

TERAK MINN-DRAFT VERSION 11 USER'S GUIDE

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TERAK MINN-DRAFT VERSION 11 USER'S GUIDE

PREFACE

This User's Guide is designed to be used in conjunction with the Terak Minn-Draft Installation Guide, the Terak Minn-Draft Startup Guide and the Terak Minn-Draft Courseware. It provides reference material on the Minn-Draft applications package which is used to create and edit three-dimensional drawings. The majority of text is intended for all users, from novice to advanced.

Consult the Installation Guide in order to familiarize yourself with the Terak Minn-Draft system. Once you begin creating your own drawings, you will need to be able to use the numerous drafting and file maintenance commands efficiently. Sections 1 and 2 provide general information on using the Minn-Draft system. Sections 3 through 9 describe the drafting functions available through the digitizer menu. Sections 11 and 12 describe Main Selection Menu options. All System Menu options are described in detail in Appendix A, and System error messages and the appropriate corrective actions are included in Appendix B. This document is divided into the following sections:

SECTION 1 - INTRODUCTION

- o Provides a product description
- o Defines textual conventions and definitions
- o Lists differences between Minn-Draft Versions 10 and 11
- o Provides a short explanation of keyboard usage

SECTION 2 - SOFTWARE INSTALLATION

- o Describes floppy disk handling procedures
- o Describes software installation procedures

SECTION 3 - GETTING STARTED

- o Provides data file set up procedures
- o Provides a quick summary of the Digitizer Menu options

SECTION 4 - INPUT MODE

- o Explains coordinate input methods and coordinate systems
- o Describes the INPUT section of the Digitizer Menu

SECTION 5 - GEOMETRIC INPUT

- o Describes the Geometric Input section of the Digitizer Menu

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SECTION 6 - SPECIAL FUNCTIONS AND SCREEN

- o Describes the Special Functions and Screen section of the Digitizer Menu

SECTION 7 - DIMENSIONING

- o Explains the Dimensioning section of the Digitizer Menu

SECTION 8 - CELLS AND CELL LIBRARIES

- o Explains the Cell portion of the Digitizer Menu

SECTION 9 - OPERATIONS

- o Describes the Operations section of the Digitizer Menu

SECTION 10 - CONSTRUCTIONS

- o Explains the Constructions portion of the Digitizer Menu

SECTION 11 - OUTPUT

- o Explains drawing output to plotter, printer or screen

SECTION 12 - VIEWS

- o Describes manipulation of drawing views

SECTION 13 - BOOKKEEPING

- o Describes the Bookkeeping options available with the system
- o Describes setting system defaults

APPENDIX A - OVERVIEW OF SYSTEM MENU PROCEDURES

- o Provides a reference guide of System Menu procedures

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REFERENCE DOCUMENTS

The following documents are provided (or available) with the Terak Minn-Draft system. Each document contains information of specific value to users and should be used in conjunction with this manual to provide a complete understanding of the Terak Minn-Draft system. These documents should be read in the order presented for best understanding.

<u>DOCUMENT</u>	<u>USE</u>
<u>Terak 8510/C Installation And User's Guide</u> 50-0038-001B	Provides detailed hardware installation instructions for the basic Terak 8510/C workstation.
<u>Terak 5 1/4 Winchester Installation And User's Guide</u> 50-0040-001A	Provides detailed hardware installation instructions for the winchester disk drive.
<u>Terak 8600 Installation And User's Guide</u> 50-0020-001B	Provides detailed hardware installation instructions for the Terak 8600 color system.
<u>Terak Minn-Draft User's Guide</u> 60-0166-001A	Provides detailed instructions on using the Minn-Draft CAD System, emphasizing drafting information according to Digitizer Menu Divisions.
<u>Terak Minn-Draft Instructor's Manual</u>	Provides an outlined course for teaching the Minn-Draft system. The modular form allows for variation in presenting the material. Lab Exercises, Performance Checklists and Criterion Exams are included for student evaluation.
<u>Terak Minn-Draft Student Packets</u>	Provides student material to accompany the Minn-Draft Instructor's Manual. Each packet relates to a specific module and contains a lecture outline, a glossary of terms, lab exercises and a worksheet.

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SECTION 1

INTRODUCTION

Computer systems are essentially made of two types of components: hardware and software. Hardware is all of the physical items: monitors, keyboards, cables, wires, printed circuit boards, etc. Software is more conceptual. It is the instructions (or programs) that make the system function. These instructions are stored as magnetic data. Minn-Draft stores its software on floppy disks. (On winchester systems the software is also stored on a winchester disk.) Sometimes the disks themselves are referred to as the software, since they contain it. This document provides instructions on how to install the software for a Terak Minn-Draft Computer-Aided Design/Drafting (CAD/D) workstation.

The most basic functioning of a computer is very simple. Data is input to the system, it is then processed, and then output. Input comes from many sources: it may be from a disk that is read into the system, or typed in from a keyboard, or it may be digitized from a tablet. The physical items that give data to a computer are input devices.

Likewise, data may be output in many ways: a file can be written to a disk, the screen may display a drawing or text, a printer or plotter may make a copy of text or a drawing on paper. The physical items that produce information from a computer are output devices.

Product Description

Terak Minn-Draft is a three-dimensional Computer Aided Design/Drafting (CAD/D) package which is designed to run on the Terak microcomputer. Supplied with the Terak Minn-Draft system is software for drafting and system maintenance, a Minn-Draft Version 11 Digitizer Menu, and reference and training documentation as well as the standard Terak hardware which consists of a processor, disk drives, a monochrome monitor, a keyboard and a digitizer.

With the move to Version 11, the Terak Minn-Draft system has come to closely resemble an industry-level CAD/D system. The Minn-Draft system is still structured mainly for teaching, however, and with the addition of the Minn-Draft Courseware is an excellent tool for training students in the methods of computer-aided design and drafting.

The typical Terak CAD workstation consists of a Terak 8510 data processor and disk drives, a monochrome monitor, a keyboard, a digitizer and the Minn-Draft software. A plotter or printer, to serve as an output device, is considered optional. The Terak CAD work station may also include a color floppy monitor. Two disk drives are required and may be either two floppy drives or a combination

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of one floppy and one winchester disk drives.

Minn-Draft is a three-dimensional CAD/D package which is designed to run on the Terak CAD/D workstation. The software is divided into five functional groups:

1. Disk/File Maintenance (System Utilities)
2. Drafting
3. Output
4. Views
5. Bookkeeping

These functional groups are accessed through a System Menu. The Disk/File Maintenance and Communications options are available directly from the System Menu and the rest are accessed through the Minn-Draft program (the first option on the System Menu).

This system, along with the courseware which provides students with many of the concepts of CAD/D as well as hands-on experience in producing CAD/D drawings, is an excellent tool for training students in the methods of computer-aided design and drafting.

Textual Conventions

The following symbols and definitions are used throughout this document.

Symbols

< > Characters within these symbols are abbreviations indicating which key should be pressed. For example:

<RETURN> Indicates that the RETURN key should be pressed

<LF> or <Line Feed> Indicates the LINE FEED key should be pressed

— Underlined letters, numbers, words, or phrases indicate exact keys to be typed. For example:

Y Indicates that the letter Y should be pressed

Example: B<Return> Indicates that you should type the letter B, immediately followed by the RETURN key.

Definitions

Press means to press a single key. For instance, you "press" the <RETURN> key.

Type means to press a sequence of keys. For instance, you "type" the sequence B<Return>.

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- Boot** means to load the operating system software (the programs that control the overall operation of the computer) so that the Minn-Draft system can be used for drafting. This is accomplished by either 1) turning the system on, then placing the disk(s) in the appropriate drive(s), or, if the system is already powered and the disks are in the drives, 2) pressing the power switch on the processor unit upwards with the disk(s) in the appropriate drive(s).
- Cursor Unit** refers to either the puck or stylus used with the digitizer to enter commands from the digitizer menu, location points on the screen for geometric entities or to indicate a geometric entity that is to be manipulated in some manner.
- Digitize** means either 1) to move the Cursor Unit to a location on the Digitizer Menu and press the button on the puck or gently press down the tip of the digitizing pen (stylus), or 2) to move the screen crosshairs via the keyboard arrows or the Cursor Unit in the Active Cursor Area on the Digitizer Menu; when the crosshairs are in the desired location hit any key on the keyboard (except the arrow keys) or press the the puck button or stylus tip.

Components

The basic Minn-Draft CAD/D workstation consists of four main units, listed below. (See Figure 2.1 for an illustration of a typical workstation configuration.)

- a. processor unit with two disk drives (either two floppy disk drives or one floppy and one embedded Winchester drive)
- b. keyboard
- c. monochrome monitor (command console)
- d. digitizer tablet

Additionally, a color system, printer and/or plotter are optional extensions to the workstation.

Processor

The Terak 8510 processor and disk drives are located in the same unit. The processor controls system operations, performs arithmetic calculations and maintains memory.

If you are using a floppy drive system, there will be two floppy drive units. The lower one is the System Drive; the Minn-Draft System Disk should be inserted here. The upper drive is the Data Drive; a Minn-Draft Data Disk should be inserted here. Both disk

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drives are necessary for running the Minn-Draft program with a floppy drive system.

If you are using a winchester system, you will only need to be concerned with inserting the Boot Disk or a Data Disk in the lower drive. After the initial installation, the instructions to run the Minn-Draft system will be stored on your hard disk (Winchester) unit. The Boot Disk will always be necessary to boot your system, but after the System Menu appears on your screen, the Boot Disk may be removed and a Data Disk inserted.

Keyboard

The keyboard resembles a standard typewriter keyboard and has keys for entering text and numbers, as well as several special function keys. (See your Terak Minn-Draft User's Guide for more information.)

Monochrome Monitor

The display screen is a high resolution graphics screen. High resolution screens provide you with a high quality picture, for example lines without jags and well-rounded circles.

Both textual prompts and the graphic image are displayed on the monitor. An alphanumeric block cursor, a hit window graphics cursor or a crosshair graphics cursor may be displayed, depending on the state of the system. Combined with the keyboard, the monitor is also referred to as the command console.

Digitizer

The Terak Digitizer is an 12" x 17" tablet which senses the location of a stylus on its surface and transmits that location back to the processor. It can be used to digitize drawings directly into the computer, or, by means of a Menu as with the Minn-Draft system, to give drafting commands to the computer. It provides input to the computer only during drafting and output.

Color Monitor (optional)

Used in conjunction with a system that has a monochrome monitor, the color monitor displays graphics while all textual prompts are displayed on the monochrome monitor.

Plotter (optional)

The plotter serves as an output device for the Minn-Draft system. It converts the drawing file displayed on the screen into a hard copy (plotted) drawing.

Printer (optional)

The printer serves as an output device for the Minn-Draft system.

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It converts the drawing file displayed on the screen into a hard copy (printed) drawing.

An illustration of a typical Minn-Draft hardware configuration appears below.

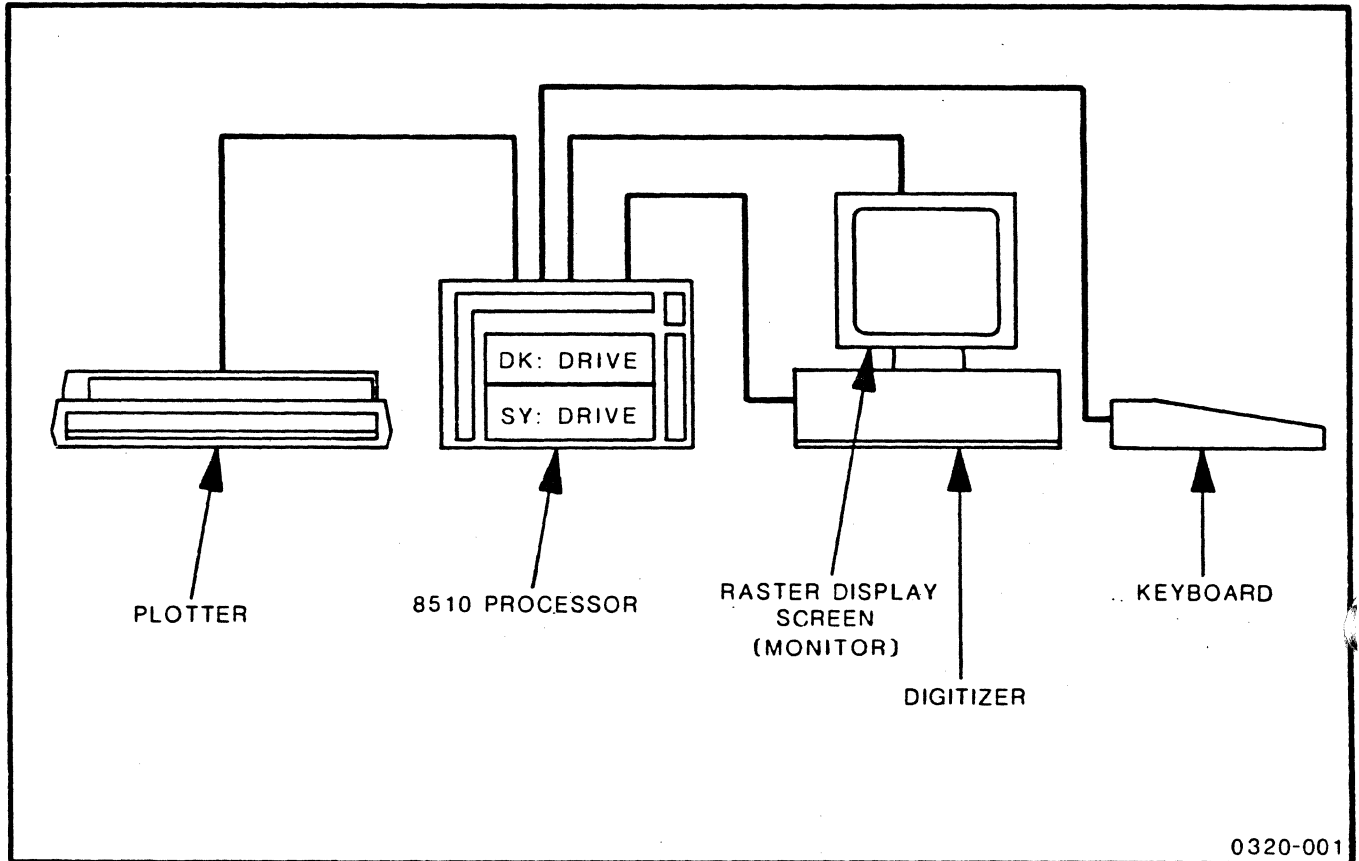


Figure 2.1 - Typical Minn-Draft Configuration

Installing the Digitizer Menu

To attach the Minn-Draft Digitizer Menu to the digitizer, place the Menu into the depression in the middle of the Terak digitizer. Place the plastic cover over the Menu and secure both the Menu and plastic cover to the digitizer with tape. If the Digitizer Menu comes loose or needs replacement after initial installation, this procedure should be repeated.

The Digitizer Menu should also be aligned, but software is necessary for this procedure. Alignment will be discussed in Preliminary Procedures (Section 3, page 3-19).

Difference Between Terak Minn-Draft Version 10 and Version 11

The following is a summary of the major difference between the Terak Minn-Draft Version 10 and Version 11 software.

System Installation

The installation procedure for Version 11 has been modified to include automatic backup of Master Disks. The disks received with your system will not run. The copies obtained from them will. Three blank disks have been included in the Terak Minn-Draft Software Kit for making these backup copies.

New date and time prompts have been written which include default values of the last system entries. (Original defaults: 12-31-84 for the date and 00:00.00 for the time.) The time prompt can help keep track of the amount of time spent on each drawing. (Records must be manual at this time.)

The installation procedure is now standardized between Terak products. If you own a Minn-Draft system and purchase any other Terak application programs, the installation procedure will be the same.

The configuration for your system (whether 8510/A or /B or /C) is determined when the Minn-Draft system is first entered. There is no need to choose a separate option from the System Menu to optimize your software for your system.

System Menu

The System Menu has changed considerably from Version 10 to Version 11. The Menu is now nested. There are three main options for floppy systems, and six main options for winchester systems. These options are listed on the System Menu. Subordinate options are accessible through them.

A breakdown of the nesting levels follows.

FLOPPY SYSTEM MENU NESTING LEVELS

- Run Minn-Draft
- System Utilities
 - Disk Directories
 - CELL Libraries
 - DATA Files
 - BACKUP Files
 - Files on the DATA Disk
 - File Maintenance
 - Load a CELL Library
 - Store a CELL Library
 - Copy a DATA Disk
 - Restore a DATA File
 - DELETE Files
 - Delete CELL Library
 - Delete DATA File
 - Delete BACKUP File
 - Compress Disks

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- Backup Disks
- Disk Preparation
 - Format & Verify a Single Sided, Single Density Floppy Disk
 - Format & Verify a Single Sided, Double Density Floppy Disk
 - Format & Verify a Double Sided, Double Density Floppy Disk
 - Verify a Floppy Disk
- System Shutdown

WINCHESTER SYSTEM MENU NESTING LEVELS

- Run Minn-Draft
- Run NC File
- Run Micro Linkages
- Run Robotics
- System Utilities
 - Disk Directories
 - CELL Libraries
 - DATA Files
 - BACKUP Files
 - CNC Files
 - NCD Files
 - Files on the DATA Disk
 - File Maintenance
 - Load a CELL Library
 - Store a CELL Library
 - Copy a DATA Disk
 - Restore a DATA File
 - Copy CNC Files
 - Copy NCD Files
 - DELETE Files
 - Delete CELL Library
 - Delete DATA File
 - Delete BACKUP File
 - Delete CNC Files
 - Delete NCD Files
 - Compress Disks
 - Backup Disks
 - Disk Preparation
 - Format & Verify a Single Sided, Single Density Floppy Disk
 - Format & Verify a Single Sided, Double Density Floppy Disk
 - Format & Verify a Double Sided, Double Density Floppy Disk
 - Verify a Floppy Disk
- System Shutdown

These options are similar to the Version 10 options and are discussed in detail in Appendix A of this manual.

In addition to the functions available on the general Minn-Draft

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disks (listed above), a separate Instructor's Aide Disk has been developed to allow Instructors, but not students, access to such system functions as copying files from disk to disk. These options are discussed in the Teachers' Aide Disk Set.

Digitizer Menu

The layout of the Digitizer Menu has been changed to place more frequently used sections in more accessible locations. A new section of Constructions allowing the entry of intersected entities, tangent entities, and perpendicular and parallel lines has also been added. A few changes and deletions have also occurred in other sections of the Menu.

System prompts for input have also been modified to a minor degree.

DELETE and DELETE LAST ENTITY have been removed from the Special Functions Section and are now found in the Operations Section of the Digitizer Menu. DELETE has been expanded to perform as an Operation by requiring input as to what to delete. Options include the last entity, an entire layer or layers, all of one type of entity, or a cell, single entity, group, or window.

Filletts, with and without line trimming, have been added to the Geometric Input Section of the Digitizer Menu.

An Isometric Rotation has been added to the Screen Functions Section of the Digitizer Menu and Screen Functions has been made a separate Section on the Menu.

Crosshatching is now available. The Modify Spline option has been expanded to allow modification of all geometric entities and has been placed as the Modify option in the Special Functions Section of the Digitizer Menu.

The LOCATE POINT Input Mode has been expanded to allow you to locate the endpoint of an entity, the center point of an entity or simply the nearest point.

In Dimensioning, centerlines now allow the placement of the center dash. Center crosses for circles are also available. Also, circles can now be radially dimensioned.

The RETURN option of the Digitizer Menu has been renamed EXIT and returns you to the Main Selection Menu only. It can no longer be used in place of OP.REJECT for exiting from ongoing functions.

Any blank area on the digitizer menu, above the Active Cursor Area, can now be used in place of OP.REJECT from exiting from ongoing functions.

Keyboard Usage

The keyboard is a primary tool for user-system interaction. It enables you to enter and delete text and coordinates, move the cursor, and type in responses requested by system prompts. All entries from the keyboard require that the <RETURN> key be typed after data is entered.

Numeric Keys

When numbers are requested for input, use either the lower case row of number keys along the top of the keyboard or the uppercase numeric keys located to the right of the keyboard. Do not use the lower case numeric keys located to the right of the keyboard; they are used for special codes.

Letter Keys

When text or alphabetic input is requested, use the normal letter keys. All characters are upper case. No lower case letters can be generated in the DRAFTING option. Use the SHIFT key to access special characters.

BACK SPACE Key

Use the BACK SPACE key near the upper right corner of the keyboard to delete characters entered by mistake. For every character to be erased, type the BACK SPACE key once. Each time the BACK SPACE key is typed, one character will be erased from the screen.

The BACK SPACE Key cannot remove information entered incorrectly on another line. If you have entered information and pressed the <RETURN>, that information cannot be deleted using the BACK SPACE Key.

Arrow Keys

The cursor (arrow) keys located in a column on the right side of the keyboard can be used to move the graphics cursor in Minn-Draft unless the input mode is key-in. If a digitizer is being used, lift the cursor unit off the digitizer tablet surface; then use the appropriate cursor keys to move the graphics cursor in the direction desired. Direction is indicated by the arrow on each key (up, down, left, right). These keys can be used to make minor adjustments in the cursor position which are not possible with the cursor unit itself.

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NOTES

SECTION 2

SOFTWARE INSTALLATION

This section describes how to install the Minn-Draft software. Please read the entire section before beginning the software installation.

One uses the master disk set only to install the system. During installation, the master disks are copied. These copies are used for all subsequent system startup and use. This way, if anything happens to the copy of the system disks, the master disks will be available to re-install the software. Blank disks are included in your Software Kit for copying the master disks.

Installation on a floppy-based system requires two master disks and three blank disks. The master disks are the Master System Disk and the Master Data Disk. The master disks will be copied onto them the blank disks which will be used as working copies for drafting. If anything happens to your working copies, new copies should be made from your Master Disk. The master disks should be especially safe-guarded.

Installation on a winchester-based system requires three master disks and five blank disks. The master disks are the Master System Utilities disk, the Master Application Software disk and the Master Boot/Data Disk. You will copy all the disks included with your Master Disk Set, a second copy of the Boot/Data disk and create an Instructor's Aide Disk. Store your master disk set and the copies of it. These copies should be used if your system ever needs to be rebuilt. The Boot/Data Working Disk and the Instructor's Aide Disk will be used for daily system use.

Follow the steps below to install your Terak Minn-Draft software.

- 1) Be sure that your system is set up and cabled correctly. The installation manual that came with the specific hardware you chose gives this information.
- 2) Push the power switch on the disk drive upward.
- 3) Be sure that the blank disks included with the Software Kit have write enable tabs on them. Write enable tabs are small silver squares. The tab allows information to be stored (written) on the disk. Without the tab, no information can be written on the disk. The write enable tab should appear in the upper left corner of the disk when the disk is inserted into the drive. If no tab is on the disk, there should be some included with the Software Kit. If not, call Terak Customer Service. See Figure 2.1 on page 2-2 for identification and location of write enable tabs. Since you want to maintain the master disks exactly as they are, do not put write enable tabs on the master disks. There is one

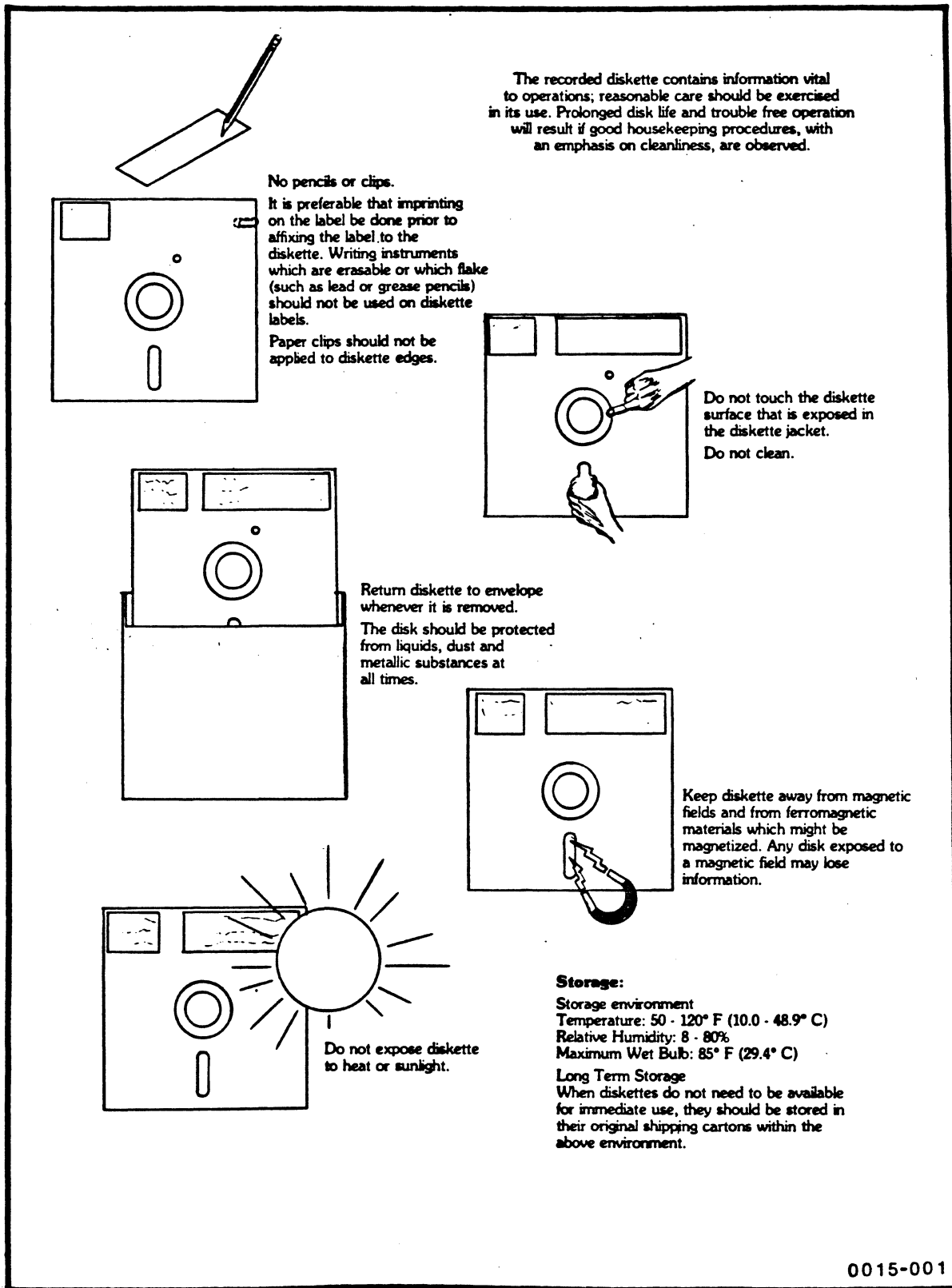


Figure 2.1 - Floppy Disk Handling

exception to this. On winchester systems, the Master System Utilities Disk should have a write enable tab.

- 4) All disks should also have hub reinforcing rings. These will be supplied with the Terak Disks in the Software Kit. If non-Terak disks are also used, reinforcing rings should be purchased and applied to them as well.

