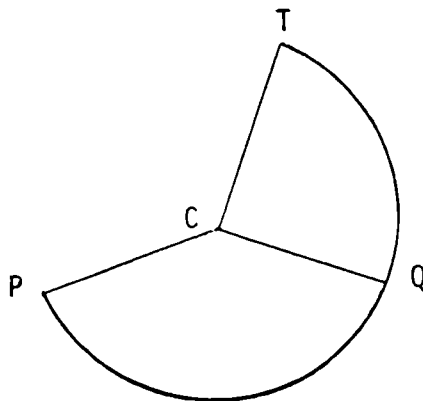
$$D = 2D_1 - 2D_2,$$

$$N_1 = S - R, N_2 = R - E, N_3 = E - S$$

$$X(4) = - (Y(3)N_1 + Y(1)N_2 + Y(2)N_3)/D.$$

$$Y(4) = (X(3)N_1 + X(1)N_2 + X(2)N_3)/D.$$

$$\text{RADIUS} = \text{SQRT} ( (X(4) - X(1))^2 + ((Y(4) - Y(1))^2 )$$



TITLE

TELEPHONE CABLE LAYOUT

## MATHEMATICAL FORMULA #3: INTERSECTION OF PARALLEL LINES AND ARCS

Given arc with center O, radius r

and a concentric arc with

radius (r + d),

and parallel lines, separated by

a distance b, at an angle  $\alpha$ :

Find coordinates of

intersection Q, given P = (X1,Y1), O = (X0,Y0)

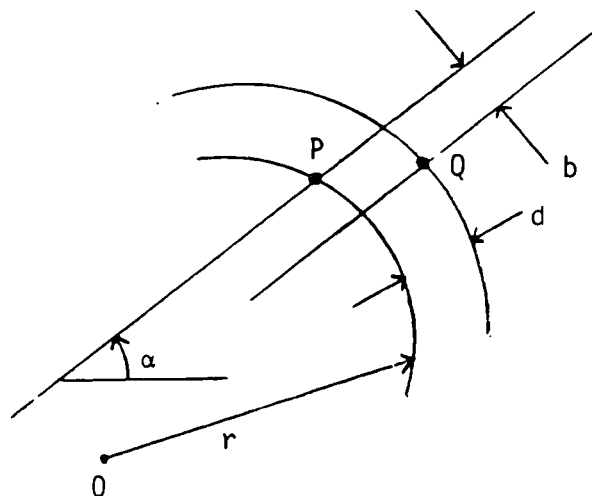
Let R1 = r + d

a = Tan  $\alpha$ ,

C = Y1 - Y0 - Tan $\alpha$  (X1 + b/Sin $\alpha$ )

$$X = \frac{(X0 - aC) \pm \text{SQRT} \{ (X0 - aC)^2 - (1 + a^2) (X0^2 + C^2 - R1^2) \}}{(1 + a^2)}$$

$$Y = \text{Tan}\alpha(X - X1) + Y1$$



TITLE

TELEPHONE CABLE LAYOUT

## MATHEMATICAL FORMULA #4: SKEW CORRECTION

Given two points in the user drawing, with coordinates

$(H2, P2)$  and  $(H4, P4)$ , which are digitized as

$(H1, P1)$  and  $(H3, P3)$ ,

calculate transformation for digitized points:

$$1. \quad C0 = \text{ATN}(H3 - H1) / (P3 - P1)$$

$$E6 = \cos(C0)$$

$$E7 = \sin(C0)$$

$$D = E7 \times H3 + E6 \times P3$$

$$C5 = P2 \times D - P4(E7 \times H1 + E6 \times P1)$$

$$C5 = C5 / (E7(H3 - H1) + E6(P3 - P1))$$

$$C1 = (P4 - C5) / D$$

$$C4 = P2 - C1(E6 \times H1 - E7 \times P1)$$

2. Given digitized coordinates H, P, the values in the user's system will be:

$$X = C1(E6 \times H - E7 \times P) + C4$$

$$Y = C1(E7 \times H + E6 \times P) + C5$$



TITLE

## TELEPHONE CABLE LAYOUT

1. In order to optimize speed for drawing side road intersections, a pointer file was created with one record corresponding to each segment of the Basic Road. The Basic Road will have N (currently 16) segments for each arc, and one per straight line section. The pointer file indicates which side road, if any, intersects in that segment. As a consequence, the pointer file can reference only one side road per Basic Road segment.

This should not present a problem for arcs, but for long straight Basic Roads it may be desired to have several side roads per straight section. This may be accomplished by digitizing a straight section as several segments. This simply means digitizing, say, 10 points on a straight line instead of only the end point.

In practice, it is probably wise to digitize  $5N$  equally spaced points (where  $N$  is the maximum number of side roads that might be entered) for a given straight section.

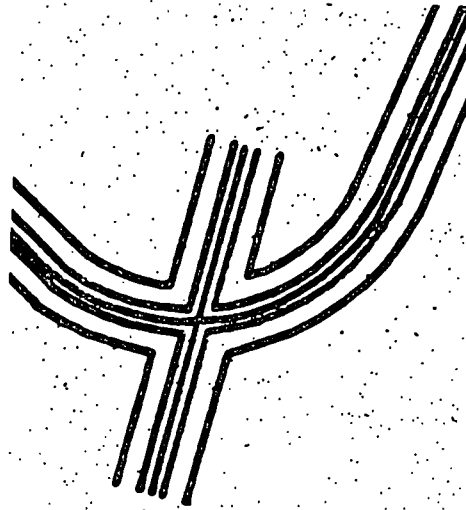
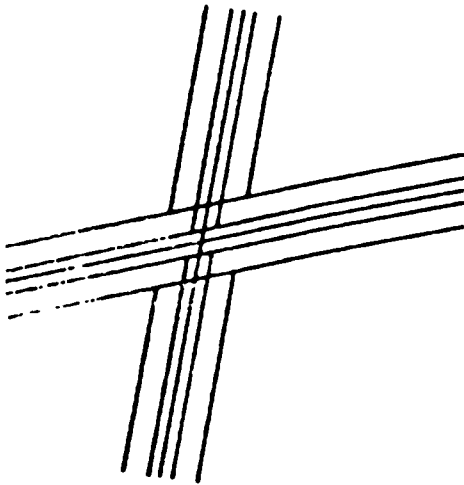
2. Two options are provided for the drawing of the intersections of side roads and the Basic Road. The first, termed "simple intersections," allows all lines of both roads to be drawn through the intersection. "Complete intersections" have the appropriate segments of curb and right-of-way lines removed to emphasize the intersection visually and to reflect the actual physical/legal geometry more accurately. The complete intersection option, because it involves a search procedure, takes more time. Consequently, standard operating procedure might be to use the "complete" option only when the road is added (for verification) and on the final plot, and at other times allow the simple option to be used.

These two options are controlled by UDK #4. The initial condition is "simple." The condition can be "flip-flopped" at any time by pressing UDK #4.

The figures below show the two types of intersections.

TITLE

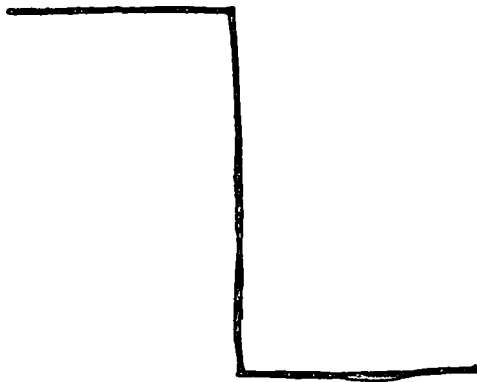
TELEPHONE CABLE LAYOUT



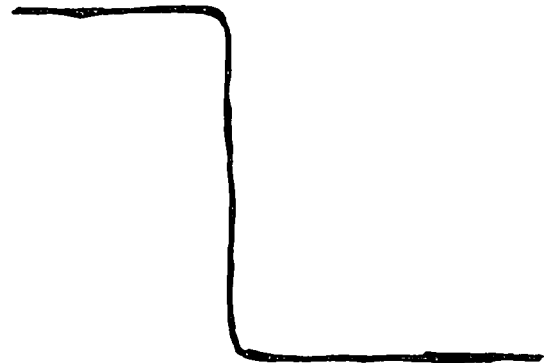
TITLE

## TELEPHONE CABLE LAYOUT

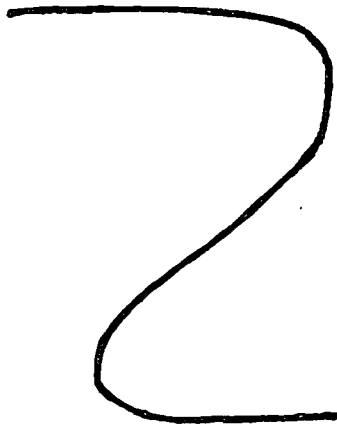
3. The program is designed around the concept of an essentially horizontal "Basic Road" acting as a spine for side roads arrayed at any angle. In particular, several calculations in the program depend on X being unique; that is, there can be no vertical lines in the basic road. This requirement also excludes "S" shapes, unless they can be rotated so that no two X values are the same. Several examples are drawn below:



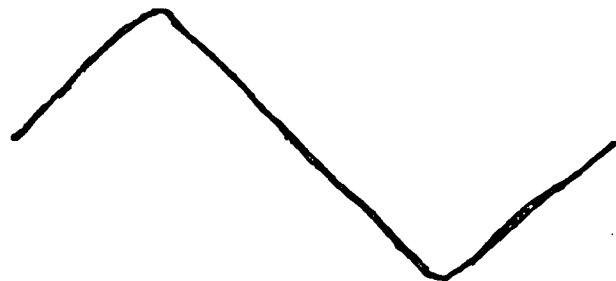
a) Not allowed (90° turns, vertical line)



b) Not allowed, vertical line



c) Not allowed, "S" curve



d) O.K., rotation of b) so that line is no longer vertical

## TITLE

## TELEPHONE CABLE LAYOUT

Glossary Of Terms

Arc	Part of a circle. Determined by three points (current location and two others).
BM70	A special parts designation indicating, for a pedestal, the amount of smaller width trench leading from the main (parallel to the road) trench to the given pedestal.
Basic Road	A road crossing the staking sheet roughly horizontally to which side roads are attached, with numbered pedestals, and ascending meter readings (left to right).
Cable Name	Contains description of cable parameters between two pedestals, including adjoining pedestals, cable types, and construction units.
Cable Type	Main cable running between two pedestals associated with cable name.
Center Line Format	A special format written for this application allowing alternating lines and arcs.
Construction Unit	A necessary operation on a cable path.
Curb Lines	Lines parallel to the center line of a basic road or a side road showing the approximate curb location.
Customer Code	An abbreviation, unique to the given customer, used by the computer to identify the job, create libraries on the disc, etc. It must be 1-12 alpha characters, with no embedded blanks.
Designation Standard	A part name from the master parts list associated with a pedestal.
Display List	A file on the job disc for a given staking sheet giving for each basic road, side road, label, symbol or non-symmetric item: meter location, scale, rotation, X and Y location, and the name if it's a symbol. Each of these element types has a separate code.
Edit Command	A command used to edit a staking sheet. For example, DSM: Delete a Symbol given its Meter location by the operator.
Full Customer Name	The full customer name, to be written in the Sheet title block. It may be any string of up to 72 characters.

