2000

Cat. No. 26-5282

TANDY

Versacad—Entry Level

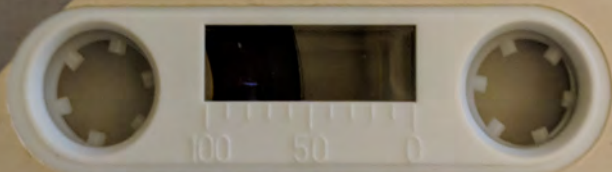01.00.00

TANDY®

1200/2000   Cat. No. 26-5282

TANDY®   Versacad—Audio Tour

100   50   0

Audio Cassette

Custom Mfd. in U.S.A. for Radio Shack, A Division of Tandy Corp., Ft. Worth, TX 76102

READ ME FIRST

All computer software is subject to change, correction, or improvement as the manufacturer receives customer comments and experiences. Radio Shack has established a system to keep you immediately informed of any reported problems with this software, and the solutions. We have a customer service network including representatives in many Radio Shack Computer Centers, and a large group in Fort Worth, Texas, to help with any specific errors you may find in your use of the programs. We will also furnish information on any improvements or changes that are "cut in" on later production versions.

To take advantage of these services, you must do three things:

(1) Send in the postage-paid software registration card included in this manual immediately. (Postage must be affixed in Canada.)

(2) If you change your address, you must send us a change of address card (enclosed), listing your old address exactly as it is currently on file with us.

(3) As we furnish updates or "patches", and you update your software, you must keep an accurate record of the current version numbers on the logs below. (The version number will be furnished with each update.)

Keep this card in your manual at all times, and refer to the current version numbers when requesting information or help from us. Thank you.

APPLICATIONS SOFTWARE VERSION LOG

OP. SYSTEM VERSION LOG

01.00.00

ADDENDUM TO VERSACAD ENTRY LEVEL 26-5282

NEW DEVICES SUPPORTED

VersaCAD - Entry Level now supports the Houston Instruments PC-595 and 695, DMP-40 series and DMP-50 series plotters. Installation of these plotters is as follows:

Switch Settings

PC-595 and PC-695: Set the block of switches on the back of the plotter as follows (U=up; D=down):

1	2	3	4	5	6
U	D	D	D	D	D

DMP-40, -41, -42: There are no switch settings on the plotter. The baud rate must be set to 9600 each time the plotter is turned on. Do this with the keys on the front panel: Press the [enter] key, followed by the [up-arrow] key.

DMP-51 and -52: There are no switch settings on the plotter. All settings are made using a setup program, which is correct from the factory except for the baud rate. Change it as follows:

Load a large piece of paper and install a pen. Press [SCALE UR] to put the plotter into Menu mode. The plotter will plot each setting and pause for you to press [ENTER] to accept the setting or use the arrow keys to move the pen over the desired setting, followed by [ENTER]. Accept the standard settings EXCEPT the baud rate, which should be 9600. When you are finished, press [SCALE UR] again to exit the Menu mode.

Software Plotter Drivers

Refer to the section of *Part 1 - Installation* on removing the unnecessary plotter driver files from your Working disk and make the following change:

If you are using a Houston Instruments plotter, the driver file you need is called **HIPLOT.OVL.** Erase the other two plotter files as instructed in the *Installation* section.

TANDY DMP2100/DMP2100P PRINTER
SWITCH SETTINGS

All switches on the row of switches behind the front
panel should be set to OFF, except when using the
Tandy 1200, Switch #6 should be set to ON.

DEFINITION OF DEFAULT PLOTTER SPECS

The following will serve to clarify the meaning of
Default Plotter Specs, as discussed in *Part 13 - Output.*

To plot the current screen image onto the entire plotter
surface (the Default Spec), simply select PLOTTER
from the OUTPUT menu, then press [enter] when asked
for the name of your plot spec. There is no need to select
the SPECS option.

When the SPECS option is selected from the OUTPUT
menu, the initial values displayed are not the same as the
Default Plot Specs. These values are merely starting
points for your own plot spec definition.

VERSACAD-ENTRY LEVEL

Version 01.00.00

CONTENTS

VERSACAD—ENTRY LEVEL
QUICK REFERENCE CARD

ADD	MODIFY	SKETCH	GROUP	FILER	WINDOW	INQUIRE	PROPERTIES	SWITCHES	UNITS	OUTPUT	EXIT
Line	Move	Edit	Build	New	Base	Start/end	lineStyle	Marker	Rotation	Plotter	
Rectangle	Copy	Justify	Move	Crunch	In	Change	Density	Template	Increment	pRinter	
Polygon	Rotate	Adjust	Copy	What	Out	Rotation	lineWidth	Grids	Units	Specs	
Circle	Scale	Find	Rotate	sketch	Pan	Length	Level	Reverse	Base	Window	
Ellipse	Image	(&)	Scale	Out	Full	Center	Pen	Upright	Grids	Boundaries	
Arc	Delete	sketch	Image		Get	Diam/rad	Color	All levels	sketch	Factor	
Bezier	Undelete	Out	Properties		Save	Incl angle	group Name	Levels	Out	Get	
pOint	Explode		Delete		Delete	Properties	Text	sketch		Save	
Dimension	Text		Undelete		List	(+) add	Out	Out		Delete	
Text	Handle		List		Redraw	(−) subtract				List	
Guides	Properties		Where		What	Zero totals				Out	
sketch	Find		Find		sketch	Find				sketch	
Out	(backward		Number		Out	(&)				Out	
	) forward		Guides			Out					
	sketch		sketch								
	Out		Out								

FUNCTION KEYS

F1: DIGITIZER KEYBOARD OR PLOTTER
    ABSOLUTE RELATIVE POLAR
F2: SNAP MODE FREE INCREMENT
    GRID OBJECT
F3: ORIGIN SHIFT
F4: OBJECT TRACKING—interactive display
F5: CURSOR DISPLAY—large/small
F6: UPDATE PROPERTIES
F7: DIGITIZER SCALE—reset
F8: DIGITIZER SCALE—set

NOTE: Properties may be changed from the MODIFY and GROUP menus and with Function Key F6.

USE OF THE FUNCTION KEYS

To help increase the efficiency of your work, the VersaCAD program provides you with several function keys. They are used to select a particular operating mode or turn a switch on and off. The unique thing about a function key is that it can be used at any time, so for example, you can turn the Snap option on or off while in the middle of a complex operation. All function key options are selected from the keyboard.

Function key F1:

This key selects among the various types of input, as explained in the *Introduction* section of this manual. You will be presented with a menu of options: digitizer or absolute, relative or polar keyboard entry.

Function key F2:

This key switches among the various snap modes, as explained in the *Introduction*. The current snap mode is shown near the coordinate display on your screen. 'I' means increment snap is selected, 'G' stands for grid snap, 'O' means object snap is enabled and a '.' means that all snap is turned off. Select the appropriate snap mode from the menu display.

Function key F3:

This key allows you to change the origin and reference points as you work. The normal origin is at the lower lefthand corner of the screen (0,0); by selecting Origin, you can redefine it by placing the cursor at the desired location. If the program is in the shifted origin mode, an 'O' will be shown near the coordinate display on your screen. If you are using the standard origin, a '.' will be displayed.

When selecting the Reference option, you can change the Reference point used in Relative and Polar modes to be at the current location of the cursor. (In the ADD menu, the normal Reference point is the last endpoint added; in the MODIFY menu, it is the object's handle point.)

Function key F4:

This key switches the Object Tracking mode, as discussed in the *Introduction*. When tracking is off, the program will no longer continuously draw an object as you move it on the screen; it will only be drawn when you 'accept' the object with the keyboard or stylus. If the program is in the tracking mode, a 'T' will be displayed near the coordinate display on your screen. If it is not, a '.' will appear instead.

Function key F5:

This key switches between the short and long cursor. The 2D program normally uses a short cursor, which looks like a small cross. By pressing this function key, you can display a large crosshairs that extends across the entire screen as an aid for precise visual alignment of objects.

Function key F6:

This is the 'Update' key, allowing you at any time to change the 'global' properties, which are those inherited by an object when it is created (as discussed in the *Introduction*). Changing properties with this key also changes them on the PROPERTIES menu.

Pressing this key gives you a menu of properties that can be changed.

> line Style
> Density
> lineWidth
> Level
> Pen
> Color
> group Name
> Rotation
> Increment
> Text
> Quit
> [esc]

An explanation of each of these options can be found in the PROPERTIES and UNITS sections of the manual. Typing one of the capitalized letters on this list allows you to change the corresponding property. Typing [Q] (Quit) or selecting any letter not on the list will return

you to your previous operation, incorporating all of your changes to that point.

Function key F7:

This key resets the digitizer scaling to its normal mode and allows unrestricted cursor movement across the entire graphics screen. It undoes what Function key F8 accomplishes (see below).

Function key F8:

This key is the digitizer scaler. Its purpose is to restrict the movement of the cursor so that you can place it more precisely. When this key is used, the movement of the cursor is limited to whichever ¼ of the graphics screen the cursor is in. This now represents the entire surface area of the digitizer. A large movement of the digitizer stylus results in a small movement of the cursor across the screen. Each time you press this key, the sub-area is itself divided into quarters. The process is cancelled by pressing Function key F7.

PART 1 - INSTALLATION
AND DISK OPERATIONS
System Requirements for VersaCAD - Entry Level

VersaCAD - Entry Level is easy to install on your Tandy 1200 or Tandy 2000 microcomputer. You will need to have the following minimum components:

- MS-DOS 2.11.00 or greater (TANDY 1200 25-3130)

REQUIRED EQUIPMENT TO:	USE MONOCHROME DISPLAY	USE COLOR DISPLAY
Tandy 2000 with 256K and 2 floppy disk drives (26-5103) -or- Tandy 2000 with 256K and 1 hard disk and 1 floppy drive (26-5104)	This option not available	(8 colors) High Resolution Graphics Board (26-5140) Color Chip Kit (26-5141) CM-1 Color Monitor (26-5112)
Tandy 1200 with 256K (25-3000) Graphics Display Adapter (25-3043) Captain Multifunction Board (25-3061) RS232C Cable Connector (26-1495)	(Green on Black) VM-3 Monochrome Monitor (25-3010)	(White on Black) CM-2 Color Monitor (26-3212)

- Tandy GT2000 digitizer (26-1186)

- Tandy FP215 (26-1193) (Tandy 2000 only) or Hewlett-Packard HP7470 or HP7475 plotter

- Tandy DMP2100/DMP2100P (26-1274) printer is an optional addition for screen dumps.

Switch Settings
TANDY GT2000 DIGITIZER: Set the long row of switches on the back of your digitizer as follows (U=up; D=down):

```
1 2 3 4 5 6 7 8
U D D D U U U U
```

Set the short row of switches as follows:

```
1 2 3 4
D D D U
```

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TANDY FP215 PLOTTER: Set the switches on the back of the plotter as follows (U=up; D=down):

1	2	3	4
D	D	D	D

To connect your Tandy 2000 computer to the Tandy FP215 plotter, use a parallel interface ribbon cable (26-1323).

HEWLETT-PACKARD HP7470 PLOTTER: Set the switches on the back of the plotter as follows (1=on; 0=off):

S2	S1	Y	US	B4	B3	B2	B1
0	0	0	1	1	0	1	0

HEWLETT-PACKARD HP7475 PLOTTER: Set the switches on the back of the plotter as follows (1=on; 0=off):

S2	S1	Y	US	A3	B4	B3	B2	B1
0	0	0	1	1	1	0	1	0

On the HP7475 plotter, press [enter] and [size] simultaneously to switch between A and B size paper.

To connect your computer to either HP plotter, use the HP13242G plotter cable.

INSTALLING YOUR SYSTEM

Your VersaCAD - Entry Level package contains three diskettes. Two of them are for use on a Tandy 1200HD and are intended to be loaded onto your hard disk, as described below. The remaining disk is for the Tandy 2000.

Before running either version, be sure to follow the sequence below that is appropriate for your system configuration. Briefly, you will:

- Format a blank diskette (for floppy disk systems)
- Copy the VersaCAD - Entry Level program to your disk
- Move MS-DOS to your working disk (for floppy disk systems)
- Configure the device drivers for VersaCAD - Entry Level.

FOR TANDY 2000 FLOPPY DISK SYSTEMS, DO THIS:

1. Turn on the computer's power. Place your MS-DOS disk in the lower drive (assumed here to be Drive A) and press **Ctrl-Alt-Delete** simultaneously to restart your computer.

2. Insert a blank disk into Drive B. (Make sure the write-protect notch is not covered).

3. At the system prompt (A > or equivalent), type:

FORMAT B:/V [enter]

FORMAT displays this message:

Insert new diskette for drive B: and strike any key when ready

4. Press a key. FORMAT begins formatting the diskette in Drive B. The screen shows:

Formatting tracks

When the format is done without error, each dash, which represents an area on the disk, becomes a period. A question mark in place of a period indicates that a portion of the diskette contains flawed areas. FORMAT locks out these areas so that MS-DOS never writes to them.

5. When FORMAT is finished, you are asked if you want to name your diskette:

Volume label (up to 11 characters, ENTER for none)?

Type in a name up to 11 characters, followed by [enter], or else just press [enter] for no name.

Now FORMAT displays this message:
Format complete
nnnnnn bytes total disk space
nnnnnn bytes available on disk
Format another (Y,N)?

Press [N] for No. MS-DOS exits the FORMAT command and returns you to the system prompt.

6. To copy all the files from your VersaCAD - Entry Level disk onto the formatted disk in Drive B (including the drawing currently in your workfile), place your VersaCAD disk in Drive A, then type:

DISKCOPY A: B: [enter]
(Be sure you have a blank space in front of the B:)

When the copy procedure is finished, MS-DOS asks if you want to copy another disk. Answer [N] for No, and you will be returned to the system prompt. You may now check the directory listing of the files on your new disk with the **DIR B:** command.

7. The disk you have just created does not contain MS-DOS and is therefore not bootable. If you wish, you can boot your system each time from an MS-DOS system diskette in Drive A and use the disk you just created in Drive B to execute the program. For extra convenience, however, you can make your copied VersaCAD - Entry Level diskette bootable through the use of a special MS-DOS utility, COPYDOS.

Use COPYDOS only once for each VersaCAD working diskette. With your MS-DOS system diskette once again in Drive A and your copied VersaCAD - Entry Level disk in Drive B, type the following at the A > prompt:

COPYDOS [enter]

The rest of the COPYDOS procedure is handled automatically by the computer. Once the files are copied, the system prompt reappears.

8. Put your original VersaCAD - Entry Level disk away for safekeeping. From now on, use the copy for your work, with one complete copy for each drawing you want to save for future use. (You can make these subsequent copies from the disk you are now making by using the **DISKCOPY A: B:** command.)

9. Finally, you will need to erase the plotter driver file that you are not using from your working disk. This allows you to save both disk space and computer memory. Your disk contains two plotter files:

FPPLOT.OVL (for Tandy FP215 plotter)
HPPLOT.OVL (for HP7470 or HP7475 plotter)

WARNING: Make sure to do this on your Working disk, not the Master that you originally received. That way, if you change plotters later, you will still have both files on your Master diskette.

Erase the file you *DON'T* need by typing *ONE OF* the following:

B:ERASE HPPLOT.OVL [enter]
-OR-
B:ERASE FPPLOT.OVL [enter]

(Assuming your VersaCAD working disk is still in Drive B)

10. Reboot the system, using your newly-configured diskette in Drive A. You are now ready to run VersaCAD - Entry Level. Please remember that your current drawing will always be stored in the file VCADI0.WRK, which is replaced whenever you select "New" from the FILER menu. If you want to keep the existing drawing, use another copy of the disk you prepared above for your next drawing.

> **FOR TANDY 1200 AND TANDY 2000 HARD DISK SYSTEMS, DO THIS:**

1. Boot up your computer with MS-DOS under hard disk control. You should see the system prompt C>.

2. Make a sub-directory for VersaCAD - Entry Level on your DOS hard disk by typing in the following commands, followed by [enter]:

CD	
MKDIR VCAD	(you may use any name you wish for the sub-directory we have called VCAD)
CD VCAD	
DIR VCAD	(make sure you are in the right sub-directory)

3. Place your program diskette (or Diskette 1 if you have two) in the floppy drive (assumed here to be Drive A). Now type:

COPY A:*.* C: [enter]

(Be sure you have a blank space in front of the C:)

The computer will display each file name as it is copied, then return you to the C> prompt when finished. If your program came on two diskettes, place the second diskette in Drive A and repeat Step 3.

You may now check the directory listing of the files you transferred with the **DIR** command.

4. Put your original VersaCAD - Entry Level diskette(s) away for safekeeping. Although hard disk systems are very reliable, loss of information does sometimes occur, and the results can be disastrous because of the large amounts of information you could lose. It is therefore important for you to keep floppy diskette copies of all hard disk information, and to back up your working files periodically. To find out how to back up your hard disk, consult your MS-DOS Commands Reference Manual.

5. Finally, if you are setting up a Tandy 2000, you will need to erase from your hard disk the plotter driver file that you are not using. (The Tandy 1200 supports only the HP plotters, so only that driver is included on those disks. If you are setting up a Tandy 1200, go directly to Step 6.)