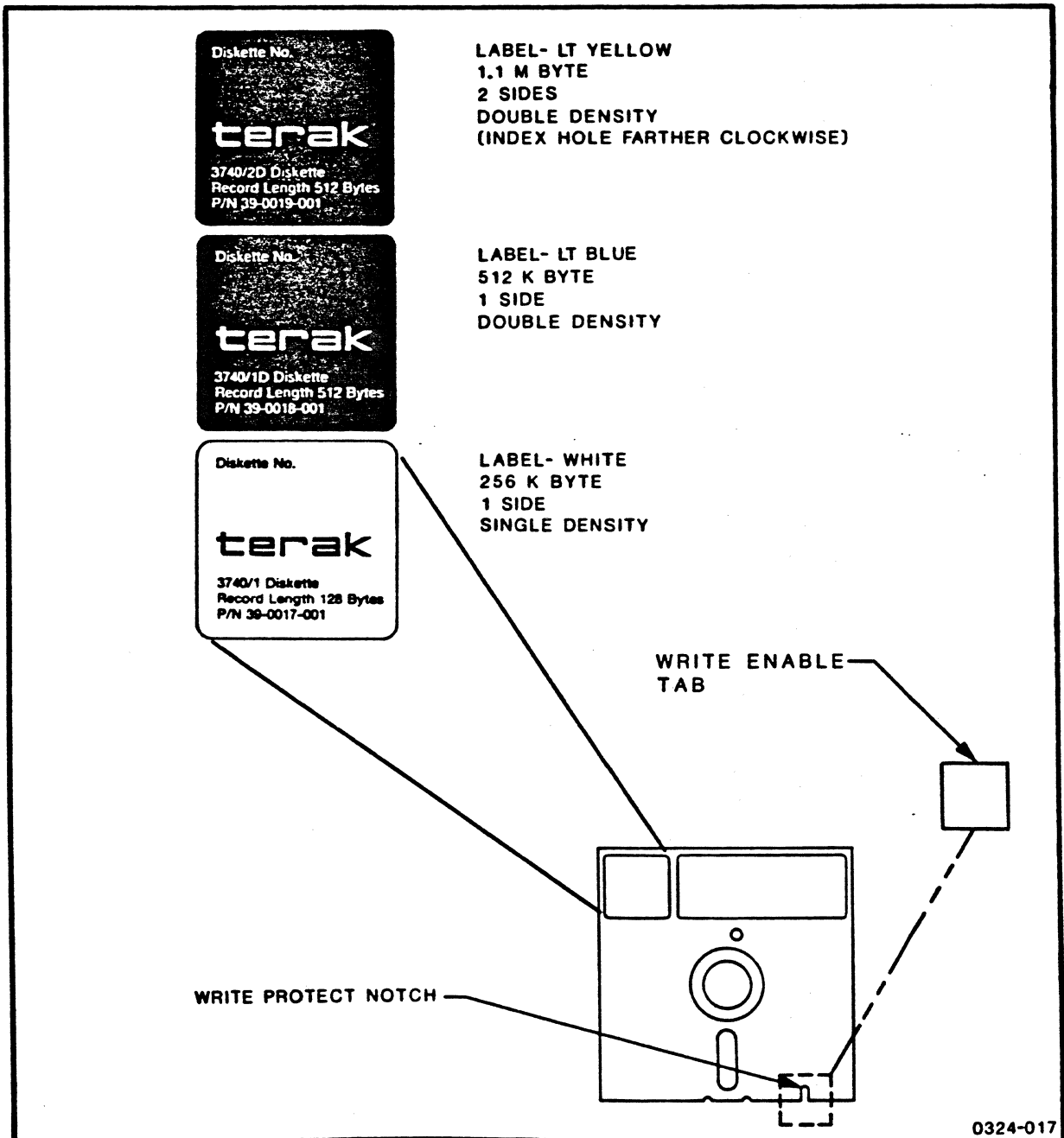


Figure 2.2 - Identifying Terak Disks

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Hub reinforcing rings are available from
MISCO Computer Supplies and Accessories
404 Timber Lane
Marlboro, NJ 07746
Toll Free Number 1-800-631-2227

The standard kit to order, which includes 50 rings and the applicator for 8-inch diskettes, is MISCO DD5020 (or the equivalent, if not purchased from MISCO). Additional rings in 50 ring quantities are MISCO DD5021 (or the equivalent, if not purchased from MISCO).

If you do not purchase additional backup disks from Terak, please ensure that the disks you do purchase are of the highest quality obtainable. Errors may result from the use of lower quality disks.

When backing up (copying) disks, both the original and the new copy must have the same density and number of sides. Disks bought from Terak are easily recognized as single, dual or quad by the label attached to them. See the illustration on page 2-2 for indentifying your disks.

If you do not choose to purchase Terak disks, be sure that you purchase the same density each time. You cannot back up dual density disks onto a quad disk or vice versa.

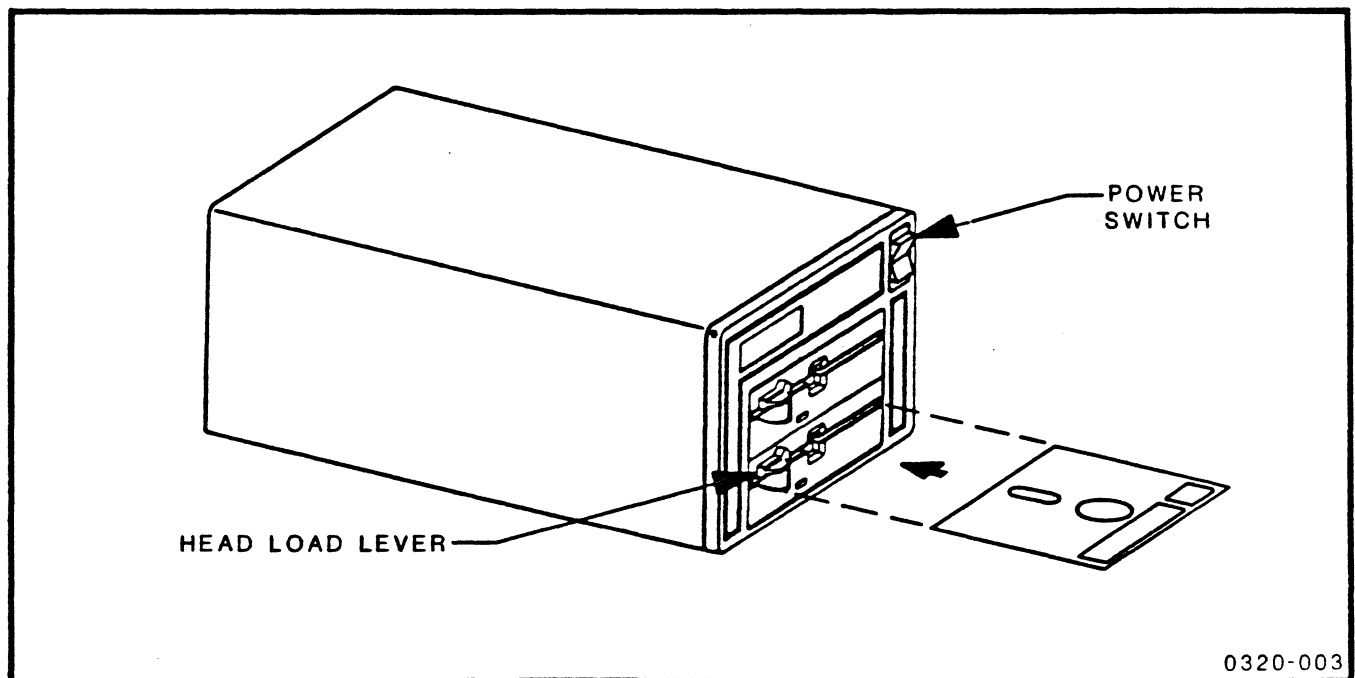


Figure 2.3 - Disk Insertion Process

5) Insert the Master System disk, for floppy systems, or the Master System Utilities disk, for winchester systems, into the lower drive. The disk insertion process is shown in Figure 2.2 below. Turn the head load lever downward to a vertical position. This loads the software into the system.

The system will boot. Messages on the screen will guide you through installing the Minn-Draft software. Follow the instructions exactly. Computer response may occur immediately or it may take a few minutes, depending on what it is doing internally. You can tell that the system is working when the small red light on the front of the disk drive blinks and a clicking sound is audible. If the light and clicking are not occurring within a few moments after correctly responding to a prompt, the system is not responding. Check to see that you have completed your response. If so, call Terak Customer Service.

On floppy systems, there is one incorrect prompt. It occurs as you are creating the backup data disk. The system has you put a blank disk in the upper drive and the master data disk in the lower drive. It asks you to then press <Return>. Do so. Next the system asks you to "Place system disk back in drive." Do not change any disks; do press <Return>, again. From here on follow the prompts exactly.

When you are asked to enter the date and time, either press the LINE FEED key, which will advance 1 day at a time (or 1 minute at a time), or enter the date (or time) in the same format as the default value, that is, day-month-year (ot hour:minute:second). If you discover that you have typed the date (or time) incorrectly, press the LINE FEED key and the cursor will jump to the first character of the date. You may then enter the correct value. When the date is correct, or if you do not wish to enter a date, press the <RETURN> key.

Once your Minn-Draft system is booted, you can switch Data Disks without rebooting the system. The only time the Boot Disk is needed is when the system is first turned on. If you do not turn the system off between uses, you do not need to use the Boot Disk each time you use the system.

NOTES

If Minn-Draft for a winchester system is originally installed on a color system, it can be run on a monochrome system only by detaching the color unit and re-installing the Minn-Draft software. Follow the procedures listed in this section for installation.

The System Disk (for floppy systems) or the Boot Disk (for winchester systems) must be used each time you turn on the system. The system cannot be booted (initialized for drafting) without this disk.

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NOTES

SECTION 3

GETTING STARTED

Follow the instructions in Section 2 - SOFTWARE INSTALLATION to boot the system. Be sure to use the backup copies of the disks. Enter the date and time when requested. When the date and time are correctly entered, the System Menu will appear.

SYSTEM MENU

- 1) RUN MINN/DRAFT
- 2) SYSTEM UTILITIES
- 3) SYSTEM SHUTDOWN

Enter Choice <1,2,or 3>

Type 1<Return> to enter the DRAFTING option. The Minn-Draft program logo (identification, version number and revision date) will appear.

NOTE

Winchester systems will have three additional options. Unless these have been purchased, they cannot be accessed. If they have, they have their own User's Guides.

MINN-DRAFT

COMPUTER AIDED DESIGN
DRAFTING SYSTEM

DEVELOPED IN CONJUNCTION
WITH THE
UNIVERSITY OF MINNESOTA
JUNE 20, 1980

VERSION 11.0 - REVISED JAN 15, 1985

DATA FILE SPECIFICATION
O(LD N(EW S(TOP
?

Aside from the preliminary considerations described above, one other condition must be met for drafting to take place; a data

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file must first be specified and prepared to hold all information associated with a drawing.

To edit a previously created file, type O<Return> for Old.
To create a new file type N<Return> for New.

When O<Return> or N<Return> is typed, the following prompt appears.

ENTER FILE NAME (6 CHARACTERS OR LESS) *

Enter the file name (either existing file or new), followed by <RETURN>; the file name must be six characters or less and begin with a letter.

If a new file name is entered, the screen will display the Main Selection Menu. (See page 3-5.) The system will add ".DAT" to the end of the filename you specify, indicating that the file is a data file.

If S<Return> is typed, the system will exit the DATA FILE SPECIFICATION MENU. Minn-Draft exits with the message:

STOP -- MINN/DRAFT EXITING

The System Menu then will reappear.

If a valid, existing file name is entered for an Old file, the following prompt appears.

OPEN THIS FILE

1: EDIT AND BACKUP (DEFAULT)
2: INSPECT ONLY

?

Type 1<Return> to perform drafting or any other functions. The system will create a backup copy of the file.

Type 2<Return> if the file is to be used for viewing or output only. No drafting can be done with this response, and changes made to Bookkeeping will not be stored (though may be used for this Output).

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For either a 1 or 2 response, the screen will display the following:

```
-A NEW COPY OF YOUR FILE IS NOW BEING MADE
-A BACKUP COPY OF THE OLD FILE WILL BE MADE UPON QUITTING

-----> PLEASE WAIT <-----

BLOCK#
```

As the file is loaded, the number of the current block being loaded will appear after "BLOCK#". This is actually copying the file into the computer's memory. This copy of the file will be saved with the same name, but a ".BAK" extension. For example, if you are editing the file "TEST.DAT," the system will copy this file into a file called "TEST.BAK." Should there be a power failure or system crash, or if you should boot the system, the "TEST.DAT" file may be unrecoverable. However, the "TEST.BAK" file will still exist containing all the information that was present when this backup file was created (eg., when the old filename "TEST" was entered in response to the file specification request).

When the file is fully loaded, if there is a file header (user supplied through Bookkeeping), the following message will appear:

```
File Header:

<whatever you supply in the bookkeeping section for a
file header>
PAUSE -- PRESS -RETURN- TO CONTINUE
```

- 1) If you enter an existing file name incorrectly, or a non-existent file name when an existing name should be given, the system will respond with this message:

```
FILE NOT FOUND - TRY AGAIN

DATA FILE SPECIFICATION
O(LD N(EW S(TOP
```

- 2) If N<Return> is answered to the DATA FILE

SPECIFICATION prompt, but the file name already exists, the system will respond with the following message.

```
THERE IS ALREADY A FILE WITH THE NAME
<name>

DO YOU WISH TO OVERWRITE THIS FILE (Y/N)
```

A Y<Return> will display the MAIN SELECTION MENU. Any current information will be erased. The old file with the ".DAT" extension will be deleted.

An N<Return> will redisplay the DATA FILE SPECIFICATION MENU.

- 3) If the data disk is too full and cannot accomodate a new file, the following prompt will appear.

```
DATA DISK FULL
COMPRESS THE DISK
DELETE SOME FILE
OR CREATE A NEW DATA DISK

PAUSE -- TYPE A RETURN TO CONTINUE...
```

When this appears, press <RETURN> to return to the System Menu. Refer to Appendix A for instructions on compressing the disk.

Main Selection Menu

After all the preliminary operations just listed are performed, the MAIN SELECTION MENU will be displayed.

MINN/DRAFT
3-DIMENSIONAL CAD/D SYSTEM
VERSION XX.XX

MAIN SELECTION:

- 1 - DRAFTING
- 2 - OUTPUT
- 3 - VIEWS
- 4 - BOOKKEEPING
- 5 - QUIT

DATE: <DEFAULT>

TIME: <DEFAULT>

CURRENT DATA FILE NAME: <FILENAME>.DAT

SELECTION ?

The current file open for work will be displayed in the place of <FILENAME> and the date and time will be the defaults, or those entered when the system was booted for use. The time operates as a clock and keeps track of the amount of time spent using the system. The time will be updated automatically whenever this Menu is redisplayed. It will not mark off passing time.

There is no file kept of how much time is spent reviewing or editing each file; if you wish to determine how much time is spent, you will need to manually note the time when you first enter the file and display this message, then note the time again as you exit the file on your way to the DATA FILE SPECIFICATION.

Entering a wrong selection number or just pressing <RETURN> will give an error message and will redisplay the screen as above.

There are four options that can be selected from this Menu for file manipulation (1-4), and one operation (5) for quitting or exiting the file.

1. DRAFTING - This selection is used to create and edit drawings. The digitizer tablet is the primary means of input. The digitizer table must be properly connected and powered. Note that this is the only selection where the tablet is the primary means of input. Drafting is described in detail in Sections 3 through 10.
2. OUTPUT - This selection allows one to layout a drawing and output to either the screen or to a plotter. The digitizer tablet may be used to provide some input. Section 11 describes the OUTPUT procedures in detail.

3. VIEWS - This selection allows specific views of the object to be examined or manipulated. The digitizer tablet may be used to provide some input. See Section 12.
4. BOOKKEEPING - This option allows default drawing parameters to be changed, if desired. See Section 13.
5. QUIT - This option will close the current data file, restart the MINN-DRAFT program and redisplay the DATA FILE SPECIFICATION prompt.

DRAFTING

When the "DRAFTING" Main Selection Menu option (Number 1) is chosen, control is transferred to the digitizer. Input occurs by digitizing option boxes on the Digitizer Menu. The keyboard becomes an auxiliary input device. The digitizer table must be properly connected and powered to draft. If it is not, when drafting is selected, the system will enter drafting, but cannot do anything until the tablet is properly connected and powered or the system is booted. The following is an illustration of the Digitizer Menu.

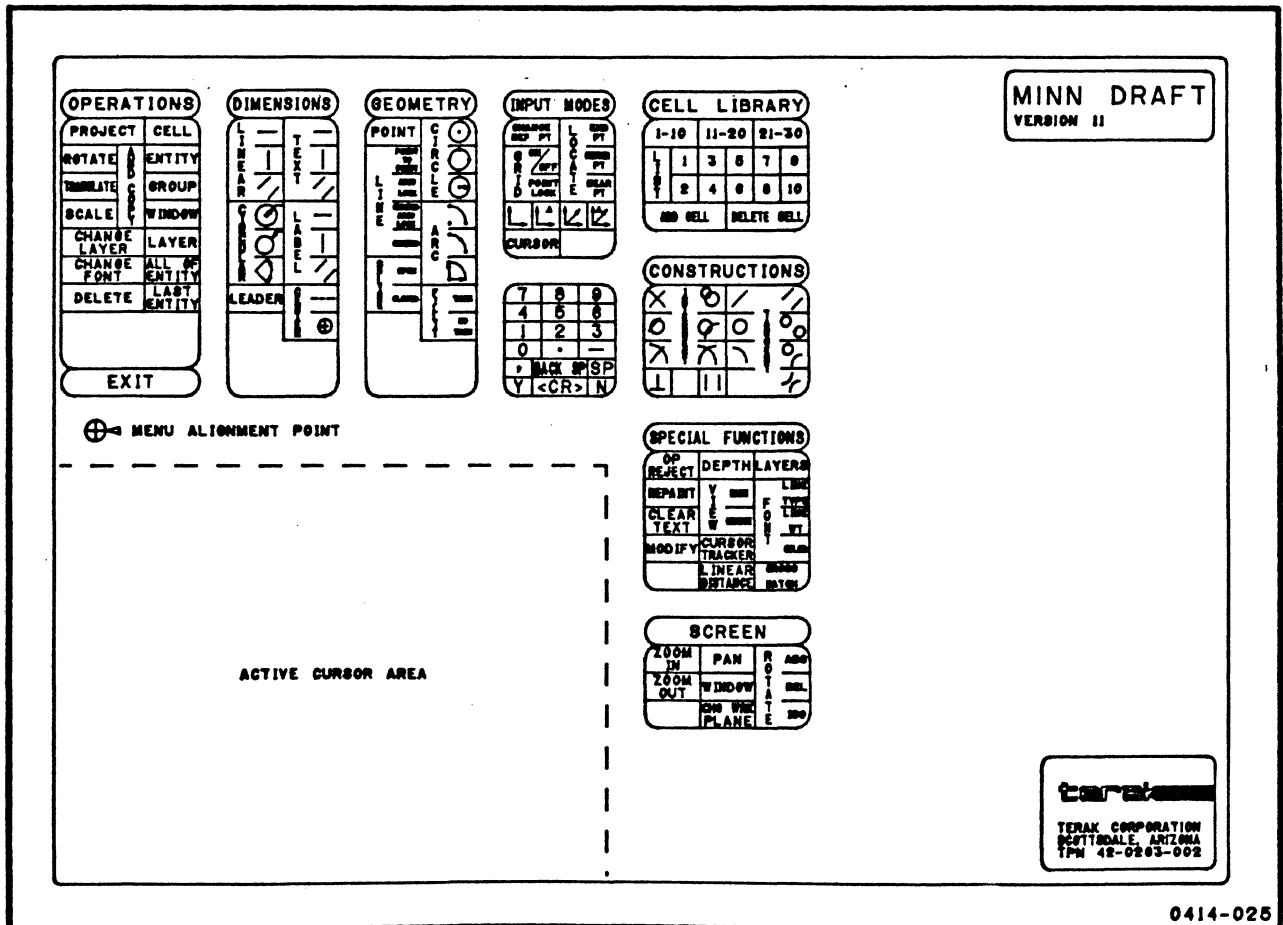


Figure 3.1 - Digitizer Menu

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The Digitizer Menu is divided into eight functional categories:

- 1) **Input Mode** - commands for specifying how point locations are to be entered
- 2) **Special Functions** - commands for performing special operations such as DELETE or ROTATE
- 3) **Screen Functions** - commands for changing the size of the information displayed
- 4) **Geometric Input** - commands that draw lines, circles, etc.
- 5) **Dimensioning And Text Input** - commands that measure lengths and apply appropriate dimensions and text
- 6) **Operations** - commands that translate, rotate, copy, delete, etc., collections of entities
- 7) **Cell Library** - commands for adding, deleting and listing symbols in a library, and for inserting the symbols into drawings
- 8) **Constructions** - commands for creating intersecting or tangent entities, or perpendicular or parallel lines

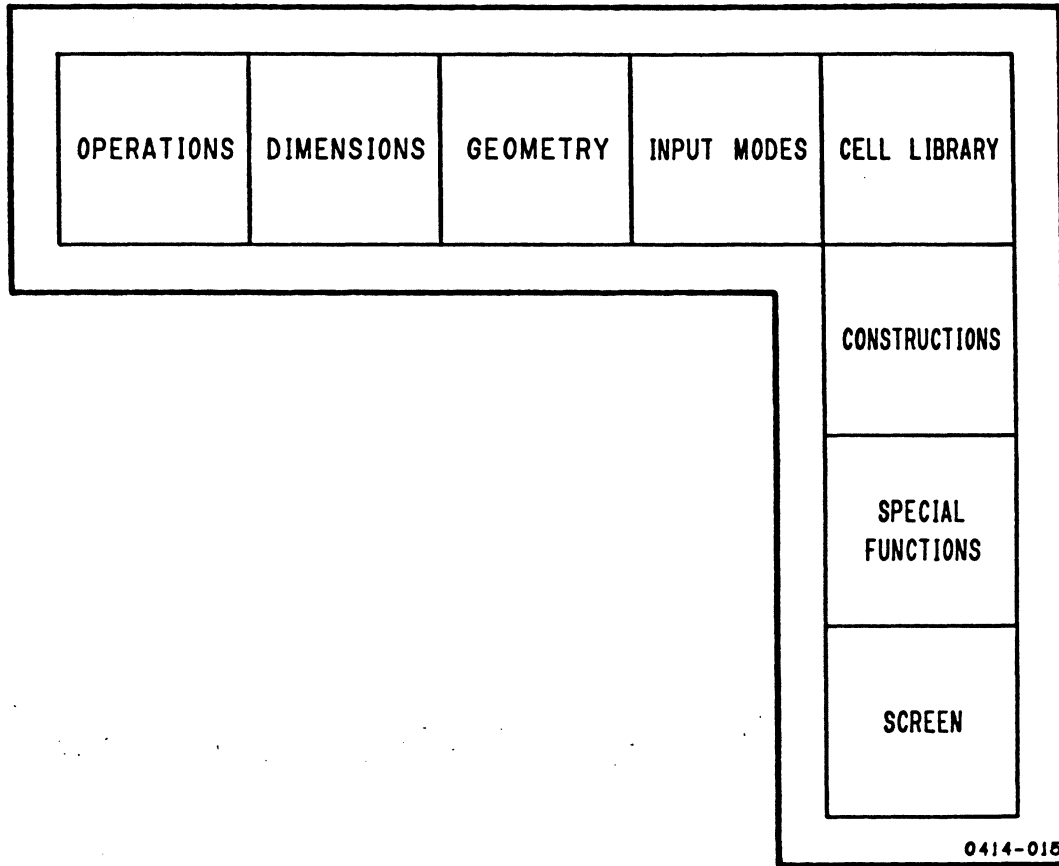


Figure 3.2 - MENU DIVISIONS

SECTION 4

DRAFTING: INPUT MODE

Input may come from either the keyboard or the digitizer tablet. Coordinates and similar data may be entered from either the digitizer or the keyboard. Text must come from the keyboard, and drafting commands must come from the digitizer. System commands must usually come from the keyboard. Conventions used in this section pertain directly to keyboard entry, but digitizer input is identical, except that responses are digitized from the digitizer menu.

Digitizing involves moving the puck or stylus to the selected place on the menu and pressing the button or tip, respectively. When used with reference to a cursor coordinate, digitize means entering the point the cursor is at (or the closest grid coordinate if a grid is in use). This is done by positioning the cursor via the puck or stylus on the digitizer tablet, or by positioning the cursor via the keyboard arrow keys.

The crosshair will not appear on the screen unless you are in a geometric command. Also, the arrow keys should only be used when the crosshair is visible on the screen.

Once the cursor is positioned, the selected coordinate is digitized by either pressing any keyboard key (except arrow keys) or pressing the button or tip. It is probably best to digitize the point by the same means that you located it; if you use arrow keys, digitize from the keyboard; if you use the digitizer tablet, press the button or tip. Mixing the methods for moving the cursor and digitizing a point at its location can result in inadvertently moving it from the desired location.

Figure 4.1 shows the Input Mode portion of the digitizer menu.

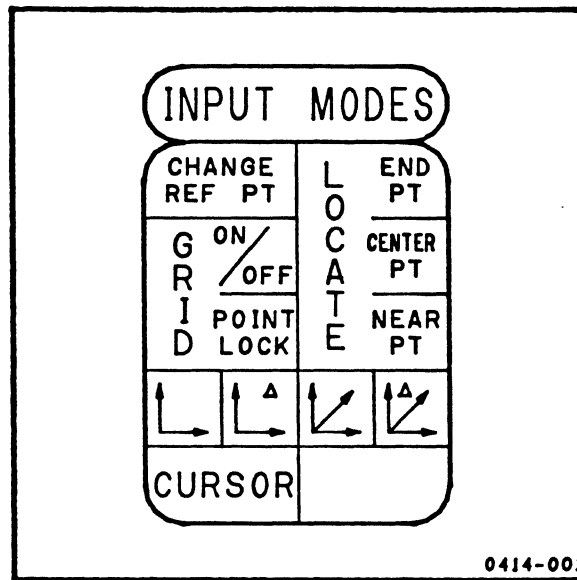


Figure 4.1 - Digitizer Menu: Input Mode

The Digitizer Menu Keypad is located near the middle of the Menu. Options included on it are the numbers 0-9, a period, a minus sign and a comma, that can be used for responding to system prompts for coordinates, or other entries. There are also five option boxes that can be used to perform equivalent operations as the keyboard. These are

- BACK SP This is equivalent to the BACK SPACE key. When digitized, it can be used to delete characters entered incorrectly. Each BACK SP will delete one character to the left of the cursor. If a <Return> has been entered at the end of a line, the BACK SP will not delete from the previous line.
- SP This is equivalent to pressing the space bar on the keyboard. When digitized, it inserts a space between characters during coordinate or other textual entry.
- Y This is equivalent to entering "YES<Return>" or "Y<Return>" from the keyboard when prompted for a yes or no response. When digitized, it performs this function.
- <CR> This is equivalent to the <Return> key on the keyboard, and when digitized performs the same function.
- N This is equivalent to entering "NO<Return>" or "N<Return>" from the keyboard when prompted for a yes or no response. When digitized, it performs this function.

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All points on a graphics system must be located for the computer in respect to their positions on the X-Y-Z coordinate axes. The computer is designed to allow input based on the Cartesian coordinate system or a Polar coordinate system. All of Minn-Draft's input modes deal with these coordinate systems in different ways.

All three assume that the lower left hand corner of the monitor screen and the Digitizer Menu Active Cursor Area initially correspond with $X=0, Y=0, Z=0$ (the Absolute Origin). From here, the differences in the methods will be outlined in the appropriate sections.

There are three methods of inputting the coordinates of a point on the Minn-Draft system:

1) **CURSOR** - The location of a small graphics crosshair cursor which appears as a small cross or "+" on the monitor screen is controlled using the arrow keys on the keyboard or by moving the cursor unit around on the surface of the Digitizer Menu Active Cursor Area. Once located, any key on the keyboard (except arrow keys) is struck or the stylus or puck button is pressed, digitizing the point indicated by the crosshair. The exact coordinates will be calculated by the computer.

2) **KEY IN** - The exact location of the point is specified by typing in its coordinates from the keyboard or using the numerical keypad on the Digitizer Menu.

3) **GRID (POINT LOCK)** - In this method of input, the exact location of a coordinate is entered in relation to the points on a grid. Points will "snap" to the nearest grid point and their coordinates will be the same as the grid point. This will only happen if the cursor is used to position the points; keyed-in coordinates will override a grid.