## TITLE

## TELEPHONE CABLE LAYOUT

GIN	Graphics input; providing an X and Y location on the graphics input device.
In-line Trenching	Trenching used to go around an obstacle in the straight line cable path.
Job	One or more staking sheets, each with a different page number.
Job Disc	The disc containing all the staking sheets for a given job (display lists, non-symmetric information files, parts lists, etc.).
Label	A phrase on a staking sheet associated with a road, landmark, etc. Labels can be plotted at any angle or location on the staking sheet, and may be in italics.
Leroy Characters	The character font used by the program, a standard draftsman's font.
Library Disc	A disc containing the basic road library, the symbol library, and the master parts and cable lists.
Master Cable List	A reference list of cable names, stored on the library disc. In entering parts names for cables, only the names in this file will be allowed by the program.
Master Parts List	A reference list of parts names stored in a file on the library disc. In entering parts, only names already on this list will be accepted.
Meter Reading	Reading from a truck distance meter along the basic road center line.
Non-Symmetric Information	Graphic data for a sheet, unique to that sheet, and digitized during its construction; in particular, cable paths.
Page Number	The page number from the title block used to identify the staking sheet. Also called sheet number. (This should not be confused with the numbers in "Sheet ___ of ___," neither of which is used by the program.)
Parts List or Bill of Materials	For a pedestal, cable segment, staking sheet or job, the list of materials required for the given configuration.
Pedestal	Intersection of two or more cables.

TITLE

TELEPHONE CABLE LAYOUT

Right-of-Way Lines	Lines parallel to the center line of a basic road, enclosing the maximum area in which pedestals and cables can be installed.
Sheet Number	The page number from the title block used to identify the staking sheet. Also call page number.
Side Road	A straight road segment intersecting the basic road at a specified angle.
Skew Correction	Corrections calculated from reference points on a drawing and later used during digitizing of the drawing to compensate for its being completely parallel to the tablet axis.
Symbol	A relocatable picture element, containing relative moves and draws, in a file in a symbol library. A landmark.

TITLE

TELEPHONE CABLE LAYOUT

G. J. O R P H A N & A S S O C I A T E S  
C O N S U L T I N G E N G I N E E R S

CABLE LAYOUT PROGRAM

\*\*\* ENTRY TASK \*\*\*

TITLE

TELEPHONE CABLE LAYOUT

How many Disks are there in your System? 2

Insert the System Disk in Disk Unit #1 and the Job Disk in Disk Unit #0. Type <CR> to continue.

Space is being reserved for the Master Parts List!

WORKING!!!

Enter the Part Names for the Master Parts List:  
(type <CR> to end input)

Part Name #1: BM70  
Part Name #2: PART2  
Part Name #3: PART3  
Part Name #4: PART4  
Part Name #5: PART5  
Part Name #6:

The following are the Part Names just entered:

PART2  
PART3  
PART4  
PART5

Are all Part Names correct? Y

There are 5 entries altogether, including 'BM70'.

BM70  
PART2  
PART3  
PART4  
PART5

Type <CR> to continue.



TITLE

TELEPHONE CABLE LAYOUT

Space is being reserved for the Master Cable List!

WORKING!!!

Enter the Cable Types for the Master Cable List:  
(type <CR> to end input)

Cable Type or Unit #1: CABLE1  
Cable Type or Unit #2: CABLE2  
Cable Type or Unit #3: CABLE3  
Cable Type or Unit #4:

The following are the Cable Types or Units just entered:

CABLE1  
CABLE2  
CABLE3

Are all Cable Types or Units correct? Y

There are 3 entries altogether.

CABLE1  
CABLE2  
CABLE3

To continue, type <CR>.

TITLE

TELEPHONE CABLE LAYOUT

**Staking Sheet Information:**

**Indicate the Job or Customer Code for this Job? USGOVT  
(type <CR> to end Task)**

**Indicate the Sheet or Page Number: 100**

**Space will now be reserved for Customer Code USGOVT,  
Sheet 100. Okay? Y**

**WORKING!!!**

**WORKING!!!**

**WORKING!!!**

**WORKING!!!**

**WORKING!!!**

TITLE

TELEPHONE CABLE LAYOUT

Indicate desired Pedestal Number (type <CR> to end input): 1  
Space will now be reserved for Pedestal 1. Okay? Y  
WORKING!!!

Indicate Meter Reading for Pedestal 1: 100

Indicate a Designation Standard: PART2  
(type <CR> to end input):  
Indicate quantity: 20

Indicate a Designation Standard: PART3  
(type <CR> to end input):  
Indicate quantity: 30

Indicate a Designation Standard: PART6  
(type <CR> to end input):  
PART6 isn't in the Master Parts List!

Indicate a Designation Standard: PART5  
(type <CR> to end input):  
Indicate quantity: 50

Indicate a Designation Standard:  
(type <CR> to end input):  
BM70 has not yet been entered for this pedestal! Please do so.

Indicate a Designation Standard: BM70  
(type <CR> to end input):  
Indicate quantity: 40

Indicate a Designation Standard:  
(type <CR> to end input):

TITLE

TELEPHONE CABLE LAYOUT

Existing Pedestal Names are:

1

Indicate desired Pedestal Number (type <CR> to end input): 1AB

Space will now be reserved for Pedestal 1AB. Okay? Y

WORKING!!!

Indicate Meter Reading for Pedestal 1AB: 200

Indicate a Designation Standard: BM70  
(type <CR> to end input):

Indicate quantity: 50

Indicate a Designation Standard:  
(type <CR> to end input):

TITLE

TELEPHONE CABLE LAYOUT

Existing Pedestal Names are:

1  
1AB

Indicate desired Pedestal Number (type <CR> to end input): 1AB

Information for Pedestal 1AB already exists; it can be changed.

Meter Reading is presently 200. This can be changed.  
Indicate Meter Reading for Pedestal 1AB: 300

The presently indicated Part Names and quantities are:

BH70 - 50

These can be changed, or they can be deleted by typing '0' for it's Quantity.

Indicate a Designation Standard: PART2  
(type <CR> to end input):  
Indicate quantity: 30

Indicate a Designation Standard:  
(type <CR> to end input):

Existing Pedestal Names are:

1  
1AB

Indicate desired Pedestal Number (type <CR> to end input):

TITLE

TELEPHONE CABLE LAYOUT

Indicate desired Cable Name (type <CR> to end input): 100

Space will now be reserved for Cable Name 100. Okay? Y

WORKING!!!

Indicate adjoining Pedestal Numbers, typing a <CR> after each Number  
 \$OR\$ Type a <CR> to get a list of defined Pedestal Numbers.

1  
 1AB

Indicate adjoining Pedestal Numbers, typing a <CR> after each Number  
 \$OR\$ Type a <CR> to get a list of defined Pedestal Numbers.

1  
 1AB

How much In-Line Trenching? 10

Indicate Cable Type: CABLE1  
 (type <CR> to end input)

Indicate Cable Type: CABLE2  
 (type <CR> to end input)

Indicate Cable Type:  
 (type <CR> to end input)

Indicate Construction Unit: CABLE1  
 (type <CR> to end input)

CABLE1 is the main Cable Type; it can not be a Construction Unit!

Indicate Construction Unit: CAB  
 (type <CR> to end input)  
 This Construction Unit doesn't exist in the Master Cable List!

Indicate Construction Unit: CABLE3  
 (type <CR> to end input)  
 Indicate Length: 30

Indicate Construction Unit:  
 (type <CR> to end input)

TITLE

TELEPHONE CABLE LAYOUT

Existing Cable Names are:  
100

Indicate desired Cable Name (type <CR> to end input): 100

This Cable Name has already been defined. The information for Cable 100 can be changed.

The adjoining Pedestal Names are presently indicated to be 1 and 1AB. Do you want to change them? N

In-Line Trenching is presently 10. Do you want to change this? Y  
In-Line Trenching: 20

Cable Types presently indicated are:

CABLE1  
CABLE2

To modify the Cable Types, ALL desired Cable Types must be indicated. Do you want to modify the Cable Types? Y

Indicate Cable Type: CABLE1  
(type <CR> to end input)

Indicate Cable Type:  
(type <CR> to end input)

TITLE

TELEPHONE CABLE LAYOUT

The Construction Units presently indicated are:

CABLE3 - 30

A Construction Units can be deleted by indicating '0' for its Length. Do you want to modify the Construction Units? Y

Indicate a Construction Unit: CABLE3  
(type <CR> to end input)  
Indicate Length: 0

Indicate a Construction Unit: CABLE2  
(type <CR> to end input)  
Indicate Length: 30

Indicate a Construction Unit: CABLE1  
(type <CR> to end input)  
CABLE1 is the main Cable Type; it can not be a Construction Unit!

Indicate a Construction Unit:  
(type <CR> to end input)

Existing Cable Names are:  
100

Indicate desired Cable Name (type <CR> to end input):

End of Task! To get a Summary of Customer Code USGOVT,  
Sheet 100, use the REPORT Task.



TITLE

TELEPHONE CABLE LAYOUT

G. J. O R P H A N & A S S O C I A T E S  
C O N S U L T I N G E N G I N E E R S

CABLE LAYOUT PROGRAM

\*\*\* REPORT TASK \*\*\*

TITLE

TELEPHONE CABLE LAYOUT

How many Disk Units are there in your System? 2

Insert if System Disk in Disk Unit #1 and the Job Disk in Disk Unit #8. Type <CR> to continue.