This allows you to save both disk space and computer memory. (If disk space is not a problem, you can rename the unused file instead.) Your VersaCAD - Entry Level master disk for the Tandy 2000 contains two plotter files:

> FPPLOT.OVL (for Tandy FP215 plotter)
> HPPLOT.OVL (for HP7470 or HP7475 plotter)

Erase the file you *DON'T* need by typing **one of** the following:

> **ERASE HPPLOT.OVL** [enter]
> -OR-
> **ERASE FPPLOT.OVL** [enter]

6. Re-boot the system. You are now ready to run VersaCAD Entry Level from your hard disk. Please note that your current drawing is always stored in the file VCADI0.WRK, which is replaced whenever you select "New" from the FILER menu. If you want to keep the existing drawing, you must either rename the current VCADI0.WRK file or else copy it to another sub-directory.

VERSACAD - ENTRY LEVEL

PART 2 - INTRODUCTION

The VersaCAD - ENTRY LEVEL general purpose drafting program is a powerful design tool that is very easy to use.

From the beginning, the program was designed with a two-fold goal in mind: to help the beginner quickly become comfortable with computer-aided drafting, and to provide the experienced user with the necessary capabilities for sophisticated drawings.

If you understand the concepts outlined in this Introduction, you will learn the system more quickly and soon be able to use its full power. Throughout, the program is ...

1. **Menu based** to quickly and simply present the program choices to you. Knowing exactly where you are with respect to the sub-menus will greatly ease your ability to move around in the system.

2. **Straightforward**, always telling you what your options are. If an option is displayed on the screen, you can use it; if not, it isn't available at that point.

3. **Interactive**, giving you immediate visual and audio feedback on all of your actions. For example, you can actually see portions of your drawing being dragged across the screen, all under your direction.

4. **Easy for beginners**, with pre-defined 'default' actions and values that enable the beginner to produce usable drawings right away. These 'defaults' can be changed at will by the experienced user, providing much more power.

5. **Failsafe**, never allowing you to become trapped. If an incorrect path is taken, type the [esc] key to escape from the erroneous action.

THE 2D SYSTEM HARDWARE

The VersaCAD - ENTRY LEVEL 2D drafting system consists of the following basic 'hardware' components:

1. Display monitor: The television-like device used to display both menus and graphics on its screen.

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2. Computer: The device that includes the processor (the 'brains') and the central memory. The keyboard may or may not be attached. Disk drives may or may not be built in.

3. Disk drives: The devices used to save and retrieve information on a 'floppy' disk or on a hard disk. Information on the disks can consist of the stored Operating System programs, the 2D drafting program, and your disk-based workfile.

4. Input device: The digitizer which you use to move the cursor (crosshairs) around on the screen. This is the primary device used to send information to the computer.

5. Plotter: Device used to place the drawing on bond, vellum or mylar, using one or more pens.

GETTING STARTED

It is assumed that you or your dealer have set up your system, attached input and output devices, etc. If not, refer to the manuals that came with your computer equipment for details on how to do this.

Your drawing will be kept on the program disk, one drawing per disk. When you select the 'New' option in the program, the drawing will be permanently erased. IF YOU WANT TO SAVE YOUR DRAWING FOR LATER, make a copy of the disk BEFORE you select the 'New' option. You may then store either copy of the disk. (On a hard disk system, copy the file called 'VCAD10.WRK' under a new name to save the workfile.) See the *Installation* section or your MS-DOS manual for details on formatting and copying disks

The ENTRY LEVEL program works with one serial port in your computer. If you wish to use both a digitizer and plotter, you will need to switch the cables when you plot. The program will prompt you at the appropriate time.

You can run the VersaCAD - ENTRY LEVEL program as follows:

1. 'Boot' your computer under MS-DOS (for a floppy disk system, use the VersaCAD disk you prepared in the

Installation section). When the computer is ready, you will see a single-letter prompt on the screen, indicating the active drive (such as A>).

If you have a hard disk, switch to the directory containing the Versacad program by typing **CD \VCAD** [enter] (assuming you have named the directory VCAD).

2. Type **VCAD10** and press [enter]. VersaCAD will load itself, then give you a title and copyright screen. Press any key and the program will recover any existing drawing in the workfile and display the MAIN MENU.

This is the starting point for all your work in the 2D drafting program. For details on using the menus, see the 'Concepts' section which follows.

CONCEPTS

The 2D program receives most of its input from your digitizer (sometimes called a graphics tablet). The pencil-like object that you move across its surface is called a 'stylus'. It in turn moves a small crosshairs on the screen, called a 'cursor'. When the cursor is in the position you desire, press in on the stylus to 'accept' the location, such as when you are placing a line in position. You will know when the computer has received your input because it will 'beep'. Throughout this manual, the word 'accept' refers to this operation of pressing the stylus until the computer beeps in acknowledgement.

The cursor is used to create various graphic objects such as lines, circles and rectangles. It is also used to graphically manipulate the entire picture or any part of it. These actions are performed by selecting the appropriate function, positioning the cursor, and then pressing down on the stylus.

MENUS

The VersaCAD program is organized around a collection of 'menus'. A menu is simply a list of the options available to you. Each menu has a specific purpose. For example, the ADD menu allows you to enter commands that add objects to your drawing, and the OUTPUT menu allows you to send your completed drawing to the plotter.

The menus are displayed along the side of the screen.

They each begin with a capitalized title, followed by a list of the available choices.

To select a choice listed on the menu, simply type the capitalized letter. This is usually the first letter in the word, but occasionally (such as sKetch) it is not. There is no need to type [enter] after the letter.

An alternate method of selecting a menu choice is by placing the on-screen cursor over the selection and pressing the stylus.

All menus begin at the MAIN menu and branch off from it, like a tree. Anytime you want to exit a menu, press [Q] for Quit and you will move down the 'tree' until you are back where you started.

After you select a menu function, you will often be presented with a sub-menu of options, which allow you to lock an object along the X-axis, add an arrowhead, etc. These options are only available when they are displayed.

OBJECTS

The 2D program allows you to create a drawing using basic building blocks called **objects**. These 'primitives' consist of lines, rectangles, polygons, circles, ellipses, circular arcs, Bezier curves, points and text.

LEVELS AND GROUPS

The 2D program allows you to manipulate up to 250 different levels or layers. A **level** can be thought of as one sheet of a clear plastic overlay. All objects with the same level number are on the same plastic sheet. Turning on one level is like viewing only one sheet. Turning on a second level is like placing a second overlay on top of the first - you can now see the objects on both sheets (or levels). Turning off a level is like removing the corresponding plastic overlay.

Levels are most useful if you place related objects together in a common level. For example, if you are doing a floor plan, you might want to put the basic plan on level #1, all chairs on level #2, all fixtures on level #3, and so on. Then you could work with any combination of the items at any time.

The 2D program also allows you to manipulate objects in the form of 'groups'. A **group** is an arbitrary collection of objects that you build by one or more group names in common.

IMPORTANT: Levels and groups are **completely** independent of one another. For example, turning off a particular **level** could affect objects in several different **groups**. Likewise, moving a group could move objects on several different levels.

WINDOWS

The 2D program allows you to view your drawing through any **window** you have set up. To understand this concept, imagine that the display screen is a movable window through which you see your drawing. You can move this viewing window around, and thus look at different portions of your drawing. In addition, you can shrink the window so that you are looking at only a tiny detail of the drawing (magnified to fill your display screen), or you can expand the window and take a large 'birds-eye' view. Windows can be saved to disk (by size and location) and later recalled for use.

PROPERTIES

Every time you create an object on your display screen, it is automatically assigned certain **properties** that stay with it. For example, a line will have a 'Linestyle' associated with it, whether solid, dashed, dotted, etc. Pen and level number are just two of many properties that go with an object. When you first run the 2D program, these properties are pre-set for you. As you develop experience, you may change them at any time for complete control over the appearance of your finished drawing.

REAL WORLD COORDINATES

Each drawing is created using the appropriate 'real world' units. Whether the drawing consists of a 100 millimeter machine part or a 500 foot facilities layout, you can create and position each object in its actual dimensions on the drawing. For example, if a house you are designing has walls 20 feet wide, you would enter them on the screen as 20'. (All the scaling is done later when you are plotting your final drawing.) Grids and

windows too are defined using the X,Y coordinates that are appropriate for the drawing, in the same units of measure.

SNAP

It is sometimes difficult to precisely position an object using the cursor. This is due to the limits of screen resolution and the steadiness of your hand. For this reason, a **snap** feature has been included in your VersaCAD program. Snap pulls (or snaps) the cursor to the precise X,Y location that you desire.

Three different types of snap may be selected:

1. **Increment snap** pulls the cursor to the nearest increment that you have defined. When increment snap is in use, the coordinate display (at the bottom of the screen) always shows the snapped cursor value (i.e. the values displayed are multiples of the smallest increment). For example, if you have defined the increment to be 0.5, the cursor will snap to 0.5, 1.0., 1.5, etc.

2. **Grid snap** pulls the cursor to the nearest grid intersection point. Here too, the coordinate display always shows the snapped cursor value (i.e. the values displayed are grid intersection points).

3. **Object snap** pulls the cursor to any object that you define with the cursor, including text. In this mode, you are presented with two options:
  - Equation OFF locks snap to pre-defined points on the object
  - Equation ON snaps the cursor to the nearest point on the object itself or its extension (in the case of a line, for example) and stays on the object.

OBJECT TRACKING

Normally, all image manipulation is done on 'rubberband' objects. That is, you can see the objects change size and orientation on the screen as you move the control on your input device. We call this highly-effective visual mode **object tracking**, since all graphics objects track or follow your movements. However, such tracking does have its price: the constant redrawing of an object can slow down the response of the program if you have a complex drawing on the screen. So the 2D program will

allow you to turn off the tracking mode at any time with the appropriate function key.

LOSS OF PRECISION

All computers have a limit on the number of decimal digits of precision they can deal with. The more digits that must be computed, the more memory and time it takes the machine to do the work. In order to maintain the highest possible precision, the 2D program will not allow you to type in real numbers that cannot be represented exactly.

HANDLE POINTS

Several of the options that allow you to manipulate your drawing require you to use and/or define a **handle point**. The handle point is the point by which the cursor will 'hold on' to an object or group of objects while it is being manipulated. For example, when moving a group of objects, you pull it across the screen by its handle point. All objects have at least one handle point; most have several alternates which can be selected with the **Handle** option.

THE WORKFILE

As you are creating a drawing, the VersaCAD program saves to your disk each object added. Included are the properties, switch settings, etc., as well as objects you have deleted (unless you have 'Crunched' the workfile in the FILER menu).

When you clear the graphics screen by selecting the 'New' option in the FILER menu, you are also erasing the contents of your workfile. If you do not wish the drawing to be erased, use another disk for your next drawing and store the first disk, properly labeled, for later retrieval.

Whenever you 'boot' VersaCAD - ENTRY LEVEL, you will recover whatever workfile is on the disk. If no workfile exists, you will start out with a blank screen. By the same token, this means that the workfile contains all the information needed to completely restore your working environment should an unexpected interruption occur, such as a power failure.

TEMPLATE OBJECTS

The 2D program does not remove 'hidden lines' (when one object 'goes behind' another), nor does it allow drawing of partial objects, but it does let you use a manual substitute with **template** (or guide) objects. For example, if you want to place a circle across a portion of a rectangle, the 'template' function allows you to change the rectangle to a series of dots. You can then trace over the portions that should remain on the screen and, when satisfied, delete the remaining dotted portion. The drawing will now show a circle in front of a rectangle with the hidden sections of the rectangle removed.

SKETCH

As you work on your drawing, erasing some objects and moving others, you sometimes want to 'clean up' the screen and fill in holes left by deleted objects. To accomplish this, simply press [K] for sKetch, and the screen will be redrawn. You can abort any sketching operation at any time by pressing [esc]. (However, if you abort the operation, you will need to use the **Redraw** command on the WINDOW menu in order to display the complete drawing again.)

INPUT MODES

In addition to the 'free' mode of input, using a digitizer, VersaCAD allows you to use the coordinate entry mode from the keyboard, making available three types of coordinate entry:
>   Absolute
>   Relative
>   Polar.

These three modes allow you to type in the actual coordinates of an object by using the keyboard. The coordinate input mode does not use the Snap feature; if turned on, it will just be ignored.

Absolute coordinate entry is the easiest to use. You simply type in the absolute real world X and Y coordinates, following each with [enter]. The program will use these coordinates to do its calculations.

Relative coordinate entry is a little more complicated. In this mode, the program will ask you to type in the relative X and Y coordinates, that is, the *difference*

between the desired location and the existing one (delta X and delta Y).

If you are working in the ADD or GROUP menu, the coordinates are relative to the last X,Y coordinates that you defined. However, in the MODIFY menu, coordinate entries become relative to the 'handle point' of the blinking object. For example, a line's handle point is its first endpoint and a circle's handle point is its center. Any additional points that need to be defined within a particular option are relative to the last X,Y coordinates you used.

Polar coordinate entry allows you to use a polar coordinate system for specifying X,Y points. The program will ask you to enter the angle (in degrees, measured counterclockwise from the horizontal) and the length (in absolute real world units) of the polar point. Both the angle and length are relative to the same defined point that is explained above in Relative coordinate entries.

DRAWING UNITS

Whenever you begin a new drawing, you usually have in mind the type of drawing units that you will need to use. For example, an architect will probably want to work in 'feet', while a mechanical engineer might want to use the metric system. For this reason, a variety of drawing units have been provided, as listed in the table below.

Selecting the appropriate drawing units is very important BEFORE you start to work. The units currently being used will always be displayed on the Status Line at the bottom of the screen. The following examples illustrate the types of display you can expect for each of the drawing units:

CONCEPTS

DRAWING UNIT	SAMPLE DISPLAY LINE

Inches: in [17. 3/ 4",   13.15/ 16"   ]
Inches as feet: in [1'- 5. 3/ 4",   1'- 1.15/ 16"   ]
Inches as decimal: in [17.7500   13.9375   ]

Feet: ft [16'- 0. 3/ 4",   12'-11. 3/ 16"]
Feet as inches: ft [192. 3/ 4",   155. 3/ 16"   ]
Feet as decimal: ft [16.0625,   12.9323   ]

miles: mi [16.0625,   12.9323] (decimal format)
millimeters: mm[16.0625,   12.9323] (decimal format)
meters: m [16.0625,   12.9323] (decimal format)
kilometers: km [16.0625,   12.9323] (decimal format)
user defined: ud [16.0625,   12.9323] (decimal format)

In addition to the various coordinate display formats, the program will also allow you to input data in a 'feet, inches and fraction' format. This format may only be used if the Units option of the UNITS menu is set to one of the following: inches, inches as feet, inches decimal, feet, feet as inches or feet as decimal.

(There are cases where the program will not accept this special format even when the Units are defined correctly as described above. For example, if you want to scale a drawing to half size, you will have to use '0.5' as the scale factor, since feet and inches have no meaning in this instance.

When the feet, inches and fraction format *is* acceptable, you can enter the expression as in the sample chart above.

Here are six examples of the feet, inches and fraction format (note the decimal point separating the fraction from the other numbers):

45'	4"	3/4"
10'5.15/ 16"	5'.1/2"	2.1/8"

THE DISPLAY SCREEN

The bottom line on your display screen is used as the Status Line. It includes data relating to the cursor's position on the screen and information about features you have selected.

From left to right, the information is displayed as follows:

1. **INPUT MODE:** The full word is displayed, with the possible options of DIGITIZER, ABSOLUTE, RELA-TIVE and POLAR. Function key Fl displays the Input Mode menu, allowing you to select the various options.

2. **DRAWING UNITS:** The next item displays the drawing units currently being used (such as 'ft' for 'feet'). These are selected from the UNITS menu.

3. **COORDINATE DISPLAY:** Within the brackets on the Status Line is a continuous display of the screen cursor's current X-Y position. This is calculated relative to the origin (normally 0,0 at the lower lefthand corner of the screen) in the units of measure you have selected from the UNITS menu.

4. **SNAP MODE:** Just to the right of the brackets is the Snap Mode display. You can change Snap Mode with the F2 function key:

    I indicates INCREMENT Snap is on
    G indicates GRID snap is on
    O indicated OBJECT snap is on
    . indicates all snap is OFF.

5. **ORIGIN MODE:** The next position displays the origin mode you have selected with the F3 function key:

    O indicates SHIFTED origin
    . indicates NORMAL origin (lower left corner)

6. **OBJECT TRACKING:** The far righthand position on the Status Line indicates whether or not your objects will 'track' across the screen as you move them, selected with the F4 function key:

    T indicates TRACKING ON
    . indicates TRACKING OFF.

ADDITIONAL DEFINITIONS

A software system such as VersaCAD sometimes uses words that are confusing at first. If you encounter a word or term that you don't understand, look in the **Glossary** and the **Quick Reference Index** at the end of the manual.

GOING ON FROM HERE

If you have carefully read this Introduction, you have a head start in using the 2D program. Don't worry if some of it doesn't make sense; after you have 'played' with the system a while, it will fall into place. When you have gained a little experience on the 2D system, come back and read the Introduction again. With a full under-standing of the principles outlined here, your use of the drafting system will be greatly enhanced.