These three modes of input can be selected and changed as often as desired, even while entering a line or a circle, etc., without loss of continuity. A grid must be displayed before using the POINT LOCK mode, however.

CURSOR

The cursor can be used in one of two ways:

- 1) with cursor input mode or
- 2) with grid input mode to indicate the approximate point for the grid to lock onto or "snap to" for an exact grid point.

Additionally, with cursor input mode, the cursor may be used two ways:

- 1) to specify the location of a point or
- 2) to "pick" or "lock onto" one of the bounding points of a

previously entered entity (the end point of a line, for example)

The first option is the simple CURSOR Input Mode, the second is the LOCATE POINT option of the CURSOR Input Mode.

CURSOR input is essentially free-hand drawing. Points are digitized without knowing their actual axis locations on the screen; location is indicated by moving the cursor crosshairs to the desired position and digitizing that point. The computer will figure exact computational locations.

CURSOR input is automatically drawn on the Z=0 plane unless the Z-Depth is changed by using the DEPTH Menu Option Box in the Special Functions section. (See page 5-2.)

NOTE

The CURSOR Input Mode is the only input mode with which the Z-DEPTH function will work. Any other Input Mode will override a Z-Depth chosen with the Z-DEPTH Menu Option Box. The other Input Modes have Z-Depth options built in.

LOCATE POINT

The LOCATE POINT option, on the digitizer menu, will attach a new coordinate to an already existing one. Suppose the following shape has been drawn.

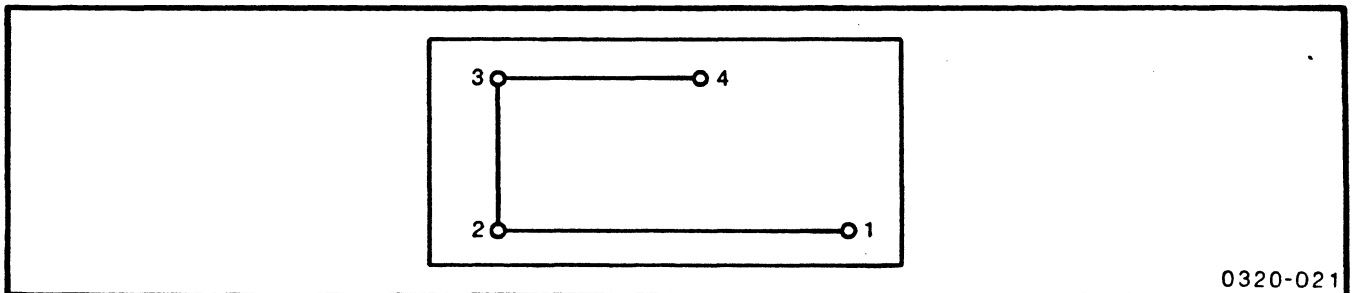


Figure 4.2 - LOCATE POINT Example

To draw a line from the last point (i.e., point 4) to the first point (point 1), the LOCATE POINT option should be used. LOCATE POINT ensures that the exact coordinates of these two points will be used as the endpoints for the line drawn between them.

The CURSOR mode by itself will not locate the exact points, but only the point at the exact location of the crosshair. This point may not coincide with the endpoint of the line. Although the two points (the position of the crosshair and point 1 or 4) may appear to be the same, only the LOCATE POINT mode ensures that they are.

NOTE

Matching endpoints with LOCATE POINT ON becomes extremely critical if the drawing is to be used later for numerical control files. Even a slight degree of variation in the coordinates of the two points can cause a machine malfunction.

Likewise it is especially important to pick the exact end of a line when drawing entities in a three dimensional drawing.

The crosshairs will not appear on the screen except in response to graphic commands. Unless the crosshair is on the screen, do not press the arrow keys. This could cause the text or graphics to disappear from the screen; however, a Clear Text or a Repaint will restore the graphics and text.

KEY-IN

There are four different types of coordinates under KEY-IN INPUT mode. These are illustrated in Figure 4.3.

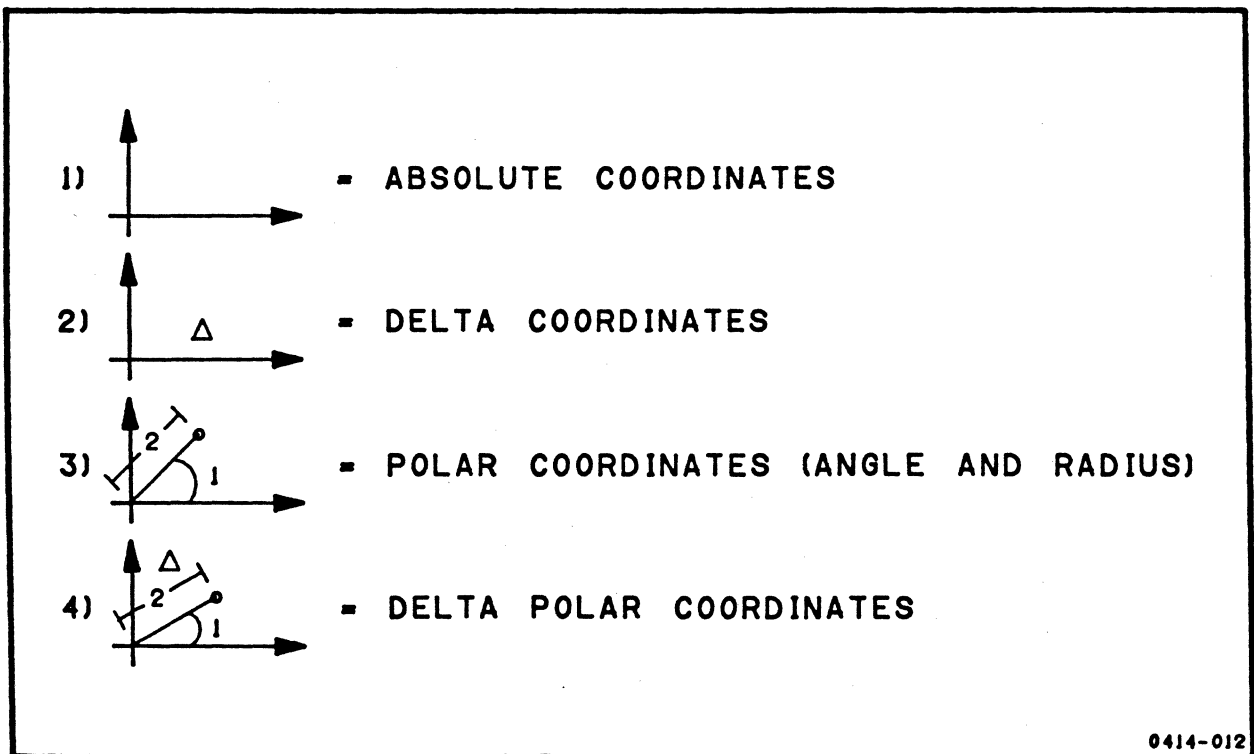


Figure 4.3 - Types of Key In Coordinates

Absolute coordinates are entered with reference to the Absolute Origin (initially in the lower left hand corner, pan, zoom or rotate may alter this screen position). Each point must be entered with respect to its location from that origin. Selections 1 and 3 assume a fixed reference point--the Absolute Origin.

Since the absolute coordinates of points are not always known, it may be awkward or inconvenient to enter point coordinates this way. A more convenient way to specify coordinates is with respect to some reference point. This alternate method is called delta input and is used in selections 2 and 4.

Each of these options is discussed in the following subsections.

Absolute Coordinates

Absolute Coordinates input mode expects X, Y and Z coordinates to be entered with respect to the Absolute Origin (0, 0, 0), initially located in the lower left corner of the screen. When a PAN, ZOOM or ROTATE is performed, the Absolute Origin may appear elsewhere, either on or off the screen. See Figure 4.4.

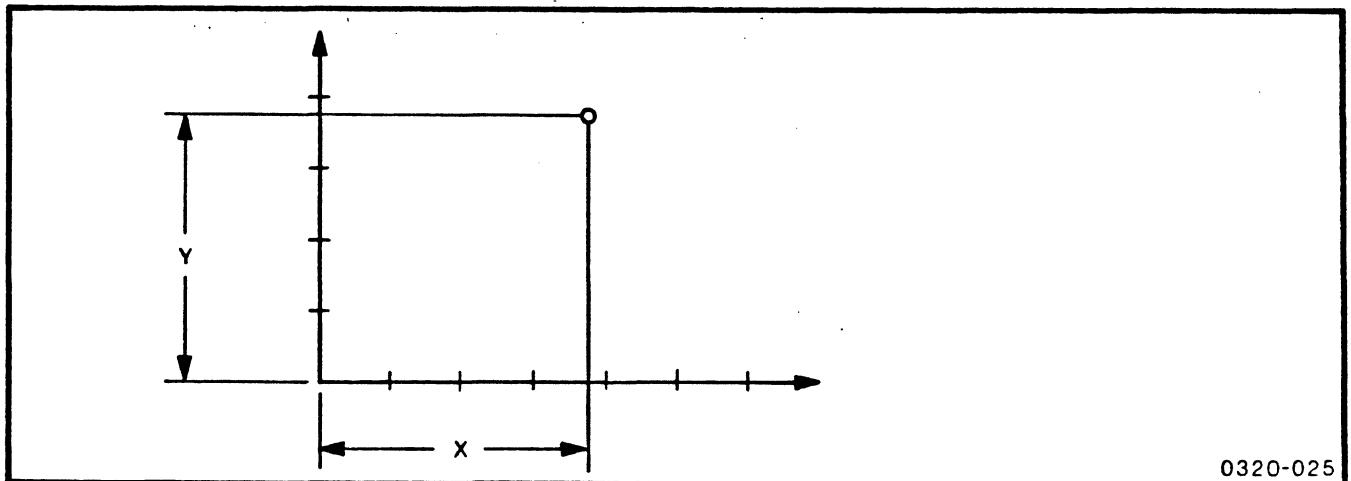


Figure 4.4 - Cartesian Coordinate System

To use absolute coordinates, digitize a type of geometric entity (see section 4) and then the ABSOLUTE COORDINATE box(|_). This message will then appear:

```
KEY-IN ABS. COORDS[INPUT MODE:ABS. KEY-IN] [<type of entity>]  
X =
```

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This is the prompt for the X-coordinate of the point. Enter the value from the keyboard or digitize the correct number from the numeric keypad on the Digitizer Menu. When a <Return> is pressed the prompt for the Y coordinate will appear after the information you have just entered.

NOTE

Note that the input mode appears as the second part of the prompt.

Enter the correct value and press <RETURN>. This will display the prompt for a Z value and all the preceding information.

Enter the correct Z value and <RETURN>. As an example, suppose a point is being input which has an X-coordinate of 2, a Y-coordinate of 3 and a Z-coordinate of -1.5. These values would be typed in as follows.

X = 2<Return>
Y = 3<Return>
Z = -1.5<Return>

or

X = 2,3,-1.5<Return>

Single line entry, as in the second example, is equivalent to answering the three separate prompts. The comma separating the entries serves the same function as a <RETURN> after each separate entry. If single line entry is used, no prompts for Y or Z values will appear.

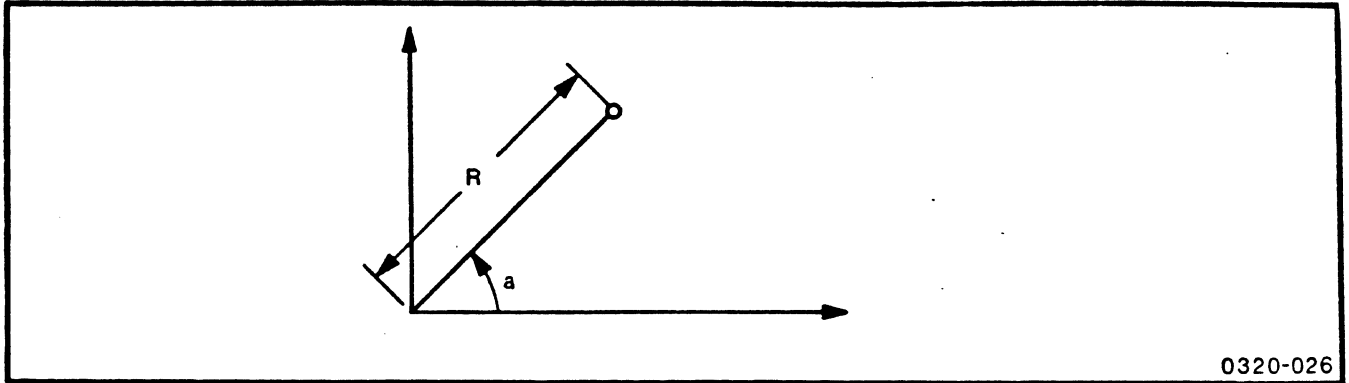
If the Z-coordinate is identical to the previous Z-coordinate, it may be omitted and only the X and Y coordinates typed in. Press <Return> when the system prompts for the Z-coordinate or press <Return> after the second entry in the single line entry method. Similarly the X- or Y-coordinates may be omitted if they haven't changed by pressing <Return> or inserting commas in the single line entry

(X = 2,-1.5 or X = ,3,-1.5).

Polar Coordinates

In Polar Coordinate Input Mode, an angle from the X-axis is specified and then a radius. Polar Coordinates use the same principles as Cartesian Coordinates, except "angle" and "radius" are used instead of X and Y. Z remains the same. The Absolute Origin is the same (0,0,0) as with Absolute (Cartesian) Coordinates.

"Angle" refers to the angle from the X-axis (or the line parallel to the X-axis running through the reference point). The radius is the distance away from the reference point. See Figure 3.5.



0320-026

Figure 4.5 - Polar Coordinate System

After a GEOMETRIC INPUT is chosen and the Polar Coordinate box on the Digitizer Menu is digitized the message below appears.

```
KEY-IN POLAR COORDS[INPUT MODE: ABS. POLAR][<type of entity>]  
ANGLE =
```

NOTE

Note that the input mode appears as the second part of the prompt.

Type in the angle or digitize the correct number from the numeric keypad on the Digitizer Menu. Press <Return>. The prompt for the radius will then appear.

Type in the radius or digitize the correct number from the numeric keypad on the Digitizer Menu. Press <RETURN>. The prompt for the Z-depth will then appear.

If the Depth is to be 0 (regardless of the previous delta input), press <RETURN>. If not, enter the correct Z-Depth and <RETURN>. The same information could be input as single line entry.

As an example, suppose that you have a point with an angle of 33° , a radius of 5 and a Z-Depth of -3. The information should be input as follows:

```
ANGLE= 33<RETURN>  
RADIUS= 5<RETURN>  
DEPTH= -3<RETURN>
```

or

```
ANGLE= 33,5,-3<RETURN>
```

DELTA COORDINATES

Delta coordinates are in relation to a specified reference point, not the absolute origin. Both cartesian and polar systems are available with delta coordinates.

CHANGE REFERENCE POINT

Change Reference Point is only used in conjunction with delta coordinate entry. It relocates the coordinate reference point from the absolute origin to a position the user specifies. It can be relocated by using CURSOR or KEY-IN (of absolute coordinates) to specify the new reference point, or by using the LOCATE POINT mode to specify a particular existing point. When CHANGE REF PT is digitized the following prompt appears.

CURRENT SCLAE:<scale>[INPUT MODE: CURSOR][RESET REFERENCE POINT]

Since the CURSOR mode is being used in this example, move the cursor to the desired position digitize the point. A small figure resembling the X-Y coordinate axes will appear at the point digitized.

If the LOCATE POINT mode is chosen the prompt will request the type of entity on which the point is to be located. For example, if the reference point is to be changed to coincide with an existing point in a drawing, digitize LOCATE NEAR PT and then POINT. The following prompt will then appear for the CHANGE REFERENCE POINT.

CURRENT SCALE:<scale>[INPUT MODE:LOCATE PT][RESET REFERENCE PT]

Move the cursor to a position near the desired point and digitize. The small figure of the X-Y coordinate axes will coincide with the desired point.

NOTE

To properly utilize this option, one of the delta coordinate types (Delta or Delta Polar) must be used. Absolute or Polar coordinates will override a changed reference point and will assume the Absolute Origin instead of the changed reference point.

You may leave the file and return to it later without losing the current changed reference point.

To change the reference point again, digitize CHANGE REF PT and input the new location using any input mode.

To return the reference point back to the Absolute Origin, digitize CHANGE REF PT and then ABSOLUTE COORDINATES. Enter 0,0,0<RETURN> to the X= prompt.

Delta Coordinates

Delta coordinates are identical to absolute coordinates, except the X-, Y- and Z-coordinates are with respect to a user-specified reference point instead of the absolute origin. See the illustration below.

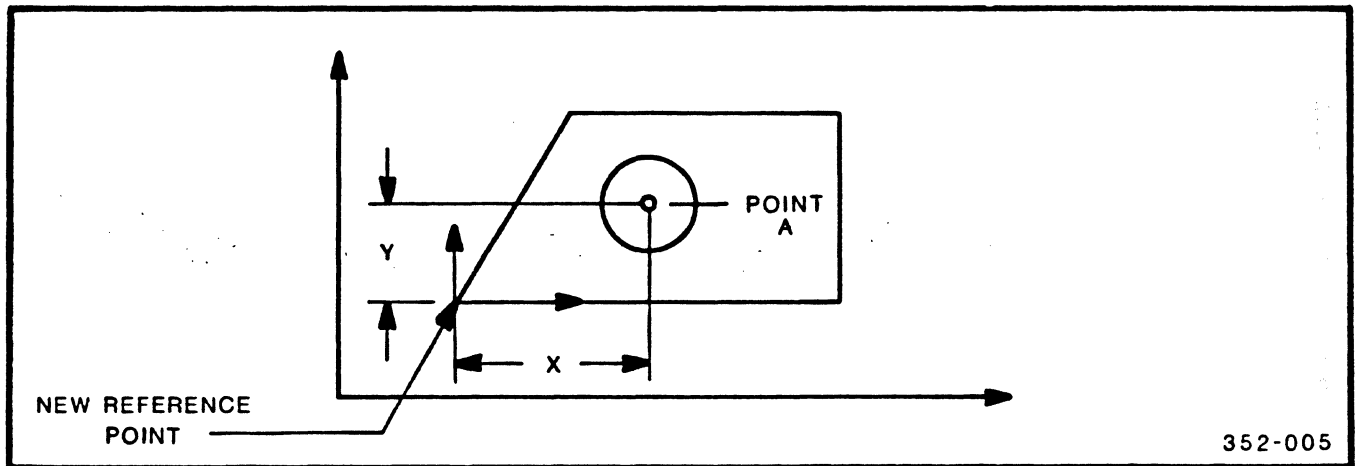


Figure 4.6 - Locating Point A with Delta Coordinates

Two things must be done for locating Point A in this drawing using the Delta Coordinate Input Mode.

- 1) Specify the new reference point - The new reference point must be identified for the system. The CHANGE REFERENCE POINT option should be used for this purpose. If this method is chosen, any Input Mode may be used to indicate the new reference point. Using LOCATE POINT will guarantee that the new reference point matches exactly with the point in the lower left corner of the stamping.
- 2) Type in the coordinates with respect to this reference point. After the reference point has been indicated, select Delta Coordinate Input (Δ) on the Digitizer Menu. The delta coordinates may now be entered (X-, Y- and Z-coordinates, in that order) relative to the new reference point.

Delta Coordinates are input exactly as Absolute Coordinates.

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The prompt for Delta Coordinate Input Mode appears as follows:

```
KEY-IN DELTA COORDS[INPUT MODE:DELTA KEY-IN][<entity type>]  
X=
```

NOTE

Note that the input mode appears as the second part of the prompt.

Use Absolute Coordinate (or Polar Coordinate) Input Mode if you wish to input coordinates in relation to the Absolute Origin. Absolute and Polar Coordinate Input will override the changed reference point.

Delta Polar Coordinates

The procedure for entering Delta Polar Coordinates is a combination of that used to enter Delta Coordinates and that for Polar Coordinates:

- 1) Specify the new reference point (if necessary).
- 2) Type in the angle and radius with respect to this reference point.

See Figure 4.7 for an example.

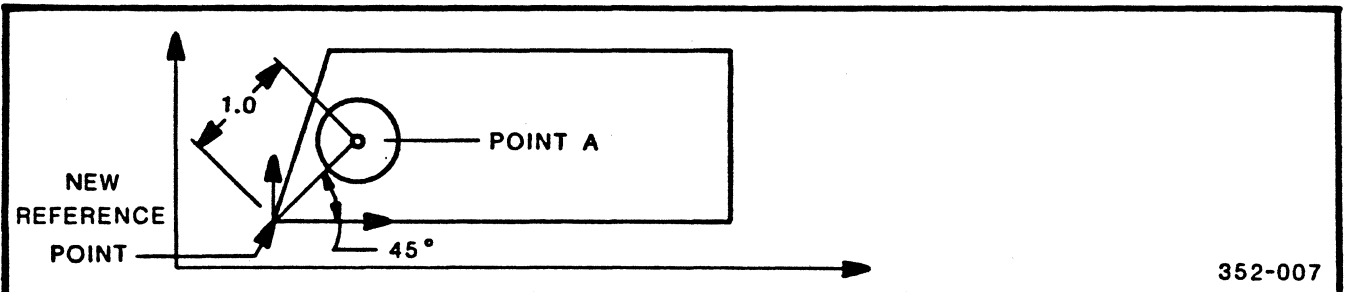


Figure 4.7 - Locating Point A with Delta Polar Coordinates

The prompt for Delta Polar Coordinate Input Mode is as follows:

```
KEY-IN POLAR COORDS [INPUT MODE: DELTA POLAR][ POINT ]  
ANGLE =
```

NOTE

Note that the input mode appears as the second part of the prompt.

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The responses to input the center point of the circle shown in Figure 4.7 would be as follows:

```
ANGLE = 45<RETURN>
RADIUS = 1<RETURN>
DEPTH = <RETURN>
```

or

```
ANGLE = 45,1<RETURN>
```

You may leave Delta Polar or Delta Coordinate Input Mode or even the file and return to it later without losing the current selected reference point.

GRID

The GRID option serves as a drafting aid. When the grid is activated, a grid of dots, at an interval you specify, will appear on the screen. When the POINT LOCK input mode is specified, points that are input will snap to the nearest grid point, thereby allowing you to create proportioned figures.

The grid is not part of the drawing, but may appear on the screen as long as the GRID option is activated. When GRID is digitized, the following prompt appears.

```
DO YOU WANT A GRID TO BE DISPLAYED? (Y/N) *
```

To activate a grid, enter Y<Return>. The next prompt will be

```
ENTER THE GRID SPACING:
```

Enter the size of the spaces between the dots on the grid. For a grid spacing of .1", enter .1<RETURN>.

When the desired spacing size has been entered followed by a <RETURN>, the following prompt will appear.

```
CURRENT SCALE:<scale>[INPUT MODE: CURSOR][INDICATE GRID REF PT]
```

Digitize a point to correspond with a point on the grid. The grid will then be displayed.

NOTE

To create a grid beginning at 0,0,0 and spaced at your intervals, digitize Absolute Coordinate Input when the prompt asking for the Grid Reference Point appears. Then type 0,0,0<RETURN> when the X= prompt appears. This is the most accurate way to use a grid in the creation of a drawing.

The grid is drawn in columns from the bottom to the top of the graphics screen, starting in the lower left corner. To stop the painting of the grid, press any key on the keyboard. The grid painting will be stopped at the end of the column in process and the following prompt will display.

DO YOU WISH TO COMPLETE THE GRID (Y/N)?

If Y<RETURN > is entered, the grid will continue to paint. N<RETURN> will repaint the rest of the screen, and leave the grid function active without painting in the rest of the grid.

To deactivate a grid, digitize the GRID option. When the prompt

DO YOU WANT A GRID TO BE DISPLAYED? (Y/N) *

appears, enter N<RETURN> and the grid function will be removed. The grid itself will only disappear when the screen is REPAINTED. The drawing will not be affected.

Unless the grid is deactivated after REPAINTING has been interrupted, each REPAINT will attempt to redraw the entire grid again.

NOTE

If you pressed any key in an attempt to stop the painting of the grid and no prompt appears immediately, the size of the grid may be so small that the end of a column has not been reached. Grid sizes of .0001 or smaller which are activated on the full graphics screen are nearly invisible to the naked eye and require extensive painting times. The interrupt prompt will eventually appear but not until the end of a column has been reached.

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For grids of extremely small sizes such as this, it is strongly recommended that you ZOOM IN or use a WINDOW (see Section 5) to define a smaller portion of the graphics screen. This will increase the size of the grid proportionally and decrease painting time.

The grid remains at the same depth at which it was originated. Eg., if you are at a Z-depth of zero and turn a grid on, then change depths, the grid will still be at a Z-depth of zero, not the new Z-depth.

POINT LOCK

To create a figure using the GRID option, digitize POINT LOCK once the grid has been activated. This will then appear as the input mode for each command and each point digitized on the digitizer tablet will "snap" to the nearest grid point.

Coordinates do not need to be exact for proportional figures if the POINT LOCK option is used. Grid spacing will need to be kept in mind, but points digitized near the correct grid point will "snap" to that point.

The grid remains at the same depth at which it was originated. Eg., if you are at a Z-depth of zero and turn a grid on, then change depths and use the cursor to enter the points, they will be at the new depth, but if you use the cursor and Point Lock, the points you input will be at a Z-depth of zero, unless you reset the grid after you changed depth.

EXIT

This option, located at the bottom of the Operations Section of the Digitizer Menu, allows you to exit the DRAFTING mode and return to the MAIN SELECTION MENU.

SECTION 5

DRAFTING: GEOMETRIC INPUT

Four key points should be kept in mind in relation to geometric input:

- 1) Objects are created by placing geometric entities (such as lines, arcs, circles) in the appropriate positions on the monitor.
- 2) These geometric entities are placed by
 - a) selecting the input mode (e.g., Cursor, Absolute Coordinates, LOCATE POINT mode);
 - b) selecting the appropriate entity (e.g., LINE, ARC, CIRCLE); and
 - c) inputting the location of the bounding points in response to system prompts, so the system will draw the entire entity.
- 3) Once a command is selected, that command is in effect until another menu selection is made. That is, if ARC is chosen, the system will continue to expect arcs to be input until another menu selection such as LINE is selected, BACK SP is digitized or any of the blank space between the menu boxes and above the active cursor area is digitized. (OP.REJECT does not work correctly at this time.)

Should a reference point be changed, once the new reference point is entered, the system will continue to expect the type of entities that were previously being entered. The prompt

CURRENT SCALE:<scale>[INPUT MODE:<mode>][OPERATION: PREVIOUS]

will appear.

- 4) Various Input Modes can be used with each command to create a drawing. Points already specified by a line or an arc, for example, can be used as the endpoints, or definition points, for other entities using LOCATE POINT. The first endpoint of a line may be input with Absolute Coordinates and the second with Polar Coordinates; the first may be keyed in and the second located with the cursor; etc. For msot commands, once an input mode is selected, that mode will remain in effect until another input mode is selected.

NOTE

The Geometric Input descriptions included in the rest of this section assume that the

CURSOR input mode has been chosen. Other types of input can be chosen instead. Normally you will change input modes frequently to facilitate specific parts of the drawing creation. (See Section 4 for a description of the differences in input modes.)

The geometric entities available through MINN-DRAFT are points, lines, splines, circles, arcs and fillets. Each of the geometric entities is discussed.