Shall the Report be generated on the Screen(32) or on the Line Printer(41 or 51)? 32

Indicate Job or Customer Code: USGOVT

The Sheet Numbers associated with Customer Code USGOVT are:  
100

Would you like to see the Report for all Sheet Numbers(1) or for one given Sheet Number(2)? 2

Indicate desired Sheet Number: 100

TITLE

TELEPHONE CABLE LAYOUT

**CUSTOMER CODE USGOVT, SHEET NUMBER 100****Pedestal 1, Meter Reading: 100****Parts:****BM70 - 40  
PART2 - 20  
PART3 - 30  
PART5 - 50****Pedestal 1AB, Meter Reading: 300****Parts:****BM70 - 50  
PART2 - 30****Totals:****BM70 - 90  
PART2 - 50  
PART3 - 30  
PART5 - 50****Cable 100****Adjoining Pedestals: 1 and 1AB****In-Line Trenching: 20****Cable Types:****CABLE1 - 326****Construction Units:****CABLE2 - 30****Totals:****In-Line Trenching: 20****Cable Types:****CABLE1 - 326****Construction Units:****CABLE2 - 30**



# DESKTOP COMPUTER APPLICATIONS LIBRARY PROGRAM

TITLE		EQUIPMENT AND OPTIONS REQUIRED
Drafting Digitizer		
ORIGINAL DATE	REVISION DATE	16K
May, 1980		
AUTHOR Tom Sutherlin Cameron University Lawton, OK		PERIPHERALS 4662 Plotter Optional-4956 Tablet
ABSTRACT		
<p>Files: 2 Program Statements: 406</p> <p>The program consists of two files: the menu and the digitizer.</p> <p>The menu is designed to be plotted on the 4662 Plotter. This is then placed on the 4956 Tablet to be used by the digitizer. The menu allows a blank area for sketching and digitizing with the basic symbols shown.</p> <p>The digitizer allows the user to transform sketches into a finished drawing using the basic symbols selected from the menu. Input is from the 4956 Tablet, but may be easily modified to allow input from the 4662 Plotter. The User-Definable Keys are used to select the screen or the plotter for output.</p> <p>200 X and Y coordinates may be input. For machines with more than 16K memory, the program may be modified to accept additional X,Y coordinates.</p> <p>Menu selections include:</p> <p><u>Line</u>-input points A and B; a line will be drawn between the two points.</p> <p><u>Hidden Line</u>-same as Line, but draws a dashed line.</p> <p><u>Center Line</u>-input points A and B; a dash .15 inches long will be drawn at the center distance of the line.</p> <p><u>Circle</u>-input point A(center) and B(right of center); used as radius to compute and draw circle.</p> <p><u>Hidden Circle</u>-same as Circle, but draws dashed circle.</p> <p><u>Partial Arc</u>-input points A,B, and C; calculates distance between A and B for radius, length is angle calculated between AB and BC.</p> <p><u>Leader</u>-input points A and B, draws arrowhead at point A .07 inches wide and .1 inches long with line to B.</p> <p><u>Dimension Input</u>-Input points A and B (to the right), enter dimension from the keyboard (up to 16 alphanumeric characters) data is output in a horizontal position.</p> <p><u>End of Program</u>-Ends digitizing input.</p> <p><u>Rectangle</u>-input points A (lower left corner) and B (upper right corner); calculates the length of the horizontal and vertical sides.</p> <p><u>Point-to-Point</u>-input points A,B,C,D . . . , will draw straight line segment to connect the points, points may be at any position.</p>		
<p>The program material contained herein is supplied without warranty or representation of any kind. Tektronix, Inc., assumes no responsibility and shall have no liability, consequential or otherwise, of any kind arising from the use of this program material or any part thereof.</p>		

## TITLE

Drafting Digitizer

INTRODUCTION

This program has been in use since 1977 in Cameron University's Design Drafting Technology. It was developed in a modular fashion, to facilitate the teaching of digitizing logic.

The program provides an operational minimum for emulating larger commercial software systems. We have expanded the program to allow for storage of the data to tape and corrections to drawing errors. However, these features require 32K of memory. Therefore, you may begin work with this program and expand it to fit your system.

The program offers the basic components for the development of a drawing. If you are limited to 16K of memory, simply start the program again when you run out of X and Y components.

OPERATING INSTRUCTIONS

1. Place an 11 x 17 paper in the 4662 Plotter. SUGGESTION: Use a standard GRID paper for the output of the menu. It will greatly enhance the quality of your DRAFTING DIGITIZER input and output.
2. MOUNT the disk, or insert the tape.
3. OLD "@DRAFTING/MENU" and RUN. Or FIND 2, OLD and RUN.

Output of this program will be used as the input document for the sketch which is required for the DRAFTING DIGITIZER program.

A reduced menu is illustrated on the following page.

Sketch the rough input drawing on a grid menu output by the MENU program.



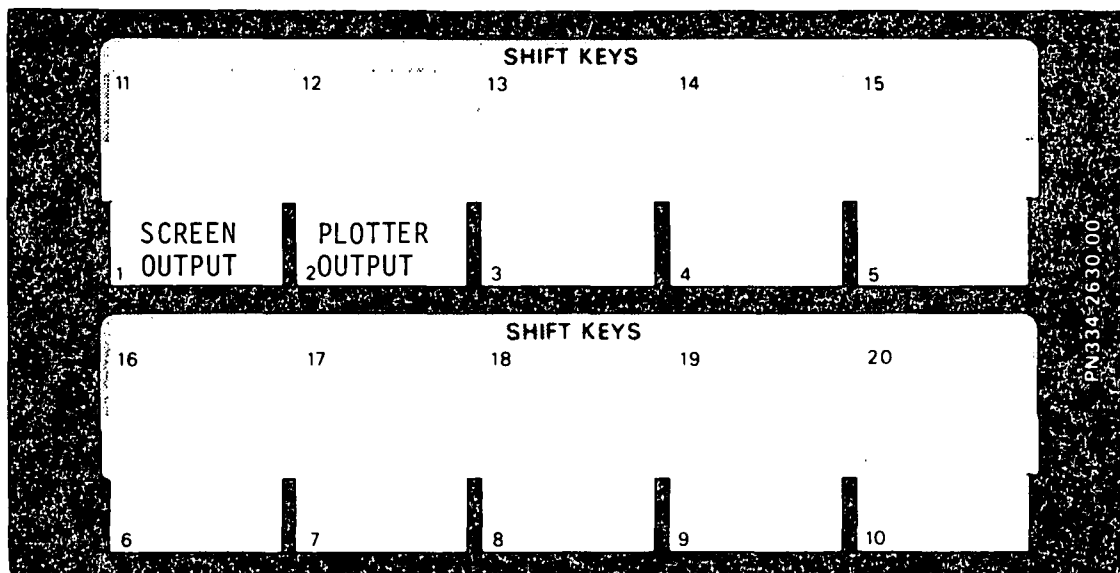
TITLE

Drafting Digitizer

TITLE Drafting Digitizer

TAPE #

FILE #

VARIABLE LIST

VARIABLE	USED TO STORE	TYPE
A,A1	Angle of orientation for line connecting two points	SIMPLE
A2,A3	Angle increment and limits	SIMPLE
B\$	Dimension string storage	ARRAY (16)
C\$	Dummy input	ARRAY (1)
H,H1	Horizontal distance	SIMPLE
I	Increment for X and Y coordinates	SIMPLE
J	To subtract 2 from current I increment	SIMPLE
J1	To subtract 3 from the current I increment	SIMPLE
K	To subtract 1 from the current I increment	SIMPLE
L	Increment in FOR...NEXT Loops Dummy variable	SIMPLE
M	Increment	SIMPLE
N	Increment	SIMPLE
P	Increment to account for number points used in a specific ROUTINE	SIMPLE
Q	Output device address	SIMPLE
S,S1,S2	Distance between two points	SIMPLE
T	Dummy variable	SIMPLE
V,V1	Vertical distance	SIMPLE
X	X coordinates	ARRAY (200)
Y	Y coordinates	ARRAY (200)
Z\$	Dummy input	ARRAY (1)

## TITLE

Drafting Digitizer

## 1. Load the DRAFTING DIGITIZER program into 4050 memory:

From the CAD T1 tape: Choose from the AUTOLOAD menu or  
FIND 3 and OLD

From the CAD D1 disk: Choose from the "\$DIRECTORY" or  
OLD "@DRAFTING/DIGITIZE"

## 2. If you have more than 16K of memory, modify the DIM statement in line 140 for an increase in X and Y components.

Digitizing from the 4956 Tablet

Align the bottom edge of the MENU (produced by the Drafting Digitizer Menu routine earlier) with the bottom of the 4956 tablet and approximately 2 inches up and 2 inches from the left side of the tablet.

Follow exactly the origin setting message appearing on the screen for the 4956. (See the MENU illustration for ORIGIN placement.)

Press UDK 1 for output to the screen or UDK 2 for output to the Plotter.

Digitizing from the 4662 Plotter

Output will be to the screen only.

```
DELETE      8  INIT
            9  Q=1
           10  GO TO 110
```

Input will be from the 4662 Plotter.

```
CHANGE      FROM: 180 INPUT @8:X(I),Y(I),Z$
            TO:   180 INPUT @1:X(I),Y(I)
```

```
DELETE      200  X(I)=X(I)/20
            210  Y(I)=Y(I)/20
            160  GOSUB 24000
            24000 through 24130 (this is the 4956 ORIGIN setting routine)
```

Digitizing

Digitize your drawing according to the MENU instructions.

HINT: Your original sketch may be inaccurate so target on the grid intersection.

The 4050 bell will ring each time you digitize a point.

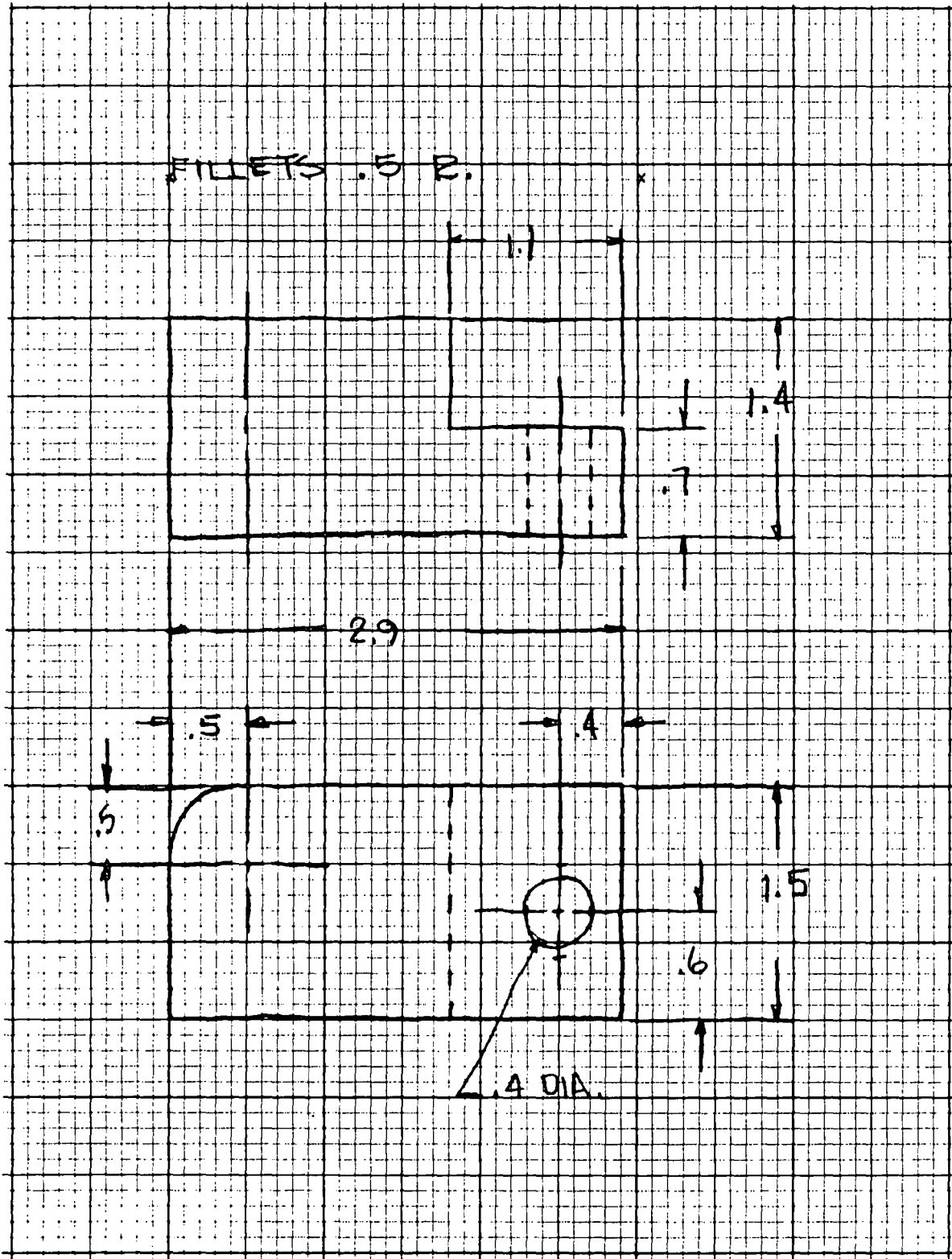
Multiple bells indicate that you should look at the 4050 screen and respond.