If you are new to this 2D drafting system, we highly recommend that you work through the exercises in the **Tutorial** section. They will give you the necessary background to draw nearly anything you wish.

PART 3 - TUTORIAL

IMPORTANT: Be sure to read the *Installation* and *Introduction* sections of this manual before beginning the Tutorial. They will give you valuable information about starting up the program, using menus, etc.

To begin this Tutorial, you should be looking at the VersaCAD MAIN menu (if you're not, Quit the sub-menus until reaching that point). Before you start on the first exercise, why not take a look around the system? You can't hurt it, so don't be afraid to try things.

Think of the screen as your drawing board. Add lines and other figures from the ADD menu and change them from the MODIFY menu. Take a few minutes to go through the various menus and see what options they present to you. Try them; you can always back out of a command by pressing the [esc] key or Quit from a menu by pressing [Q].

Be sure that 'object tracking' is ON, so you can see each object as you add it. You can turn tracking on and off by using function key F4. Press the key until a "T" is placed along the bottom right of your screen on the Status Line.

EXERCISE 1: ADDING YOUR FIRST OBJECTS

To add a RECTANGLE (or any other object) on the display screen, you must first be at the ADD menu, selected from the MAIN menu by pressing [A] or placing the cursor next to the word 'Add' on the menu and pressing the digitizer stylus. Now press [R] for Rectangle.

Move the cursor to the position on the screen where you want one corner of the rectangle. 'Accept' the location by pressing the stylus on your digitizer. The first corner is now permanently fixed.

Move the cursor to the position on the screen where you want the opposite corner of the rectangle. As you move the cursor, the program will repeatedly draw a rectangle (called "rubber banding"). When you are satisfied with its size and shape, accept the location as before. The rectangle is now part of your drawing.

If you make a mistake while ADDing an object, leave it

for now and continue making objects. Remember, you are just beginning. Go ahead and add a few more rectangles.

Now add some LINES to the drawing. Confirm that you are still in the ADD menu (Does the computer display the word ADD in the upper lefthand corner?). If not, Quit the other menus until you reach the MAIN menu, then select Add. Now press [L] for Line. Place a few lines just as you did the rectangles.

Notice that all the lines on your screen are connected. If you want to start a new line somewhere else, press [D] for 'Detach'. You can do this anytime after accepting the starting point of a line but before accepting the endpoint.

While you were making lines, did you notice the list of options that are available? You can lock the line to the X or Y axis, cause an arrowhead to appear on one end of the line, erase the last line, and many other options.

Nearly all of the options on the ADD menu work in a similar way. You select the object from the ADD menu, position the first characteristic point, then select any of the options displayed by typing the letter of the option. Finally, you position the last characteristic point and accept the object. Try a few of them now. The on-screen commands will guide you through the operation.

When you have a few objects on the screen and the ADD menu is displayed, press Q (Quit) and return to the MAIN menu.

EXERCISE 2: MODIFYING OBJECTS

Now you can practice modifying (changing) the objects on your drawing. At the MAIN menu, type [M] (Modify). When the MODIFY menu is displayed, notice that one of the objects on the graphics screen is blinking. It is probably the most recent object that you added.

To change an object in the MODIFY mode, you must always cause it to blink first. That is how the computer lets you know which object it will be working on. There are two ways to get an object to blink:

1) Use the [<] and [>] keys to run backward and forward through the objects you have entered (the

computer stores them in memory in the order you have entered them). NOTE: You do not need to press the [shift] key to use these arrows.

-OR-

2) Press [F] (Find), then move the cursor to touch the object and accept it.

To repeat: THE OBJECT YOU WANT TO MODIFY MUST BE BLINKING before you can work on it with one of the commands such as Delete, Move, Copy, etc. Once you understand this idea, you can use most of the options on the MODIFY menu by following the screen messages.

To practice modifying objects, press [F] for Find, then position the cursor over one of the lines you have drawn on the screen and accept the location. The program will search for that object, and when found, the object will blink.

Now press [M] for Move. The blinking object will attach itself to the cursor. Move the cursor to a different location on the drawing. When you are satisfied with the new location, accept it and the blinking object will be fixed in its new position. Try some of the other commands on the MODIFY menu such as Copy, Rotate and Delete.

EXERCISE 3: SETTING UP A DRAWING

This exercise will let you draw a border and title block. See Figure 1 for the drawing you should copy. If you make a mistake while adding objects, you can always Quit back to the MAIN menu and select Modify. Here you can delete an object, move it around on the screen or any of several other operations.

The first step in any drawing is to clear the screen and workfile. At the MAIN menu, select [F] for Filer and then [N] for New. When the computer asks "Are you sure (Y/N)?" answer [Y] for Yes. Notice that the graphics screen is now blank (and your workfile is now erased). Leave the FILER by pressing [Q] (Quit) and return to the MAIN menu.

The second step in a drawing is to set up the units in which you want to work. Like any drawing, a CAD project must be planned out in advance. To set up the

basic dimensions, select the Units menu and enter on it the figures that are given below.

1. From the Units menu, select the 'Units' sub-option. The computer will display the current unit of measure being used by the VersaCAD program. Press the space bar until the words 'inches decimal' are displayed, then press [enter].

2. The 'Window' through which we will view our drawings will be 12 inches wide. That is, the distance from the left edge of the display screen to the right edge will represent 12". To set the 'Base Window' which defines our drawing 'world', select [B] for Base from the Units menu and type in the following (each followed by [enter]):

Base left:	0
Base right:	12
Base bottom:	0
Base top:	[The computer calculates this]

Now we have a screen area from coordinate (0", 0") at the bottom lefthand corner to about (12", 8") at the upper righthand corner. Move the cursor around on the screen and watch the coordinate display along the bottom of the screen; observe how it tracks the cursor location in the 'world' you have just defined.

3. Next you will need to set up grid spacing. Grids are a useful aid to accurate drawing on the screen (they will not appear on your final plotted drawing). For this exercise, we will set up grids one inch apart in both the X and Y axes, and we will also include 3 dots between grid lines, with ¼" spacing. To set this, select [G] for Grids from the UNITS menu and type in the following (each followed by [enter]):

Grid X spacing: 1	Grid X Divs: 4
Grid Y spacing: 1	Grid Y Divs: 4

4. Now, in order to have the cursor on the screen 'snap' to each of these ¼" dots as you draw, you will need to set Increment to .25. Do this in the same way you changed the numbers above.

5. There is one more parameter to set before you start drawing: text size. Since this does not appear on the

UNITS menu, you will need to Quit out of UNITS and return to the MAIN menu. From there, select Properties, and from the PROPERTIES menu select Text.

We want our lettering on the title block to be ¼" high and ¼" wide, so type in .25 for both width and height (followed by [enter]). (Just press [enter] to skip the column and row options.)

You have now set up your 'world' for drawing. There are many other options available to you when you gain more experience with the system, but the ones you have just set will be adequate for most simple drawings.

Quit back to the MAIN menu and select Add. (If the grids are not displayed, go first to the SWITCHES menu, select Grids and answer Yes, you want them to be on.) Referring to Figure 1, draw the border and title block as follows:

1. Use a rectangle to draw the border (it should fill most of the screen area). Notice that the cursor 'snaps' to ¼" increments (if it doesn't, press function key F2 and select [I] for increment snap).

2. Use lines (including the Detach feature) to draw the title block.

3. Use text to write the titles. For each line of text, first type the line, then press [enter]. The text will blink on the screen at the location of the cursor. Move the line of text with the cursor to the desired location and accept it. When you are done adding text, press [enter] by itself. You will be returned to the ADD menu.

NOTE: If parts of your drawing contain broken lines because of changes you have made, simply press [K] for sKetch and a clean version will be drawn. If your text for some reason does not fit in the area you have drawn, use the MODIFY/Scale feature to change its size.

When you have finished your border and title block, go to the FILER menu and select 'New'. Your workfile and graphics screen will be erased, preparing you for the next drawing. (If you want to save a drawing for later, you will need to prepare a new workfile disk and save the present one, as explained in the *Introduction* section.

EXERCISE 4: COPY AND GROUP

In this exercise you will draw a simple schematic on the blank screen (see Figure 2).

Since you already set up your drawing 'world' in the previous exercise, those dimensions are still intact even though you cleared the workfile. You are still drawing in a 12″ world, with grid lines an inch apart.

Before drawing, we will make one change. We want the objects you add in this exercise to be collected together as a 'group' so that later you can move them around the screen as a unit. A Group is defined by giving the objects a common group name, then building those objects by name into a 'working group' when you are ready to manipulate them. Select the Properties menu and set the Name to SCH. This means that all the objects you add to this drawing will have that name 'assigned' to them as they are created.

Quit back to the MAIN menu and select Add to draw the schematic as follows:

1. Use a rectangle to draw the first 'chip'. Then Quit the ADD menu and select Modify. Select Copy from the MODIFY menu and a second rectangle will appear on the screen. Position that with the cursor, and repeat the process for the third chip. Quit until you return to the MAIN menu.

2. From the Add menu, use lines to draw the connectors. Place the first endpoint of the first line, then select Detach immediately after accepting the second endpoint. This gives you a separate line, instead of connecting all the line segments together.

3. Turn off Snap with function key F2 (select 'None' from the Snap menu). Use polygons to draw the connector dots (the number of polygon sides is up to you). Like the chips, you should draw the first polygon, then copy the others into the correct position. You may wish to switch Snap back to Increment to more easily place the copies.

4. Type in and place the text (numbers) as shown. You will probably wish to turn Snap back off for this.

Quit back to the MAIN menu and press [G] to reach the

GROUP menu. Select the 'Build' option and respond to the program's prompt by typing in 'SCH', followed by [enter]. Press [enter] again to signal that you are finished building the group. You have now built a 'working group' consisting of every object that was created with the identifying name of SCH. To confirm this fact, select Where from the Group menu. Your circuit diagram should begin blinking.

Now press [M] for 'Move'. At the computer's prompt, pick any point on the drawing as your 'handle point' and move the cursor to the place where you want the handle point moved. Accept the location and the schematic will be drawn at the new position. (Use [K] for sKetch if you need to clean up the lines.)

Back at the MAIN menu, select Output and then Plotter. Use the plot specifications that are built into your system (the 'defaults' it asks you about) and make the drawing.
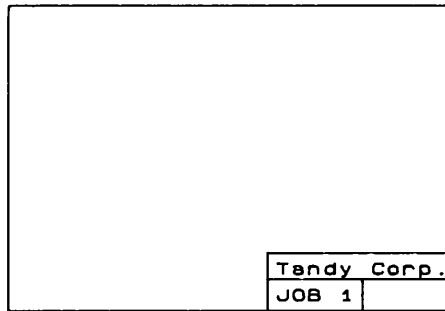
Figure 1
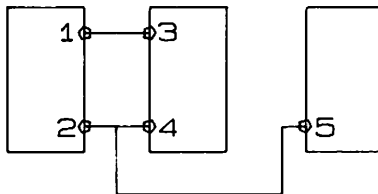
Figure 2

PART 4 - ADD MENU

The **ADD** menu allows you to place on the screen the 'primitive' objects that make up a drawing. It is reached by selecting [A] from the Main menu or placing the cursor next to [ADD] and pressing the stylus. You will be presented with a complete list of the objects that can be created.

> ADD
> Line
> Rectangle
> Polygon
> Circle
> Ellipse
> Arc
> Bezier
> pOint
> Dimension
> Text
> Guides
> sKetch
> Quit

ADDING A LINE

The Line option is selected from the ADD menu by pressing [L] or placing the cursor next to [Line] and pressing the stylus. A line is defined by two characteristic points:

1. The first endpoint of the line
2. The second endpoint of the line

To draw a line, place the cursor where you want the first endpoint and 'accept' the position with the stylus. Then move the cursor to where you want the second endpoint. If Object Tracking is on, you will see a flashing 'rubberband' line from the first endpoint to the cursor position.

When you are satisfied with the line's length and rotation, accept the second endpoint. The line will become fixed, indicating that the computer has accepted the input.

As you continue moving the cursor, another line will be drawn from the second endpoint of the previously

created line to the present cursor location. This process will continue until you 'Quit' back to the ADD menu by pressing [Q] or 'Detach' your line from the endpoint by pressing [D] (see Keyboard Options below).

The keyboard options available while creating a line are:

Arrow [A]: Places an arrowhead at the second endpoint of the line. Press [A] again to remove the arrowhead.

Template [T]: Causes the line to become a template line. Press [T] again to turn off the template option.

Marker [M]: Displays a marker at the center of the line. Press [M] again to remove the marker.

X-axis lock [X]: Holds the line along the horizontal axis (0 or 180 degrees rotation).

Y-axis lock [Y]: Holds the line along the vertical axis (90 or 270 degrees rotation).

Free [F]: Releases the X or Y option, returning you to the normal, unlocked state.

Rotate [R]: Each keypress rotates the line counter-clockwise by the increment set up in the UNITS menu.

Detach [D]: Detaches the current line from the last endpoint entered, allowing you to start a new line anywhere on the screen.

Single [S]: Allows you to draw a single line at a time (similar to Detach).

Erase [E]: Erases the last endpoint entered, allowing you to reposition the line. Repeatedly pressing [E] will erase endpoints in the reverse order you created them.

Quit [Q]: Quit adding lines and return to the ADD menu.

ADDING A RECTANGLE

The Rectangle option is selected from the ADD menu by pressing [R] or placing the cursor next to [Rectangle] and pressing the stylus. A rectangle is defined by two characteristic points:

    1. One corner of the rectangle
    2. The opposite corner of the rectangle

To draw a rectangle, place the cursor where you want the first corner and 'accept' the position with the stylus. Then move the cursor to where you want the opposite

corner. If Object Tracking is on, the computer will repeatedly draw a rectangle.

When you are satisfied with the rectangle's size and proportions, accept the second corner. The rectangle will become fixed, indicating that the computer has accepted the input.

The keyboard options available while creating a rectangle are:

Template [T]: Causes the rectangle to become a template rectangle. Press [T] again to turn off the template option.

Marker [M]: Displays a marker at the center of the rectangle. Press [M] again to remove the marker.

X-Axis [X]: This is the normal or default mode of the program, locking the rectangle to an X-Y rotation.

Rotate [R]: Each keypress rotates the rectangle counterclockwise by the increment set up in the UNITS menu.

ADDING A POLYGON

The Polygon option is selected from the ADD menu by pressing [P] or placing the cursor next to [Polygon] and pressing the stylus. A polygon is defined by two characteristic points:

1. The center of the circle within which the polygon is inscribed (essentially the center of the polygon).
2. The radius of the circle within which the polygon is inscribed (essentially the radius of the polygon).

When this option is selected, the program will first ask how many sides the polygon will have. A polygon can have from 3 to 9 sides. Type in the number and press [enter].

To draw a polygon, place the cursor where you want the center to be and accept the position with the stylus. Then move the cursor to define the radius of the polygon. If Object Tracking is on, the computer will repeatedly draw the polygon. Moving away from the center will cause the polygon to grow; moving toward the center will cause it to shrink. The polygon can also be rotated by moving the cursor around the center.

When you are satisfied with the size and rotation of the

polygon, accept it. The object will become solid, indicating that the computer has accepted the input.

The keyboard options available while creating a polygon are:

Template [T]: Causes the polygon to become a template polygon. Press [T] again to turn off the template option.

Marker [M]: Displays a marker at the center of the polygon. Press [M] again to remove the marker.

X-axis lock [X]: Holds the polygon to a horizontal rotation, so only the X-component of cursor movement affects its size.

Y-axis lock [Y]: Holds the polygon to a vertical rotation, so only the Y-component of cursor movement affects its size.

Free [F]: Releases the X or Y option, returning you to the normal, unlocked state.

Rotate [R]: Each keypress rotates the polygon counterclockwise by the increment set up in the UNITS menu.

ADDING A CIRCLE

The Circle option is selected from the ADD menu by pressing [C] or placing the cursor next to [Circle] and pressing the stylus. A circle can be defined in two different ways:

1. Center and radius (the program's normal or 'default' mode. Also selected by pressing [C] from the keyboard sub-menu.)

2. Diameter (selected by pressing [D] from the keyboard sub-menu)

CENTER AND RADIUS:
The two characteristic points are:

1. The center of the circle
2. The radius of the circle

To draw a circle by this method, place the cursor where you want the center of the circle to be and 'accept' the position with the stylus. If Object Tracking is on, the computer will repeatedly draw a circle whose radius becomes larger as you move the cursor away from the center and smaller as you move toward it. When you are satisfied with the size of the circle, accept it.

DIAMETER:
The two characteristic points are:

1. One endpoint of the diameter
2. The other endpoint of the diameter

To draw a circle by this method, first press [D] on the keyboard. Place the cursor where you want one endpoint of the circle's diameter to be and accept the location. If Object Tracking is on, the computer will repeatedly draw a circle whose diameter is the distance from the first endpoint to the cursor. When you are satisfied with the size of the circle, accept it.

The keyboard options available while creating a circle are:

Template [T]: Causes the circle to become a template circle. Press [T] again to turn off the template option.

Marker [M]: Displays a marker at the center of the circle. Press [M] again to remove the marker.

X-axis lock [X] : Holds the circle to a horizontal rotation, so only the X-component of cursor movement affects its size.