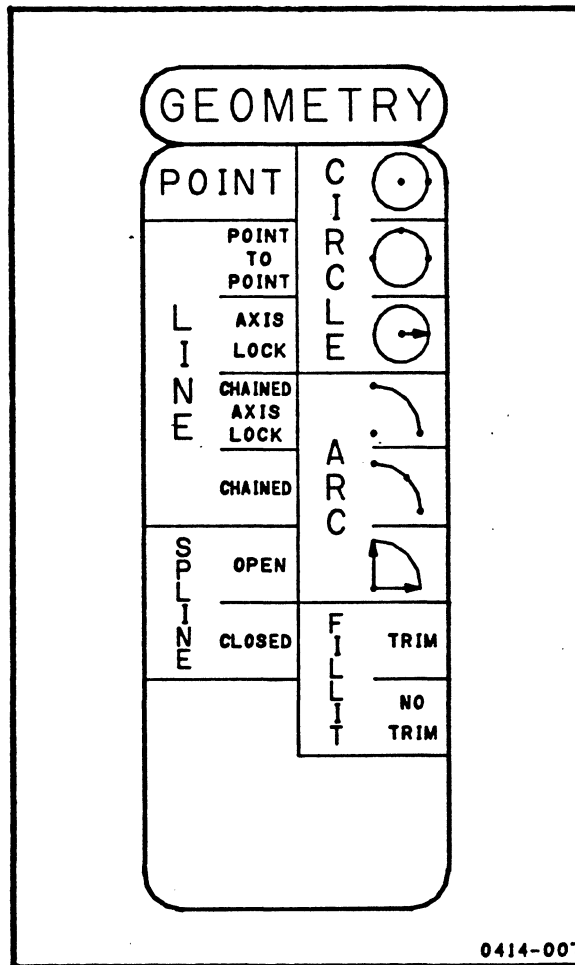


Figure 5.1 - Digitizer Menu: Geometry

POINT

A point is specified by supplying its location coordinates. A point serves as a reference point when inputting other entities. For example, the Reference Point could be changed to coincide with a specific point already entered.

When the POINT option on the digitizer menu is digitized, the following prompt appears.

```
CURRENT SCALE: <scale> [INPUT MODE: CURSOR][ POINT ]
```

Locate the crosshairs in the correct position, digitize the point and a small point will appear in that location on the screen. If you have a grid displayed and are using POINT LOCK, any points entered will not be distinguishable from the grid points; if you redisplay without a grid, the points will be seen then.

LINE

There are four different options available for inputting a line: Point to Point, Axis Lock, Chained and Chained Axis Lock.

POINT TO POINT

The POINT TO POINT operation expects two points: a beginning point and an ending point. A straight line will be drawn between the two points indicated.

When this option is digitized, the following prompt appears.

```
CURRENT SCALE: <scale> [INPUT MODE: CURSOR][ LINE-PT. 1]
```

Specify the first point. The following prompt will appear.

```
CURRENT SCALE: <scale> [INPUT MODE: CURSOR][ LINE-PT. 2]
```

Specify the second point and the line will be drawn. The two points may be located in any relation to each other.

AXIS LOCK

Like the POINT TO POINT option, this option expects a beginning and an end point. However, the system assumes that the line is to be either horizontal or vertical. If the end point given is not perfectly horizontal or vertical with the beginning point, then the computer adjusts the coordinates of the end point so that it will be either horizontal or vertical. This is illustrated with a horizontal line in Figure 5.2.

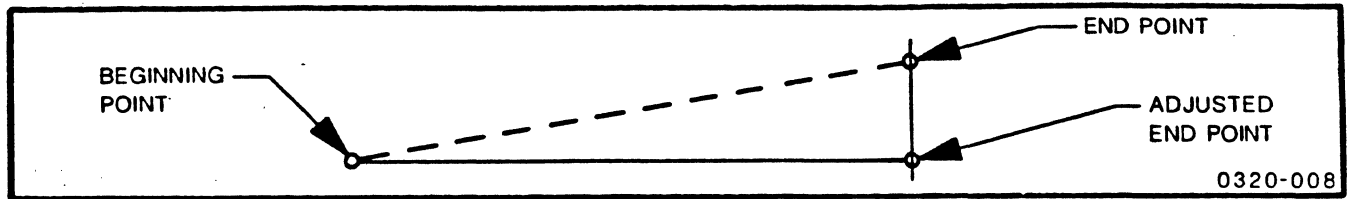


Figure 5.3 - Coordinate Adjustment

When this option is digitized, the following prompt appears.

CURRENT SCALE:<scale>[INPUT MODE: CURSOR][LOCKED LINE-PT. 1]

After the first point is specified, the prompt will ask for the second point, just as with POINT TO POINT. After the second point is specified, the line will be drawn.

CHAINED

The CHAINED option assumes that all lines designated will be linked together; the end point of the last line is assumed to be the beginning point of the next line, and so does not have to be re-digitized. Connected end points will be identical.

When this option is chosen, the following prompt will appear.

CURRENT SCALE:<scale>[INPUT MODE: CURSOR][CHAINED LINE-PT. 1]

After the first point is specified, the system will prompt for the second point, just as in POINT TO POINT.

With the CHAINED option, digitizing three points could generate the following line pattern.

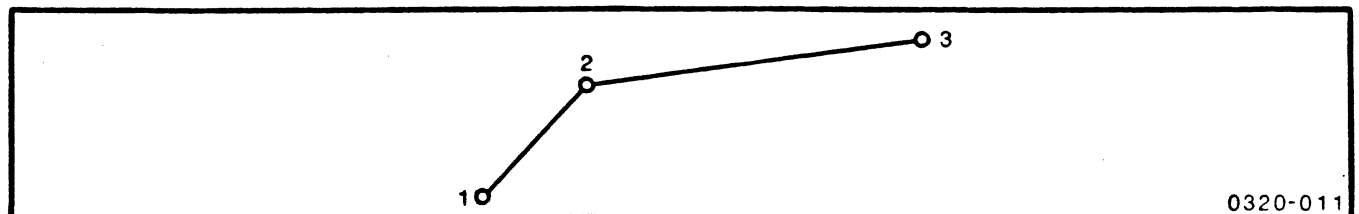


Figure 5.4 - Point Input for Chained Line

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CHAINED AXIS LOCK

The CHAINED AXIS LOCK option functions like AXIS LOCK in assuming horizontal or vertical lines. It also resembles the CHAINED command in that the second point of the first line will be the first point of the second line.

When this option is digitized, the following prompt will appear.

```
CURRENT SCALE: <scale> [INPUT MODE: CURSOR][CH-LOCK LINE PT.1]
```

After the first point is specified, the system will prompt for the second point, as with the POINT TO POINT.

Using chained lines (with or without axis lock) will insure that the endpoints are truly connected.

SPLINE

A spline is another name for a free curve. The most commonly known spline is the french curve. There are two types of splines available on the drafting system: open and closed. A closed spline may be defined by three to five points, and an open spline may be defined by three to seven points. As a point is entered, the system prompts for the next point. Once three points have been given, if no more are wanted, simply press <RETURN> to additional prompts.

OPEN SPLINE

When the OPEN SPLINE option is selected, the system will prompt you for each of the 7 points in the manner below.

```
CURRENT SCALE:<scale> [INPUT MODE: CURSOR][SPLINE-PT. 1 OF 7]
```

When the first point has been specified, the system will prompt for the second point.

```
CURRENT SCALE:<scale> [INPUT MODE: CURSOR][SPLINE-PT. 2 OF 7]
```

Prompts like this will continue for each of the seven points. Once the seven points have been input, a curve is drawn which passes through the seven points. The spline remains "open"

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unless the same point is specified for both the first and the seventh point.

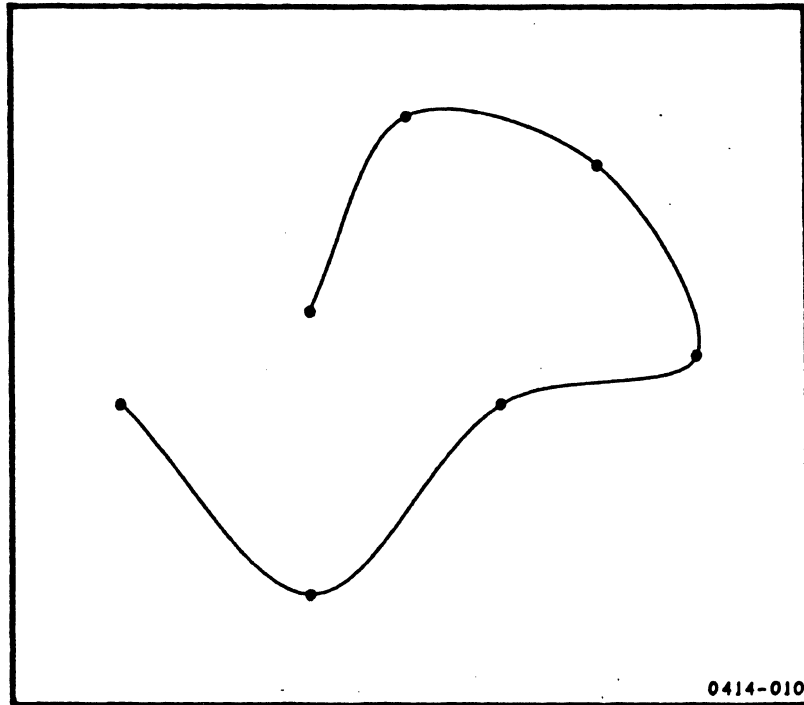


Figure 5.5 - Open Spline

CLOSED SPLINE

When the CLOSED SPLINE option is selected, the system also prompts for each of the five points. Once the five points have been input, a curve is drawn which passes through the five points, with the fifth and first points connected. The object that results will be "closed", such as a figure eight, and can be made to resemble most free form shapes.

The same prompts are given for this option as for the OPEN SPLINE option.

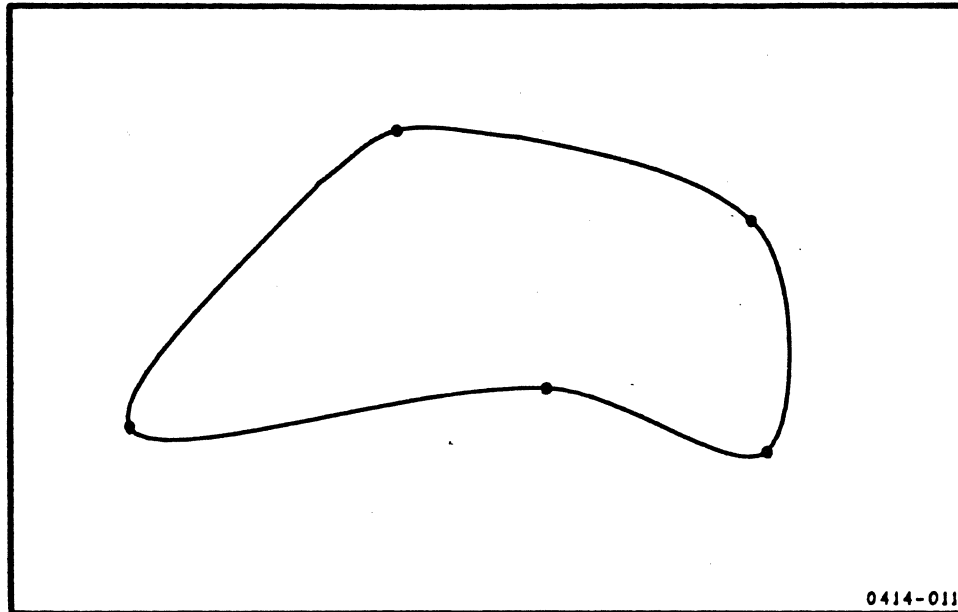


Figure 5.6 - Closed Spline

CIRCLE

There are three methods for defining and drawing a circle. As with LINE, each option is selected by digitizing the appropriate box on the menu. These three options are discussed below.

NOTE

All circles and arcs are drawn in a counterclockwise direction.

CENTER POINT CIRCLE POINT

This option requests the center point of the circle and any point on the circumference of the circle.

A circle which is flat to the viewing plane ($Z=0$) will be drawn with this option if the Cursor Input Mode is chosen.

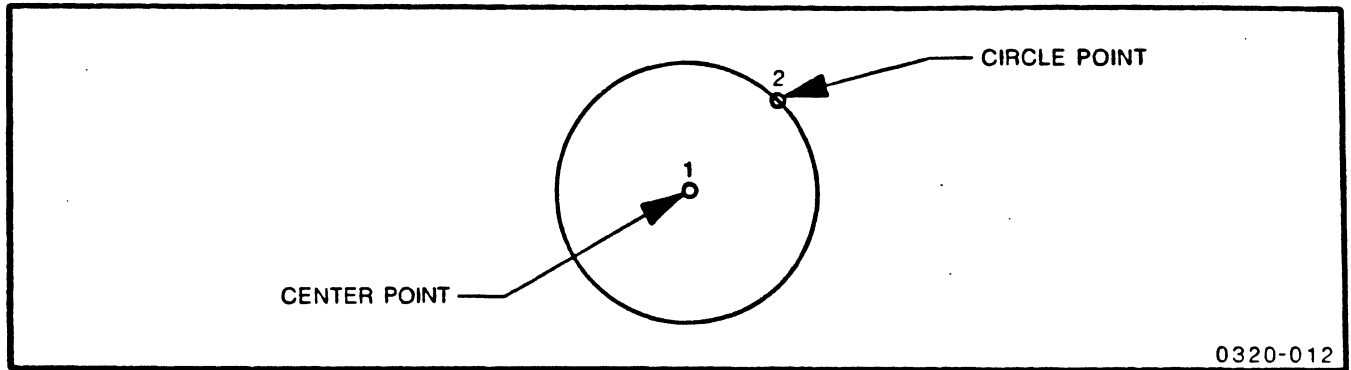


Figure 5.7 - Center Point, Circle Point

When CENTER POINT CIRCLE POINT is chosen, the following prompt will appear.

```
CURRENT SCALE:<scale>[INPUT MODE:CURSOR][CIRCLE:CENTER POINT]
```

When the center has been specified, the system will prompt with the following.

```
CURRENT SCALE:<scale>[INPUT MODE:CURSOR][CIRCLE:START POINT]
```

After a point on the circle has been specific and the circle has been drawn, the "CENTER POINT" prompt will return.

THREE CIRCLE POINTS

This option requires three points. The computer then creates a circle that will pass through all three points. It does not matter in what direction the points are input, clockwise or counterclockwise; the system will draw in a counterclockwise direction and pass through all three points.

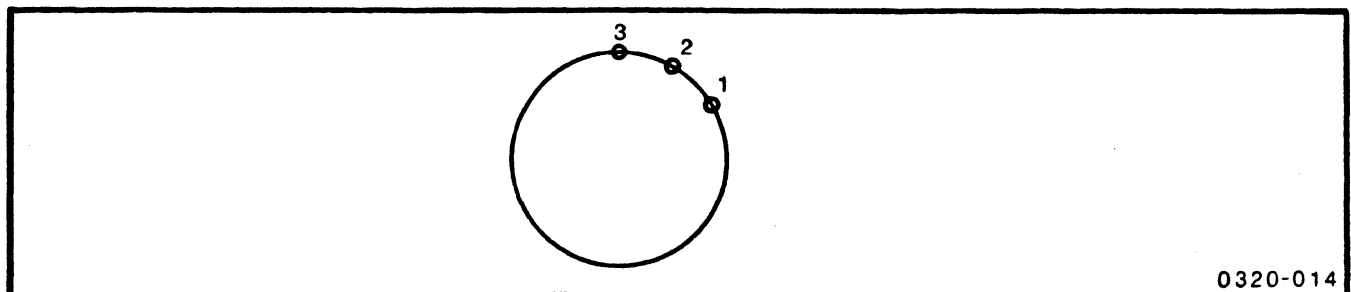


Figure 5.8 - Three Circle Points

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When the THREE CIRCLE POINTS box is digitized, the following prompt will appear.

```
CURRENT SCALE:<scale>[INPUT MODE:CURSOR][CIRCLE: START POINT]
```

After the first point is specified the system will prompt

```
CURRENT SCALE:<scale>[INPUT MODE:CURSOR][CIRCLE:SECOND POINT]
```

For the third point, it will prompt

```
CURRENT SCALE:<scale>[INPUT MODE:CURSOR][CIRCLE: THIRD POINT]
```

After the third point is entered, the circle will be drawn. The circle will be flat to the viewing plane if the Cursor Input Mode is chosen.

CENTER POINT RADIUS

This option requires the center point of the circle to be specified and the radius of the circle to be entered from the keyboard or digitized from the Digitizer Menu keypad.

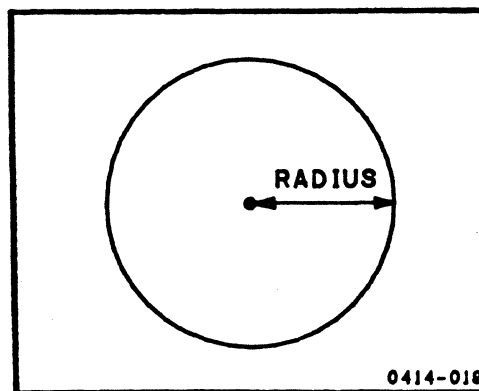


Figure 5.9 - Center Point Radius

When this option is digitized, the following prompt will appear.

CURRENT SCALE:<scale>[INPUT MODE:CURSOR][CIRCLE:CENTER POINT]

After the center point has been specified, the system will prompt

[TYPE IN RADIUS]

Enter the appropriate radius numbers followed by a <RETURN>. The circle will then be drawn. The circle will be flat to the viewing plane if the Cursor Input Mode is chosen.

ARC

As with circles, there are three basic options available for arcs.

NOTE

Arcs, like circles, are drawn in a counter-clockwise direction. While the circle will be the same, regardless of the order in which circumference points are chosen, it DOES matter with an arc. If descretion is not used, the opposite arc of the one desired could be drawn.

Arcs with three points in the same location will hang the system, and it will have to be booted.

CENTER POINT, START POINT, END POINT

This option requires the center point and then the two end points of the arc to be specified. If the center point and start are the same point, an error message will appear after the end point is entered. If the start and end points are the same, the system will draw a semi-circle beginning at that point. If the center point and the end point the same, the system will hang, and have to be booted. The start point actually identifies a radius as well as a specific point, while the end point actually identifies a vector from the center point. The actual end point is on that vector at the radius supplied by the start point.

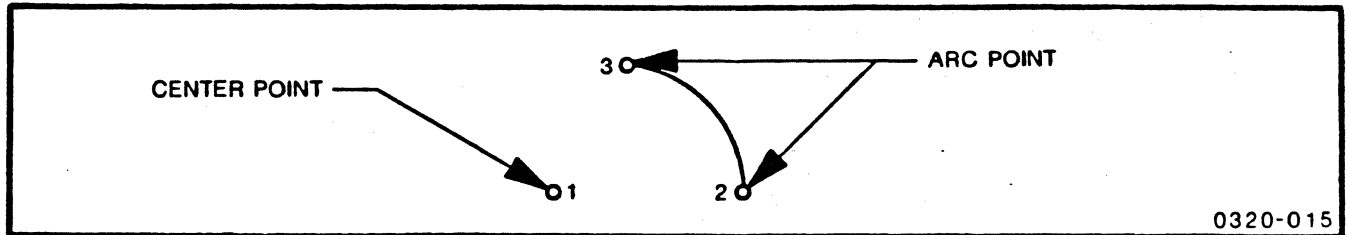


Figure 5.10 - Center Point, Start Point, Endpoint

When this option is chosen, the following prompt will appear.

```
CURRENT SCALE:<scale>[INPUT MODE: CURSOR][ ARC: CENTER POINT]
```

After the center point has been specified, the system will prompt

```
CURRENT SCALE:<scale>[INPUT MODE:CURSOR][ ARC: START POINT]
```

For the end point

```
CURRENT SCALE:<scale>[INPUT MODE: CURSOR][ ARC: END POINT]
```

NOTE

Remember that arcs are drawn in a counter-clockwise direction. If the third point is specified in a clockwise direction from the second one, the system will draw counter-clockwise through the points and the opposite arc will result.

THREE ARC POINTS

This option requires a beginning point, any mid-point, and an end point.

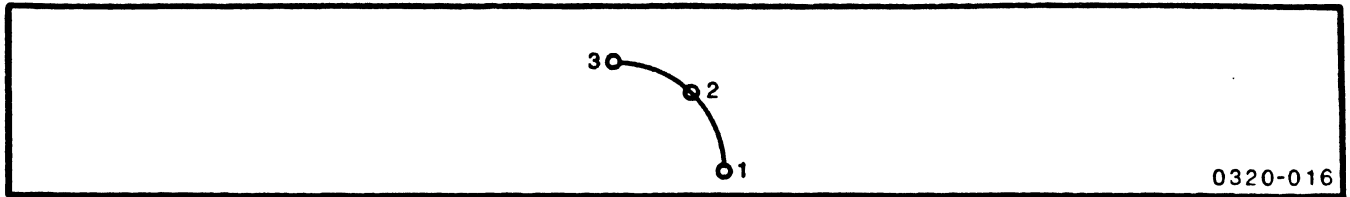


Figure 5.11 - Three Arc Points

When THREE ARC POINTS are chosen, the following prompt will appear.

CURRENT SCALE:<scale>[INPUT MODE: CURSOR][ARC: START POINT]

The second and third points will be requested in the same manner as for the THREE CIRCLE POINTS.

NOTE

If the second point of the arc is entered in a clockwise direction from the start point, but the third point is entered in a counterclockwise direction from the start, the system will ignore the second point. The arc will be drawn in a counterclockwise direction, only through the first and the third points.

All points must be unique, or a colinear error message will appear.

CENTER POINT RADIUS & ANGLES

With this option, a center point is required, and then a radius. Next the system must be informed where the arc begins and ends. It requests a start angle and an end angle. Both angles are specified in degrees, and are measured from an imaginary horizontal line extending from the arc center point to the right.

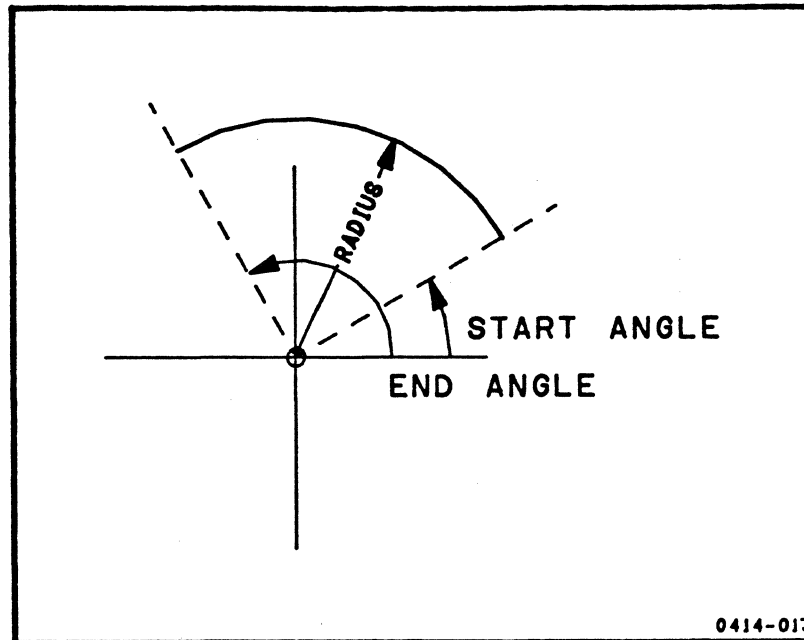


Figure 5.12 - Center Point, Radius and Angles

When CENTER POINT RADIUS & ANGLES is digitized, the following prompt appears.

```
CURRENT SCALE:<scale>[INPUT MODE: CURSOR][ ARC: CENTER POINT]
```

After the center has been specified, the system prompts

```
[TYPE IN RADIUS]
```

The radius can be entered from the keyboard or from the Digitizer Menu Keypad. When it has been entered, the system prompts for the start angle.

```
[TYPE IN START ANGLE]
```

Finally it requests the end angle.

```
[TYPE IN END ANGLE]
```

FILLETS

The MINN-DRAFT system allows you to input fillets with or without a trim. Fillets are the rounding of an edge where two lines meet. If a fillet is trimmed, the two lines will be cut back to the edge of the fillet. If the fillet is not trimmed, the two lines will remain and the fillet will be drawn also.

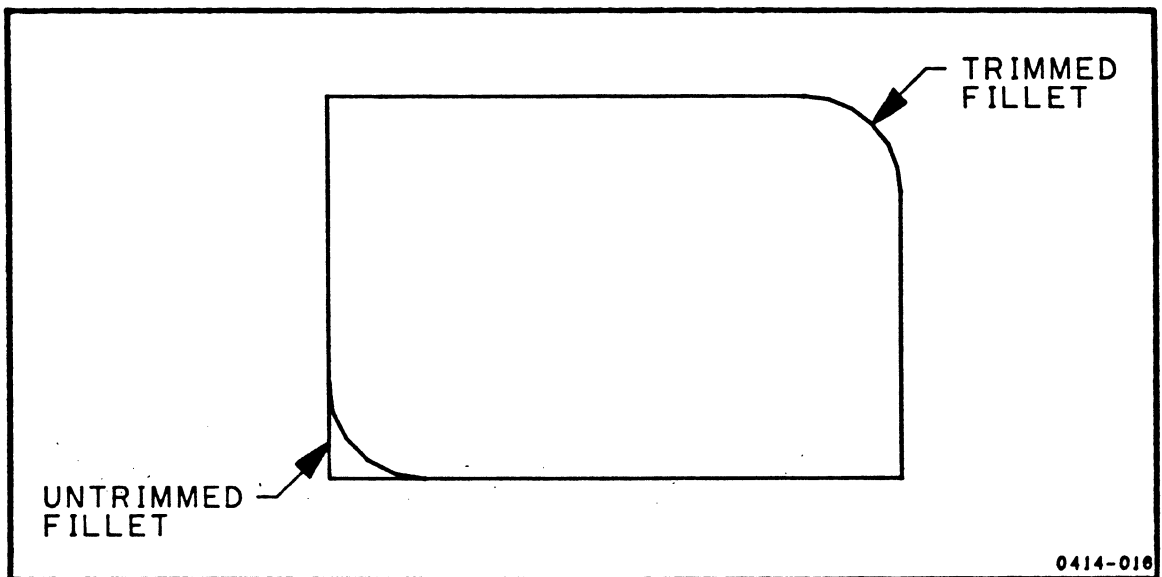


Figure 5.13 - Fillets

TRIM

Trimmed fillets cut back the two lines which connect to form the fillet. This type of fillet is best used to round the corners of a square or rectangle. When the TRIM Menu Option Box is digitized, the following prompt will appear.

```
CURRENT SCALE:<scale>[INPUTMODE:CURSOR][FILLET:INDICATE LINE#1]
```

Choose one of the lines you wish to connect with a fillet and digitize it somewhere near the end where the fillet is to be located. The system will automatically locate the end point. When the first line has been indicated, the system will prompt as follow:

```
CURRENT SCALE:<scale>[INPUTMODE:CURSOR][FILLET:INDICATE LINE#2]
```

Digitize the other line for the fillet, again near the end where the fillet is to be located. When that line has been indicated, the prompt for the radius of the fillet will appear.

ENTER THE FILLET RADIUS *

Enter a number greater than 0.0001 and less than or equal to the length of the shorter of the two lines. The fillet will be drawn and the connecting lines will be trimmed back to form a smooth edge with the fillet.

Once a radius has been entered, a <Return> to the radius prompt will default to the previous radius.

NO TRIM

A No Trim fillet asks the identical prompts and reacts the same as the trimmed fillet. It does not trim back the lines of intersections, however. (One cannot tell from the prompts whether the fillet is trimmed or not, so be careful in digitizing the menu box.

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NOTES

SECTION 6

DRAFTING: SPECIAL AND SCREEN FUNCTIONS

SPECIAL and SCREEN FUNCTIONS are options that allow you to delete, modify, manipulate or magnify portions of a drawing or the entire drawing.

SCREEN FUNCTIONS affect the entire viewing area and the entire drawing. If, for example, the Screen Function ROTATE is chosen, the entire drawing will be rotated, not just one entity in that drawing. The same applies to ZOOM-IN and ZOOM-OUT. No single entity can be ZOOMed by itself.