TITLE  
DRAFTING DIGITIZER

EXAMPLE INPUT

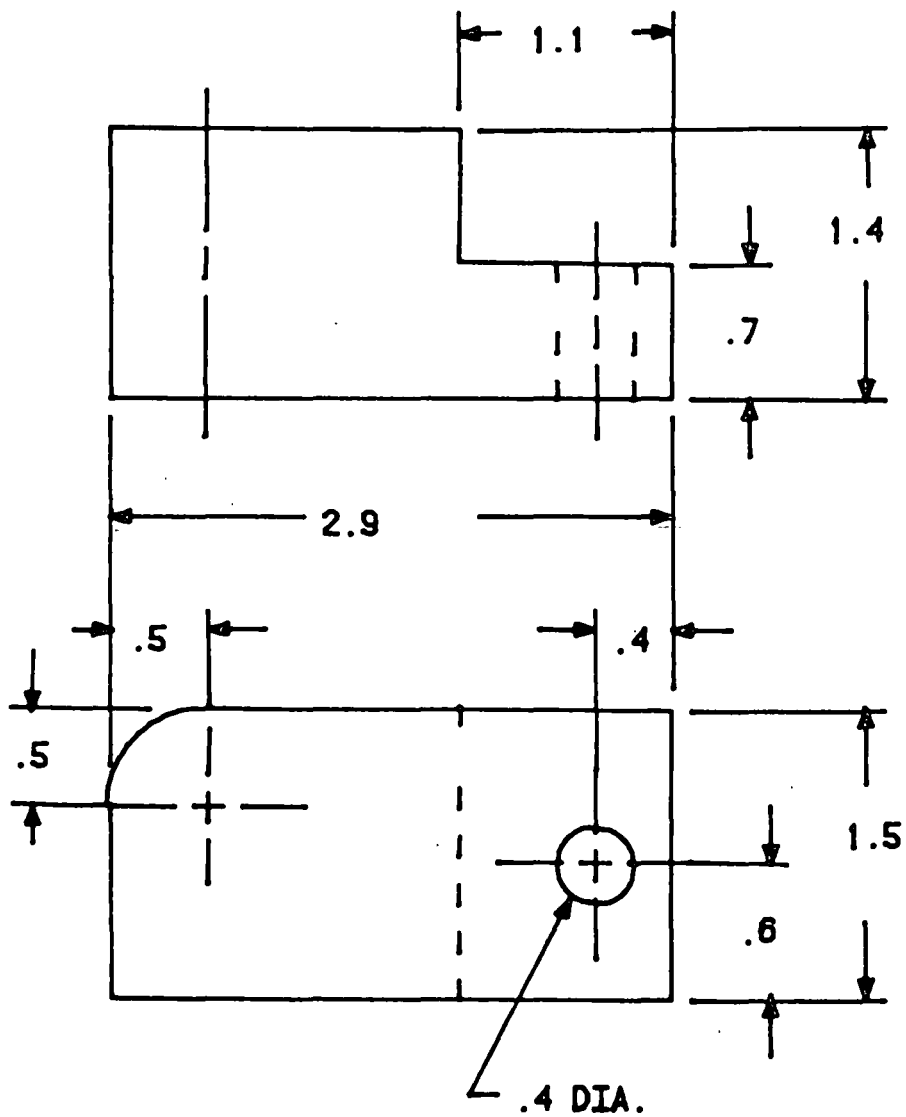
SKETCH TO BE DIGITIZED



TITLE  
DRAFTING DIGITIZEREXAMPLE OUTPUT

FROM PLOTTER

FILLETS .5 R.

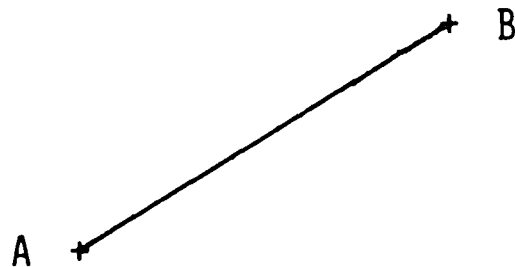
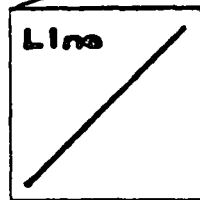


# TITLE

## DRAFTING DIGITIZER

### LINE

1. DIGITIZE POINT A
2. DIGITIZE POINT B
3. DIGITIZE MENU



### EXECUTION:

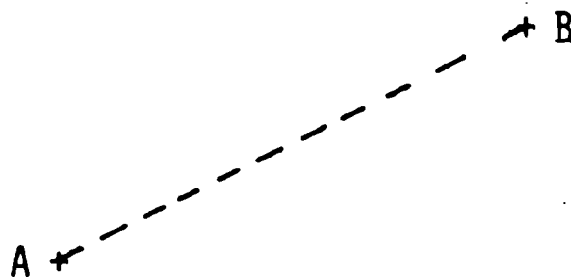
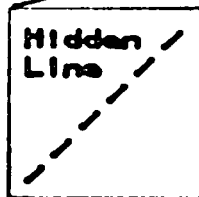
The 4051 will store the X and Y coordinates of each point. When the MENU LINE is digitized, the program calculates the angle of the line, the distance between the points, and RDRAW's the line between the points. This line orientation is good for any angle.

TITLE

## DRAFTING DIGITIZER

## HIDDEN LINE

1. DIGITIZE POINT A
2. DIGITIZE POINT B
3. DIGITIZE MENU



## EXECUTION:

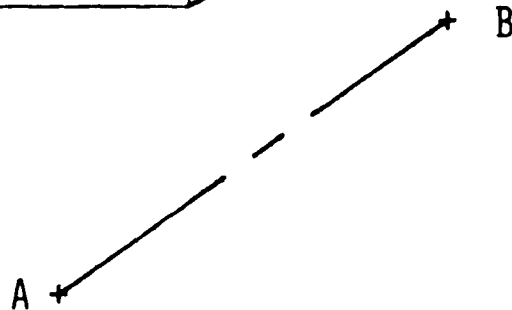
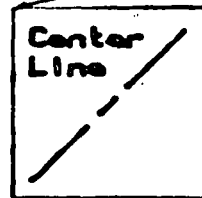
The 4051 will store the X and Y coordinates of each point. When the MENU HIDDEN LINE is digitized, the program will calculate the distance between the points. With the calculated angle of the line, the output will start and end with a .1 inch dash. A .15 inch space will occur between each dash except for the final space. The final space will be adjusted according to the distance between points A and B. If the distance between points A and B is less than .3 inches, two .075 inch dashes will be drawn between the points. The line orientation is good for any angle and the dashes are achieved by RDRAW and the spaces by RMOVE.

TITLE

DRAFTING DIGITIZER

## CENTER LINE

1. DIGITIZE POINT A
2. DIGITIZE POINT B
3. DIGITIZE MENU



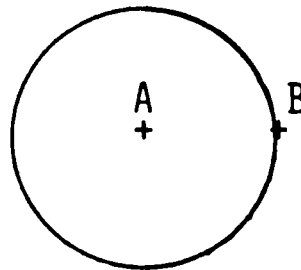
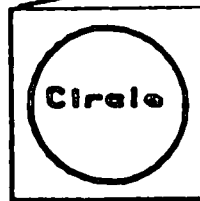
## EXECUTION:

The 4051 will store the X and Y coordinates of each point. When the MENU CENTER LINE is digitized, the program calculates the distance between the points and the angle of the line. The dash will be drawn .15 inches long at the center of the distance between A and B. The spaces between the lines and the center dash are .1 inches long. The center line can be drawn at any angle. RDRAW and RMOVE are used for the generation of this line.

TITLE  
DRAFTING DIGITIZER

## CIRCLE

1. DIGITIZE POINT A (CENTER)
2. DIGITIZE POINT B (RIGHT OF A)
3. DIGITIZE MENU



## EXECUTION:

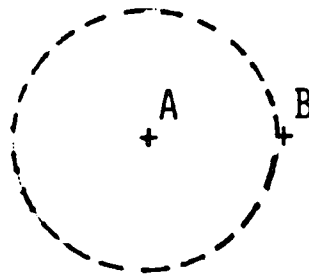
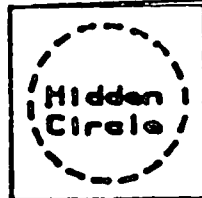
The 4051 will store the X and Y coordinates of each point. When the MENU CIRCLE is digitized, the program will calculate the distance between points A and B and use this for the radius of the circle. Circles are drawn with the DRAW command and are segmented on  $10^0$  increments.

TITLE

DRAFTING DIGITIZER

## HIDDEN CIRCLE

1. DIGITIZE POINT A
2. DIGITIZE POINT B
3. DIGITIZE MENU



## EXECUTION:

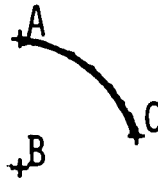
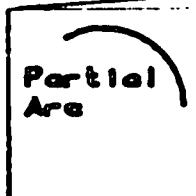
The 4051 will store the X and Y coordinates of the points A and B. When the MENU HIDDEN LINE is digitized, the program will calculate the distance between A and B and use it for the radius of the hidden circle. Circles with radii less than .6 inches will be drawn with 20<sup>0</sup> dashes and spaces. Circles with .6 inch radii or larger will be drawn with 10<sup>0</sup> dashes and spaces. The routine uses DRAW and MOVE commands.

TITLE

## DRAFTING DIGITIZER

## PARTIAL ARC

1. DIGITIZE POINT A
2. DIGITIZE POINT B
3. DIGITIZE POINT C
4. DIGITIZE MENU



## EXECUTION:

The 4051 stores the X and Y coordinates of points A, B, and C. When the MENU PARTIAL ARC is digitized, the program calculates the distance between points A and B and uses that for the radius. The length of the arc is determined by the angle calculated between line AB and BC. This routine uses the DRAW command. The arc routine is good for all angles except when A is in quadrant I and C in quadrant IV.