Y-axis lock [Y]: Holds the circle to a vertical rotation, so only the Y-component of cursor movement affects its size.

Free [F]: Releases the X or Y lock above.

Radius [R]: (Available with Center/Radius option only) Allows you to type in a radius for the circle from the keyboard. Accept with the stylus.

Diameter [D]: (Available with Diameter option only) Allows you to type in a diameter for the circle from the keyboard. Accept with the stylus.

ADDING AN ELLIPSE

The Ellipse option is selected from the ADD menu by pressing [E] or placing the cursor next to [Ellipse] and pressing the stylus. An ellipse may be defined in two different ways:

1. Three endpoints on the major and minor axes (the program's normal or 'default' mode. Also selected by pressing [A] from the keyboard sub-menu.)
2. The center and two endpoints (selected by pressing [C] from the keyboard sub-menu)

THREE ENDPOINTS: The three characteristic points are:

1. One endpoint of the minor axis
2. The other endpoint of the minor axis
3. One endpoint of the major axis

To draw an ellipse using this method, place the cursor where you want one endpoint of the minor axis to be and 'accept' the position with the stylus. Then move the cursor to where the other endpoint of the minor axis should be and accept it. If Object Tracking is on, the computer will repeatedly draw an ellipse whose major axis is located at the position of the cursor as you move it across the screen. Accept the position when you are satisfied with the shape and rotation of the ellipse.

CENTER AND TWO ENDPOINTS: The three characteristic points are:

1. The center of the ellipse
2. One endpoint of the minor axis
3. One endpoint of the major axis

To draw an ellipse using this method, first press [C] on the keyboard. Place the cursor where you want the center of the ellipse to be and accept the location. Next, move the cursor where you want one endpoint of the minor axis to be and accept it. If Object Tracking is on, the computer will repeatedly draw the ellipse. Move the cursor to locate an endpoint of the major axis and accept it when you are satisfied with the shape and rotation of the ellipse.

The keyboard options available while crea'··g an ellipse are:

Template [T]: Causes the ellipse to become a templatc ellipse. Press [T] again to turn off the template option.

Marker [M]: Displays a marker at the center of the ellipse. Press [M] again to remove the marker.

X-axis lock [X]: Holds the rotation of the ellipse to zero degrees (major axis parallel to the X [horizontal] axis).

Y-axis lock [Y]: Holds the rotation of the ellipse to 90 degrees (major axis parallel to the Y [vertical] axis).

Free [F]: Releases the X or Y option, returning you to the normal, unlocked state.

Rotate [R]: Each keypress rotates the ellipse counter-clock wise by the increment set up in the UNITS menu.

ADDING AN ARC

The Arc option is selected from the ADD menu by pressing [A] or placing the cursor next to [Arc] and pressing the stylus. An arc may be defined in three different ways:

1. Three points on the arc (the computer's normal or 'default' mode. Also selected by pressing [T] from the keyboard)
2. Two points and radius of the arc
3. Center and two endpoints of the arc (selected by pressing [C] from the keyboard sub-menu)

THREE POINTS ON THE ARC: The three characteristic points are:

1. One endpoint of the arc
2. The second endpoint of the arc
3. A third arbitrary point on the arc

To draw an arc using this method, place the cursor where you want the two endpoints of the arc to be and accept the positions with stylus. If Object Tracking is on, the computer will repeatedly draw an arc through the cursor. Move the cursor until you are satisfied with the shape of the arc and accept it.

TWO POINTS AND RADIUS: The three characteristic points are:

1. One endpoint of the arc
2. The second endpoint of the arc
3. The radius of the arc

To draw an arc using this method, begin by defining the two endpoints as in the Three Points method. Then press [R] from the keyboard sub-menu and enter the desired radius of the arc from the keyboard. As you move the cursor near the arc, the computer will display the four possible arcs that may be drawn with those two endpoints and that radius.

When you are satisfied with the arc displayed, accept it. If the arc radius you entered is too small, the computer will display an error message and give the smallest possible radius that can be entered.

CENTER AND TWO ENDPOINTS: The three characteristic points are:

1. The center of the arc
2. One endpoint of the arc
3. The other endpoint of the arc

To use this method, press [C] on the keyboard before you define the first characteristic point. Then place the cursor where you want the center of the arc to be and accept the position with stylus. Define the first endpoint in the same way. If Object Tracking is on, the computer will repeatedly draw an arc. Move the cursor to locate the other endpoint and accept it.

The keyboard options available while creating an arc are:

Arrow [A]: Places an arrowhead at the second endpoint of the arc. Press [A] again to remove the arrowhead.
Template [T]: Causes the arc to become a template arc. Press [T] again to turn off the template option.
Marker [M]: Displays a marker at the center of the arc. Press [M] again to remove the marker.
Free [F]: Allows the radius of the arc to be determined by the position of the cursor. The program is in this mode when the Three Points method is first selected and is only available with that method.
Radius [R]: Allows you to specify the radius of the arc from the keyboard when using the Three Points method.
Direction [D]: Causes the arc to be drawn in the opposite direction. This option is only available when you are using the Center and Two Endpoints method.

ADDING A BEZIER CURVE

The Bezier option is selected from the ADD menu by pressing [B] or placing the cursor next to [Bezier] and pressing the stylus. A Bezier curve is defined by four characteristic points:

1. The first endpoint of the curve.
2. The second endpoint of the curve.
3&4. The first and second curve control points. These determine the shape of the curve.

To draw a Bezier curve, place the cursor where you want the first endpoint to be and 'accept' the position with the stylus. Then move the cursor to the second endpoint and accept that. If Object Tracking is on, the computer will repeatedly draw a Bezier curve whose shape is dependent upon the location of the cursor, which now defines both control points.

You can move the first or the second control point independently at any time by selecting the appropriate keyboard option (see below). The program always draws from the first endpoint toward the first control point, then toward the second control point, and finally to the second endpoint. When you are satisfied with the curve, accept it with stylus.

After you have defined the first Bezier curve, the program will wait for you to define a second curve, beginning at the second endpoint of the first curve. The computer will continue creating Bezier curves in the same way as the first one until you press [Q] to return to the ADD menu.

Bezier curves can be linked together to appear as if they form one continuous curve with many inflection points. This can be done as follows:

1. Create the first Bezier curve. When creating the curve, select the Line keyboard option [L] to draw a guide line. Notice that this dotted guide line goes through the second control point and the second endpoint.

2. Create a second Bezier. Be sure that the beginning point of the second curve is the same as the ending point of the first one. (This will be automatic if you create the curves one after another.) The second endpoint of the second Bezier can be placed wherever you would like it.

3. Position the first control point of the second Bezier in such a way that it lies on the dotted guide line.

4. Position the second control point of the second Bezier wherever you want it to be.

5. The resulting Bezier curves should appear to be continuous.

The keyboard options available while creating a Bezier are:

Arrow [A]: Places an arrowhead on the end of the Bezier. Press [A] again to remove the arrowhead.

Template [T]: Causes the Bezier to become a template Bezier. Press [T] again to turn off the template option.

Marker [M]: Displays a marker at all four characteristic points of the Bezier. Press [M] again to remove the marker.

Line [L]: Draws a guide line that can be used to create continuous Bezier curves.

First [F]: Causes the first control point to follow the cursor, while the second control point is fixed at its current location.

Second [S]: Causes the second control point to follow the cursor, while the first control point is fixed at its current location.

Both [B]: Allows both control points to follow the cursor. The program is in this mode when the Bezier option is first selected.

Place [P]: Fixes the location of both control points and allows the cursor to be moved around freely without changing the shape of the curve.

Quit [Q]: Saves newly-created Beziers in your workfile and returns to the ADD menu.

ADDING A POINT

The pOint option is selected from the ADD menu by pressing [O] or placing the cursor next to [pOint] and pressing the stylus. A point can be a single dot on the drawing, an arrowhead or a marker cross.

To draw a point, place the cursor where you want the point to be and 'accept' the position. Repeat this process until you have defined all of your points. When you are finished, press [Q] to save them to your workfile and return to the ADD menu.

USER TIP: To create dots of varying sizes on your

plotted drawing, create points with the lineWidth feature in the PROPERTIES menu set to different widths.

The keyboard options available while adding a point are:

Arrow [A]: Places an arrowhead at the cursor location instead of a dot.

Template [T]: Causes the point to become a template point. Press [T] again to turn off the template option.

Marker [M]: Places a marker cross at the cursor location instead of a dot.

Rotate [R]: Used with the arrow option. Each keypress rotates the arrowhead counterclockwise by the increment set up in the UNITS menu.

Erase [E]: Erases the last accepted point. (If [E] is selected and no points remain, the program will return to the ADD menu.)

Quit [Q]: Quit adding points and return to the ADD menu.

ADDING A DIMENSION LINE

The Dimension option is selected from the ADD menu by pressing [D] or placing the cursor next to [Dimension] and pressing the stylus. With it you can measure the distance between any two points on the screen. A dimension line is defined by three characteristic points:

1. One endpoint on the item you are dimensioning.
2. The other endpoint on the item you are dimensioning.
3. A point defining the distance of the dimension line from the object (in other words, the length of the leader lines).

To use the Dimension option, place the cursor at one endpoint of the item and accept the position with the stylus. Do the same with the other end of the item. If Object Tracking is on, the computer will repeatedly draw a set of dimension lines between the two endpoints.

Now move the cursor away from the item you are dimensioning to establish the length of the leader lines. You can position the dimension line on either side of the object with the cursor. (The two endpoints just entered are fixed, and can be changed only by aborting the Dimension option and returning again). When you are

satisfied with the length of the leader lines, accept the position.

Next the computer will generate a text display of the numeric value of the dimensioned distance. It will be in the units set on the UNITS menu. Move the cursor to place the text and accept it with the stylus.

The keyboard options available while creating a dimension line are:

X-axis [X]: Projects the dimension line along the X (horizontal) axis and calculates only the X-component of the dimension.

Y-axis [Y]: Projects the dimension line along the Y (vertical) axis and calculates only the Y-component of the dimension.

True angle [T]: Positions the dimension leader lines perpendicular to the item that is being dimensioned. The program is in this mode when the Dimension option is first selected.

Leaders [L]: Allows you to selectively delete either or both of the leader lines (adds and deletes each line in sequence every time you press the key).

Marker [M]: Changes the arrowheads on the dimension line to 'slash' marks (press [M] again to return to arrows).

The keyboard options available while placing dimension text are:

X-axis [X]: Places the text horizontally.

Y-axis [Y]: Places the text vertically.

True angle [T]: Positions the text perpendicular to the direction of the leader lines. The program is in this mode when the Dimension option is first selected.

Rotate [R]: Allows you to rotate the text counterclockwise by the angle defined in the UNITS menu.

Break [B]: Breaks the dimension line at its center to allow dimension text to be inserted. If the size of the text generated is too large, the program will inform you of that fact and will not break the dimension line. Change the text's width and height properties to make it fit.

Outside [O]: Moves the dimension lines to the outside of the leader lines. That is, the arrowheads will be pointing inward, toward the text, instead of out-

ward. With this option, the dimension lines are always ¼ inch in length.

Decimal [D]: Displays the dimension text in decimal format. You will be asked to enter the number of significant decimal places. For example, 68.5930 would be a typical decimal measurement. If you enter 0 significant digits, the dimension text will become 68. If you enter 2 significant digits, the dimension text will be 68.59.

Feet [F]: Displays the dimension text in feet and inches.* For example, if the drawing unit is defined as feet, 68.5930 would be represented as 68′-7.⅛″. The computer will round the dimension to the nearest 1/64″.

Inches [I]: Displays the dimension text in an inches format.* For example, if the drawing unit is defined as feet, 68.5930 would be represented as 823.⅛″.

Edit [E]: Allows you to override what the computer produces as the dimension text. The program will ask you to edit the current dimension text. Type up to 60 characters, followed by [enter].

Quit [Q]: Deletes the dimension text and returns you to the ADD menu.

*This option is only available if the drawing units are specified in feet, feet as inches, feet as decimal, inches, inches as feet, or inches as decimal in the Units option of the UNITS menu.

SPECIAL NOTE ON ARROWHEADS: When your dimension line is plotted, the length of the arrowhead will always be 5/32 of an inch. If the length of the dimension line is calculated to be less than this amount, the computer will not plot the arrowhead at all. Also, the included angle of the arrowhead will always be 15 degrees.

ADDING TEXT

The Text option is selected from the ADD menu by pressing [T] or placing the cursor next to [Text] and pressing the stylus. Text is defined by one characteristic point, the lower lefthand corner.

To enter text, type on the keyboard and accept it with [enter]. (If you are in Block Mode, accept each line with

[enter]. Lines will be automatically left-justified.)

If Object Tracking is on, the computer will repeatedly draw the text. SPECIAL NOTE: To speed entry of text on the screen, it is recommended that you turn object tracking OFF when entering more than a few characters of text.

You can position the text in two ways:

1. Cursor method (Block Mode OFF): Place the text like any other object by moving the cursor with digitizer stylus or keyboard controls (depending upon the input mode selected).

2. Keyboard method (Block Mode ON): Use the [ctrl] key along with the 'cursor control keys' of I,J,K,L to move the cursor up, left, down, or right, respectively. The amount the cursor moves with each keypress is determined by your setting of the 'row' and 'column' parameters in the PROPERTIES/Text menu (also changeable with the UPDATE function key). These control keys must be used before typing [enter] to accept the text.

When you are satisfied with the location of the text, accept it in the usual way. To leave the text option, press [enter] instead of the next line of text. This will store your text in the workfile and return you to the ADD menu.

The keyboard options available while entering text are:

[Backspace]: Deletes the last character typed.
[Delete]: Erases the whole line of text.
[Enter]: Accepts all the characters you have entered.
[Esc]: Erases all the text created since you entered the text option and returns you to the ADD menu.
Rotate [Ctrl-R]: Each keypress rotates the text counterclock wise by the increment set up in the UNITS menu.
Block [Ctrl-B]: Sets text in Block Mode, automatically entering each line of text below the preceding one.
Erase [Ctrl-E]: Erases lines of text in reverse order.
[Ctrl-I,J,K,L]: Moves the text up, left, down, and right, respectively.
Quit [Ctrl-Q]: Exits the text option.

The keyboard options available while placing text are:

Rotate [R]: Each keypress rotates the text counter-clockwise by the increment set up in the UNITS menu.

Block [B]: Sets text in Block Mode, automatically entering each line of text below the preceding one.

Erase [E]: Erases to the beginning of the text string.

Quit [Q]: Accepts all the text entered and returns you to the ADD menu.

CONSTRUCTING GUIDE LINES

The Guides option is selected from the ADD menu by pressing [G] or placing the cursor next to [Guides] and pressing the stylus. It allows you to place dotted guide lines on the screen to use as temporary 'construction' lines as you work.

When you select this option, the computer will display a blinking horizontal line on the screen. Moving the cursor will move the line. When you are satisfied with the location of the guide line, accept it and the final dotted guide line will be drawn. Guide lines are only temporary and will disappear whenever the screen is redrawn.

The keyboard options available while constructing Guide Lines are:

Move [M]: Allows the guide line to follow the cursor across the screen. The angle of the guide line will not be changed. If you were rotating the guide line, selecting [M] will fix its angle and moving the cursor will no longer cause the guide line to rotate. This is the normal or default mode of the program.

X-axis lock [X]: Causes the guide line to become horizontal. The program is in this mode when the Guides option is first selected.

Y-axis lock [Y]: Causes the guide line to become vertical.

Rotate [R]: Causes the guide line to rotate about a fixed point. The position of the cursor just prior to selecting [R] will be the point about which the guide line rotates and will be indicated with a marker. Once you select [R], moving the cursor will no longer move the guide line but will instead cause the line to rotate about the fixed point.

Crosshairs [C]: Allows you to switch between a single guide line and the full-screen crosshairs.

QUIT

This option is selected from the ADD menu by pressing [Q] or placing the cursor next to [Quit] and pressing the stylus. It returns you to the program MAIN MENU.

PART 5 - MODIFY MENU

The **MODIFY** menu allows you to change and manipulate objects in your drawing. It is reached by selecting [M] from the Main menu or placing the cursor next to [Modify] and pressing the stylus. You will be presented with a complete list of the modifications you can make from the program.

MODIFY
Move
Copy
Rotate
Scale
Image
Delete
Undelete
Explode
Text
Handle
Properties
Find
< backward
> forward
Guides
sKetch
Quit

Every time you place an object in your drawing, it is added to the end of a list in the workfile. When you enter the MODIFY mode, the last object you created will blink on the screen (assuming Object Tracking is on).

To modify an object, IT MUST FIRST BE BLINKING. There are two ways to accomplish this.

    1.   Step through the list in your workfile, one object at a time. This is accomplished by using the [<] and [>] keys, to move backward or forward through the list. The list is 'circular', so you will eventually reach one end of the list and start over.

    2.   Use the 'Find' option to let the computer do the searching for you. Select [F] from the MODIFY menu, then place the cursor over the object you wish to modify. Accept the location, and the

object will blink when the computer has found it in the workfile list.

MOVING AN OBJECT

The Move option is selected from the MODIFY menu by pressing [M] or placing the cursor next to [Move] and pressing the stylus.