SPECIAL FUNCTIONS

SPECIAL FUNCTIONS		
OP REJECT	DEPTH	LAYERS
REPAINT	V I NAME	LINE TYPE
CLEAR TEXT	E W CHANGE	FONT LINE WT
MODIFY	CURSOR TRACKER	COLOR
	LINEAR DISTANCE	CROSS HATCH

0414-008

Figure 6.1 - Digitizer Menu: Special Functions

OP(Operation).REJECT

OP REJECT doesn't work correctly at this time, as it won't interrupt an ongoing function. Digitizing BACK SP or any of the blank space between menu boxes above the active cursor area will achieve the desired result of interrupting an ongoing process such as drawing chained lines, etc.

This option terminates the current command and redisplay the [MENU SELECT] prompt. When this option is digitized, the message

OP. REJECT

will appear very briefly on the screen and then

[MENU SELECT]

will reappear.

For example, the option LINE POINT TO POINT is chosen and the prompt appears on the screen. At this point, you determine that a circle should be drawn. By digitizing OP.REJECT, the LINE POINT TO POINT prompt will be exited, the [MENU SELECT] prompt will reappear and you can select the CIRCLE option instead.

REPAINT

This option clears the screen and redraws the drawing, removing miscellaneous text prompts or deleted entities that have not been erased from the display, if present. It does not affect the drawing in any way. If a GRID is currently activated, the grid will also be redrawn when a REPAINT is digitized, even if you selected to interrupt the grid painting when the grid was activated. A GRID (see page 3-9) will have to be performed again to stop REPAINTing the grid. To interrupt REPAINT, hit any key on the keyboard. To terminate the repaint type T<Return>; to resume type any key followed by a <Return>, or press <Return>.

CLEAR TEXT

This option erases the text messages on the screen but leaves all objects, labels and dimensioning in their present states. This option is actually only necessary with a monochrome system where the drawing and the text prompts are all painted on the same screen. When the drawing is obscured by text, this option will clear the text prompts and allow you to see the drawing. The MENU SELECT prompt then will reappear.

MODIFY

Modify allows you to change an entity that already exists, for example, you may move one end of a line, thereby shortening or lengthening it, or locating it at a specific location such as the center point of a circle. When you digitize the MODIFY box on the SPECIAL FUNCTIONS menu the following prompt will appear.

SPECIFY THE -KIND- OF ENTITY BY MAKING A MENU SELECTION

Digitize an entity type from the GEOMETRY menu. You will next be asked to identify the specific entity to be modified.

CURRENT SCALE:<scale>[INPUT MODE:<mode> [INDICATE ENTITY]

Digitize a point on the specific item you wish modified. A small box will be drawn on the screen indicating the point digitized. The system will ask you to double check to ensure that the correct entity is modified.

ARE YOU SURE? (Y/N) *

At this time the prompts will begin to differ for the type of entity chosen. If you digitized the LINE or SPLINE box on the GEOMETRY menu, you will be given a prompt asking for the point to be moved.

CURRENT SCALE:<scale>[INPUT MODE:<mode>][INDICATE PT TO MOVE]

Using the LOCATE input mode, digitize near the point you want moved. Minn-Draft will draw a small diamond on the closest point of the entity chosen. You will then be asked for the new point. Also, if you digitized the POINT box, you will receive this prompt.

CURRENT SCALE:<scale>[INPUT MODE:<mode>][INDICATE NEW POINT]

Using any input method, enter the new point. The line or spline will be redrawn as modified.

If you indicated either CIRCLE, FILLET or ARC as the type of entity to modify, the following prompt will appear. (Filletts may be modified, but they will no longer attach to the line they were originated with. Also, CIRCLES will not have option 4, below.)

```
ENTER NUMBER OF ITEM TO MODIFY
1: RADIUS
2: CENTERPOINT
3: START POINT
4: END POINT
SELECTION ?
```

If you enter 1, you will be asked to supply the new radius.

```
[TYPE IN RADIUS]
```

Enter the new radius and the circle, arc or fillet will be redrawn with the SAME centerpoint and the new radius.

If you enter 2, to change the center point, you will be asked for the new centerpoint, which may be entered with any valid input method.

```
CURRENT SCALE:<scale>[INPUT MODE:<mode>][NEW CENTER POINT]
```

Enter the new center point. The circle, arc or fillet will be redrawn with the SAME radius but a new center point.

If you enter 3, to change the start point, a similar prompt will appear.

```
CURRENT SCALE:<scale> [INPUT MODE:<mode>] [NEW START POINT]
```

Enter the new start point. A circle will be redrawn exactly as it was before; arcs and fillets will be redrawn with a new start point, but otherwise will be the same.

If you enter 4, to change the endpoint, you will be given a similar prompt.

```
CURRENT SCALE:<scale> [INPUT MODE: <mode>] [NEW END POINT]
```

Enter the new endpoint. A circle will be redrawn exactly as it was before; arcs and fillets will be redrawn with a new endpoint,

but will otherwise not be modified.

DEPTH

The surface of the digitizing board and the surface of the graphics screen represent a single plane in the coordinate system.

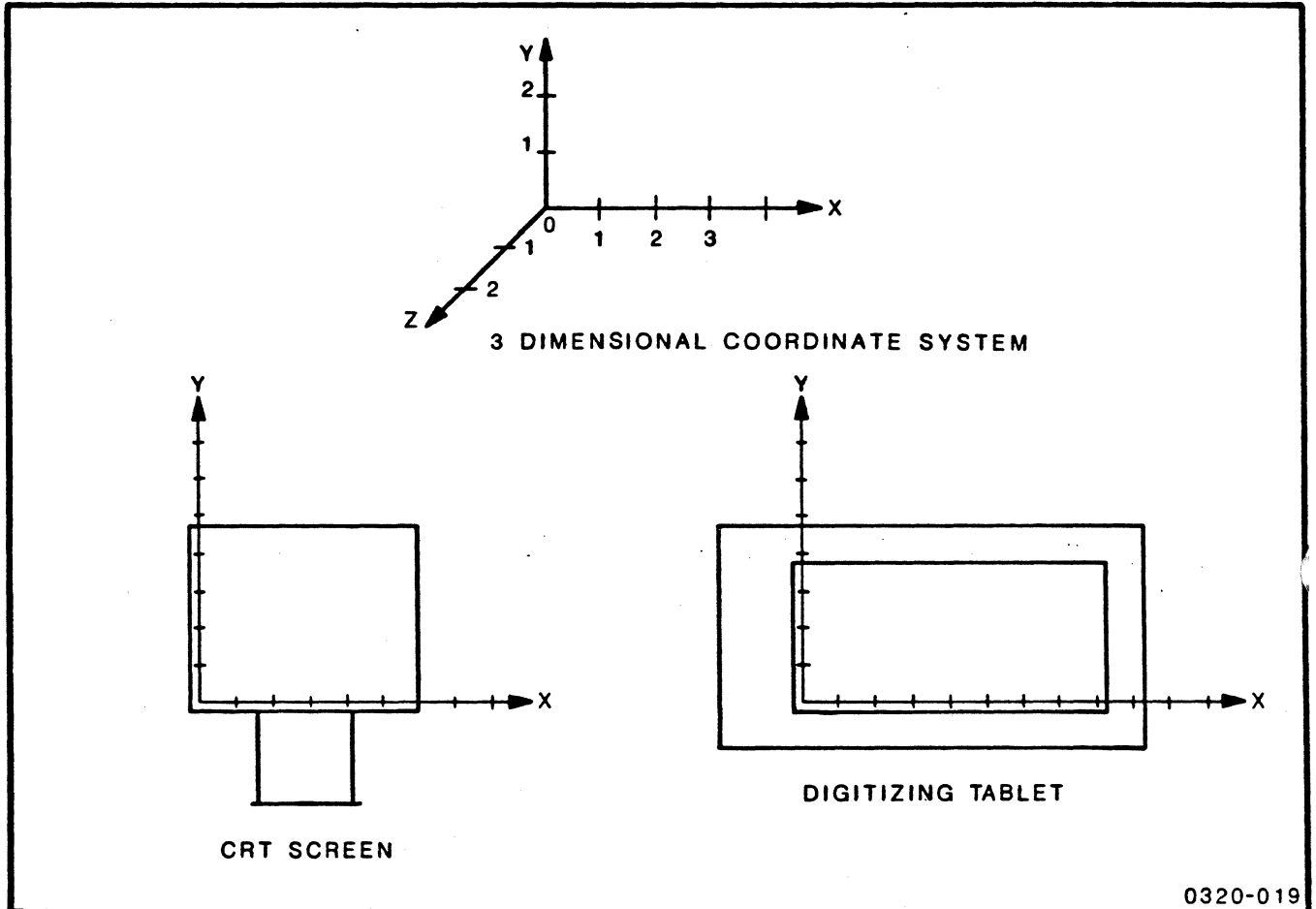


Figure 6.2 - Z-Depth

Initially, the lower left corner of both the digitizer and the graphics screen is the Absolute Origin (0,0 in the X-Y plane).

By moving the cursor around in this plane, any X and Y value may be easily specified. The Z-value for that point is the same as the Z-value for the working plane. The working plane may be moved in or out along the Z-axis using the DEPTH option. See the illustration above, representing three planes at different Z-Depths.

When this option is selected, the following message appears.

```
CURRENT DEPTH ALONG Z-AXIS =      0.0000000000  
ENTER NEW DEPTH ALONG Z-AXIS  *
```

Type in the new Z-depth followed by <RETURN>. A positive Z comes "out" of the screen and a negative value goes "into" the screen. Typing <RETURN> will leave the current Z-value unchanged. The depth will stay the same until returned to 0 or altered again.

This option comes in handy when drawing objects with asymmetrical faces. The back face of a square-shaped object may be larger than the front face. You do not want to create the different faces on different layers because the two faces are integral parts of the same object. And, because you want to plot an isometric view of the final object, you do not want to create them on the same depth, as you would if you were drawing by hand. You can choose to draw one face on one depth and another on a second depth with this option; a subsequent rotation will show the proper perspective between the two faces.

NAME VIEW and CHANGE VIEW

After a drawing is created, you may want to rotate it in several different ways, or otherwise modify it, and still plot the original drawing, along with several of its modifications. The most efficient method for performing these operations is to create VIEWS of the drawing in various stages. For example, a 3-D box might be plotted with a full front view, a full side view, a rotated top view and a rotated side view. In order to change from one view to another quickly, each of those aspects must have been created as a VIEW.

NOTE

All responses must be given from the keyboard.
No input from the digitizer keypad will be
accepted for NAME and CHANGE VIEW.

NAME VIEW

The NAME VIEW option allows the current view (the drawing as it appears on the graphics screen) to be stored under a name of six characters or less (the first must be a letter). When this option is selected, the following prompt will appear.

```
WILL THIS VIEW CONTAIN DIMENSIONS? (Y/N) *
```

If the view will have dimensions included, enter Y<RETURN>. This

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will activate the drawing layer which contains dimensions so that they will be stored with the view.

An N<RETURN> does not activate the dimensioning layer and dimensions cannot be added to that view later.

NOTE

If you try to enter dimensioning before the view is named, this prompt will not appear. Requesting dimensioning will automatically activate the appropriate layer. You will, however, be required to name the view before dimensioning will be allowed (an error message will tell you to use name view).

After a Y<RETURN> or N<RETURN> entry, the following prompt appears.

ENTER VIEW NAME (6 CHAR. OR LESS) *

Give the view a name of six or fewer characters, beginning with a letter, and press a <RETURN>. The VIEW that currently appears on the screen will be stored under that VIEW name.

VIEWS can be created only in the DRAFTING mode. Manipulation of VIEWS prior to OUTPUT is accomplished in the VIEWS option of the Main Selection menu. (See Section 11.)

NOTE

LAYERS to be displayed in a view should be set before the view is named (see page 6-). Once LAYERS are displayed, those layers are saved when the VIEW is NAMED and will be stored as part of the VIEW.

To display different layers with the next VIEW, be sure to change the layers before naming the VIEW.

CHANGE VIEW

The CHANGE VIEW option allows any named VIEW to be displayed as the current VIEW on the graphics screen. When this option is chosen, a list of all stored views is displayed as in the example below.


```
1 <name>
2 <name>
3 CURRENT

ENTER THE NUMBER OF THE VIEW TO BE DISPLAYED *
```

The number of the VIEW appears in the left column, the name in the right. The last VIEW listed (CURRENT) is always the current display on the screen. When the new VIEW number is entered (e.g., 1<Return>), the screen will be REPAINTed with the chosen VIEW.

If no VIEWS have been created, the only option available will be Current, which is the current screen display. Choosing that option will be the same as REPAINTing the screen.

Once a VIEW is changed, it can be modified and stored with the modifications under either a different, or the same name. This allows one to retain the original and also make copies.

CURSOR/TRACKER

The CURSOR/TRACKER locates the cursor coordinates. When this option is selected the following message appears on the screen.

```
CURRENT SCALE:<scale>[INPUT MODE: CURSOR ][ CURSOR TRACKING ]
```

The crosshair should be moved to a position on the screen and digitized (or any key typed except the <Return> or the arrow keys). The X, Y and Z coordinates of the digitized position are then displayed as below.

```
ABSOLUTE   X =   n.nnnn   Y = n.nnnn   Z = n.nnnn
RELATIVE   X =   n.nnnn   y = n.nnnn   Z = n.nnnn
```

(n.nnnn stands for a four place decimal number representing the location of the point.)

The location is given relative to the Absolute Origin, initially located in the lower left corner of the screen. If the reference point has been changed, the RELATIVE position is given with respect to the new reference point. The two locations will be the same if the reference point has not been changed.

LINEAR DISTANCE

This option measures the distance between two points. For example, to find the length of a line, select LINEAR DISTANCE. The following prompt will appear on the screen.

```
INDICATE ANY TWO POINTS ON THE SCREEN  
CURRENT SCALE: <scale> [ INPUT MODE: CURSOR ] [ DISTANCE ]
```

Then digitize LOCATE END POINT and LINE. Move the crosshairs close to one end of the line and digitize. Move the cursor to the other end of the line and digitize.

```
DISTANCE IS: <nn.nnnn>  
[ MENU SELECT ]
```

The distance calculated will be shown and the system will be ready for additional drafting commands. If POLAR or DELTA POLAR input mode is the current Input Mode or has been used to create parts of the drawing, the CURSOR/TRACKER option will locate the point relative to the absolute reference point and the changed reference point in terms of the ANGLE and RADIUS of the point as well as the X, Y and Z coordinates. The display will appear as below.

```
ABSOLUTE: X = n.nnnn Y = n.nnnn Z = n.nnnn  
RELATIVE: X = n.nnnn Y = n.nnnn Z = n.nnnn  
ABS. POLAR: ANGLE = n.nnnn RADIUS = n.nnnn Z = n.nnnn  
DELTA POLAR: ANGLE = n.nnnn RADIUS = n.nnnn Z = n.nnnn
```

LAYERS

A drawing may be considered to be contained on a series of transparent sheets, one stacked on top of the next with each sheet containing different information for the drawing. One sheet may contain all lines, circles and geometric entities making up a frontal view of the object. The next sheet may contain the side view, the third an auxiliary view, the fourth the revision notices, and the last the dimensions.

This concept is illustrated in Figure 6.3.

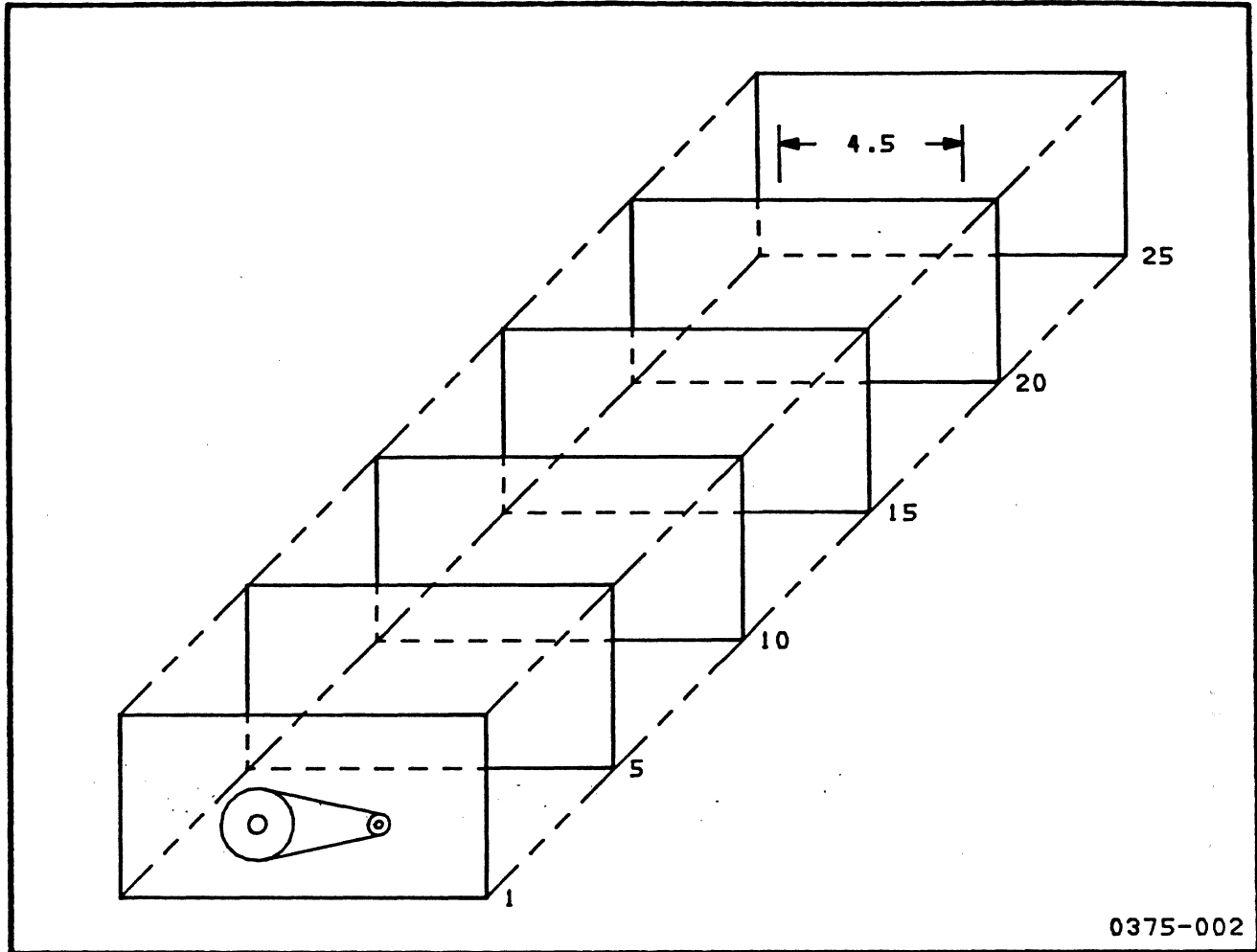


Figure 6.3 - Multiple Layers of Information

By stacking one transparency upon another, a single drawing can be made, complete with revisions and dimensions. These transparent sheets are called "overlays" or "layers." Each layer may be displayed or not displayed independently of the others. This allows different blocks of information to be displayed together in different combinations and allows you to modify only the layers desired.

There are twenty-five layers in the MINN-DRAFT system. When the LAYERS option is chosen from the Digitizer Menu, the following screen display is shown.

- LAYERS -

1. CHANGE WORKING LAYER
2. CHANGE DISPLAYED LAYERS
3. LIST LAYER INFORMATION
4. QUIT

ENTER 1-4 *

Each option is selected by typing the corresponding number followed by a <RETURN>.

CHANGE WORKING LAYER

The working layer is the layer on which the entities (lines, circles, etc.) are stored as they are created. Initially, the system assumes the working layer is layer 1. CHANGE WORKING LAYER allows you to designate any of the twenty-five layers as the working layer. When 1<RETURN> is entered, the following message appears.

WORKING LAYER = <number>

INPUT NEW WORKING LAYER (1-25) *

You may enter any number (1-25) followed by a <RETURN> to change the working layer to one other than the current layer. Only one layer at a time may be used as the working layer.

NOTE

The system uses layer 25 for dimensioning. Layer 25 should not be used as the working layer. When dimensions are added to a drawing, they are automatically be placed on layer 25.

CHANGE DISPLAYED LAYERS

This option allows you to designate which layers will be displayed. Originally, only layer 1 will be displayed. Layer 25 will also be displayed if dimensions have been added to the figure. When 2<RETURN> from the Layers Menu is entered, the following prompt appears.

LAYER	STATUS	LAYER	STATUS	LAYER	STATUS
1	ON	11	OFF	21	OFF
.
.
10	OFF	20	OFF	25	OFF

CURRENT WORKING LAYER = <n>
PLEASE TYPE IN THE LAYER NUMBER(S) TO BE DISPLAYED
?

"ON" indicates the layer is currently turned on (visible); an "OFF" indicates the layer is currently turned off (invisible). In this example, layer 1 is the only one visible. The others are invisible.

To designate layer(s) to be displayed, type in the layer number(s) separated by a comma or a space.

2,3<RETURN>

or

2 3<RETURN>

This example will turn on layers 2 and 3 and turn the rest of the layers off.

LIST LAYER INFORMATION

This option provides the same information as CHANGE DISPLAYED LAYERS, but you will not be able to change anything. The display is provided for information only. The LAYERS menu will also be redisplayed after the LIST LAYER INFORMATION is provided.

To exit from LAYERS, type 4<Return>.

FONT

There are three ways to create different lines in the MINN-DRAFT system: LINE TYPE, LINE WEIGHT and COLOR. Each option is part of the FONT group of SPECIAL FUNCTIONS on the Digitizer Menu and is discussed further below.

LINE TYPE

All lines are drawn solid by default. This option changes solid lines to dashed line and dashed lines to solid. The following prompt will appear when the LINE TYPE menu box is digitized.

LINE TYPES

1: SOLID
2: DASHED

SELECTION?

LINE WEIGHT

When the FONT option is digitized, you can change the thickness of the lines to be printed on the plotter. The system will display the following prompt.

CURRENT LINE WEIGHT = 1

PLEASE ENTER THE NEW LINE WEIGHT (1-8)
DEFAULT: NO CHANGE ?

Enter a number between 1 and 8 and a <RETURN> to change the line weight.

NOTE

Currently, the LINE WEIGHT option has no effect on the appearance of lines on the screen or plotter. The line weight for each line is simply stored in the system's database.

COLOR

For both monochrome and color monitors, lines can be entered in different colors. The colors will actually appear only on color monitors, but they can be plotted from both color and monochrome systems with an 8-pen DMP29 plotter.

NOTE

Colors on a DMP29 plotter will depend on what pens are used. Colors will not automatically correspond to the colors on the Terak system.

To change the current color, digitize the COLOR option on the Digitizer Menu. The following prompt will appear.

AVAILABLE COLORS:

- 1 = WHITE
- 2 = BLUE
- 3 = RED
- 4 = GREEN
- 5 = YELLOW
- 6 = CYAN
- 7 = MAGENTA
- 8 = BLACK

CURRENT COLOR = 1

PLEASE ENTER THE NEW COLOR (1-8)
DEFAULT: NO CHANGE ?

Enter the number of the color desired and press <RETURN>. The current color will stay in effect until changed.

NOTE

Occasionally, the system will arbitrarily change the color to 0. This will actually default to color number 1. The user will then need to again select the desired color using this option.

CROSS HATCH

Crosshatching is the drawing of lines at a specified angle and spacing within a boundary. Thus, one can create the appearance of a solid object, or code different objects by their crosshatch scheme. Crosshatching can only be done on named views. After a view has been named, digitizing the CROSSHATCH box on the SPECIAL FUNCTIONS menu will cause the following prompt to appear on the screen.

HOW MANY ENTITIES DEFINE THE BOUNDARY?

Enter the number of lines, arcs, circles, splines or combinations thereof that define a closed space. You will then be asked to identify these boundaries.

INDICATE THE <n> BOUNDARIES, ONE AT A TIME
CURRENT SCALE:<scale>[INPUT MODE:CURSOR][(<n>)CROSSHATCHING]

A small square "hit window" cursor will replace the crosshair cursor. Position this cursor over each boundary and digitize. As each boundary is identified, the system will indicate it has received the information by incrementing the count.

When all boundaries are identified, Minn-Draft will ask at what angle you want crosshatching drawn.

ENTER THE CROSSHATCH ANGLE (0-180):

Enter a number from 0 to 180. The system will then want the spacing between crosshatch lines.

ENTER THE CROSSHATCH SPACING:

You may enter any number, but the closer the spacing, the more lines Minn-Draft will have to draw, and the longer it will take. If your scale is small and your spacing is small, it is possible to fill the disk with crosshatch lines. If this happens, you will get an error message and the system will stop. To recover, you will have to restore your data file (if you had a backup) and reenter your crosshatch command with a greater spacing. You can make the lines close enough to appear solid without reaching this point.

Minn-Draft will draw the crosshatching and then return the MENU SELECT prompt. If you again digitize CROSSHATCH, the system will ask:

SAME BOUNDARIES ? (Y/N)

If you type Y<Return> you will be given the angle and spacing prompts. If you type N<Return> you will be given all the prompts.

If you attempt to crosshatch without naming the view, the system will respond:

VIEW IS NOT NAMED - USE NAMEVIEW OPTION
[MENU SELECT]

Once you name the view you will be allowed to crosshatch objects

within it.

SCREEN FUNCTIONS

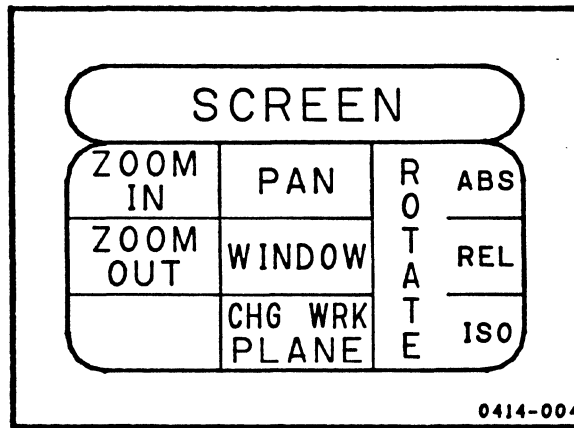


Figure 6.4 - Digitizer Menu: Screen

There are three options for changing the size of the drawing as it appears on the screen: ZOOM IN, ZOOM OUT and WINDOW. PAN does not change the size of the drawing; it relocates the drawing on the screen. CHANGE WORKING PLANE causes the system to change planes to match a plane identified by an entity or entities in the three dimensional drawing. The entire drawing is rotated in relation to a user identified point via the ROTATE command. Each of these options is discussed below.

NOTE

When any of these options is chosen, the Absolute Origin, initially located in the lower left corner of the screen, will be moved also. It may be located off the screen, or somewhere in the middle of the screen.

ZOOM IN

ZOOM IN magnifies a particular portion of a drawing, like looking through a microscope or a magnifying glass. When selected, this message appears.

ZOOM IN
PLEASE TYPE IN THE MAGNIFICATION FACTOR
?

Enter the number corresponding to the scale factor desired and

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press <Return> (e.g., if 3<Return> is entered, the drawing will be three times larger than its previous size).

After a magnification factor is entered, this message appears.

INDICATE CENTER OF INTEREST. STRIKE KEY WHEN DONE

Since a large drawing may not completely fit on the graphics screen, this prompt allows you to ZOOM IN and magnify a specified area. The crosshair appears in the center of the screen and you can reposition it (using arrow keys or cursor unit) and then press any key (except <RETURN> or the arrow keys) or digitize the point. The position of the cursor when the key was struck or the point digitized will appear at the center of the screen when the screen is repainted. The screen will display only the portions of the drawing which will fit. The rest will be off screen. No changes can be made to the parts of the drawing which are off screen and you will have to RETURN TO PREVIOUS SCALE or PAN in order to modify them. Only the parts currently on the screen can be modified.