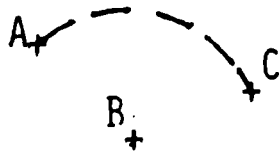
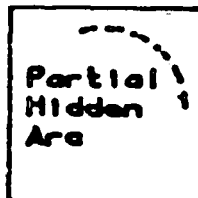


TITLE

DRAFTING DIGITIZER

## PARTIAL HIDDEN ARC

1. DIGITIZE POINT A
2. DIGITIZE POINT B
3. DIGITIZE POINT C
4. DIGITIZE MENU



## EXECUTION:

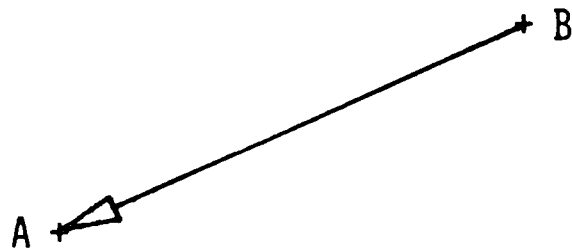
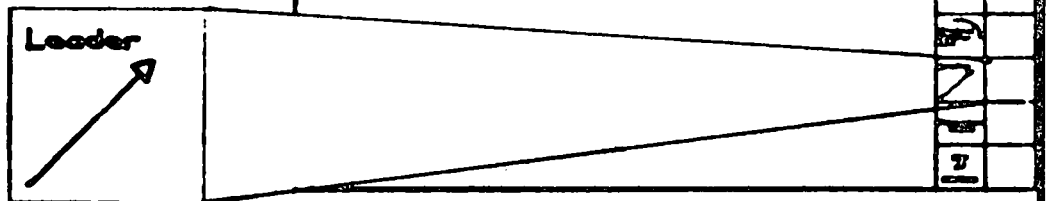
The 4051 will store the X and Y coordinates of all of the points. When the MENU PARTIAL HIDDEN ARC is digitized, the program calculates the distance between points A and B and uses the distance for the radius. The length of the arc is determined by the angle between lines AB and BC. This routine uses the MOVE and DRAW commands. The routine is good for all angles except when A is in quadrant I and C is in quadrant IV.

TITLE

## DRAFTING DIGITIZER

## LEADER

1. DIGITIZE POINT A
2. DIGITIZE POINT B
3. DIGITIZE MENU



## EXECUTION:

The 4051 will store the X and Y coordinates of the points A and B. When the MENU LEADER is digitized, the program calculates the distance between points A and B. The arrowhead is .07 inches wide and .1 inches long. The leader can be drawn at any angle.

**TITLE**

# DRAFTING DIGITIZER

## DIMENSION INPUT

1. DIGITIZE POINT A
2. DIGITIZE POINT B(RIGHT OF A)
3. DIGITIZE MENU

## Dimension Input

4. ENTER DIMENSION ON 4051 KEYBOARD AND PRESS RETURN  
(LIMIT YOUR DIMENSION OR NOTE TO 16 CHARACTERS)

$$+^A \text{ (ANY ALPHANUMERIC DATA) } +^B$$

**EXECUTION:**

The 4051 stores the X and Y coordinates of the points. When the MENU DIMENSION INPUT is digitized, the program will flash five times the message:

"ENTER YOU DIMENSION, LIMIT 16 CHARACTERS".

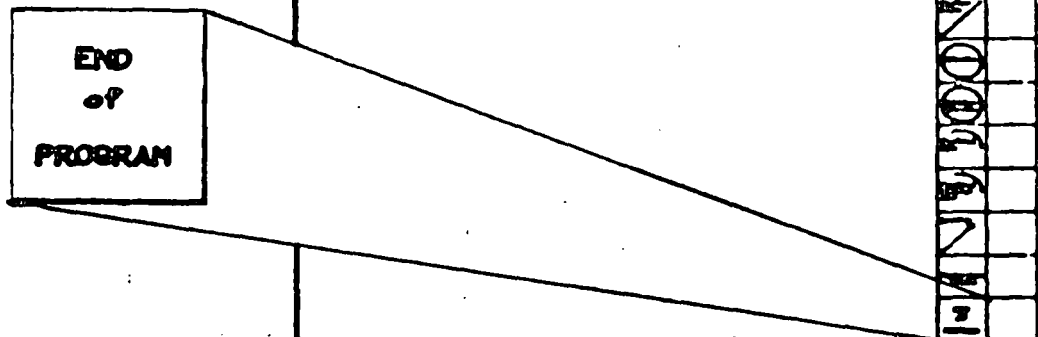
This message will appear in the upper left corner of the 4051 screen. Next, the 4051 cursor and/or plotter pen move to the X and Y coordinate of A. The system will await the input of any alphanumeric information from the 4051 keyboard. After the data is typed, do not forget to press the RETURN key. This routine outputs the data in a horizontal position and limits input to 16 characters. WARNING, do not get too close to the right side of the drawing area.

TITLE

DRAFTING DIGITIZER

END OF PROGRAM

1. DIGITIZE MENU



END  
of  
PROGRAM

## EXECUTION:

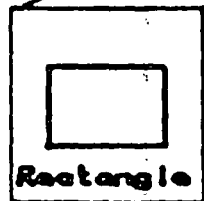
The 4051 will flash "PROGRAM TERMINATED" five times in the lower left corner of the screen. The 4051 bell will ring with each flash. The program is completed and control returns to the BASIC interpreter.

TITLE

## DRAFTING DIGITIZER

## RECTANGLE

1. DIGITIZE POINT A  
(LOWER LEFT CORNER)
2. DIGITIZE POINT B  
(UPPER RIGHT CORNER)
3. DIGITIZE MENU



## EXECUTION:

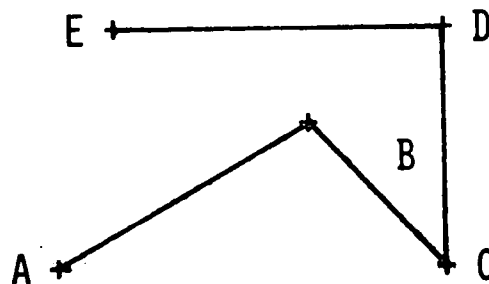
The 4051 stores the X and Y coordinates of the points. When the MENU RECTANGLE is digitized, the program calculates the distance between A and B. With the diagonal distance, the program calculates the length of the horizontal and vertical sides. The routine uses the RDRAW command to execute ONLY horizontal and vertical lines.

# TITLE DRAFTING DIGITIZER

## POINT-TO-POINT

1. DIGITIZE POINT A  
B  
C  
...  
ETC.
2. DIGITIZE MENU

POINT  
to  
POINT



### EXECUTION:

The 4051 will store the X and Y coordinates of the points. When the MENU POINT-TO-POINT is digitized, the program will use the DRAW command to connect the digitized points with straight line segments. Points may be located at any position.



# DESKTOP COMPUTER APPLICATIONS LIBRARY PROGRAM

TITLE		
POINT Mode Digitize		
ORIGINAL DATE	REVISION DATE	EQUIPMENT AND OPTIONS REQUIRED
October, 1980		32K (64K Optimum)
AUTHOR Craig Bulmer Tektronix, Inc. Chicago, IL		PERIPHERALS 4956 Tablet
<p>ABSTRACT</p> <p>Statements: 355</p> <p>Files: 1 Program</p> <p>Requires pre-marked data files on tape</p> <p>Optional: 4662/4663 Plotter 4907 File Manager</p> <p>This program allows you to digitize a drawing on the 4956 Tablet in POINT mode using the Writing Pen. The data format on disk is compatible for use with "4052/4 Drafting Program" in this disk/tape.</p> <p>User-Definable Keys invoke the routines. As you are digitizing, the drawing is reproduced on the 4050 Screen. Lines may be deleted from your drawing. The completed drawing may be re-displayed, or continued. The drawing may be saved to tape or disk and recalled from either.</p> <p>A grid structure coupled with a 'ZOOM' windowing routine helps you choose your window.</p>		
<p>The program material contained herein is supplied without warranty or representation of any kind. Tektronix, Inc., assumes no responsibility and shall have no liability, consequential or otherwise, of any kind arising from the use of this program material or any part thereof.</p>		

## TITLE

POINT Mode Digitize

SET UP

Interface the 4956 Tablet to your 4050 system and power up. Depress the POINT button on the tablet controller.

If you are going to store your sketch on tape, MARK a file to hold your data.

Change array X in statement 130 to reflect the size of your machine; e.g., for a 4051 you might dimension X(500,3).

Change statement 160 if Tablet address is not 8.

Change statement 13 if Plotter address is not 1.

Load the POINT Mode Digitize program into 4050 memory.  
Tape: FIND 4, OLD. Disk: OLD "@DIGITIZE/POINT".

OPERATION

Lay your sketch on the 4956 Tablet.

Press UDK #10.

Set ORIGIN and outline boundaries as directed by the prompts on the 4050 Screen.

Program flow is controlled through the User-Definable Keys which are described on the following pages.



TITLE

POINT Mode Digitize

TITLE POINT Mode Digitize

TAPE #

FILE #

SHIFT KEYS				
11 DELETE LINE	12 SAVE TO DISK	13 DISPLAY FRM TAPE	14 DISPLAY FRM DISK	15 SAVE TO DISK/DRFTG
1 MOVE	2 DRAW	3 PLOTTER	4 REDISPLAY	5 SAVE TO TAPE
SHIFT KEYS				
16 Z7=Z	17 DELETE LAST POINT	18	19 RESTORE WINDOW	20 CONTINUE
6 SCREEN	7 GRIDS	8 TERMINATE	9 WINDOW	10 RESTART

PN334 2630 00

TITLE

POINT Mode Digitize

Digitizing. UDK #1 - next digitized point will be a MOVE.

UDK #2 - next digitized point will be a DRAW.

The program automatically enters digitize mode and sets the first digitized point to be a MOVE.

Therefore, digitize the beginning point on your drawing. Then press UDK #2 and digitize the next point(s). You'll see your sketch displayed on the screen.

Delete Last Point. (Don't get this mixed up with Delete Line.)

Press UDK #17. Digitize one more point (anywhere, it will be discarded). The last point of your sketch will be deleted and the corrected object redisplayed. The program will automatically return you to digitize mode and will set the next point to be a MOVE. Continue digitizing. (DON'T press UDK #20 to continue!)

Grids. Press UDK #7. Digitize your next point (it will be included in your sketch). A grid will be drawn over your sketch and you'll be returned to digitize mode and to the DRAW or MOVE state you were in.

Terminate. Press UDK #8. Digitize one more point (it will be discarded).

THE FOLLOWING ROUTINES MAY BE USED AFTER YOU HAVE TERMINATED THE DIGITIZING MODE.

Delete Line. Press UDK #11 to delete a line. Digitize a point along the line to be deleted. The program will locate the beginning and end points of the line and convert the end point to a MOVE, thus deleting the drawn line. NOTE: Pinpointing the line requires great accuracy. If you wish to TERMINATE or CONTINUE before you've located the line, press UDK #8 or UDK #20, digitize one more point (it will be discarded) and you'll escape the Delete Line mode.

Continue. Press UDK #20. You'll be returned to digitizing mode to continue your sketch.

Window. Press UDK #9 to change the window size. The program will display your original window and ask you for new values.

Restore Window. Press UDK #19 and your original window will be restored.