When the desired object is blinking, move the cursor to position it. The 'handle point' will follow the cursor. When you are satisfied with the new location of the object, accept it, and it will remain fixed in its new location.

The keyboard options available while Moving are:

Handle [H]: Changes the handle point of an object that has alternate handle points.
X-axis lock [X]: Restricts object movement to the X-axis only.
Y-axis lock [Y]: Restricts object movement to the Y-axis only.
Free [F]: Releases the X or Y lock, returning you to the normal, unlocked state.
Original [O]: Returns the object to its original location, before being moved.
Swap [S]: Swaps the direction of a object having directionality (an arc with an arrowhead, etc.).

COPYING AN OBJECT

The Copy option is selected from the MODIFY menu by pressing [C] or placing the cursor next to [Copy] and pressing the stylus.

When the desired object is selected, the computer automatically makes a copy of it, which will be blinking. The copy will follow the cursor across the screen, attached by its handle point. Position the cursor at the desired location and accept the copied object. Another copy will be produced, which you can place in the same way.

When you have made all of your copies, press [Q] to Quit back to the MODIFY menu. All of your copies will then be stored in your workfile.

The keyboard options available while Copying are:

Handle [H]: Changes the handle point of an object that has alternate handle points.

Free [F]: Releases the X or Y lock, returning you to the normal, unlocked state.

X-axis lock [X]: Restricts copy movement to the X-direction only.

Y-axis lock [Y]: Restricts copy movement to the Y-direction only.

Original [O]: Returns the copy to its original location, before being moved.

Place [P]: Fixes the location of the object, allowing the cursor to be moved without the object following it.

Repeat [R]: Allows you to repeatedly copy the object in one direction, two directions, or in a circular path about a selected point. See details below.

Erase [E]: Erases the last accepted copy of the object. If no objects remain, returns you to the MODIFY menu. (To erase all the objects you have copied since selecting [Copy], press [esc]).

Quit [Q]: Stores your copies in the workfile and returns you to the MODIFY menu.

HOW TO MAKE MULTIPLE COPIES: Select [R] (Repeat) from the keyboard sub-menu and then indicate whether you want copies in one or two linear directions, or around a circular path.

ONE DIRECTIONAL COPIES: At the prompt, enter the total number of copies you desire. (Be sure to include the original object in the count.) Then use the cursor to define the distance and direction from the handle point of the original object. The computer will then draw the specified number of copies.

TWO DIRECTIONAL COPIES: At the prompt, enter the total number of copies you want in the X and Y directions. (Be sure to include the original object in the count.) Then use the cursor to define the horizontal and vertical offset from the original object. The computer will then draw the specified X-Y matrix.

COPIES IN A CIRCULAR DIRECTION: The following list of options appears on the screen:

Incremental rotation:	90.0000
Total number of copies:	4
Object rotation:	90.0000

You are first asked the relative angular offset (in degrees) between each of the copies (that is, how great an angle about the rotation point should exist between copies). Then you need to enter the total number of copies desired. Finally, enter the relative angular offset (in degrees) to be applied to each copy (usually this entry is the same as the first entry). Use the cursor to define the point about which the copies will be rotated. The computer will then draw the copies.

ROTATING AN OBJECT

The Rotate option is selected from the MODIFY menu by pressing [R] or placing the cursor next to [Rotate] and pressing the stylus. When the desired object is blinking, use the cursor to rotate it by its handle point around its pivot point (the first endpoint). A marker cross will show at each of these two points as a guide. The object's size will not change, and its pivot point will remain fixed. When the object is rotated correctly, accept it with the stylus.

The keyboard options available while Rotating are:

Handle [H]: Toggles the handle point of an object to the next alternate.

Pivot [P]: Allows you to define a new pivot point with the cursor.

Swap [S]: Swaps the direction of an object having directionality (an arc with an arrowhead, etc.).

Rotate [R]: Each keypress rotates the object counterclockwise by the increment set up in the UNITS menu.

Original [O]: Resets the object rotation to the original orientation.

Zero [Z]: Lines up the pivot point and handle point along the X-axis (0 degrees polar rotation).

Free [F]: The normal or default mode, allowing free rotation by moving the cursor.

SCALING AN OBJECT

The Scale option is selected from the MODIFY menu by pressing [S] or placing the cursor next to [Scale] and pressing the stylus.

Each object is scaled by fixing a stationary point and then changing size by pulling a handle point on the object. The same scaling factor (size ratio) is applied in

both the X and Y directions, so the object is not distorted when scaled.

When you select this option, the computer will display a marker at the fixed point on the object and another on the object's handle point. The distance between the two represents the scaling factor. Moving the cursor will move the handle point and scale the object.

The keyboard options available while Scaling are:

Handle [H]: Changes the handle point of an object that has alternate handle points.

Factor [F]: Allows you to enter a numeric scaling factor from the keyboard (relative to the original 1.0).

Swap [S]: Swaps the direction of an object having directionality (an arc with an arrowhead, etc.).

IMAGING AN OBJECT

The Image option is selected from the MODIFY menu by pressing [I] or placing the cursor next to [Image] and pressing the stylus.

When the desired object is blinking, manipulate the blinking 'image line' about which the object is to be imaged or mirrored. This line can be made vertical or horizontal, rotated to any angle and moved anywhere on the screen. When the image line is positioned correctly, accept it with the stylus. A mirror image will be drawn and the original erased. (To preserve the original as well, use the Copy option below.)

The keyboard options available while Imaging are:

Move [M]: Pulls the image line across the screen with the cursor. The angle of the image line will not be changed. When rotating the image line, use this option to fix its angle. This is the normal or default mode of the program.

X-axis [X]: Produces a horizontal image line. This is the normal or default mode of the program.

Y-axis [Y]: Produces a vertical image line.

Rotate [R]: Rotates the image line about a point defined by the cursor's position at the time [R] is pressed. A marker will indicate this point, and moving the cursor will rotate the line.

Copy [C]: Draws an imaged copy of the object while keeping the original in place.

DELETING AN OBJECT

The Delete option is selected from the MODIFY menu by pressing [D] or placing the cursor next to [Delete] and pressing the stylus.

When this option is selected, the computer will delete the blinking object from the screen. It remains in your workfile, but is no longer associated with your drawing.

UNDELETING AN OBJECT

The Undelete option is selected from the MODIFY menu by pressing [U] or placing the cursor next to [Undelete] and pressing the stylus.

When this option is selected, the computer will look for any objects that have been deleted. If it does not find any, it will immediately return to the MODIFY menu. However, if it does find some deleted objects, it will cause the first object deleted to blink and display this prompt:

UNDELETE: Yes No Quit

Typing [Y] will return the blinking object to your drawing. Typing [N] will cause the program to skip over this object and blink the next deleted object. Typing [Q] tells the program to quit Undeleting and return to the MODIFY menu. (NOTE: Only objects in the current workfile can be brought back.)

EXPLODING AN OBJECT

The Explode option is selected from the MODIFY menu by pressing [E] or placing the cursor next to [Explode] and pressing the stylus.

All objects, except text, points and dimensions, can be exploded into their component parts, such as the line segments that make up a primitive object.

For example, if you wish to explode a five-sided polygon, find the object and start it blinking, then press [E]. The original polygon will be deleted from the workfile and replaced by five line segments. The first of these five lines will begin blinking, ready for you to modify.

If you wish, you can even explode the blinking line into

two equal segments, which themselves can be subdivided further. The original, unexploded object remains in your workfile, although it is no longer part of your drawing. You can retrieve it with the Undelete option.

MODIFYING TEXT

The Text option is selected from the MODIFY menu by pressing [T] or placing the cursor next to [Text] and pressing the stylus. When you select this option, you will be presented with a sub-menu, from which functions are selected as with any other menu.

> TEXT
> Edit
> Justify
> Adjust
> Find
> < backward
> > forward
> sKetch
> Quit

EDIT TEXT:

When you select this option the text line will blink on the screen and be repeated near the bottom of the screen on a line labeled 'TEXT:'. You may now edit that text. Typing in characters will add to the text. The following keys will perform other modifications:

[backspace]: Deletes the last entered character.

[enter]: Accepts your edit changes.

[esc]: Aborts the editing operation and redisplays the original text. Returns you to the TEXT menu.

[Ctrl-I,J,K,L]: Moves the text up, left, down and right, respectively (relative to the text's orientation, not the screen orientation).

Rotate [Ctrl-R]: Each keypress rotates the text counter-clockwise by the number of degrees set up in the UNITS menu.

Quit [Ctrl-Q]: Allows you to leave the EDIT option and return to the Text sub-menu.

JUSTIFY TEXT:

The Justify option allows you to align text along a 'justification line'. For example, if you are drawing a graph and want all the labels along the vertical axis to

start in the same row, you would use the Justify option. When you select this option the computer will display the following sub-menu:

> JUSTIFY
> Right
> Left
> Center
> Top
> Bottom
> Quit

Select the functions as follows:

> Right - The right hand edge of the text will be lined up with the justification line.

> Left - The left hand edge of the text will be lined up with the justification line.

> Center - The center of the bottom edge of the text will be lined up with the justification line.

> Top - The top edge of the text will be lined up with the justification line.

> Bottom - The bottom edge of the text will be lined up with the justification line.

> Quit - Exits the JUSTIFY menu and returns to the TEXT menu.

Move the cursor to position the blinking justification line, then accept it. Next, the program will ask you to choose the text that you want to justify. Move the cursor until it touches the appropriate text and accept it. The computer will move that text and align it according to the justification line.

You may continue in the same manner with additional text, or press [Q] to Quit and return to the JUSTIFY menu.

ADJUST TEXT:
The Adjust option allows you to flip over upside-down text so that it is right-reading.

FIND TEXT:
The Find option allows you to quickly select the text that you want to modify, by placing the cursor on the

desired text, accepting the location and waiting until it blinks. It works the same as Finding any other object you want to modify (see MODIFY/Find for more detail).

< and > :

An alternate Find method. See MODIFY/Find for more detail.

QUIT:
Exits the Text option and returns you to the MODIFY menu.

CHANGING HANDLE POINT

The Handle option is selected from the MODIFY menu by pressing [H] or placing the cursor next to [Handle] and pressing the stylus. This option allows you to define an additional handle point to the currently blinking object. At the prompt, place the cursor on the desired location and accept. This additional handle point will be stored with the object in your workfile.

CHANGING OBJECT PROPERTIES

The Properties option is selected from the MODIFY menu by pressing [P] or placing the cursor next to [Properties] and pressing the stylus. When you select this option, you will be presented with the Object Properties menu.

MOD PROPS
lineStyle
Density
lineWidth
Level
Pen
Color
group Name
Rotation
Text
Miscellaneous
Global
Klear
Update
Find
 <backward
 >forward
Quit

As explained in the *Concepts* section, all primitive objects have several properties. For example, two properties of a line could be a rotation of 135 degrees and a linestyle number of 3.

Using the Object Properties option, you can selectively change one or more of the properties of the currently blinking object. To do so, select the capitalized letter from the keyboard of the property you want to change. The program will display the current value of that object property and position you to type in a new one. Press [enter] if you don't want to change the value.

You can enter as many changes as you want during a single Modify Properties operation. Each time you make a proposed change to a property, the program will "flag" that property on the menu listing with a small arrow (<) to help you keep track.

When you are done typing in new values, update the current values to the proposed values all at once by selecting the Update option. After this, you can change the properties of any number of objects to the new values by pressing Update as each object blinks in turn on the screen.

IMPORTANT: Proposed values are just that: proposed. The current values of the blinking object ARE NOT actually changed to the proposed values until you press [U] (Update).

CHANGING LINE STYLE:
The Style option allows you to change the linestyle number of the currently blinking object.

When you select this option the program will display the current number and position you to enter the new linestyle, an integer from 1 to 8. Press [enter] after the number. When you are finished changing properties, press [U] to update the object properties.

(See the back of the manual for a listing of the linestyles available.)

CHANGING DENSITY
The Density option allows you to change the number of times that the plotter will overstrike each line of the currently blinking object.

When you select this option the program will display the current number and position you to enter the new density value, an integer from 1 to 7. Press [enter] after the number. When you are finished changing properties, press [U] to update the object properties.

CHANGING LINE WIDTH:
The lineWidth option allows you to change the plotter line width of the currently blinking object.

When you select this option the program will display the current number and position you to enter the new line width, an integer from 1 to 7. Press [enter] after the number. When you are finished changing properties, press [U] to update object properties.

(See the back of the manual for a listing of line widths available.)

CHANGING LEVEL:
The Level option allows you to change the level that the currently blinking object is on.

When you select this option the program will display the current number and position you to enter the new level number, an integer from 1 to 250. Press [enter] after the number. When you are finished changing properties, press [U] to update the object properties.

CHANGING PLOTTER PEN:
The Pen option allows you to change the plotter pen number of the currently blinking object.

When you select this option, the program will display the current number and position you to enter the new pen number, an integer from 1 to 8. Press [enter] after the number. When you are finished changing properties, press [U] to update the object properties.

CHANGING SCREEN COLOR: (Tandy 2000 only)
The Color option allows you to change the screen color of the currently blinking object.

When you select this option, the program will display the current number and position you to enter the new screen color number, an integer from 1 to 7. Press [enter] after the number. When you are finished changing properties, press [U] to update the object properties.

(See the back of this manual for a listing of screen colors available.)

CHANGING GROUP NAME:

The Name option allows you to change the group name that is associated with the currently blinking object.

When you select this option the program will display the current global group name that new objects are inheriting (not necessarily the current working group) and position you to enter the new group name, a text string of 7 characters or less. Press [enter] after the name. When you are finished changing properties, press [U] to update the object properties.

CHANGING ROTATION:

The Rotation option allows you to change the rotation of the currently blinking object.

When you select this option the program will display the current number and position you to enter the new rotation, a real number from 0 to 360 (polar angle in degrees). Press [enter] after the number. When you are finished changing properties, press [U] to update the object properties.

CHANGING TEXT SIZE:

The Text option allows you to change the character width and height of the currently blinking text line.

When you select this option the program will display the current numbers and position you to enter the new text width and height, real numbers which define the size of a text character in the current drawing units. Press [enter] after each number. When you are finished changing properties, press [U] to update the object properties.

MISCELLANEOUS CHANGES:

The Miscellaneous option allows you to change the switches on three of the most commonly used drawing aids for the currently blinking object:

Arrow allows you to add or remove an arrowhead.
Template allows you to switch the template feature.
Marker allows you to switch the marker feature.

When you select this option the program will display the current switch setting and position you to enter either [Y] (for yes, turn the feature on) or [N] (for no, turn the

feature off). Type in the desired value or press [enter] to leave the feature as before. When you are finished changing properties, press [U] to update the object properties.

USING FIND:

The Find option allows you to quickly select the object whose properties you want to change, causing it to begin blinking. It operates the same as the other Find functions in the MODIFY menu, by placing the cursor over the desired object and accepting the location or using the [<] and [>] keys to step through the list of objects in the computer. See the MODIFY/Find section for more detail.

USING ‹AND›:

Same as Find above. See MODIFY/Find for more details

CHANGING PROPERTIES GLOBALLY:

The Global option allows you to change the properties of the currently blinking object to the 'global' properties you have defined in the PROPERTIES menu. This is a handy shortcut if you want to change a series of objects to the current global settings. When you are finished changing properties, press [U] to update the object properties.

USING UPDATE:

The Update option sets and makes permanent all the changes you have entered for the currently blinking object.

After changing the properties, the Update option causes the 'next' object on the screen to blink (as if you had hit the [>] key). This feature allows you to repeatedly select the Update option to change the properties of several objects in sequence.

USING KLEAR:

The Klear option clears or erases the changes you have made to an object's properties (BEFORE you hit the 'Update' key). You might want to do this if you made a mistake and entered several wrong values.

QUIT:

This returns you to the MODIFY menu.

FINDING AN OBJECT (and < - >)

The Find option is selected from the MODIFY menu by pressing [F] or placing the cursor next to [Find] and pressing the stylus. It provides a fast way to get the object you want to modify blinking.

To find an object, place the cursor over any point on it and accept it. The computer will then search through the workfile until it finds that object. When found, it will begin blinking.

If the wrong object starts blinking, be sure that the cursor is properly positioned. If so, select Find again and re-select the object; the computer will look for the next closest object. Continue this process until the desired object starts blinking.

The alternate method for finding an object is to use the [<] and [>] keys to step through the list of objects in your workfile. Each time that you press a key, you will move one object forward or backward in the list, and it will begin blinking. The list of objects is 'circular', so you will eventually reach one end and start over.

MODIFYING GUIDES

The guides option is selected from the MODIFY menu by pressing [G] or placing the cursor next to [Guides] and pressing the stylus. For detail on using Guides, see the ADD section (Part 4 of this manual).

QUIT

The Quit option is selected from the MODIFY menu by pressing [Q] or placing the cursor next to [Quit] and pressing the stylus. It returns you to the Main MENU.

PART 6 - GROUP MENU

The **GROUP** menu allows you to manipulate a collection of objects as a single entity. It is reached by selecting [G] from the Main menu or placing the cursor next to [Group] and pressing the stylus. You will be presented with a complete list of the manipulations you can make to a group.