If <RETURN> is typed instead of the entry of a magnification factor, the system will prompt

RETURN TO PREVIOUS SCALE? (Y/N) *

To display the figure at the last entered scale factor, type Y<RETURN>. If N<RETURN> or just <RETURN> is typed, the system will prompt

RETURN TO ORIGINAL SCALE? (Y/N) *

A Y<RETURN> response will display the figure with the scale in which it was originally entered.

ZOOM OUT

This is similar to the ZOOM IN option, except the scale factor is for reduction instead of magnification. The screen image will appear smaller. All prompts are similar.

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PAN

PAN allows you to relocate the drawing on the screen without changing the scale of the drawing. When the PAN option is chosen, the following prompt appears.

INDICATE CENTER OF INTEREST. STRIKE KEY WHEN DONE [PAN]

Locate the crosshairs at the point on the drawing to be relocated as the center of the screen and strike any key (except <RETURN> or the arrow keys) or digitize the point. The screen will be repainted with the indicated point as the center of the screen. No scale changes will be made.

WINDOW

The WINDOW option allows you to choose which section of a figure will be magnified to fill the entire screen.

When the WINDOW option is digitized, the following prompt will appear.

INDICATE WINDOW BY TWO OPPOSITE CORNERS [WINDOW SCALE]

Enter the first point which will serve an anchor diagonal corner of a rectangle. Then, when the cursor is moved, a rubber-banding window will be displayed. When a second point is digitized, the screen will be repainted.

To return the window to the original figure, the ZOOM-OUT option should be chosen. A <Return> should be entered for the Reduction factor. A Y<Return> should be entered to either RETURN TO PREVIOUS SCALE? or RETURN TO ORIGINAL SCALE? as you desire.

CHANGE WORKING PLANE

The plane in which you are drawing entities can be changed to match any plane that existing entities can define. For example, a circle that was drawn in another plane appears as an ellipse. To change to the plane where the circle is flat to the screen, digitize the CHG WRK PLANE box in the SCREEN menu. Minn-Draft will ask you to identify the plane by digitizing entities that fall within it.

CURRENT SCALE:<scale>[INPUT MODE:<mode>][INDICATED ENTITY]

A hit-window cursor will replace the crosshairs. Digitize any entity or entities (that fit within the hit-window) that will define a plane. If there is not a sufficient plane definition, as will happen with digitizing a single line, the system will ask for a rotation angle.

TO WHAT ANGLE SHOULD THIS LINE BE ROTATED?

Enter a degree between 0 and 180. Minn-Draft will then ask for another entity that is in the same plane.

CURRENT SCALE:<scale>[INPUT MODE:<mode>][INDICATE ANOTHER ENTITY]

Once sufficient definition of a plane has been identified to the system (ie., a single circle point), the plane will be changed to make the identified plane flat to the screen. The drawing will be repainted at this rotation and plane.

ROTATE

ABSOLUTE ROTATE, ISOMETRIC ROTATE and RELATIVE ROTATE allow an entire drawing to be rotated about any of the three coordinate axes (X, Y or Z), using any specified point as the rotation center. In all cases, a small view of the current axes is shown in the upper left corner. The ABSOLUTE ROTATE option will perform the specified rotation relative to the drawing's original orientation.

The RELATIVE ROTATE option will perform a rotation relative to current rotation of the drawing. The ISO ROTATE will perform a relative rotation to give an isometric view of the drawing. The ISO relative rotation angles are: X = 30°, Y = 30° and Z = 30°.

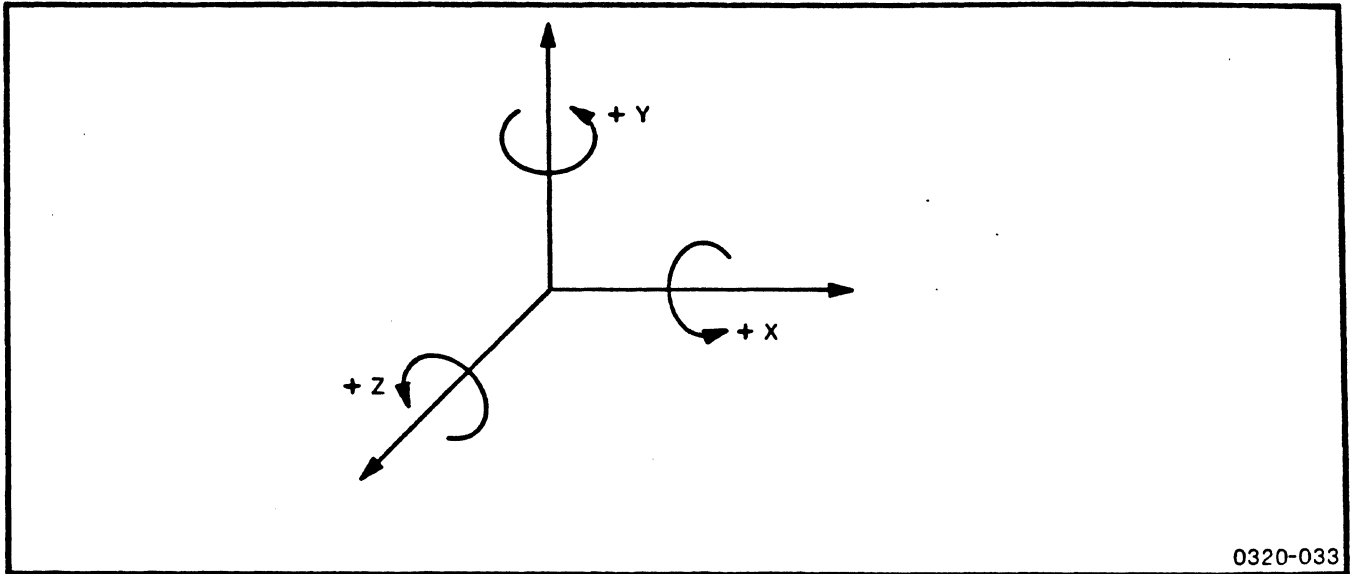


Figure 6.5 - Rotation Directions

Figure 6.5 shows the positive/counter-clockwise rotation convention for each axis.

When the ABSOLUTE option is chosen, the following message appears.

```
[ENTER ABSOLUTE ROTATION COMMAND]
X=
```

Type in the desired degree of rotation around the X-axis and press <RETURN>. The system will then respond with a prompt for the Y-, and finally the Z-axis rotation. If you wish to rotate a drawing 15 degrees around the X-axis, 45 around the Y-axis and 0 around the Z-axis, the entry would look like this.

```
[ENTER ABSOLUTE ROTATION COMMAND]
X = 15<Return>
Y = 45<Return>
Z = 0<Return> (or just <RETURN>)
```

NOTE

Single line entry can also be used. When the "X=" prompt appears, enter 15,45<RETURN> instead.

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The system will then prompt with the following:

```
CURRENT SCALE:<scale>[INPUT MODE:CURSOR][INDICATE ROT CENTER]
```

The origin of the system's axes will be placed at whatever point you now indicate and the rotation performed around that point. When the crosshairs have been positioned, digitize the point. The system will repaint the figure, rotated as desired.

The command for the RELATIVE ROTATION is exactly the same as the ABSOLUTE. Only the results are different. The first rotation of a drawing will be relative to the original orientation, just as with ABSOLUTE ROTATION. The second will be relative to the current, or last performed, rotation.

It is possible to rotate a figure off the viewing area by choosing a large angle of rotation and a center of rotation that is distant from the figure. The Z-depth is also a factor when the cursor is used to specify the center of rotation. Several figures created at different Z-depths can be rotated off the viewing area. PAN can be used to redisplay figures rotated off the screen.

To recover the figure in its original form, choose either the ABSOLUTE or RELATIVE ROTATION command. Enter <RETURN> for the X, Y and Z prompts. The system will then prompt with

```
RETURN TO ORIGINAL ROTATION? (Y/N) *
```

A Y<RETURN> response will return the figure to its original orientation and repaint the screen.

NOTE

The entire screen area is rotated with these options so all figures in a drawing are affected.

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NOTES

SECTION 7

DRAFTING: DIMENSIONING

The Digitizer Menu provides five types of dimensioning capabilities:

1. Linear Dimensioning
2. Circular Dimensioning
3. Leaders
4. Text
5. Labels
6. Centerlines
7. Center Crosses

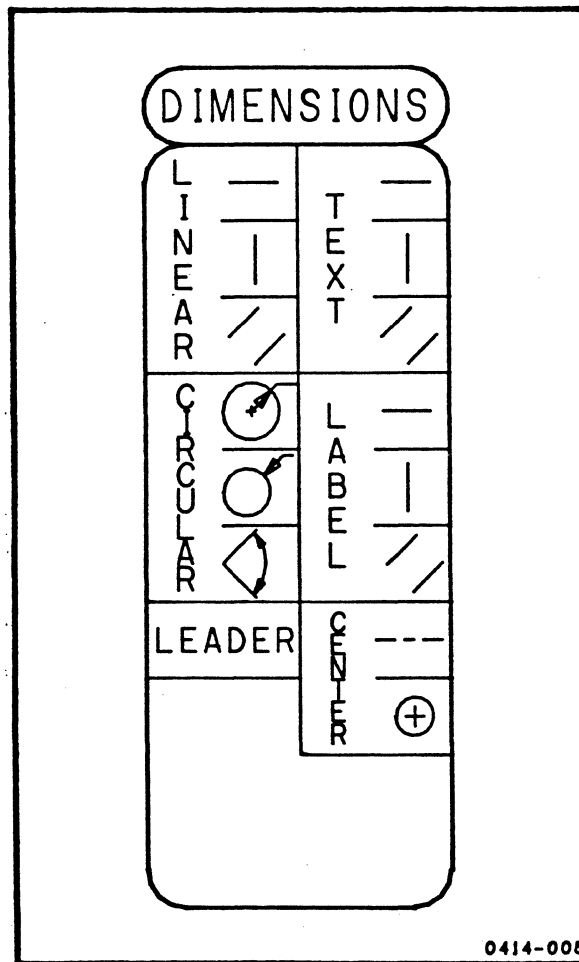


Figure 7.1 - Digitizer Menu: Dimensions

Each of these dimensioning entities must be associated with a named view. If you attempt to create dimensions before naming the view, the system will interrupt and require you to name the view before choosing any dimensioning option. (A view can be

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named by using the NAME VIEW option on the SPECIAL FUNCTIONS menu, see Section 6.)

All dimensions are in the units and scale chosen at the time of the drawing creation. (See Section 12 - Bookkeeping.)

Linear, Circular and Centerline dimensions are automatically written onto Layer 25. You do not have to change layers to place them there.

NOTE

Linear, Circular, and Centerline dimensions will not be rotated with other entities. Dimensions created with LABELS and LEADERS will be rotated.

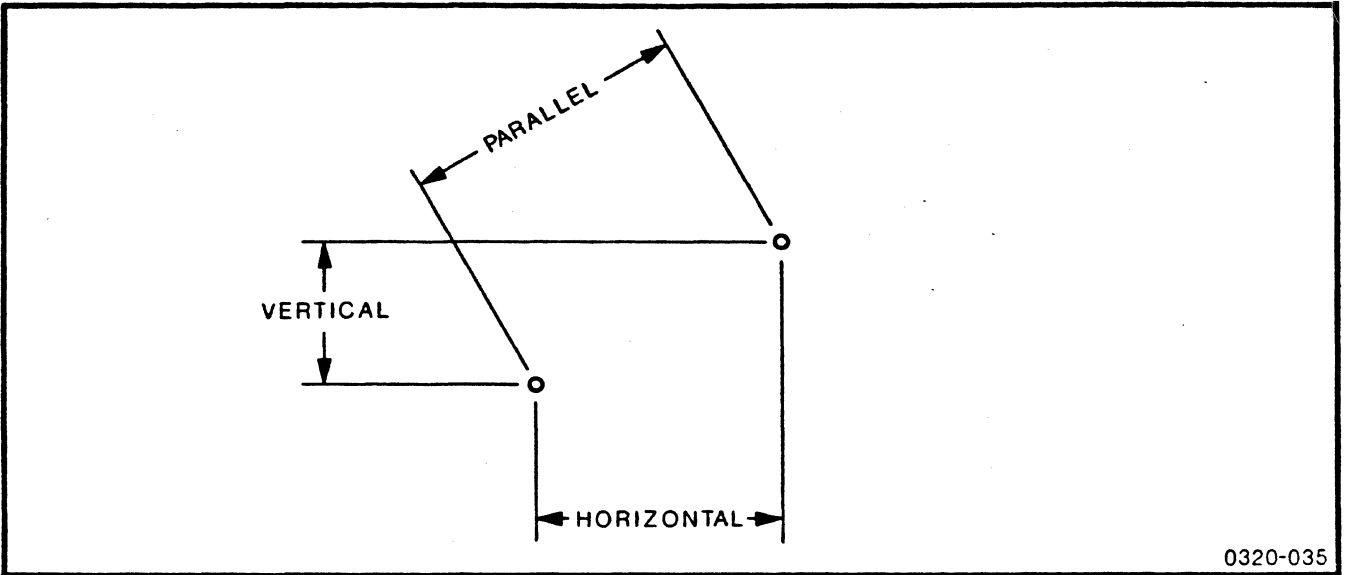
Establishing a GRID and using POINT LOCK to enter dimensioning will keep chained dimensions evenly spaced and aligned properly.

LINEAR Dimensioning

Linear dimensioning allows the distance between any two points to be measured and displayed. There are three different measurable distances between any two points: horizontal distance, vertical distance and parallel distance. See Figure 7.2.

The appropriate distance is chosen by selecting HORIZONTAL, VERTICAL or PARALLEL from the DIMENSION LINES column of linear dimensioning.

The TEXT option provided for dimensioning modifies the orientation of the text in the dimension. See Figure 7.3. HORIZONTAL, VERTICAL and PARALLEL are the options. However, PARALLEL text works only with PARALLEL dimensions and it is the only text direction that works with PARALLEL dimensions. As PARALLEL dimensions defaults to PARALLEL text, this box need not ever be digitized. The text will follow the same direction as the dimensioning option unless a separate orientation is chosen. For example, if you choose the VERTICAL line dimensioning option, the text will be printed vertically also unless the HORIZONTAL option is chosen for the text. (The example of VERTICAL dimensioning in Figure 7.2 has HORIZONTAL text orientation.)

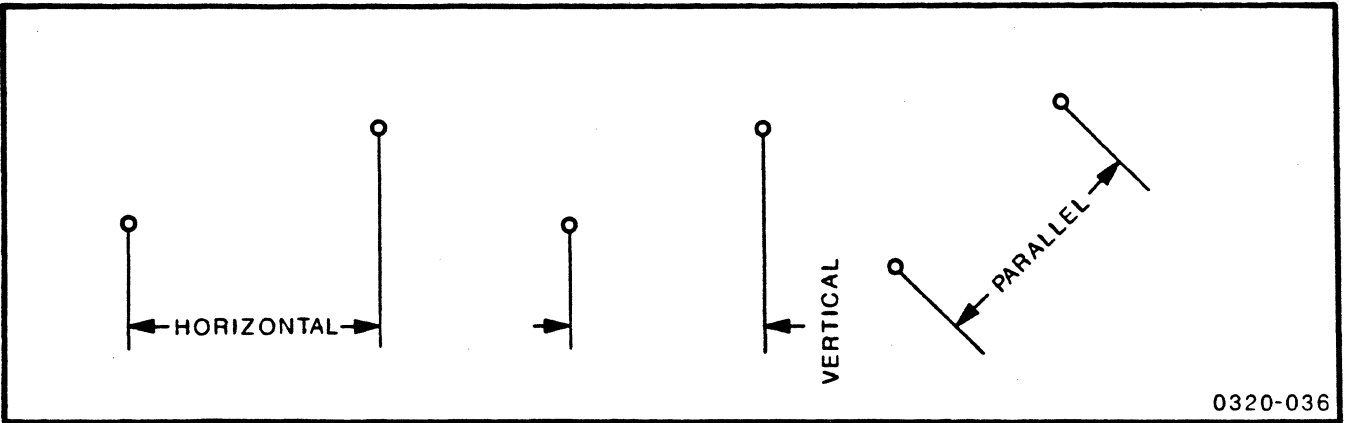


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Figure 7.2 - Distance Between Two Points

NOTE

The text orientation must be chosen before the type of dimensioning (horizontal linear, for example) is chosen.



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Figure 7.3 - Linear Dimensioning Text Orientation

Once these two selections have been made from the Digitizer Menu, the system displays a request for the bounding points of the dimension. Any input mode may be used to do so, although the LOCATE POINT mode is most commonly used. This mode exactly links the endpoints of actual lines with the dimensioning, rather than a random point digitized by the cursor. This is important in linear dimensioning since the system determines the length of each line for you. Not identifying each end of a line by LOCATE POINT may result in incorrect dimension text.

NOTE

Using Absolute or Delta Coordinate Input will also tie dimensions to the exact endpoints of lines, if these coordinates are known.

When LINEAR HORIZONTAL is digitized, the following prompt will appear.

```
CURRENT SCALE:<scale>[INPUT MODE:<mode>][X-DIM: ENTER FIRST PT]
```

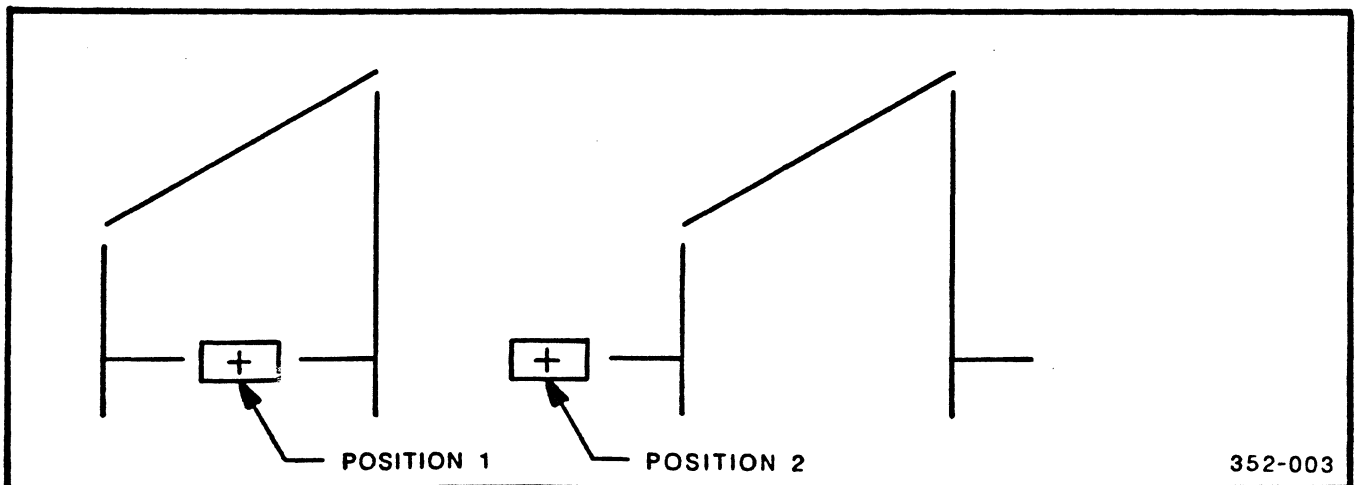
When the first point has been entered, the system will prompt for the second endpoint:

```
CURRENT SCALE:<scale>[INPUT MODE:<mode>][X-DIM: ENTER SECOND PT]
```

After the second point has been specified, the position of the text is requested.

```
CURRENT SCALE:<scale>[INPUT MODE:<mode>][INDICATE LABEL CENTR]
```

This allows you to position the text of the dimension in the desired location. When this message appears, the crosshair also appears. The system then waits for you to position the crosshair at the spot where the CENTER of the dimension text is to appear. See Figure 7.4.



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Figure 7.4 - Linear Dimensioning: Positioning the Text

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With this method of dimensioning, the distance between the points which are the dimension endpoints is automatically determined and written by the system. The text is then stroked in.

The length of the leader lines is determined by the point digitized for the center of the text. The farther from the entity the center of the text is placed, the longer the leader lines.

Internal or external arrowheads will also be determined by the location of the text. If the text is placed between the two points being dimensioned, the arrowheads will be internal. If the text is placed outside the two points being dimensioned, the arrowheads will be external.

The prompts are identical for HORIZONTAL, VERTICAL and PARALLEL dimensioning, except that where the HORIZONTAL dimensioning asks for the X-DIM, the VERTICAL and PARALLEL will ask for the Y-DIM and P-DIM, respectively.

CIRCULAR Dimensioning

Circles and arcs can be dimensioned diametrically (just the diameter) or radially (just the radius). After selecting CIRCULAR DIAMETRICAL or RADIAL from the Digitizer Menu, the following message appears on the screen.

```
CURRENT SCALE:<scale>[INPUT MODE:CURSOR][INDICATE CIRCLE OR ARC]
```

Using either the cursor unit or the arrow keys, position the crosshair next to the circle (or arc) to be dimensioned and digitize. After the system locates the circle or arc, the following message will appear on the screen.

```
CURRENT SCALE:<scale>[INPUT MODE:CURSOR][INDICATE PT ON ARC]
```

This is a request for the point of the circle (strike point) where you wish the leader arrow to appear, as illustrated below.

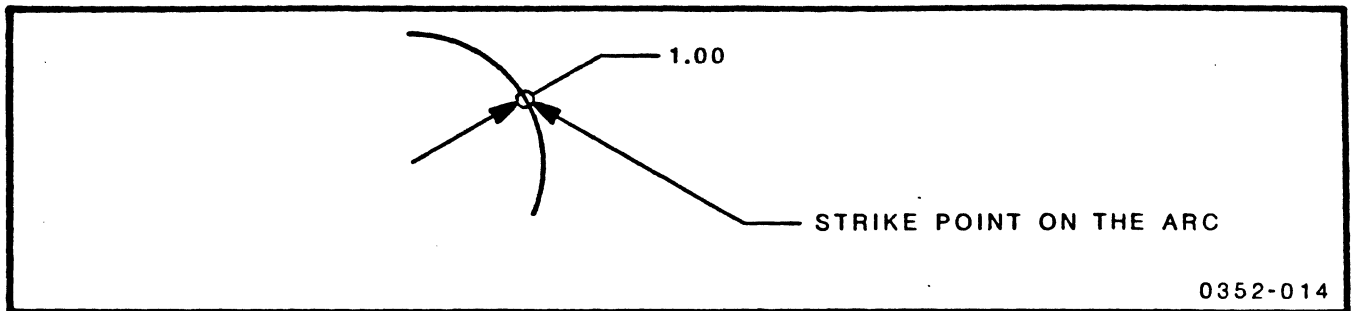


Figure 7.5 - Circle Strike Point

After this point has been chosen, this message appears.

CURRENT SCALE:<scale>[INPUT MODE:CURSOR][INDICATE TEXT CENTR]

This is the point where the text will start. This point will indicate the lower center of the text. Position the cursor in the correct location and digitize the point.

Diametrical text locations cannot be inside the circumference of a circle or arc. They must be located outside. When an invalid text location is given, the system will respond with an error message and you will be prompted to indicate the text position again. This will occur until a valid position is indicated.

NOTE

In CIRCULAR dimensioning, the best digitizing input mode available is LOCATE NEAR PT.

Several examples of valid text locations in RADIAL dimensioning are shown below.

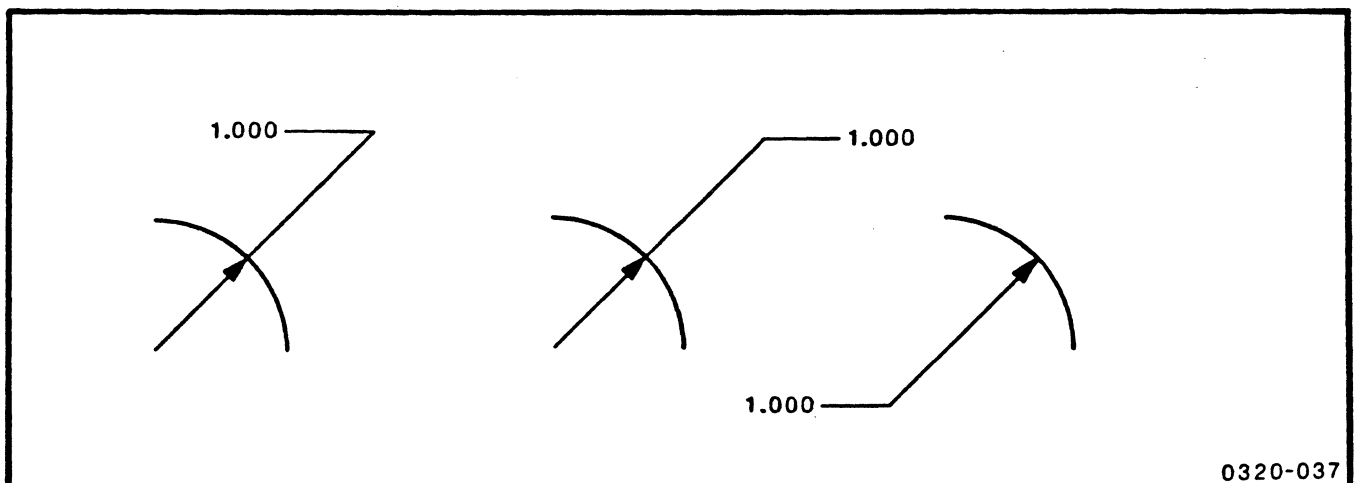


Figure 7.6 - Text Locations

Shown below is an example of radial (left example) and diametrical (right example) dimensioning.

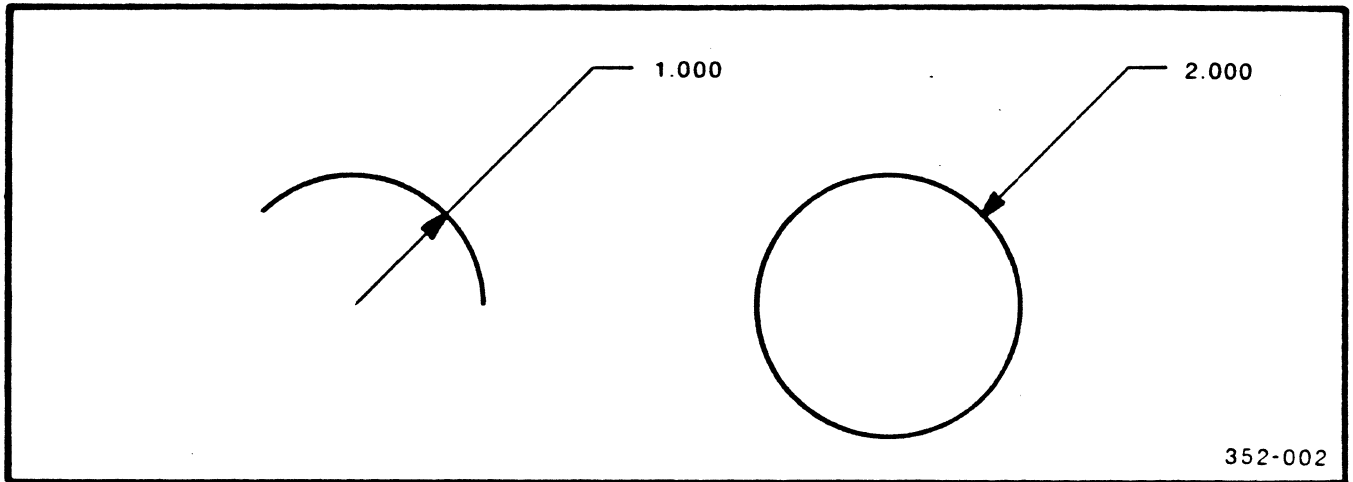


Figure 7.7 - Radial And Diametrical Dimensioning

ANGULAR Dimensioning

This option allows you to dimension angles. When the ANGULAR option is chosen, the following prompt appears.