Z7=Z. Press UDK #16. It will set window values to original values but will maintain the current display.

Redisplay. Press UDK #4. Your drawing will be sent to the screen or plotter.

## TITLE

POINT Mode Digitize

Screen. Press UDK #6. Output will be directed to the 4050 screen.

Plotter. Press UDK #3. Output will be directed to the 4662 Plotter.

Save to Tape. Have a pre-marked file ready on tape. Insert your tape, -press UDK #5 and respond to the prompt for the file number.

Display from Tape. Insert your tape with the saved data on it. Press UDK #13 and respond to the prompt for the file number.

Save to Disk. Press UDK #12. You'll be prompted for the file name. If one already exists, you'll be warned and given another chance.

Display from Disk. Press UDK #14 to display your drawing stored on disk by UDK #12.

Save to Disk/Drafting. Press UDK #15 and your data will be stored on disk in a format usable by 4050 Applications Library Program #52/07-9538/0 - "4052/4 Drafting Program."

DATA STORAGE

Tape: PRI @33: I,Z,X

Disk: PRI #1: I,Z,X (sequential file)

I = # of points entered

Z = WINDOW (Dim Z(4) )

X = Array of points entered and either move or draw. DIM X(1500,3)

X(J,1) = X coordinate

X(J,2) = Y coordinate

X(J,3) = 21=MOVE or 20=DRAW

Disk Storage for Applications Library Program 4052/4 Drafting.

Random file length of each record - 410 bytes.

First record contains # of observations.

Following records contain:

WRITE #1,J: Option, Layer#, Line style, X Starting Point,  
Y Starting Point, X Ending Point, Y Ending Point.

OPTION = 1 means line always

LAYER # = 1 means layer is always 1st layer

LINE STYLE = 0 means lines will be drawn as solids always

## TITLE

POINT Mode Digitize

INTERNAL DATA STORAGE

<u>Variable</u>	<u>Used to Store</u>	<u>Type</u>
A\$	Keyboard Input & Working	String
B\$	File Name for Disk	String
C\$	Working	String
A	X value from Tablet	Simple
B	Y value from Tablet	Simple
D	21=MOVE 20=DRAW	Simple
E	Output device 32=Screen 1=Plotter	Simple
F	Switch	Simple
G	Tablet Address = 8	Simple
I	# of points entered	Simple
J	Counters	Simple
K	Counters	Simple
K1	Skew correction	Simple
K2	Skew correction	Simple
R6	Delete line switch	Simple
X	X, Y and MOVE/DRAW	Array (1500,3)
Y	Initial Window	Array (4,2)
Z	Skew corrected window	Array (4)
Z7	Current Window	Array (4)



# DESKTOP COMPUTER APPLICATIONS LIBRARY PROGRAM

TITLE		
3D-Transformation using Homogeneous Coordinates		
ORIGINAL DATE	REVISION DATE	EQUIPMENT AND OPTIONS REQUIRED
July, 1978		24K
AUTHOR	Idaho State University Department of Chemistry Pocatello, ID	PERIPHERALS
George E. Heckler		
ABSTRACT		
<p>Files: 1 Program</p> <p>Statements: 339</p> <p>The program displays two straight sided 3-D figures on the screen. On the left is the original figure. The points at the corners of the original are transformed by a 4 x 4 matrix and displayed on the right.</p> <p>The transforming matrix and coordinates of illustrative points are also displayed. The matrix multiplication uses homogeneous coordinates.</p>		
<p>The program material contained herein is supplied without warranty or representation of any kind. Tektronix, Inc., assumes no responsibility and shall have no liability, consequential or otherwise, of any kind arising from the use of this program material or any part thereof.</p>		

## TITLE

3D-Transformation using Homogeneous Coordinates

OPERATING INSTRUCTIONS

Tape: FIND 10, OLD and RUN. Disk: OLD "@TRANSFORM" and RUN.

Should a blinking "F" appear on the screen, press HOME (not PAGE) and RUN will continue.

INTERNAL DATA STORAGE

Variables are described in the program. Method of changing the variables is described in the program.

METHODS

The cartesian coordinates of the corners of an eight cornered box are converted to homogeneous coordinate vectors by inserting ones in a fourth column of the  $8 \times 3$  matrix. This is the A matrix.

A  $4 \times 4$  homogeneous transformation matrix, M, is used to transform the corners of the original box by matrix multiplication ( $A \times M$ ). This transformation matrix, M, is easily modified.

The resulting matrix,  $D = A \times M$ , is reconverted to homogeneous coordinate vectors (b matrix) by dividing each row of the D matrix by the number appearing in the 4th column of that row. The new first three columns (an  $8 \times 3$  matrix) constitute the cartesian coordinates of the transformed eight cornered box.

The original box, A, and the transformed box, B, are drawn side by side against x, y, z axes on the screen. One illustrative, strategic corner of each box is labeled and the coordinates of these two points are printed on the screen above the drawings. The transformation matrix M is also printed at the same time.

Matrices A and B may be obtained for recording by typing A, RETURN, or B, RETURN.

The user is advised to run as received for the first perception of output (say 'YES' to both questions on first run).

There is a short wait during the transformation before box B is drawn.

REFERENCE

"Mathematical Elements for Computer Graphics" by D. F. Rogers and J. A. Adams, McGraw-Hill, 1976.

TITLE

3D-TRANSFORMATION USING HOMOGENEOUS  
COORDINATESEXAMPLES

$D = A \cdot M$   
 $B(K) = D(K) / D(K, 4)$

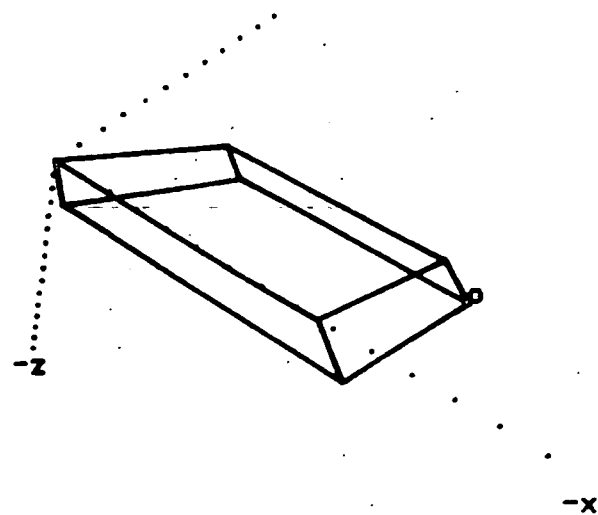
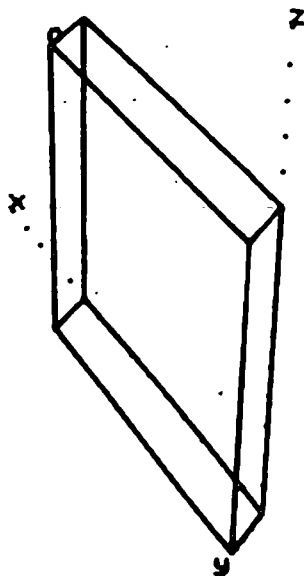
$M =$	-1.00	0.00	0.00	0.00
	-1.00	1.00	0.00	0.00
	0.00	-2.00	-1.00	0.00
	0.00	0.00	0.00	1.00

o - LABELED CORNER

o is <sup>A</sup> 3.00 0.50 2.00

o is <sup>B</sup> -3.50 -3.50 -2.00

-y



TITLE

3D-TRANSFORMATION USING HOMOGENEOUS  
COORDINATES

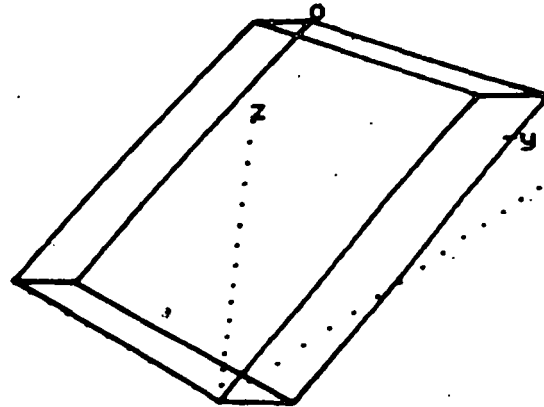
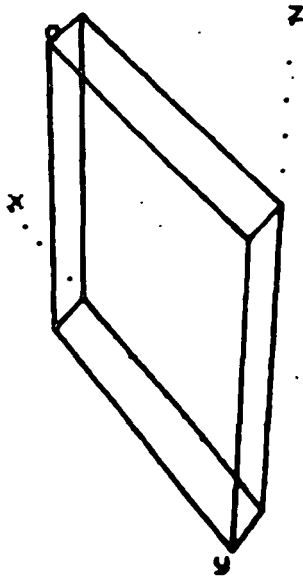
$D = A * M$   
 $B(K) = D(K) / D(K, 4)$

$M =$	1.00	0.00	0.00	0.00
	-1.00	-1.00	0.00	0.00
	0.00	-2.00	1.00	0.00
	0.00	0.00	0.00	1.00

o - LABELED CORNER

o is <sup>A</sup> 3.00 0.50 2.00

o is <sup>B</sup> 2.50 -4.50 2.00





TITLE

3D-TRANSFORMATION USING HOMOGENEOUS  
COORDINATES

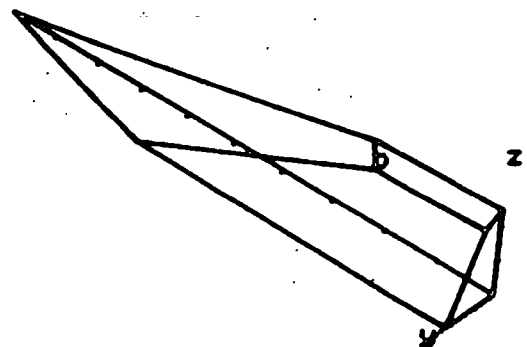
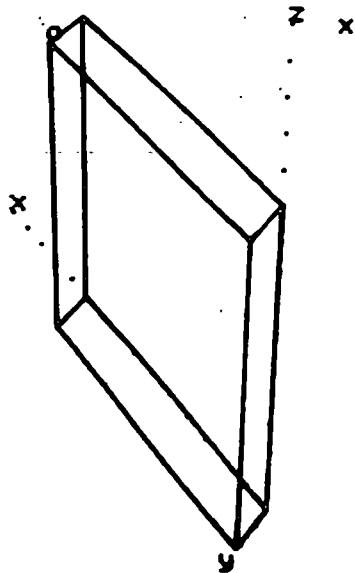
$D = A \cdot M$   
 $B(K) = D(K) / D(K, 4)$