> GROUP
> Build
> Move
> Copy
> Rotate
> Scale
> Image
> Properties
> Delete
> Undelete
> List
> Where
> Find
> Number
> Guides
> sKetch
> Quit

As explained in the *Concepts* section, a 'group' is an arbitrary, user-defined collection of objects identified by a common group name.

When you begin a new drawing, every object you add is assigned the 'global' group name until you change it (up to 7 characters in length) in the PROPERTIES menu. It is important to understand that this is a **potential** group only; OBJECTS WITH THE SAME GROUP NAME DO **NOT** BELONG TO A WORKING GROUP UNTIL YOU ACTUALLY **BUILD** THE GROUP BY THAT NAME (see below).

For example, suppose the global group name was originally set to GRP. You add 5 objects to your drawing, all of which will 'inherit' this name along with their other properties such as level, linestyle, etc. Then you change the global group name to MORE and add 8 more objects.

Now, if you want to move the first 5 objects together as a group, you would select the 'Build' option from the GROUP menu, and when asked for the name of the group you want to build, type in 'GRP'. GRP now becomes your 'working group'. From this point on, all the group functions, including Move, will operate on these same 5 objects until you select 'Build' again and change the name of the group you want to work with.

BUILDING A GROUP

The Build option is selected from the GROUP menu by pressing [B] or placing the cursor next to [Build] and pressing the stylus. It allows you to collect objects already on your drawing that have the same group name and form them into a 'working group'. The objects will remain together for manipulation by any of the group functions until you build another group by name.

When you select the Build option, you will be asked to enter one or more group names, representing the objects you want included in the new working group.

Type in each group name you want included in the working group, followed by [enter]. (Note that your working group can include more than one group name.) When you are done, press [enter]. The [*] key can be used as a 'wildcard' symbol, allowing you to include all names which begin with a certain text character or group of characters. For example, typing N* will include the groups NEW, NEW1, NEW2, and NICE. (Typing NE* will include all except NICE.)

MOVING A GROUP

The Move option is selected from the GROUP menu by pressing [M] or placing the cursor next to [Move] and pressing the stylus.

When you have built the group to be moved, the program will ask you to define the handle point by which to move it. This is an aid to precise alignment of the group with any other part of your drawing. Position the cursor over the handle point you want to use and accept it. Now move the cursor to the desired new location of the handle point and accept this location. The computer will redraw the group at its new location.

COPYING A GROUP

The Copy option is selected from the GROUP menu by pressing [C] or placing the cursor next to [Copy] and pressing the stylus. It allows you to copy a group and place the copy anywhere in the drawing. When you have built the group to be copied, the program will present you with the following sub-menu:

> Single
> One direction
> Two directions
> Circular
> sKetch
> Quit

Single [S]: Select this option when you want to make only one copy at a time.

One direction [O]: Enter the total number of copies you want in a single direction. (Be sure to include the original group in the count.) Then use the cursor to define the distance and direction from the handle point of the original group.

Two directions [T]: Enter the total number of copies you want in the X and Y directions. (Be sure to include the original group in the count.) Then use the cursor to define the horizontal and vertical offset from the original group's handle point.

Circular [C]: The following list of options appears on the screen:

> Incremental rotation: 90.0000
> Total number of copies: 4
> Group rotation: 90.0000

You are first asked the relative angular offset (in degrees) between each of the copies (that is, how great an angle about the rotation point should exist between copies). Then you need to enter the total number of copies desired. Finally, enter the relative angular offset (in degrees) to be applied to each copy (usually this is the same as the first entry). Use the cursor to define the point about which the copies will be rotated.

When you have made your menu selection, the program will ask:

> New group name (... for auto increment): [current name]

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Enter the name (7 characters maximum) that you wish to call the copied group, followed by [enter]. If you wish to use the current group name, just press [enter]. If you want the computer to automatically increment a number following the names of each group copy (such as NEW1, NEW2, etc.) enter '...' after the name. (NOTE: The starting number is set using the 'Number' option on the GROUP menu.)

Now the program will ask you to define the handle point by which to move the copied group. This is an aid to precise alignment of the group with any other part of your drawing. Position the cursor over the handle point you want to use and accept it. Now move the cursor to the desired new location of the handle point and accept this location. The computer will redraw the group at its new location.

ROTATING A GROUP

The Rotate option is selected from the GROUP menu by pressing [R] or placing the cursor next to [Rotate] and pressing the stylus.

When you have built the group you wish to rotate, the program will ask you to define the 'pivotal point' about which to rotate. Move the cursor to the desired location and accept it.

Now the program will ask you to define the handle point by which to rotate the group. Position the cursor over the handle point you want to use and accept it. A blinking line will appear between the pivotal point and handle point. Move the cursor to rotate it about the pivotal point, and accept the location when satisfied. The computer will redraw the group at its new rotation.

SCALING A GROUP

The Scale option is selected from the GROUP menu by pressing [S] or placing the cursor next to [Scale] and pressing the stylus. It allows you to change the size of the group in a number of ways.

When you have built the group you wish to scale, the program will ask you to define the 'stationary point' to fix in place while scaling. Move the cursor to the desired location and accept it.

Now the program will ask you to define the handle point by which to scale the group. Position the cursor over the handle point you want to use and accept it. A blinking line will appear between the stationary point and handle point. Move the cursor to change the length of this scaling line, and accept the location when satisfied. The computer will redraw the group at its new scale.

The keyboard option available while scaling a group is:

Factor [F]: Allows you to enter a numeric scaling factor from the keyboard.

Move [M]: Allows you to scale the group in such a way that the total area occupied by the group increases or decreases without changing the scale of the individual objects.

Scale [S]: Allows you to scale the group in such a way that the individual objects increase or decrease in size without changing their location (opposite of 'Move').

Both [B]: The normal or default mode of the program, in which both the area occupied by the group and the size of the individual objects are scaled together.

IMAGING A GROUP

The Image option is selected from the GROUP menu by pressing [I] or placing the cursor next to [Image] and pressing the stylus. It allows you to make a mirror image of the group.

When you have built the group to be imaged, the computer will display a blinking horizontal line on the screen. This is the image line, about which the group will be imaged. You can move it anywhere on the screen or rotate it to any angle. When the image line is positioned correctly, accept it and the computer will draw the imaged group.

IMAGE COPY: If you wish, you can image a group by making a copy, thus keeping both the original and the image on the screen. If you select this option, the program will ask:

New group name (... for auto increment): [current name]

Enter the name (7 characters maximum) that you wish to

call the copied group, followed by [enter]. If you wish to use the current group name, just press [enter]. If you want the computer to automatically increment a number following the names of each group copy (such as NEW1, NEW2, etc.) enter '...' after the name. (NOTE: The starting number is set using the 'Number' option on the GROUP menu.)

The keyboard options available while Imaging a group are:

Move [M]: Pulls the image line across the screen with the cursor. The angle of the image line will not be changed. When rotating the image line, use this option to fix its angle. This is the normal or default mode of the program.

X-axis [X]: Produces a horizontal image line. This is the normal or default mode of the program.

Y-axis [Y]: Produces a vertical image line.

Rotate [R]: Rotates the image line about a point defined by the cursor's position at the time [R] is pressed. A marker will indicate this point, and moving the cursor will rotate the line.

Copy [C]: Draws an imaged copy of the group while keeping the original in place.

CHANGING GROUP PROPERTIES

The Properties option is selected from the GROUP menu by pressing [P] or placing the cursor next to [Properties] and pressing the stylus.

When you select this option, you will be presented with the Group Properties menu.

> GRP PROPS
> lineStyle
> Density
> lineWidth
> Level
> Pen
> Color
> group Name
> Text
> Miscellaneous
> Global
> Klear
> Update
> Quit

By selecting one or more of these options, you can change the properties of all the objects in the group you are currently working on.

To do so, select from the keyboard the capitalized letter of the property you want to change. Then enter the number or character requested. You can enter as many new values as you want during a single Group Properties operation. Each time you make a proposed change to a property, the program will "flag" that property on the menu listing with a small arrow (<) to help you keep track.

When you are done typing in new values, you can update the current values to the proposed values all at once by selecting the Update option.

IMPORTANT: Proposed values are just that: proposed. The current values of the selected group ARE NOT actually changed to the proposed values until you press [U] (Update).

CHANGING LINE STYLE:
The Style option allows you to change the linestyle number of the objects in the current working group.

When you select this option the program will ask you to enter the new linestyle, an integer from 1 to 8. Press [enter] after the number. When you are finished changing properties, press [U] to update the group properties.

CHANGING DENSITY
The Density option allows you to change the number of times that the plotter will overstrike each line in the objects that make up the current working group.

When you select this option the program will ask you to enter the new density value, an integer from 1 to 7. Press [enter] after the number. When you are finished changing properties, press [U] to update the group properties.

CHANGING LINE WIDTH:
The lineWidth option allows you to change the plotter line width of the objects that make up the current working group.

When you select this option the program will ask you to enter the new line width, an integer from 1 to 7. Press

[enter] after the number. When you are finished changing properties, press [U] to update the group properties.

CHANGING LEVEL:

The Level option allows you to change the level that the current working group is on.

When you select this option the program will ask you to enter the new level number, an integer from 1 to 250. Press [enter] after the number. When you are finished changing properties, press [U] to update the group properties.

CHANGING PLOTTER PEN:

The Pen option allows you to change the plotter pen number of the objects in the current working group.

When you select this option, the program will ask you to enter the new pen number, an integer from 1 to 8. Press [enter] after the number. When you are finished changing properties, press [U] to update the group properties.

CHANGING SCREEN COLOR: (Tandy 2000 only)

The Color option allows you to change the screen color of the objects in the current working group.

When you select this option, the program will ask you to enter the new screen color number, an integer from 1 to 7. Press [enter] after the number. When you are finished changing properties, press [U] to update the group properties.

CHANGING GROUP NAME:

The Name option allows you to re-name the group you are currently working on.

When you select this option the program will ask you to enter the new group name, a text string of 7 characters or less. Press [enter] after the name. When you are finished changing properties, press [U] to update the group properties.

ꞮCHANGING TEXT SIZE:

The Text option allows you to change the character width and height of the current working group.

When you select this option the program will ask you to enter the new text width and height, real numbers which define the size of a text character in the current drawing

units. Press [enter] after each number. When you are finished changing properties, press [U] to update the group properties.

MISCELLANEOUS CHANGES:

The Miscellaneous option allows you to change the switches on three of the most commonly used drawing aids for the objects that make up the current working group:

The Arrow option allows you to add or remove an arrowhead.

The Template option allows you to switch the template feature.

The Marker option allows you to switch the marker feature.

When you select this option the program will ask you to enter either [Y] (for yes, turn the feature on) or [N] (for no, turn the feature off). Type in the desired value or press [enter] to leave the feature as before. When you are finished changing properties, press [U] to update the group properties.

CHANGING PROPERTIES GLOBALLY:

The Global option allows you to change the properties of the objects in the current working group to the 'global' properties you have defined in the PROPERTIES menu. This is a handy shortcut if you want to change the group properties to all or most of the current global properties. When you are finished changing properties, press [U] to update the group properties.

USING KLEAR:

The Klear option clears or erases the 'Proposed' column. You might want to do this if you made a mistake and set up several of the wrong properties.

USING UPDATE:

The Update option sets and makes permanent all the changes you entered for the current working group.

DELETING A GROUP

The Delete option is selected from the GROUP menu by pressing [D] or placing the cursor next to [Delete] and pressing the stylus. It removes all the objects in the

current working group from your drawing workfile and the computer screen (although they can be recovered; see below). Before deleting a group, the computer will give you a chance to change your mind.

UNDELETING A GROUP

The Undelete option is selected from the GROUP menu by pressing [U] or placing the cursor next to [Undelete] and pressing the stylus. Selecting this option will bring back the objects in the last group you deleted, UNLESS you have erased the current working group by selecting GROUP/Build. If this is the case, you can still recover the objects individually in MODIFY/Undelete.

LISTING GROUP NAMES

The List option is selected from the GROUP menu by pressing [L] or placing the cursor next to [List] and pressing the stylus. When selected, it will provide an alphabetical list of the group names in your drawing and the number of objects associated with each name. (Remember, these are not actual groups until you BUILD them by their group name.)

WHERE A GROUP IS

The Where option is selected from the GROUP menu by pressing [W] or placing the cursor next to [Where] and pressing the stylus. When this option is selected, the program will show you the location of the current working group by blinking each object in the group. Press any key to stop the blinking and return to the GROUP menu.

FINDING A GROUP

The Find option is selected from the GROUP menu by pressing [F] or placing the cursor next to [Find] and pressing the stylus. Then by placing the cursor over any object on your drawing, you can find out the name of the group to which that object belongs.

NUMBERING GROUPS

The Number option is selected from the GROUP menu by pressing [N] or placing the cursor next to [Number] and pressing the stylus. It allows you to enter the starting number you wish to use for automatic incrementing of

group numbers (see Copying a Group and Imaging a Group).

GROUP GUIDES

The Guides option is selected from the GROUP menu by pressing [G] or placing the cursor next to [Guides] and pressing the stylus. For detail on using Guides, see the ADD section (Part 4 of this manual).

QUIT

The Quit option is selected from the GROUP menu by pressing [Q] or placing the cursor next to [Quit] and pressing the stylus. It returns you to the MAIN MENU.

PART 7 - FILER MENU

The FILER menu allows you to clear and otherwise access your workfile on the computer disk. It is reached from the Main menu by pressing [F] or placing the cursor next to [Filer] and pressing the stylus. You will be presented with a complete list of the file manipulations you can make from within the drafting program.

> FILER
> New
> Crunch
> What
> sKetch
> Quit

STARTING A NEW WORKFILE

The New option is selected from the FILER menu by pressing [N] or placing the cursor next to [New] and pressing the stylus. It allows you to clear out the current workfile and start a new one.

When this option is selected, the program will display a warning message and ask you for verification. If you are sure you want to remove all objects from your workfile and clear the graphics screen, press [Y]. If this is not what you intended to do, press [N].

WARNING: This option is generally used whenever you start a new drawing, but remember that it will erase EVERYTHING in the existing workfile: objects, saved windows, plotter specs, etc. If you want to keep the drawing for later use, create another workfile disk rather than clearing out the existing one with the 'New' command.

CRUNCHING YOUR WORKFILE

The Crunch option is selected from the FILER menu by pressing [C] or placing the cursor next to [Crunch] and pressing the stylus. It allows you to permanently erase the objects you have deleted from your drawing so they no longer take up space in your workfile.

WARNING: Use this option only after careful thought. Once your workfile is crunched, you can no longer Undelete objects, groups or text that you have previously

deleted. Before crunching, the program will give you a chance to change your mind.

WHAT (Workfile Information)

The What option is selected from the FILER menu by pressing [W] or placing the cursor next to [What] and pressing the stylus. It provides useful information about your workfile: How much storage space is available and how much has been used. NOTE: Even if you have deleted objects from your drawing, they will continue to take up workfile space until you select the 'Crunch' option above.

QUIT

This option is selected from the FILER menu by pressing [Q] or placing the cursor next to [Quit] and pressing the stylus. It returns you to the MAIN MENU.

PART 8 - WINDOW MENU

The WINDOW menu allows you to manipulate the current viewing window through which you see your drawing on the screen. It is reached from the Main menu by pressing [W] or placing the cursor next to [Window] and pressing the stylus. You will be presented with a complete list of the manipulations you can make to a window.

> WINDOW
> Base
> In
> Out
> Pan
> Full
> Get
> Save
> Delete
> List
> Redraw
> What
> sKetch
> Quit

As explained in the *Concepts* section, a 'window' is a rectangular frame you define on the screen through which you view your drawing. The Window options allow you to move, shrink and magnify your viewing window, thus changing the portion of your drawing you see at any given time.

BASE WINDOW

The Base option is selected from the WINDOW menu by pressing [B] or placing the cursor next to [Base] and pressing the stylus. It allows you to redisplay your drawing at the 'base' window you have defined (in the UNITS menu).

When you first enter the program, you are at the base window. It is a starting point at which you begin a drawing. During the course of creating a drawing, you may have windowed 'in' or 'out' several times, so selecting this option allows you to return to your base window.

WINDOW IN

The In option is selected from the WINDOW menu by pressing [I] or placing the cursor next to [In] and pressing the stylus. It allows you to 'zoom in' on a portion of your drawing. magnifying it so it fills the entire screen.

When this option is selected, the program will ask you to define your 'window rectangle' by moving the cursor to where you want one corner to be and accepting that position. The program will now repeatedly draw a rectangle on the screen, which grows or shrinks as you move the cursor. When the rectangle surrounds the portion of your drawing that you wish to magnify, accept the second corner and the new magnification will be drawn.

You can abort the windowing and redraw operations at any time by pressing [esc]. If the requested window would cause the program to lose numeric precision (see *Concepts*). the Window In function will not be carried out.

The keyboard options available while Windowing In are:

Move [M]: Allows you to move the blinking window rectangle across the screen with the cursor. Moving the window does not change its size.

Scale [S]: Causes the blinking window rectangle to grow or shrink depending on the cursor location. This is the program's normal or default mode.

Place [P]: Locks the size and location of the blinking window rectangle. allowing you to move the cursor without affecting the window.