CURRENT SCALE:<scale>[INPUT MODE:<mode>][INDICATE ANGLE CENTR PT]

When the above prompt appears, specify the center point of the angle where the two legs meet. When this has been done, the system will prompt with the following:

CURRENT SCALE:<scale>[INPUT MODE:<mode>][INDICATE FIRST ANGLE PT]

Specify one of the legs of the angle being dimensioned. Either leg can be chosen first. The leader lines will be determined by the location of the text.

For the second leg the following prompt will appear.

CURRENT SCALE:<scale>[INPUT MODE:<mode>][INDICATE SECND ANGLE PT]

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When the second leg has been specified you will be prompted for the text location with the following prompt.

CURRENT SCALE:<scale>[INPUT MODE:CURSOR][INDICATE LABEL CENTER]

The point you specify here will determine how the leader lines are placed. If the text is placed in the area defined by the acute angle, the leader lines will appear within the area bounded by the angle. If the text is placed outside the angle, the leader lines will wrap outside the angle.

As with all other dimensioning, the text will appear as a box until the screen is REPAINTED.

NOTE

Just as with CIRCLE and ARC dimensioning, the location for the text with angles is determined by the lower left corner of the text.

When entering angular dimensions, the best input mode is LOCATE LINE. This will cause dimensions to attach to the end of the chosen line, rather than a random point chosen by the cursor.

Examples of ANGULAR dimensioning are shown in Figure 7.8.

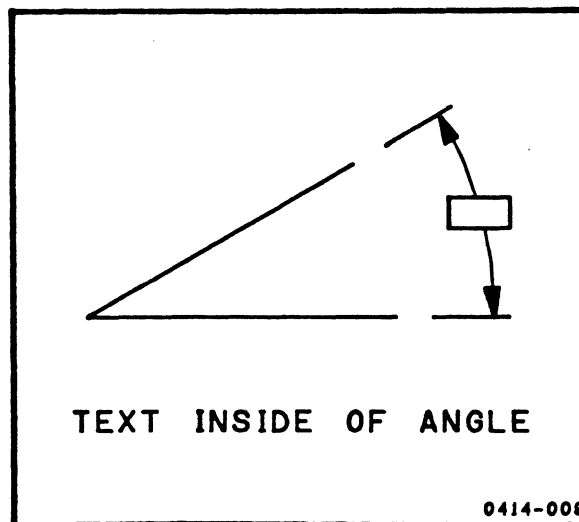


Figure 7.8 - Angular Dimensioning

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LABEL

LABEL allows you to add text to a drawing by typing in a text message (letters or characters) and then positioning the text on the screen. Unlike DIMENSIONING, this text can be rotated with the drawing and will not automatically be written onto Layer 25.

NOTE

To ensure uniform LABEL size throughout a drafting session, activate a GRID and use PT LOCK as the input mode.

There are three options for LABEL positioning: HORIZ, VERT and PT TO PT. If HORIZ is chosen, the label will be printed horizontally. If VERT is chosen, the label will be printed vertically. If PT TO PT is selected, the label will be printed according to your specifications.

Regardless of which option is chosen, the following prompt will appear first.

TYPE IN TEXT

[LABEL]

Type in the message to be displayed and press <RETURN>. A maximum of 60 characters is allowed.

Text may be thought of as being enclosed in an imaginary rectangle.

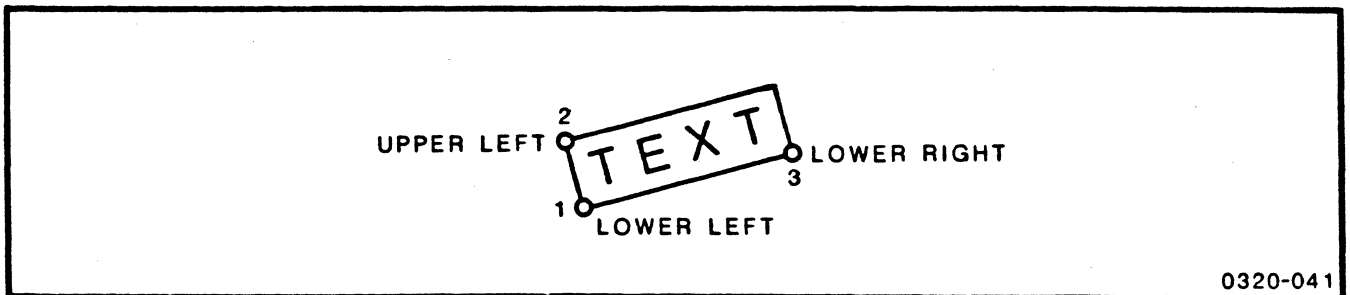


Figure 7.9 - Text Positioning

The three keypoints on this box are

- 1) lower left corner
- 2) upper left corner
- 3) lower right corner

If you select either HORIZONTAL or VERTICAL LABEL, the system will make a request for the lower left point and the upper left point.

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If you select PARALLEL, all three points must be input.

NOTE

On VERTICAL labels, the two points input for location must be relatively horizontal to each other.

If the HORIZONTAL LABEL option has been chosen and the upper left corner (second) point is specified below the first point, the text will be printed upside down.

In VERTICAL and HORIZONTAL text, the upper left corner point does not need to be directly above the lower left corner point. It is only specifying height, not the exact point where the upper left corner of the text will be located.

LEADER

A leader is defined by three points, as illustrated below. Leaders are used for annotating specific locations on a drawing.

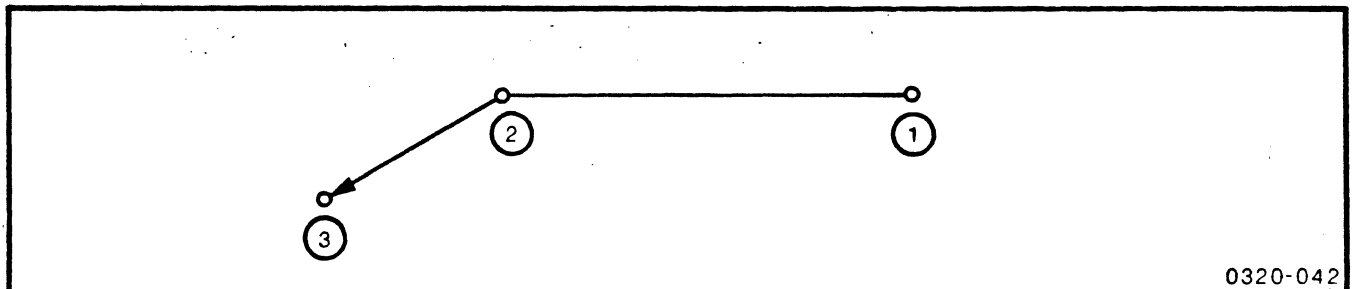


Figure 7.10 - Three-Point Leader

Points 1 and 2 define the horizontal section of the leader beginning at the text and ending at the joint. Point 3 is the end point of the leader and the tip of the arrow (the strike point of the circle).

When this option is selected, the following message is displayed.

```
CURRENT SCALE:<scale>[INPUT MODE:<mode>][LEADER:PT. 1 OF 3]
```

After the first point is input, the same message appears, except PT. 2 appears in place of PT. 1. Again, the same message (substituting PT. 3 for PT.2) appears to request the third and final point of the leader.

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If your second point is vertical to point one, the system will rechoose a first point. When the third point is chosen, the system will draw a straight line directly to the end point of the leader.

If the second point is not exactly horizontal to the first point, the system will AXIS LOCK and make the leader horizontal.

CENTERLINES AND CENTER CROSSES

Centerlines

A centerline is defined by two points as shown below. The length of the long line and the dashed line are determined by the options entered in the Bookkeeping Menu (see Section 12). The number of long lines and dashed lines that will occur in the centerline depends on how these lengths have been set up in Bookkeeping and how far apart the two points are that are used to specify the length of the entire centerline.

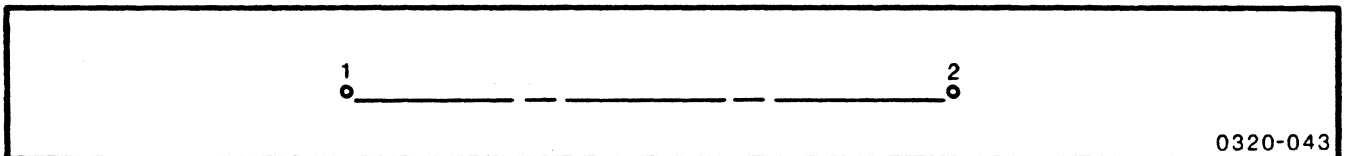


Figure 7.11 - Centerlines

When the CENTERLINE option is selected, the following message appears.

CURRENT SCALE:<scale>[INPUT MODE:<mode>] [INDICATE START PT]

The cursor should then be moved to the start position and the point digitized. After the first point is input, the following message will appear.

CURRENT SCALE:<scale>[INPUT MODE:<mode>][INDICATE END POINT]

Enter the endpoint. The following prompt will appear.

CURRENT SCALE:<scale>[INPUT MODE:<mode>][INDICATE CNTR OF DASH]

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Center Crosses

A CENTER CROSS is a small cross intended to be located at the center of an entity. When the CENTER CROSS option is selected, the following message appears.

CURRENT SCALE:<scale>[INPUT MODE:<mode>][LOCATION OF CROSS]

Be sure the cursor position is centered, as its location is where the cross will be placed when the point is digitized. LOCATE CENTER PT will ensure that the center of a line, arc, circle or fillet is chosen.

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NOTES

SECTION 8

DRAFTING: CELLS AND CELL LIBRARY

Figures or symbols which are used repeatedly can be filed as cells in Cell Libraries. For example, logic diagram symbols can be created as drawings and filed as cells in a cell library and then transferred as standard symbols into larger, more complicated drawings.

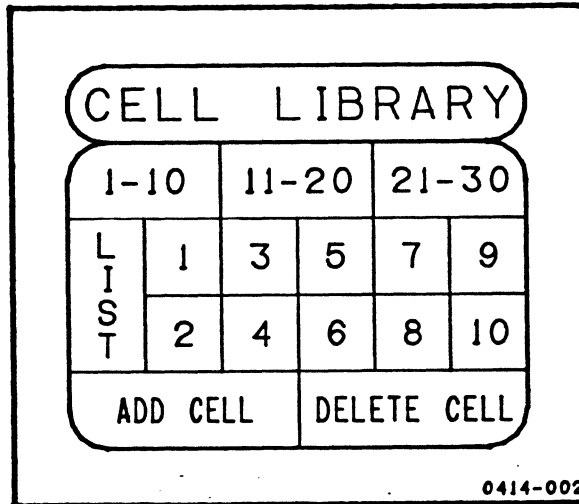


Figure 8.1 - Digitizer Menu: Cell Library

In order to use the appropriate cell library, it must then be LOADED. Creation of cells and cell libraries, their loading and use are discussed in this section.

Creating a Cell

Creating a cell first requires that it be created as a regular drawing.

Once the drawing is complete, the last entity entered on the drawing should be a point, to indicate the point of insertion, called a tag point. Later, when the cell is placed in a drawing, the tag point will be placed at the location you indicate for insertion. If no point is entered, the absolute origin (or the changed reference point) for the cell will be used as the point of insertion.

NOTE

If a small figure is to be created which will require a small grid (e.g., .001), a SCREEN FUNCTION WINDOW should be entered so that the grid painting space is relatively small.

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Digitize the ADD CELL box on the CELL LIBRARIES menu.
The system will respond with the following prompt:

```

-- CELL DIRECTORY --
CELLS 1-10      CELLS 11-20      CELLS 21-30
1. <name><size> 11. <name><size> 21. <name><size>
  :             :             :
  :             :             :
10. <name><size> 21. <name><size> 30. <name><size>

CELL INSTALLATION
PLEASE ENTER THE CELL NAME (6 CHAR. OR LESS) *
```

Enter a name for the cell and enter a <RETURN>. It need not be the same name as the data file. Something which is appropriate to the cell's function is best. When a name has been entered followed by <RETURN>, the system will prompt as follows:

```

IN WHICH CELL SHOULD THIS PART BE STORED (1-30) *
```

The cell will be stored in the specified cell in the file PARTS.CEL, which is the system's Cell Library. Enter the number of the cell followed by <RETURN>.

If you choose a cell number which is already occupied the system will display the following prompt:

```

CELL NUMBER <number> IS ALREADY OCCUPIED: TRY AGAIN
```

The NAME prompt will then reappear.

So far, we have assumed that you are adding a cell to a library that is already created and loaded. If the cell library to which you wish to add a cell is not loaded, you must load it before you can enter a drawing as a cell. This is done through System Utilities: File Maintenance and cannot be accessed through Run Minn-Draft. If the Cell Library has not been created, this must be done first. This is done through the Bookkeeping selection of Run Minn-Draft. Creation of a Cell Library requires loading the supplied cell library EMPTY.CEL. We will describe creating a new cell library since it covers both loading a library and creating one.

Creating A Cell Library

The data disk you receive with the software kit contains six cell libraries: PARTS.CEL and EMPTY.CEL for the creation of new cell libraries; LOGIC.CEL, MECH.CEL, PIPE.CEL and WELD.CEL which contain cells appropriate to their library name. You may add additional cell libraries as you need.

PARTS.CEL and EMPTY.CEL are used in the creation of new cell libraries. Once a cell library is created it should be stored in its own file (e.g., SCHEMA.CEL, ARCH1.CEL, etc.). (See Appendix A concerning loading and storing cell libraries.)

EMPTY.CEL is a cell library file that contains 30 empty cells. The first thing that must be done to create a new cell library is to load this file into the PARTS.CEL file.

When Minn-Draft accesses a Cell Library to use, add or delete a cell, it accesses the PARTS.CEL file. Therefore, the Cell Library you wish to use must be loaded into this file.

Loading a Cell Library is accomplished by entering System Utilities: File Maintenance: Load A Cell Library. The system will ask you to specify the library to be loaded. Type EMPTY.CEL <Return>. The system will copy the specified cell library into the PARTS.CEL file. If you were wanting to use another cell library, or to add or delete cells from it you would type in that name. Exit from System Utilities and return to Run Minn-Draft.

Cells may be added to a cell library either from Bookkeeping or Drafting. If the drawings are all completed you may wish to add them from Bookkeeping; if they are not drawn or need modification it may be easiest to enter them from Drafting.

Cells for libraries are most easily created one at a time in related groups (i.e., all architectural, electrical or mechanical symbols). Up to 30 related symbols can be stored in each Cell File. When you have entered all desired cells in the library, the library should be copied from PARTS.CEL into its own file. This is done with System Utilities: File Maintenance: Store A Cell Library.

Store a Cell Library creates a .CEL file for that library. The system will ask you for the name of the file in which you wish to store your library. Type in the name followed by <Return>. The system will add the ".CEL" extension. A copy of the file remains in PARTS.CEL until another cell library is loaded. This is why EMPTY.CEL must be reloaded each time a new library is begun.

NOTE

Normally, a cell library may hold up to thirty

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cells; however, if the cells are large (have many entities) it may become full with less than thirty cells.

A Cell Library does not have to be full (all 30 cells filled) before being stored in its own file. A library can be stored and later loaded into PARTS.CEL for additions or deletions. If it is modified, it must again be stored in its .CEL file or the changes will not be preserved.

Using a Cell Library

You may have several .CEL files created and stored on the current data disk. Each will have its own title and related figures. Only one cell library may be used at any given time.

First, a cell file must be loaded.

Once the file has been loaded, it is the current library. When you request a cell from the Cell Library menu on the Digitizer Menu, the cell inserted in the drawing will be from the currently loaded cell library.

To insert a symbol from the Cell Library into a drawing, digitize the appropriate cell box on the Cell Library menu on the Digitizer Menu. To check the cell names in the current library, digitize the List box on the Cell Library menu and the cells will be listed.

When you have the correct number, digitize the appropriate box (1-10, 11-20, 21-30). The system will display the following prompt:

MENU SELECT THE DESIRED CELL

Now digitize the rest of the number in the appropriate box. For example, if the correct cell number is 23, digitize the 21-30 box first and then the 3 box. The system will prompt with the following:

CELL NAME: <name>

CURRENT SCALE: <scale> [INPUT MODE: CURSOR][CELL PLACEMENT]

NOTE

If you want the insertion point for the cell to correspond with a GRID point, the input mode must be PT LOCK.

Now digitize the location for the cell. The system will continue to prompt with the STRIKE ANY KEY message, just as with any other drafting entity; digitizing another entity or the blank space above the active cursor area, between the menu boxes will exit entry of this particular cell. Thus, you can copy the cell in several places without having to choose it each time.

To insert a different cell, the above steps should be followed again, selecting the appropriate cell number and then inserting it.

Standard Cell Libraries

Four standard cell libraries are included on your data disk. They contain cells for mechanical, piping, welding and schematics drafting. These four libraries have illustrated inserts for the plastic sleeve on the Cell Library portion of the Minn-Draft Digitizer Menu.

Also included with the standard cell libraries is a package of plastic sleeves and twelve mylar illustration strips of the standard cell libraries, Cell Library Inserts. Each strip is 2-3/8" by 4" and contains ten of the standard symbols.

Each of these cell libraries can be loaded from the data disk onto the system library for use in drafting.

Using the Cell Library Inserts

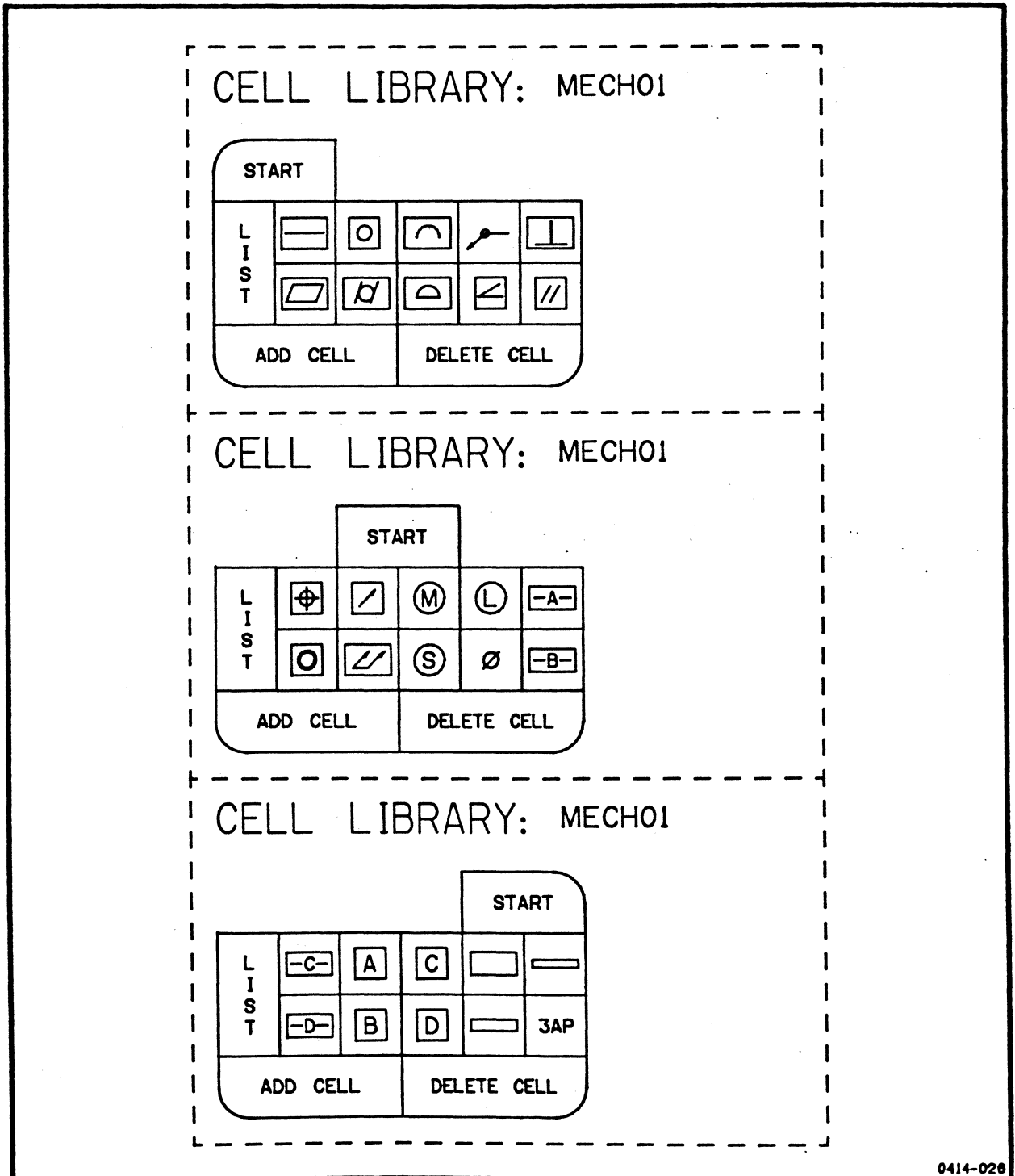
These small 10-cell Cell Library illustrations are set up to make the use of the 30 cell library more effective. Instead of the complicated process of digitizing numbers for each cell, the Cell Library Inserts allow selection of a group of 10 cells to use and then allow you to digitize the actual representation of the cell.

The illustrations are divided into 10 cells each and the "START STOP" section at the top of each illustration strip must be digitized each time before digitizing a cell picture. Only the cells pictured on the strip are available for use with the corresponding "START STOP". To change cell groups, the illustration strip must be changed.

Before the illustration strips are used at all, the appropriate cell file must be loaded into the Cell Library.

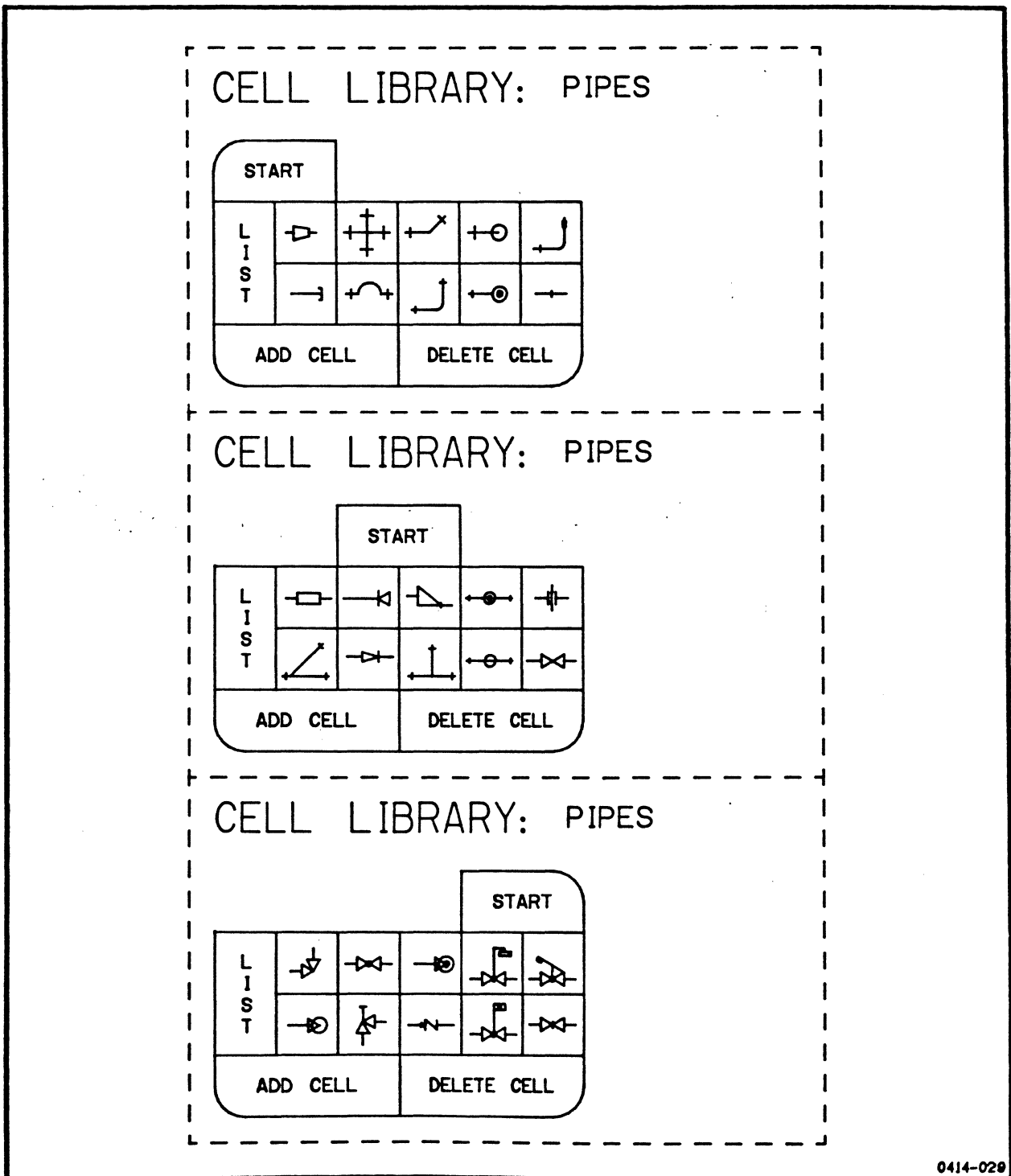
These Cell Library Insert illustration strips can facilitate

student training in systems that use menu-driven symbol libraries in the same way that cells are used with the Minn-Draft system.