$M =$	1.00	0.00	0.00	0.00
	0.00	1.00	0.00	1.30
	0.00	0.00	1.00	1.70
	0.00	0.00	0.00	1.00

o - LABELED CORNER

o is  $\overset{A}{\begin{matrix} 3.00 & 0.50 & 2.00 \end{matrix}}$

o is  $\overset{B}{\begin{matrix} 0.59 & 0.10 & 0.40 \end{matrix}}$



## TITLE

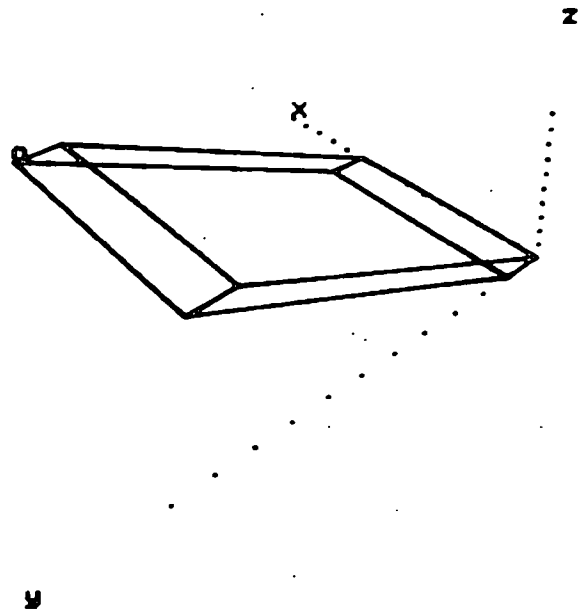
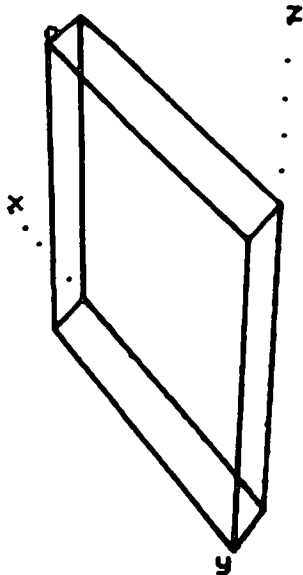
3D-TRANSFORMATION USING HOMOGENEOUS  
COORDINATES

$D = A \cdot M$   
 $B(K) = D(K) / D(K, 4)$

$M =$	1.00	0.00	0.00	0.00	
	0.00	1.00	0.00	0.00	
	0.00	2.00	1.00	0.00	
	0.00	0.00	0.00	1.00	o - LABELED CORNER

o is  $\overset{A}{3.00} \quad 0.50 \quad 2.00$

o is  $\overset{B}{3.00} \quad 4.50 \quad 2.00$





# DESKTOP COMPUTER APPLICATIONS LIBRARY PROGRAM

TITLE		EQUIPMENT AND OPTIONS REQUIRED
Performance Prediction of Sailcraft		
ORIGINAL DATE	REVISION DATE	24K
July, 1980		
AUTHOR Alex Gares University of South Florida College of Engineering, Tampa FL		PERIPHERALS Optional - 4662 Plotter " - 4641 Printer

**ABSTRACT**

Files: 1 Program

Statements: 589

The program allows the user to predict the speed of any sailing craft with respect to the wind velocity and angle to the true or apparent wind direction. Polar diagrams are generated of the ratios of:

- Boat speed to true wind speed
- Boat speed to apparent wind speed
- Velocity made good to windward to true wind speed

The program permits the sailboat designer, handicapper or performance sailor to evaluate fully the effect of the various significant parameters on sailing craft velocities at all angles to the apparent and true wind, and generate polar plots.

A test routine for a catamaran is included to demonstrate the output. Also included is a picture of the vectors involved.

User prompted input:

- Sail area in square ft.
- Sail lift coefficient
- Sail drag coefficient
- Waterline length in ft.
- Waterline length from bow to widest beam in ft. or from bow to LCB in ft.
- Displacement in lbs.
- Prismatic coefficient
- (Monohull) - Metacentric height in ft.
- (Monohull) - Vertical distance between CE and CLP in ft.
- Hull drag force at 3.16 knots in lbs.
- True wind velocity in knots
- Angle between true wind and boat velocity in degrees

The program is a result of a senior level engineering research project and stems from a study of over 20 references in the field.

The program material contained herein is supplied without warranty or representation of any kind. Tektronix, Inc., assumes no responsibility and shall have no liability, consequential or otherwise, of any kind arising from the use of this program material or any part thereof.

## TITLE

Performance Prediction of Sailcraft

Tape Structure

No provision has been made to store data externally.

Internal data storage

## INTERNAL DATA STORAGE

Variable	Used to Store.....	Type
V1	True Wind velocity -Vt	Simple
V2	Apparent wind velocity - Va	Simple
V3	Boat velocity - Vb	Simple
U3	Angle betw. Vb/Vt-gamma	Simple
U2	Angle betw.Vb/Va-beta	Simple
G3	Righting Arm -GZ	Simple
A(19)	Metacentric Height-GM	Array
U9	Heel angle - theta	Simple
L4	Sail Lift Force- Ls	Simple
P2	Air Density - rho	Simple
C9	Sail Lift. Coefficient Csl	Simple
A(8)	Sail Area - As	Array
C8	Sail Drag Coeff. -Csd	Simple
D4	Sail Drag Force - Ds	Simple
F1	Total Sail Force - Fs	Simple
U5	Sail drag angle -delta s	Simple
U7	Hydrodynamic drag angle delta h	Simple
F4	Heel Force - Fh	Simple
M2	Distance betw.CE and CLP	Simple
W7	Displacement - W	Simple
C4	Gravity Resistance Coeff-Rg	Simple
A1	Max.Submerg.Sect.Area -A	Simple
A(15)	Prismatic Coefficient - Cp	Array
L1	Waterline length bow to mid.	Simple
A(2)	Total waterline length - LWL	Array
C5	Hull Form Coeff. - Kd	Simple
R/C3	Displacement.Resist.Coeff.-Rd	Simple
A(29)	Hull Drag Force -Dh	Array
F2	Sail Drive Force - Fr	Simple

TITLE

## Performance Prediction of Sailcraft

## Internal Data Storage - continued

A(7)	Displacement -cu.ft. - delta	Array
P	Internal Variable	Simple
Pi	Internal Variable	Simple
W3	1 for catamaran 2 for monohull	Simple
I	For...Next Loop variable + tics	Simple
B	1 to explain program 2 not	Simple
C	1 for polar diag. 2. not	Simple
H1	Flag for screen,plotter,printer	Simple
D	Flag for hull resistance data	Simple
T1	Internal variable	Simple
A\$,S\$	For paging	String Null
R1	Window values	Simple
H	Angle betw. axis lines	Simple
J	For...Next loop variable	Simple
A,M,Q,S,Z	Data storage	Array
B5	Flag for drawing vector diagram on screen or x-y plotter	Simple
B7	See symbols again	Simple
B9	Test case 1.yes 2.no	Simple
H1	Flag for output to GS/x-y or line printer	Simple

## METHODS - Equations Iterated and Evaluated:

$$I. V_a = \sqrt{(V_T \sin \gamma)^2 + (V_T \cos \gamma + V_B)^2}$$

$$II. \beta = \cos^{-1} \left[ \frac{V_B^2 + V_a^2 - V_T^2}{2 V_B V_a} \right]$$

$$III. a. F_{HEEL} MZ - W G Z = \phi$$

$$b. L_s = \frac{1}{2} \rho_a C_{SL} A_s (1.69 V_a)^2 (\cos \theta)^2$$

$$c. D_s = \frac{1}{2} \rho_a C_{SD} A_s (1.69 V_a)^2 (\cos \theta)^2$$

$$d. F_s = \sqrt{L_s^2 + D_s^2}$$

$$e. \delta_s = \cot^{-1} [L_s / D_s]$$

$$f. \delta_H = \beta - \delta_s$$

$$g. F_{HEEL} = \frac{F_s \cos \delta_H}{\cos \theta}$$

$$h. GZ = GM \sin \theta$$

TITLE

Performance Prediction of Sailcraft

$$IV a. F_R - D_H = 0$$

$$b. R_d = \left[ (0.059) \frac{\sqrt{A}}{L_1} \right] W / L_{WL}$$

$$c. D_H = R_d V_B^2 + R_g (1 - \cos 360^\circ \sqrt{L_{WL}} / V_B) V_B^2$$

$$d. F_R = F_S \sin (\beta - \delta_s)$$

$$e. D_H = R_d V_B^2 \quad (\text{For } V_B \leq \sqrt{L_{WL}})$$

$$V. a. A = V / C_p * L_{WL}$$

$$b. R_d = K_d \sqrt{W}$$

$$c. D_H = R_d V_B^2$$

$$d. D_H = 2 D_H$$

$$e. R_d = D_H / V_B^2$$

$$f. P = (0.12)(75) - C_{SL}$$

$$g. C_{SL} = (0.12)(81) - P$$

$$h. C_{SD} = C_{SL} / 3.43$$

$$i. P_1 = C_{SL} + (0.02)(120)$$

$$j. C_{SL} = (-0.02)(81) + P_1$$

$$k. C_{SD} = (C_{SL} - 1.62) / (-1.2)$$

Note: Other equations used are ordinary trigonometric relations and identities.

## TITLE

Performance Prediction of Sailcraft

OPERATING INSTRUCTIONS

Disk: OLD "@SAILCRAFT" and RUN.

This program is highly interactive, and all user instructions are contained in prompts.

Examples of the three types of polar plots and the vector diagram are attached.

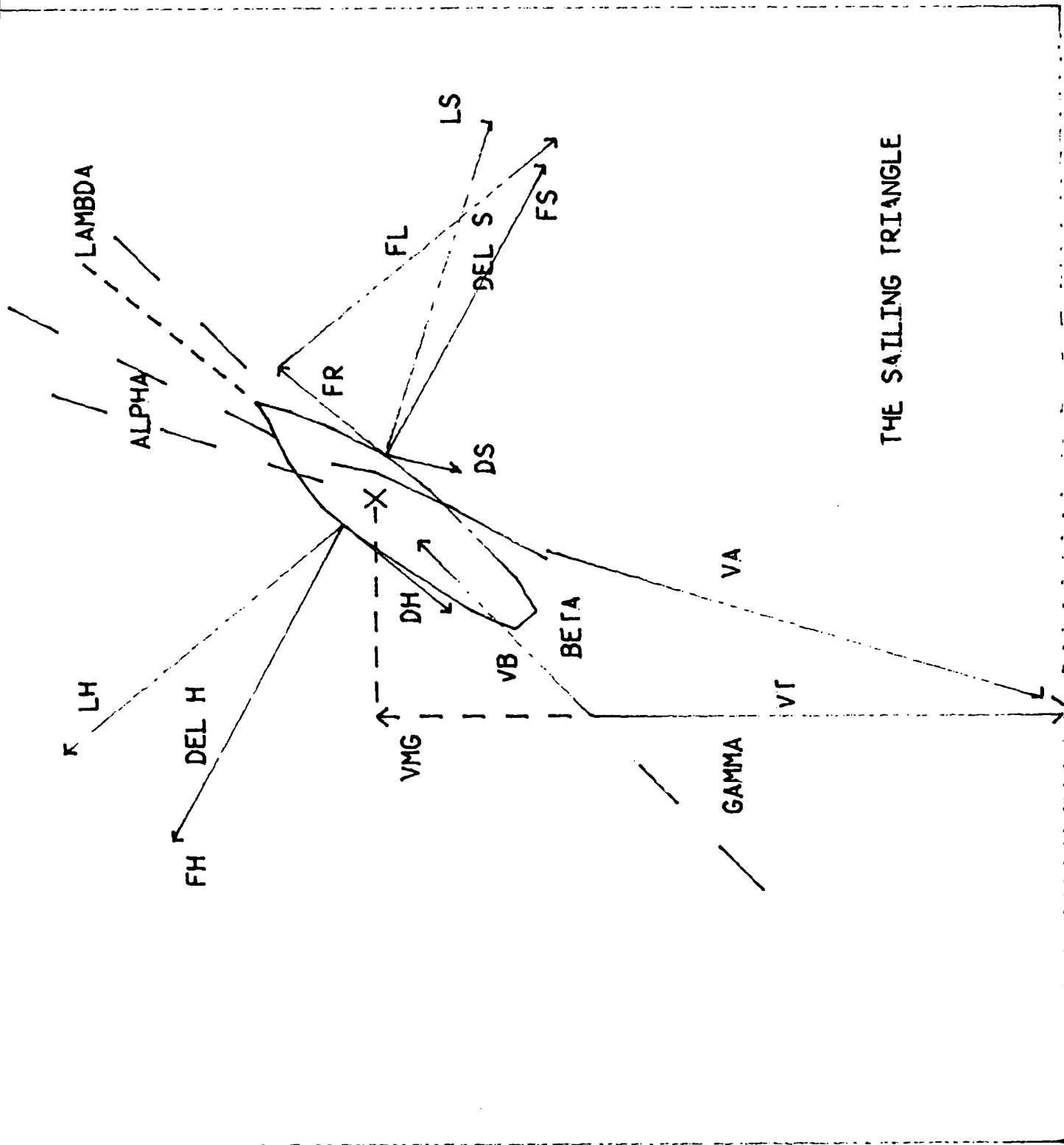
No overlays or user-definable keys are employed.