WINDOW OUT

The Out option is selected from the WINDOW menu by pressing [O] or placing the cursor next to [Out] and pressing the stylus. It allows you to shrink your entire drawing into the rectangular window you define on the screen, reducing it to a smaller scale.

When this option is selected, the program will ask you to define your 'window rectangle' by moving the cursor to where you want one corner to be and accepting that position. The program will now repeatedly draw a rectangle on the screen (representing the screen ratio),

which grows or shrinks as you move the cursor. When the rectangle surrounds the area you want your drawing to shrink into, accept the second corner and the new reduction will be drawn. Objects that were previously off the screen may now be visible.

You can abort the windowing and redraw operations at any time by pressing [esc]. If the requested window would cause the program to lose numeric precision (see *Concepts*), the Window Out function will not be carried out.

The keyboard options available while Windowing Out are:

Move [M]: Allows you to move the blinking window rectangle across the screen with the cursor. Moving the window does not change its size.

Scale [S]: Causes the blinking window rectangle to grow or shrink depending on the cursor location. This is the program's normal or default mode.

Place [P]: Locks the size and location of the blinking window rectangle, allowing you to move the cursor without affecting the window.

WINDOW PAN

The Pan option is selected from the WINDOW menu by pressing [P] or placing the cursor next to [Pan] and pressing the stylus. It allows you to move your drawing one screen width or less in any direction.

When this option is selected, the program will ask you to define the handle point by which to move the viewing window. This can be any point on the drawing, and its position on the screen will be the same as its relative position in the moving 'window rectangle'. For example, if you place the cursor at the center of the screen and accept that location as the handle point, it will then become the center of a rectangle the size of your screen, which you can move around freely to position the window.

When the rectangle is positioned where you want the viewing window placed, accept the location and the computer will redraw your work there.

WINDOW FULL

The Full option is selected from the WINDOW menu by pressing [F] or placing the cursor next to [Full] and pressing the stylus. It creates and displays the smallest window that contains your entire drawing.

This option is very useful if you have 'lost' part of your drawing by repeatedly changing windows. Sometimes the internal calculation of the full window takes a minute or so. You can abort the operation at any time by pressing [esc].

GET A WINDOW

The Get option is selected from the WINDOW menu by pressing [G] or placing the cursor next to [Get] and accepting the position. It allows you to retrieve any window that has been previously saved (by name) in your workfile (see WINDOW/Save).

When this option is selected, the program will ask you to enter the name under which the window was saved. Type in the name, followed by [enter] (if you change your mind, just type [enter]). If the window is in the workfile, the program will immediately redraw your work at that window.

SAVE A WINDOW

The Save option is selected from the WINDOW menu by pressing [S] or placing the cursor next to [Save] and pressing the stylus. It allows you to save to your workfile (by name) the window through which you are currently viewing your drawing. NOTE: The *contents* of the window are not saved, but the *view* (magnification, position, etc.) through which the drawing is seen. Thus, the same Saved window can be used on several different drawings.

When this option is selected, the program will ask you to enter the name under which you want the window to be saved (up to 7 characters). Type in the name, followed by [enter] (if you change your mind, just type [enter]).

The program will not let you save two windows with the same name. If this is attempted, you will be asked if you wish to replace the previous window saved by that name. Answer [Y] to replace, [N] to abort the Save operation.

DELETE A WINDOW

The Delete option is selected from the WINDOW menu by pressing [D] or placing the cursor next to [Delete] and pressing the stylus. It allows you to delete any previously Saved windows from your workfile.

When this option is selected, the program will ask you the name of the window to be deleted. Type in the name, followed by [enter] (if you change your mind, just press [enter]).

If the window exists in the current workfile, the program will ask if you are sure you want to delete it. Answer [Y] to delete, [N] to abort the Delete operation.

LIST THE WINDOWS

This option is selected from the WINDOW menu by pressing [L] or placing the cursor next to [List] and pressing the stylus. It allows you to list the names of all the windows saved in your current workfile. This is helpful when you cannot remember the name under which you saved a window.

REDRAW A WINDOW

The Redraw option is selected from the WINDOW menu by pressing [R] or placing the cursor next to [Redraw] and pressing the stylus. It causes the computer to go through the entire workfile and draw all objects that are visible at the current window.

This option is intended to be used after an aborted sKetch operation, in which all of the objects visible at the current window were not drawn. The Redraw option will force ALL objects to be redrawn, whereas another sKetch at this point only redraws those objects currently displayed on the screen.

USING WHAT

The What option is selected from the WINDOW menu by pressing [W] or placing the cursor next to [What] and pressing the stylus. It tells you the absolute real world limits of your current viewing window. For example:

Current window:
Left:	0.0000	Right:	40.0000
Bottom:	0.0000	Top:	30.4501

QUIT

The Quit option is selected from the WINDOW menu by pressing [Q] or placing the cursor next to [Quit] and pressing the stylus. It allows you to exit the WINDOW menu and return to the program MAIN MENU.

PART 9 - INQUIRE MENU

The INQUIRE menu allows you to analyze detail about objects in your drawing and accumulate area and perimeter totals. It is reached from the Main menu by pressing [I] or placing the cursor next to [Inquire] and pressing the stylus.

When you select this option, one object will blink on the screen. At the same time, a sub-menu will be displayed, with the type of object at its head (LINE, ARC, etc.). The attributes listed in the sub-menu are different for each type of object. Select from the menu the attribute about which you are interested; the appropriate information will be displayed.

Like the MODIFY menu, you can move to other objects in your drawing with the **Find** option (see below). If the next object about which you Inquire is the same type as the previous object (such as LINE), data will be displayed for the last attribute you Inquired about (such as Rotation).

Here are the attributes available (not all will be displayed for any given type of object):

Start/end [S]: Gives the X-Y starting and ending points of the currently blinking object in the current units.

Change [C]: The delta-X and delta-Y change between starting and ending points of the currently blinking object in the current units.

Rotation [R]: The currently blinking object's rotation in polar degrees (measured counterclockwise from the horizontal).

Length [L]: The currently blinking object's length in the current units.

Center [C]: The currently blinking object's center point in X-Y coordinates.

Diam/Rad [D]: The diameter and radius of the currently blinking object in current units.

Incl ang [I]: The included angle of the currently blinking object in degrees.

Properties [P]: The Properties setting for the currently blinking object (the same information as given with the UPDATE function key).

Add to totals [+]: Adds the area/perimeter of the currently blinking object to the cumulative total of areas and perimeters you have totaled. (You need not specifically Inquire about area or perimeter in order to use this function.)

Subtract from totals [-]: Decreases the cumulative total of areas and perimeters you have totaled by the area/ perimeter of the currently blinking object. (You need not specifically Inquire about area or perimeter in order to use this function.)

Zero totals [Z]: Resets the area and perimeter totals to zero.

Find [F]: Allows you to select the object in your drawing about which to Inquire. Place the cursor over the desired object and accept the location. The computer will search through the drawing and the object will begin blinking when found.

[<] and [>]: Steps through the drawing one object at a time to find the object about which you want to Inquire. As in **Find** above, the object will blink when found.

Quit [Q]: Returns you to the MAIN MENU.

PART 10 - PROPERTIES MENU

The PROPERTIES menu allows you to define, examine and change the properties (attributes) that are inherited by objects when they are created. It is reached from the Main menu by pressing [P] or placing the cursor next to [Properties] and pressing the stylus. An alternate method of reaching the same functions is to press [F6], the Update key.

When you select this option, you will be presented with the Properties menu.

>   PROPERTIES
>   lineStyle
>   Density
>   lineWidth
>   Level
>   Pen
>   Color
>   group Name
>   Text
>   Quit

To change any property on the menu, press the key corresponding to the capitalized letter on the property name. The program will position you to enter the new value.

CHANGING LINE STYLE:
The Style option allows you to change the linestyle number of objects being added. See the back of the manual for samples.

When you select this option the program will ask you to enter the new linestyle, an integer from 1 to 8. Press [enter] after the number.

CHANGING DENSITY
The Density option allows you to change the number of times that the plotter will overstrike each line in objects being added. This is useful if your plotter is producing weak lines, a pen is low on ink, etc.

When you select this option the program will ask you to enter the new density value, an integer from 1 to 7. Press [enter] after the number.

CHANGING LINE WIDTH:

The lineWidth option allows you to change the plotter line width of objects being added. See the chart at the back of the manual for the various line widths available.

When you select this option the program will ask you to enter the new line width, an integer from 1 to 7. Press [enter] after the number.

CHANGING LEVEL:

The Level option allows you to change the level on which objects being added will reside.

When you select this option the program will ask you to enter the new level number, an integer from 1 to 250. Press [enter] after the number.

CHANGING PLOTTER PEN:

The Pen option allows you to change the plotter pen number of objects being added.

When you select this option, the program will ask you to enter the new pen number, an integer from 1 to 8. Press [enter] after the number.

CHANGING SCREEN COLOR (Tandy 2000 only):

The Color option allows you to change the screen color of objects being added.

When you select this option, the program will ask you to enter the new screen color number, an integer from 1 to 7. Press [enter] after the number.

(See the back of this manual for a listing of screen colors available.)

CHANGING GROUP NAME:

The Name option allows you to change the 'global' group name inherited by objects as you add them to your drawing.

When you select this option the program will ask you to enter the new group name, a text string of 7 characters or less. Press [enter] after the name.

CHANGING TEXT SIZE:

The Text option allows you to change the character width and height of new text you add. It also lets you change the amount the cursor moves with each press of the 'cursor control keys' when entering text (see ADD/Text).

When you select this option the program will ask you to enter the new text width and height, real numbers which define the size of a text character in the current drawing units. It will also ask you to define the row and column movement (in current drawing units) of the cursor when you use the I,J,K,L control keys. Press [enter] after each number.

PART 11 - SWITCHES

The SWITCHES menu allows you to examine and change whether or not various drawing aids are displayed on the computer screen. It is reached from the Main menu by pressing [S] or placing the cursor next to [Switches] and pressing the stylus. You will be presented with a complete list of the switches you may 'toggle' on and off.

        SWITCHES
        Marker
        Template
        Grids
        Reverse
        Upright
        All
        Levels
        sKetch
        Quit

When a Switches option is chosen, the program will show you the current setting of that switch and position you to change the current value, either [Y] for Yes or [N] for No. The new value will then be displayed on the screen. Press [enter] for no change.

CENTER MARKER SWITCH

The Marker option is selected from the SWITCHES menu by pressing [M] or placing the cursor next to [Marker] and pressing the stylus. If the center marker switch is set to 'Yes' then all objects that are created with the marker 'on' will be drawn with a marker in their centers. If the switch is set to 'No' then the centers will not be shown. The initial value of the center marker switch is [N].

TEMPLATE SWITCH

The Template option is selected from the SWITCHES menu by pressing [T] or placing the cursor next to [Template] and pressing the stylus. If the template switch is set to 'Yes' then all template objects will be visible whenever the screen is redrawn. If the switch is set to 'No' then template objects will not be shown. The initial value of the template switch is [Y].

GRIDS SWITCH

The Grids option is selected from the SWITCHES menu by pressing [G] or placing the cursor next to [Grids] and pressing the stylus. If the grids switch is set to 'Yes' then whenever the screen is redrawn the currently defined grid lines will be shown. If the switch is set to 'No' then the grid lines will not be shown, whether or not they are currently defined. The initial value of the grids switch is [Y].

REVERSE SKETCH SWITCH

The Reverse sketch switch is selected from the SWITCHES menu by pressing [R] or placing the cursor next to [Reverse] and pressing the stylus. If the switch is set to 'No' then your drawing will be redrawn in the normal way whenever you select [sKetch] (that is, objects are sketched in the order you ADDed them). If the switch is set to 'Yes' then it will be sKetched in reverse order, with the most recently ADDed objects drawn first. The initial value of the reverse sketch switch is [N].

USER TIP: This option is especially useful if you just want to look at the part of your drawing that you most recently added. You can stop the redraw at any point by pressing [esc].

TEXT UPRIGHT SWITCH

The text Upright option is selected from the SWITCHES menu by by pressing [U] or placing the cursor next to [Upright] and pressing the stylus. It allows you to keep text in a rightreading orientation at any rotation, reading either left to right or bottom to top.

ALL LEVELS SWITCH

The All levels option is selected from the SWITCHES menu by pressing [A] or placing the cursor next to [All] and pressing the stylus. It allows you to specify whether you want to override the individual levels switch settings and unconditionally work with all levels displayed.

When the All switch is set to 'Yes' all levels are turned on and displayed, regardless of the levels configuration. Setting the switch to 'No' causes the program to use the individual levels configuration set under the **Levels** switch option below. The initial value of the All switch is [Y].

INDIVIDUAL LEVELS SWITCHES

The Levels option is selected from the SWITCHES menu by pressing [L] or placing the cursor next to [Levels] and pressing the stylus. It allows you to specify which individual levels you want displayed and which you want turned off.

When a particular level number is set to 'Y' (for Yes, show that level) that level is visible and drawn on the screen. Conversely, when a level is set to 'N' (for No, shown by a dot on the listing), all objects in that level are 'invisible' and not drawn on the screen, even though they still exist in your drawing. The initial value of all levels is [Y].

When you select this option the program will position the blinking cursor under Level number 1. The following keys allow you to set switches and move around the listing:

Yes [Y]: Turns on the level whose number is under the cursor and moves the cursor to the next level number.

No [N]: Turns off the level whose number is under the cursor and moves the cursor to the next level number.

Up [U]: Moves the cursor 50 level numbers higher.

Down [D]: Moves the cursor 50 level numbers lower.

Jump [J]: Allows you to type in a level number to which the cursor will jump.

Space bar/Backspace: The space will move forward one level number at a time, while [backspace] will move back one level number at a time. Neither key will change the level settings.

Press [enter] when you are done changing levels and want to return to the SWITCHES menu.

QUIT

The Quit option is selected from the SWITCHES menu by pressing [Q] or placing the cursor next to [Quit] and pressing the stylus. It returns you to the Main menu.

PART 12 - UNITS MENU

The UNITS menu allows you to examine or change the various units of measurement that apply to your drawing. It is reached from the Main menu by pressing [U] or placing the cursor next to [Units] and pressing the stylus. When selecting this option, you will be presented with the UNITS menu.

> UNITS
> Rotation
> Increment
> Units
> Base
> Grids
> sKetch
> Quit

When a UNITS option is chosen, the program will display the current value of that unit and position you to enter a new value. The program will tell you what type of number it expects you to enter. Type in the new value, followed by [enter]. (Press [enter] or [esc] for no change.) The new value will then be displayed on the screen.

CHANGING ROTATION

The Rotation option is selected from the Units menu by pressing [R] or placing the cursor next to [Rotate] and pressing the stylus. It allows you to define the incremental rotation (in polar degrees, 0 through 360) that is used throughout the program.

There are several areas in the program that use this rotation. One of these is the Text option of the ADD menu. Once the text has been entered, the program allows you to rotate the text by the incremental amount defined here. For example, if the Rotation was defined to be 45 degrees, then each time the appropriate key is pressed the program will add 45 degrees to its rotation.

CHANGING INCREMENT

The Increment option is selected from the UNITS menu by pressing [I] or placing the cursor next to [Increment] and pressing the stylus. It allows you to set the increment

used with 'Increment Snap', an aid in the exact placement of objects. The initial increment value is 1.0.

When the drawing Units are in inches, inches as feet, inches decimal, feet, feet as inches and feet decimal, you can enter the Increment as whole numbers (1, 3, 6), as decimal numbers (1.5 or .33) or as fractions (1.1/16" or 3/64"). Note the format for entering inches and fractions of inches: 4 feet 3 ¾ inches would be entered as 4'3.3/4".

When the drawing Units are in decimal units such as meters, miles, etc., you can enter the Increment as whole numbers or as decimal numbers.

CHANGING UNITS OF MEASUREMENT

The Units option is selected from the UNITS menu by pressing [U] or placing the cursor next to [Units] and pressing the stylus. It allows you to define the units of measure used in the drawing for coordinates and dimensions, much like assigning values to the lines on a piece of grid paper.

The different units of measure are: user-defined, inches, inches as feet, inches decimal, feet, feet as inches, feet decimal, miles, millimeters, meters and kilometers. The initial unit of measure when you begin using the program is inches. NOTE: Units can only be changed when a drawing is not in progress (in other words, there are no objects in your workfile).

When using standard units such as inches, meters, etc., you can move among the various Units options by pressing the [space bar] or [backspace]. When the desired unit is displayed on the 'drawing units' line, press [enter].

If you are using User-Defined units, display 'user defined' on the drawing units line, then enter the 'equivalent units' (one of the standard units listed above that are available from the VersaCAD program) and the 'equivalent factor' (the multiplier that will tell the computer how your User-Defined units relate to the program's built-in units). For example, if your User-Defined units will represent 'yards', the equivalent units would be 'feet' and the equivalent factor would be '3' (3 feet per yard).

CHANGING BASE WINDOW

The Base option is selected from the UNITS menu by pressing [B] or placing the cursor next to [Base] and pressing the stylus. It allows you to change the basic coordinate system (or base window) that will be used for the current drawing.

The base window is an arbitrary, user definable, screen coordinate system that will provide the basic coordinates while creating a drawing. They are defined in terms of the units from the origin to the opposite edges of the drawing 'world'. Normally, the origin is set at the lower lefthand corner of the screen (0,0) as in the example below (although you can set it anywhere you wish):

    Base left: 0.0000
    Base right: 511.0000
    Base bottom: 0.0000
    Base top: 360.2757

When you select this option, the program will ask you to enter the absolute coordinates of three of the four edges of the base window. The fourth edge is calculated automatically to preserve the correct window proportions on the screen. As the program positions you to enter each new value, simply type in the desired number, followed by [enter]. At any time, pressing only the [enter] key will keep the current value and position you for the next value. Once all the numbers have been typed in, the computer will redraw the screen using the new base window.

USER TIP: What is the 'best' base window is a matter of your preference. For example, if you are drawing a floor plan that is 30 feet by 40 feet, you will probably want to set the Units option to feet and you might want to set your base window to be 40' by 50'. Or, if you know that your drawing is to be plotted on a 15 inch by 20 inch surface, you might set your base window to be 15" by 20".

CHANGING SCREEN GRIDS

The Grids option is selected from the UNITS menu by pressing [G] or placing the cursor next to [Grids] and pressing the stylus. It allows you to change the placement

of the X-Y grid pattern on the screen, an aid to the precise alignment of graphics objects.

When you select this option the program will position you to enter the 'X spacing'. This is the spacing (in the drawing units you have set) between the vertical grid lines. Enter the desired number, followed by [enter]. Next, you will be asked to enter the 'divisions' parameter. This entry defines the number of subdivisions that will be drawn between each vertical grid line. Enter the desired divisions followed by [enter]. If only the [enter] key is pressed, the program will assume divisions equals 1.

Next, you will be positioned to enter the 'Y spacing' and 'divisions' parameters. These parameters define the characteristics of the horizontal grid lines exactly as the above procedure defined the vertical grid lines. If you want the Y grids to have spacing and divisions identical to the X grids, then press [enter] for the 'Y spacing' prompts. When you have finished defining the grids, the program will display the new grids.

Notice that a dot is always drawn at the grid line intersections. If you specify grid lines or division marks that are too close together at the current window, the program will display a message that it cannot draw the grid lines.

USER TIP: A simple way to delete your grid lines is to select the Grids option and just hit the [enter] key when you are positioned to define the 'X spacing'. This will erase the old grids and since you haven't defined any new ones, no new grids will be displayed. If you'd rather just temporarily remove your grids, use the Grids option of the SWITCHES menu. Turning this switch 'off' will remove the grids. Turning this switch 'on' will redisplay them.

QUIT

The Quit option is selected by pressing [Q] or placing the cursor next to [Quit] and pressing the stylus. It returns you to the MAIN MENU.

PART 13 - OUTPUT MENU

The OUTPUT menu allows you to create a paper copy of the drawing that is displayed on your screen. It is reached from the Main menu by pressing [O] or placing the cursor next to [Output] and pressing the stylus. You will be presented with a complete list of the output options available.

> OUTPUT
> Plotter
> pRinter
> Specs
> sKetch
> Quit

OUTPUT TO PLOTTER

The Plotter option is selected from the OUTPUT menu by pressing [P] or placing the cursor next to [Plotter] and pressing the stylus. Selecting this option initiates the actual drawing on the plotter, in accordance with the 'Plot Spec' (specification) you have selected.

There are two types of plot specs: the default spec and user-defined specs. The **default** plot spec takes the current screen image and maps it to fill the total surface area on the plotter. A **user-defined** plot spec maps the current drawing onto the plotter in any way that you define. See the **Specs** section below for more detail.

When you select this option the program will tell you when to switch your digitizer and plotter cables, and also when to switch pens on a multi-pen plotter.

Next, the program will ask you to make sure you have paper on the plotter, then ask for the name of the plot spec you wish to use. For the default spec, simply press [enter]. The computer will now begin to plot your drawing.

OUTPUT TO PRINTER

The pRinter option is selected from the OUTPUT menu by pressing [R] or placing the cursor next to [pRinter] and pressing the stylus. When you select this option, the program enables you to "dump" the complete screen

image to your dot matrix printer. The resolution of this "screen dump" will be no better than that of the screen display.

PLOT SPECS

The Specs option is selected from the OUTPUT menu by pressing [S] or placing the cursor next to [Specs] and pressing the stylus. It allows you to define your own 'plot spec'. When this option is selected, you will be presented with the following sub-menu:

> SPECS
> Window
> Boundary
> Factor
> Get
> Save
> Delete
> List
> Quit

At the same time, the computer will display the current plot spec. For example:

| Plot boundaries | left: | 0″ | bottom: | 0″ |
| in inches | right: | 30″ | top: | 21.5/32″ |

scale = inches on paper / units on screen
Factor   0.2500

Plot specs are used to determine exactly what part of a drawing will be plotted (its window), where it will appear on the paper (its boundaries), and to what scale it will be drawn (its scale factor).

A plot spec can be thought of as defining a mapping function that determines how the objects in the 'real world' coordinate system of the drawing are to be placed on the limited coordinate system of the plotting surface.

The mapping function is:

$$X \quad \frac{\text{drawing coordinate limits}}{\text{plotter coordinate limits}} \quad \text{scaling factor}$$

For short, we will call the drawing coordinate limits the

'screen window' and the plotter coordinate limits the 'plot boundaries'.

When the Specs option is selected, the computer will display a standard plot spec on the screen. The three components of a plot spec are the screen window, the plot boundaries, and the scaling factor (detailed below). Both the plot boundaries and the scaling factor are displayed as numbers. The screen window is shown as a rectangle on the screen.

Once you have the plot spec on the screen, you can change any of the components of that spec with the options below. Usually, changing one component requires an equivalent 'adjustment' in one of the other components. If this is the case, the computer will give you a choice of which component to adjust.

For example, changing the scale factor that is applied at plot time requires that either the plot boundaries or the screen window be recalculated. Once you change the scale factor, the program will ask which component you want adjusted - the boundaries or the screen window.

SELECTING SCREEN WINDOW:
The Window option under OUTPUT/Specs allows you to determine what portion of the drawing will be plotted by enclosing the desired area within a rectangle on the display screen.

When you select this option the program will begin blinking the current screen window and present you with the following sub-menu:

> Move
> Scale
> Place
> Unproportional

Move [M]: Allows you to move the current blinking screen window with the cursor. Accept the location when satisfied.

Scale [S]: Allows you to scale the current blinking screen window. One corner of the window is stationary, and the window is scaled by moving the cursor across the screen. Notice that the window is always scaled in proportion to the screen. Accept the location to lock in the size of the window. Next, the

computer will ask you which component you want it to automatically recalculate - the plot boundaries or the scale factor. Press [B] for the boundaries and [F] for the factor.

Place [P]: Allows you to move the cursor without moving the screen window. This is normal or default mode of the program.

Unproportional [U]: Used in conjunction with the Scale option above, this allows you to select an unproportional aspect ratio. One corner of the window is stationary, and the window is scaled by moving the cursor across the screen. Accept the location to lock in the size of the window. The computer will recalculate the plot boundaries or scale factor at your option (see **Scale**.)

PLOT BOUNDARIES:

The Boundary option under OUTPUT/Specs allows you to position the area (window) to be plotted on the paper, relative to a 0,0 reference point.

Once you have entered the offsets from the reference point, the computer will ask if you want it to recalculate the scale factor [F] or screen window [W]. Press the appropriate key and the new screen window will be drawn.

SCALING FACTOR:
The Factor option under OUTPUT/Specs allows you to control the size of your plotted drawing.

When you select this option the program will ask you to enter the ratio of what you want plotted to the 'real world' coordinates on the screen. First you will enter the number of 'inches on paper' and then the corresponding 'feet on screen' (or other unit). (If the second unit is '1', just press [enter]. For example, to plot ½" on paper as equivalent to 1' on the screen, enter .5 on the first line and press [enter] for the second line.)

Next the computer will ask if you want it to recalculate the plot boundaries [B] or screen window [W]. Press the appropriate key and the new screen window will be drawn.

GET A PLOT SPEC:

The Get option under OUTPUT/Specs allows you to retrieve a stored plot spec by name for inspection and/or modification.

Type in the name of the plot spec that you wish to retrieve. The computer will get that plot spec and display its parameters on the screen. You may now use the Window, Boundary or Factor options described above to change the plot spec if desired.

SAVE A PLOT SPEC:

The Save option under OUTPUT/Specs allows you to save in your workfile the plot spec that is currently displayed on your screen.

When you select this option, the computer will ask you the name under which you want the spec stored. Enter up to 7 characters, followed by [enter].

DELETE PLOTTER SPECS:

The Delete option under OUTPUT/Specs allows you to delete by name any plot spec you have saved in your current workfile. The computer will give you an opportunity to change your mind before removing a spec.

LIST PLOT SPECS:

The List option under OUTPUT/Specs allows you to list the names of all the plot specs you have saved in your current workfile.

QUIT:

The Quit option under OUTPUT/Specs allows you to exit the SPECS menu and return to the OUTPUT menu. If you select the **Quit** option without saving your currently defined plot spec, the program will ask whether you first want to save it.

QUIT

The Quit option is selected from the OUTPUT menu by pressing [Q] or placing the cursor next to [Quit] and pressing the stylus. Selecting this option returns you to the MAIN MENU.

PART 14 - SKETCH

The **sKetch** command allows you to redraw the screen to clean up broken lines, etc. It is reached by selecting [K] from the Main menu or placing the cursor next to [sKetch] and pressing the stylus.

The redraw can be stopped at any time by pressing [esc]. This is valuable to save time if you only wish to view a portion of your drawing. However, if you stop the redraw early, only the portion on the screen will be redrawn when you select [sKetch] again. To redraw the entire workfile again, select [Redraw] from the WINDOW menu.

USER TIP: Aborting a sKetch operation while GETting a drawing from the FILER option is a useful way to 'preview' just part of a large drawing.

PART 15 - EXITING THE PROGRAM

The **Exit** command allows you to leave the VersaCAD program and return to the Operating System environment. It is selected from the Main menu by pressing [E] or placing the cursor next to [Exit] and pressing the stylus.

When you select this option, the program will display a message, asking if you really want to exit the program. If you answer [N], you will return to the Main menu. If you answer [Y], you will return to the Operating System with your workfile intact. It will automatically be recovered when you reboot the VersaCAD program.

LINESTYLES

—————————————— 1
— — — — — — — — — — 2
— — — — — — — — — 3
——— . ——— . ——— . — 4
——— - — - — ——— - 5
——— - - — - - ——— - - 6
. . . . 7
.... 8

LINEWIDTHS

—————————————— 1
━━━━━━━━━━━━━━ 2
▅▅▅▅▅▅▅▅▅▅▅▅▅▅ 3
███████████████ 4
███████████████ 5
███████████████ 6
███████████████ 7
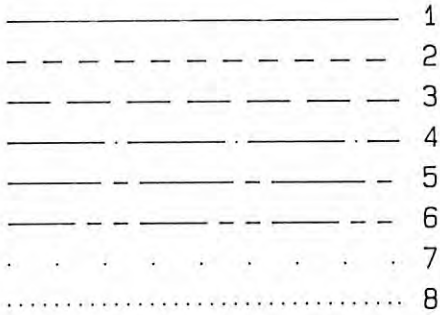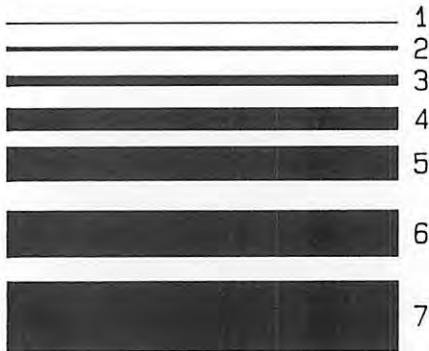
TANDY 2000 COLORS

1 - Blue	5 - Purple
2 - Green	6 - Yellow
3 - Light blue	7 - White
4 - Red	

GLOSSARY

2D: The two-dimensional drafting program with which you are working.

Absolute input: A keyboard entry mode that allows you to type in the absolute real world coordinates (X and Y).

Accept: The process of entering the current cursor location into the computer.

Alphanumeric: Any text character typed in from the keyboard, whether alphabetical or numerical.

Backup: Making a second disk copy of your drawings or the 2D program in order to guard against accidental erasure.

Boot: To start up a computer by loading a program into memory (short for 'bootstrap', as in 'pull yourself up by').

Characteristic point: The point(s) by which a primitive object is entered into the drafting system, such as the first and second endpoints of a line. The program will ask you to place the on-screen cursor where you want these points to be, then 'accept' the location (the computer will beep when you have done this).

Coordinate: The numerical value of a particular screen location as measured along the X and Y axes from the origin, in the units you have currently defined.

Cursor: (1) The crosshairs on the graphics screen that corresponds to the position of the controller on your graphics input device. (2) The prompt in the text or menu area that defines where the next character or menu command will be accepted.

Default: The option or device that will be in operation unless you specifically select another.

Disk: A magnetic storage medium that can contain such information as the drafting program or your workfile.

Display monitor: The television-like screen on which graphics and/or text is displayed.

Drive: A peripheral device that saves and retrieves drawings and other information stored on magnetic disks.

Execute: To carry out a sequence of actions such as those required by a computer program.

Field: Computer jargon for a particular group of entries in a table. For example, all the entries in Column 1 of a 5-column table could be called the first field of that table.

File: A collection of information stored on a disk by name.

Floppy disk: See **Disk**.

Format: (1) The process by which the computer makes a blank disk ready to receive information, by adding magnetic tracks and other special data. (Sometimes called **initializing**.) (2) The method by which computer information is stored.

Function keys: Special keys that allow quick changes of the drafting program's operation at any time (e.g., turning 'snap' on and off).

Graphics screen: That portion of the display monitor screen that shows your drawing.

Grids: Dotted lines along the X and Y axes that are an aid to precise drawing. The spacing of the grid lines and the number of dots between lines can be independently adjusted in the UNITS menu.

Group: An arbitrary collection of objects which share a common name.

Handle point: The point on an object by which the cursor will 'pull' it across the screen under such options as Move, Rotate, etc. Every primitive object has one handle point, and some have alternates.

Hardware: The physical components of a computer system (mechanical and electronic). Opposite of 'software'.

Increment snap: The function that pulls the cursor to the nearest increment that you have defined in the UNITS menu.

Initialize: See **Format**.

Input: Bringing information into the computer from some external device, such as a digitizer.

Level: Also called a **layer**. A collection of objects similar to those on a clear plastic overlay, which can be switched on and off the display screen independently of other levels.

Menu: A list of choices presented by the program which gives you the available options at that moment.

Mode: The method of operation currently selected by the program. For example, 'Snap mode' causes the cursor to 'snap' to predefined points, while 'Free mode' lets it move freely across the screen.

Monitor: See **Display monitor**.

Monochrome: A single-color display monitor (black and white, green or amber screen are the usual types).

Object: A primitive drawing unit, including lines, rectangles, polygons, circles, ellipses, circular arcs, and text.

Operating system: The outside or 'shell' environment in which a computer program functions. The 2D program operates under MS-DOS.

Origin: The 0,0 point from which the X and Y coordinates are measured. The origin is at the bottom left corner of the display screen.

Output: The transfer of information from the computer to some external device such as a plotter or disk drive.

Parameter: A set of variables which determine the characteristics of a system. For example, the properties of objects, such as linestyle, etc., are parameters.

Peripheral: An attachment to the computer that enhances its operation, such as a plotter or external disk drive.

Plotter: A device that reproduces on paper or other medium an inked image of the drawing on the display screen, using an electronically controlled pen or pens.

Polar: A coordinate system which uses angle and distance to define locations. Angles are measured from the horizontal and increase in the counterclockwise direction.

Program: A set of instructions that tell the computer how to accomplish a given task. They are usually stored on a magnetic disk. Collectively, programs are called **Software**.

Prompt: The square or line displayed in the menu or text area, telling you that the computer expects additional input.

Property: The attributes of an object or group of objects, including level number, linestyle, pen number, etc.

Real world coordinates: The capability to draw in the actual units of the finished product, such as feet, inches, meters, etc.

Relative input: A keyboard entry mode that allows you to type in coordinates relative to the last-entered co-ordinate.

Scale: To size an object, group of objects or drawing.

Screen dump: A direct representation of the screen image printed on paper by a graphics printer.

Sketch: The process of redrawing the display screen, usually to 'clean up' broken lines resulting from object manipulation and deletion.

Snap: The mode by which the cursor is 'pulled' to previously defined locations on the display screen, including grid intersections and increments.

Software: See **Program**.

String: A collection of alphanumeric (text) characters. (The preceding sentence is a 'string'.)

Text screen: The portion of the display monitor that shows your text.

Toggle: To switch back and forth between options. The function keys 'toggle' various options as they are pressed.

Tracking: The ability to see objects as you manipulate them on the display screen. Tracking may be switched off if desired for faster redrawing of the screen as you work.

Window: The view through which you see your drawing on the display screen. As you move the window, different parts of the drawing become visible.

Workfile: The storage area on disk which keeps a running record of your work as you go along.

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(Functions are capitalized, and the appropriate menu is shown after the slash "/".)