## References:

- A. "A Complete Mathematical Model of Sailcraft Performance;" Piper A. Mason Jr.; pp 35-50; "The Ancient Interface VI: Proceedings of the Sixth AIAA Symposium on the AER/Hydronautics of Sailing."V.15.
- B. "Full Scale Tow and Heel Resistance Test Procedures;" Piper A. Mason Jr.; ibid pp. 51-57.
- C. "The Science of Yachts, Wind and Water;" H.F.Kay. p. 98;DeGraff;1971
- D. "Design for Fast Sailing;" Bruce & Morss. p.74; AYRS 82; 1976
- E. "Sailing Theory and Practice;" C.A. Marchaj; p.319; Dodd Mead; 1964

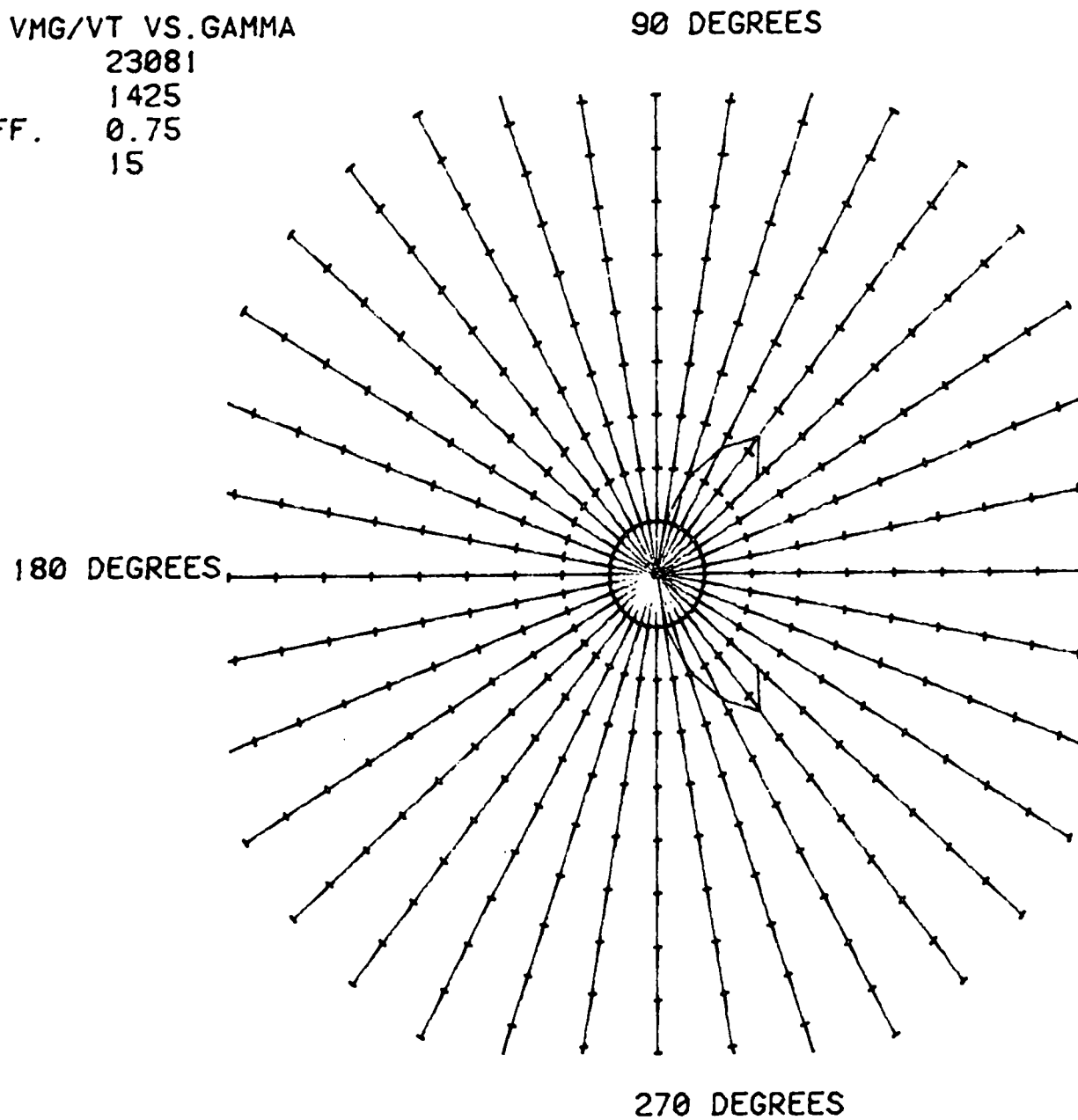
TITLE

## Performance Prediction of Sailcraft





POLAR PLOT OF VMG/VT VS. GAMMA  
DISPLACEMENT 23081  
SAIL AREA 1425  
PRISMATIC COEFF. 0.75  
POLAR FOR VT= 15



TITLE

Performance Prediction of Sailcraft

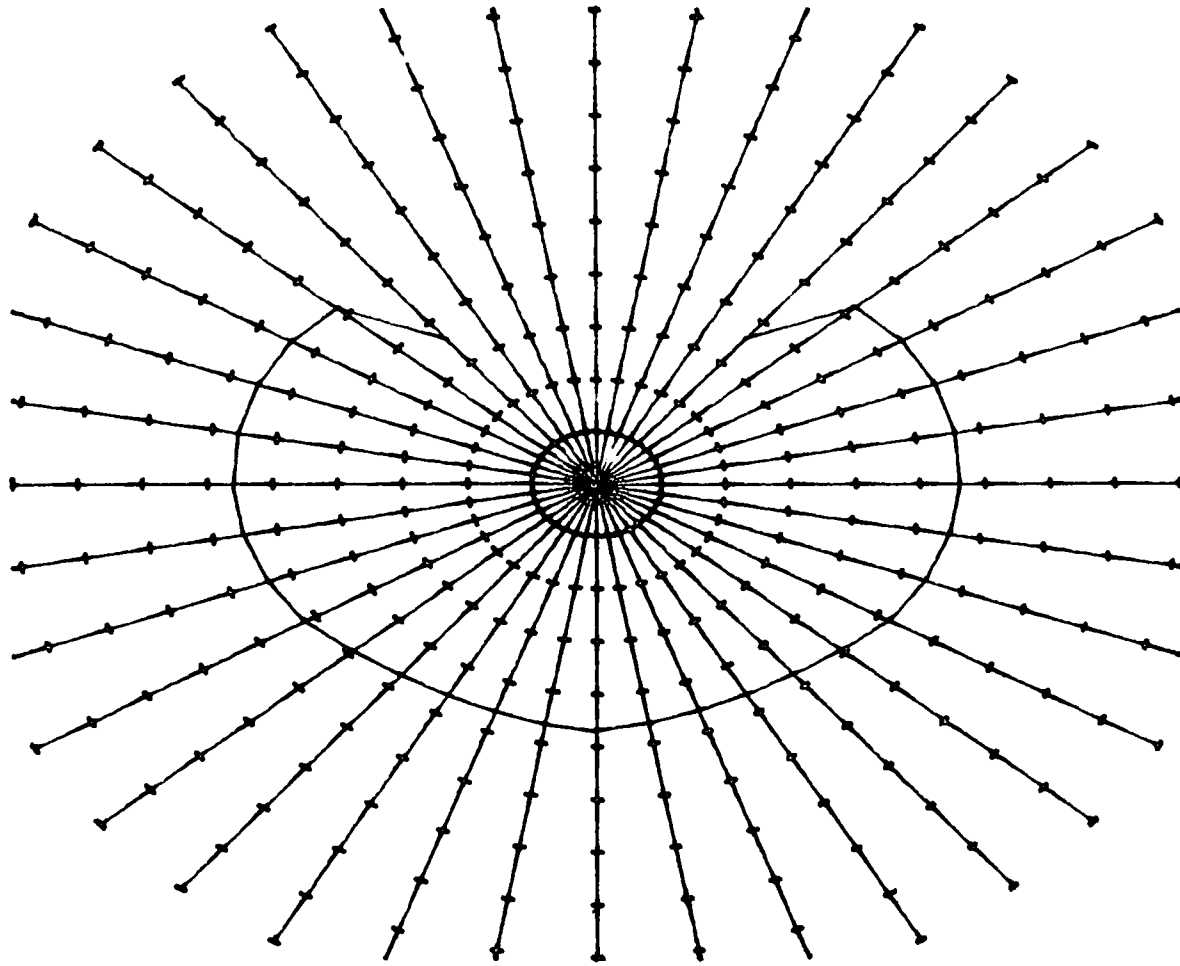
90 DEGREES

270 DEGREES

180 DEGREES

0. 0.5 1

POLAR PLOT OF  $V_B/V_T$  VS.  $\gamma$   
DISPLACEMENT 23081  
SAIL AREA 1425  
PRISMATIC COEFF. 0.75  
POLAR FOR  $V_T^2$  15



TITLE

Performance Prediction of Sailcraft

90 DEGREES

270 DEGREES

180 DEGREES

POLAR PLOT OF VB/VA VS. GAMMA  
DISPLACEMENT 23081  
SAIL AREA 1425  
PRISMATIC COEFF. 0.75  
POLAR FOR VT= 15

0. 0.5 1