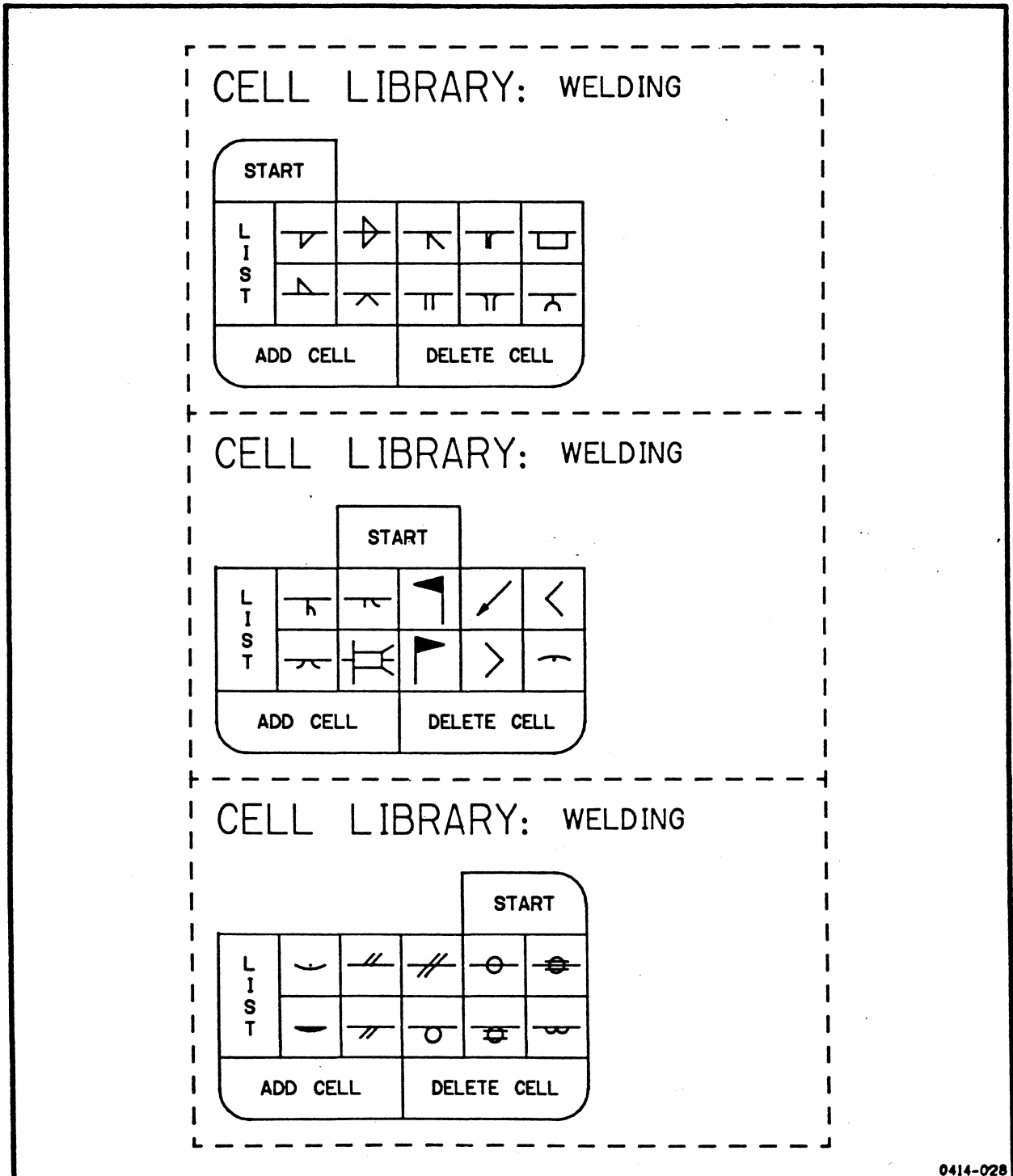
0414-028

Figure 8.2 - Mechanical Cell Library Menu Inserts



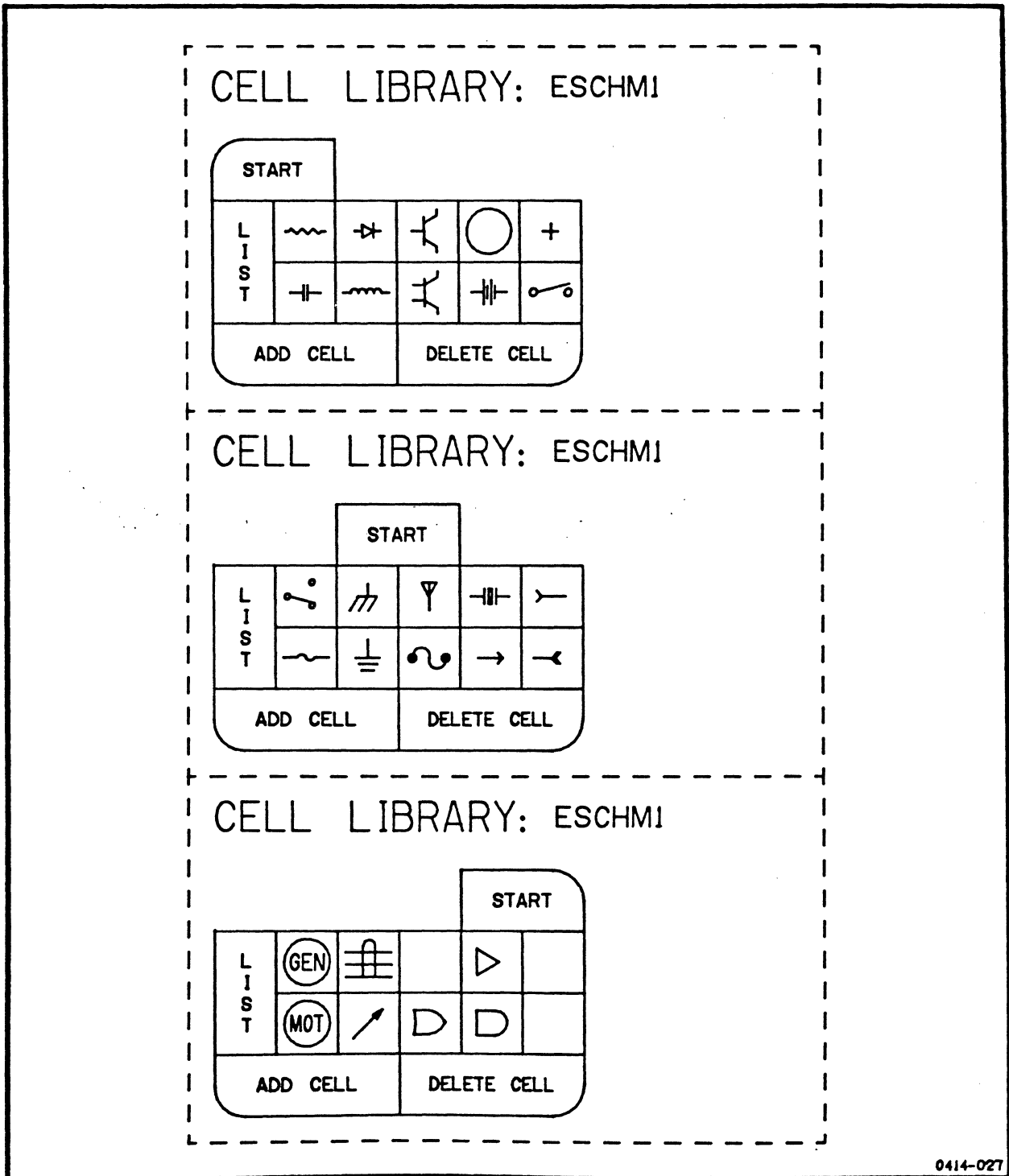
0414-029

Figure 8.3 - Piping Cell Library Menu Inserts



0414-028

Figure 8.4 - Welding Cell Library Menu Inserts



0414-027

Figure 8.5 - Schematics Cell Library Menu Inserts

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NOTES

SECTION 9

DRAFTING: OPERATIONS

The OPERATIONS portion of the Digitizer Menu contains commands that allow existing geometric entities to be moved, copied, deleted or changed in some manner. The OPERATIONS menu may be used by selecting one of seven commands:

- 1) PROJECT
- 2) ROTATE
- 3) TRANSLATE
- 4) SCALE
- 5) CHANGE LAYER
- 6) CHANGE FONT
- 7) DELETE

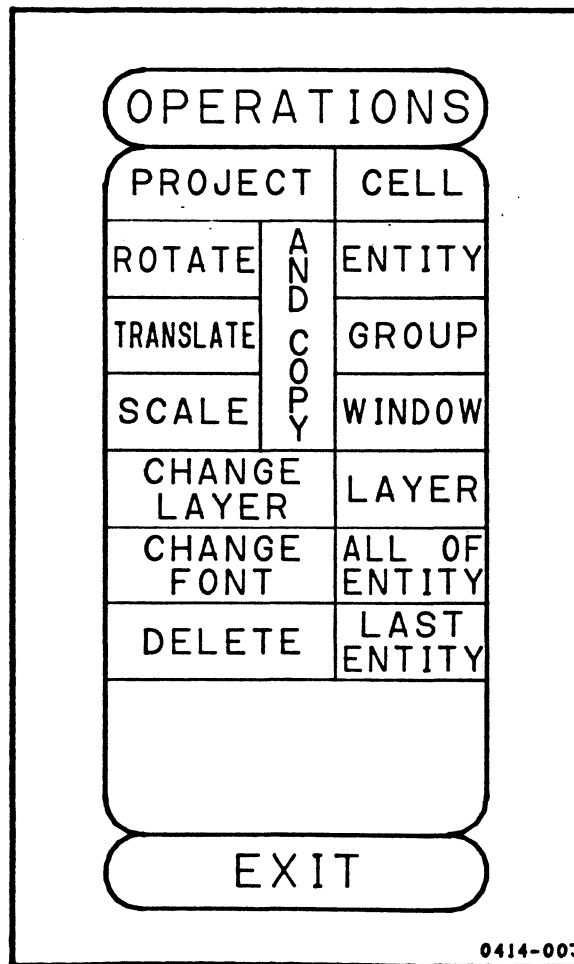


Figure 9.1 - Digitizer Menu: Operations

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PROJECT creates solid entities by projecting a flat entity to a specified depth into or out of the screen. It is commonly used for projecting a two-dimensional object into the screen, resulting in a three-dimensional wire frame object.

ROTATE causes an entity or entities to be rotated.

TRANSLATE moves an entity or entities.

SCALE changes the size of an entity or entities.

CHANGE LAYER changes the current working layer to a different layer.

CHANGE FONT changes the line weight, type or color.

DELETE deletes the specified entity or entities.

ROTATE, TRANSLATE and SCALE may be chosen along with the COPY option to alter an entity and yet leave the original in place.

ROTATE, TRANS and SCALE may be used together in one operation, in any combination.

NOTE

OPERATIONS will not affect dimensions.
Dimensions cannot be ROTATED, TRANSLATED,
COPIED or PROJECTED.

Once the operations to be performed (other than PROJECT) are selected, you may COPY or alter the chosen entities. A copy is made by selecting the operation(s) to be performed (ROTATE, TRANS, SCALE) then selecting COPY. If the COPY option is not selected, the operations are performed on the actual indicated entities rather than on duplicate entities.

If PROJECT is selected, a copy is automatically made at the specified depth and the two joined to create a three-dimensional wireframe object.

After selecting the desired operations, you must specify which entities (i.e. arc, circle, line, point) are to be altered.

You have seven choices:

- 1) CELL
- 2) ENTITY
- 3) GROUP
- 4) WINDOW
- 5) LAYER
- 6) ALL OF ENTITY
- 7) LAST ENTITY

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CELL performs the operation(s) on one cell.

ENTITY performs the operation(s) on a single one entity such as one circle, one line, etc.

GROUP performs the operation(s) on up to ten entities.

WINDOW enables you to select a group of entities by placing a window around them. All entities within the window will be operated on.

LAYER performs the operation(s) on a single layer.

ALL OF ENTITY performs the operation(s) on all entities of a particular type (ie., all lines or all arcs).

LAST ENTITY performs the operation(s) on the last drawn entity.

PROJECT

PROJECT allows an entity or entities to be made into a three dimensional solid by copying its (or their) coordinates to all depths up to a specified distance, either into or out of the current depth.

The discussion below will demonstrate how the PROJECT Operation can be used with the various types of entities to be manipulated: a single ENTITY, a GROUP of entities, a WINDOW, and a CELL.

If you want to project a circle, the PROJECT Digitizer Menu box should be digitized. The system will prompt with the following:

```
OPERATION COMMAND: PROJECT...
```

It will wait for you to indicate what entities are to be operated on: a single entity, a group, a window or a cell.

Single Entity

When you digitize ENTITY, the system will respond

```
OPERATION COMMAND: PROJECT...A SINGLE ENTITY  
INDICATE ENTITY TO BE OPERATED ON  
CURRENT SCALE:<scale>[INPUT MODE:CURSOR][SINGLE ENTITY OPERATN]
```

Move the crosshair near the entity you wish to project and

digitize. After the entity has been identified, the system will ask for the depth of the projection.

PROJECT OPERATION: NOTE: POSITIVE IS OUT OF THE SCREEN
ENTER PROJECTION DEPTH NEGATIVE IS IN TO THE SCREEN

Choose a projection depth and enter it in followed by a <Return>. Either one, or two numbers separated by a comma, are acceptable. When the desired projection depth has been entered, the system will respond with the following:

PROJECTING ----- > PLEASE WAIT <-----

No changes will be seen until a ROTATION is performed. This can be the Operation ROTATION or the ABSOLUTE or RELATIVE ROTATION command from the Screen Functions Section of the Digitizer Menu.

Entity Group

If you want to project a group of entities, the PROJECT option should be digitized first, then the GROUP option. The system will then respond with the following:

OPERATION COMMAND: PROJECT... A GROUP OF ENTITIES
ENTER THE NUMBER OF ENTITIES IN THE GROUP:

Enter the desired number of entities (1-10) followed by a <RETURN>. The system will then prompt as follows:

INDICATE THE <number> ENTITIES, ONE AT A TIME

Specify each entity by moving the crosshair close to the entity and digitizing. A small diamond will appear on each entity to be PROJECTed. If an incorrect entity is specified, digitize OP.REJECT and begin the PROJECT operation again.

After the entities have been specified, the prompts will be the same as for a single entity.

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Window

For a window the prompts are as follows.

```
OPERATION COMMAND: PROJECT...ENTITIES WITHIN WINDOW
INDICATE WINDOW BY TWO OPPOSITE CORNERS
CURRENT SCALE:<scale>[INPUT MODE: CURSOR][ WINDOW OPERATION]
```

Enter the two opposite corners of the window.

Cell

CELL PROJECT selection provides the same prompts as for a single entity. A cell must be indicated as the chosen entity, however. If a regular entity is specified, the system will return with an error message that the entity was not found.

ROTATE

ROTATE reacts similar to the ROTATE command from the SCREEN FUNCTIONS section of the Digitizer Menu, with the exception that it contains the prompts (as does the PROJECT option) concerning the identification of the single entity, the cell, the window or the group of entities to be operated on.

It should also be noted that the OPERATIONS ROTATE command actually rotates an entity, a window or group of entities or a cell separately from the rest of a drawing, rather than changing your point of view. While the rest of the drawing remains located on the normal X-Y-Z axes, the ROTATED object will be relocated in a different orientation.

This is in contrast to the SPECIAL FUNCTIONS ROTATE commands which rotate an entire drawing, resulting in a different orientation of the X-Y-Z axes (which is demonstrated by the COORDINATE AXES DISPLAY in the upper left corner of the screen).

NOTE

There is no RETURN TO PREVIOUS SCALE or RETURN TO ORIGINAL SCALE option in the OPERATIONS section ROTATE command. If <RETURN>s are entered instead of rotation angles for the three axes, no rotation of any type will take place.

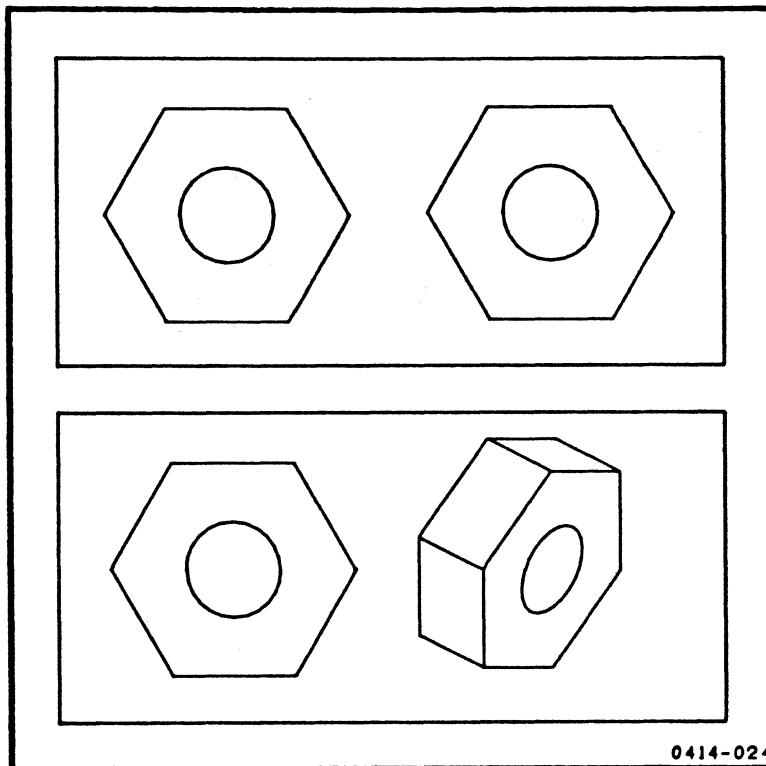


Figure 9.2 - Rotate Window

SCALE

The SCALE option changes the size of an entity, group of entities, window or cell. The SCALE command displays the same prompts for the type of entity to be scaled (window, group, cell, etc.); but after the they are indicated it will prompt with the following:

INDICATE CENTER OF INTEREST
CURRENT SCALE:<scale>[INPUT MODE: CURSOR][OPERATION]

The "center of interest" serves as the center around which the scaling will take place. Move the crosshairs to the point you wish to serve as center of interest and digitize that point. After the center of interest has been specified, the system will prompt as follows:

TYPE IN SCALE FACTOR[INPUT MODE:KEY-IN][-SCALE-OPERATION]

Type or digitize the scale factor followed by a <RETURN> and the system will perform the scaling. No effects will be visible until the screen has been REPAINTed.

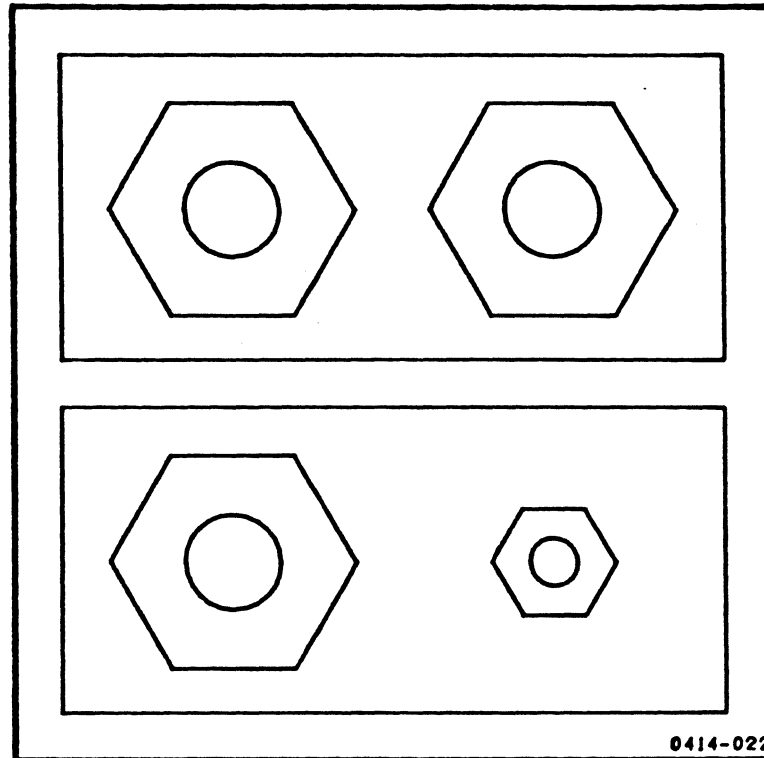


Figure 9.3 - Scale Window

TRANSLATE

The translate operation serves to move an entity, a group of entities, a window or a cell from one location to another on the screen.

When TRANSLATE is chosen, the prompts will be the same as in all other commands for each type of entity chosen (i.e. ENTITY, CELL, WINDOW, GROUP). After the entity/ies have been indicated, the system will prompt as follows:

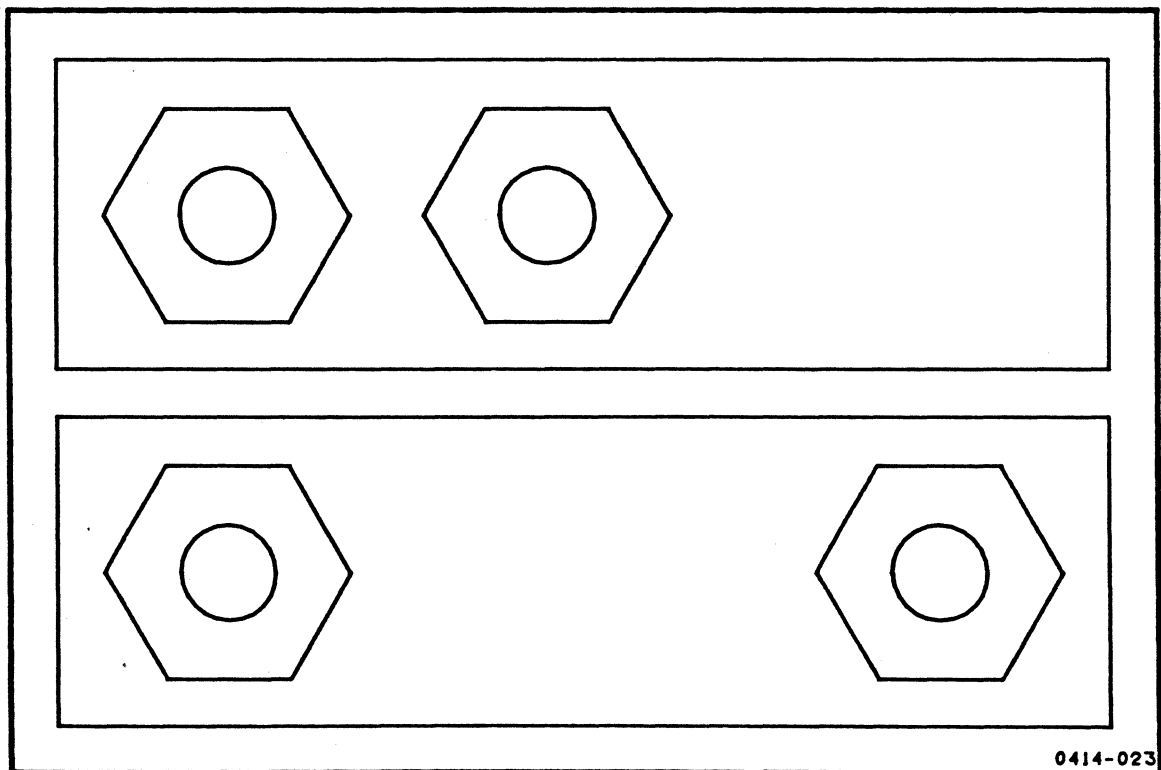
INDICATE START POINT OF TRANSLATION
CURRENT SCALE:<scale>[INPUT MODE: CURSOR][~~-TRANSLATE-OPERATION~~]

Choose a point to serve as a tag point. This point will help the system identify the relation of all the other points in the translation operation. It is the point "to be moved from." After the start point has been specified, the system will display the following prompt:

INDICATE DESTINATION POINT OF TRANSLATION
CURRENT SCALE:<scale>[INPUT MODE: CURSOR][~~TRANSLATE~~-OPERATION]

Choose the point you wish as the new location of the tag point indicated in the last prompt, and digitize. The system will perform the translation. When the screen is REPAINTed, the entities in the original location will be moved to the new location.

If you choose the COPY operation also, it will copy the entities involved in the new location and also leave the original entities as they were. When the screen is repainted, both sets of entities will be available.



0414-023

Figure 9.4 - Translate Window

COPY

If COPY is digitized after any OPERATIONS command (except PROJECT) and before the type of entity is selected, a copy of the entity/ies to be operated on will be made. The drawing will then show both the original entity/ies and new entities with the effects of the OPERATIONS command.

For example, if an entity is to be SCALED, digitizing the COPY command would result in a drawing with the original scale entity as well as the new scale entity.

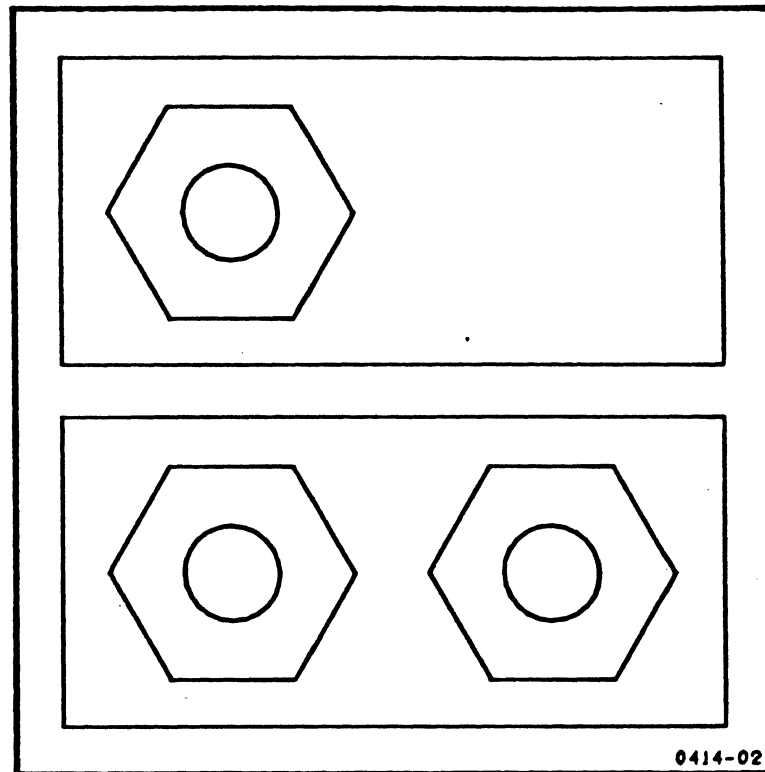


Figure 9.5 - Copy Window

CHANGE LAYER

CHANGE LAYER allows entities already created to be moved to a different layer. When the CHANGE LAYER box on the OPERATIONS menu is digitized, the following prompt will appear.

OPERATION COMMAND: CHANGE THE LAYER OF...

Digitize any of the CELL, ENTITY, GROUP or WINDOW boxes on the OPERATIONS menu. The system will then ask the various prompts to identify the specific entity or entities. These prompts are similar to those listed for PROJECT. Then Minn-Draft will ask for the layer to which the entity or entities are to be moved.

NUMBER OF NEW LAYER (1-24)

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Enter the new layer number. When the screen is repainted the entities that were moved may or may not be repainted, depending on whether the layer is turned on or not.

CHANGE FONT

CHANGE FONT will change the line type, weight or color of the indicated entities. When the CHANGE FONT box on the OPERATIONS menu is digitized the system will ask

OPERATION COMMAND: CHANGE THE FONT OF...

Digitize the cell, entity, group or window box on the OPERATIONS menu. Minn-Draft will next want to know what about the font to change.

CHOOSE NUMBER OF ITEM TO CHANGE
1: LINE WEIGHT
2: COLOR
3: LINE TYPE
SELECTION ?

If you enter 1<Return>, the system will ask

NEW LINE WEIGHT? (1-8)

If you enter 2<Return>, the system will ask

NEW COLOR?
1: WHITE
2: BLUE
3: RED
4: GREEN
5: YELLOW
6: CYAN
7: MAGENTA
8: BLACK
SELECTION ?

If you enter 3<Return>, the system will ask

NEW LINE TYPE?
1: SOLID
2: DASHED
SELECTION?

After each choice has been fully entered, Minn-Draft will repaint the screen. To change more than one characteristic of a font you must reenter the CHANGE FONT option.

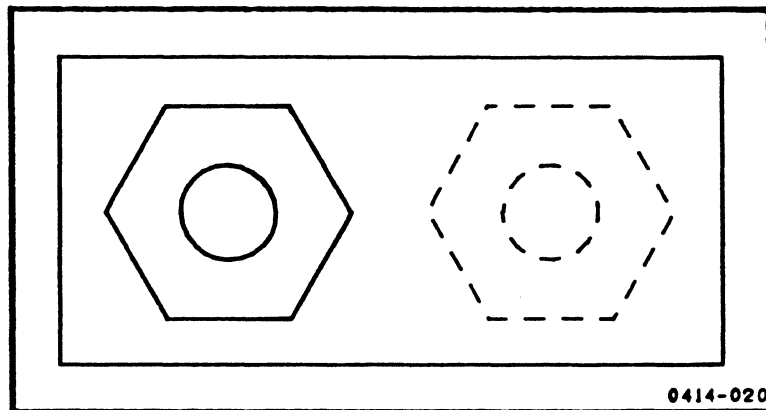


Figure 9.6 - Change Font: Window

DELETE

Items can be deleted by individual ENTITY, by GROUP, by LAYER, by ALL OF A TYPE or by LAST ENTITY. Digitize the DELETE box on the OPERATIONS menu. Then digitize one of the options.

DELETE..<option>

You will be given the prompts to identify the entity or entities. When this has been done the indicated entities will be erased from the screen. The system will "squeeze" the disk to save storage space, and then return to the menu select prompt.

RETURN TO MENU SELECT

After each of the selected OPERATIONS is performed, the system will return to the MENU SELECT prompt.

EXIT

Immediately below the OPERATIONS menu is a box entitled EXIT. Digitizing this box will exit drafting and return you to the Minn-Draft Main Selection Menu.

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NOTES

SECTION 10

DRAFTING: CONSTRUCTIONS

The CONSTRUCTIONS menu provides an easy method of entering points and creating entities at specific, relational positions that are otherwise not easy to identify, such as specifying a point at the intersection of two entities, creating an entity tangent to other entities, drawing lines that are parallel or perpendicular to another line.

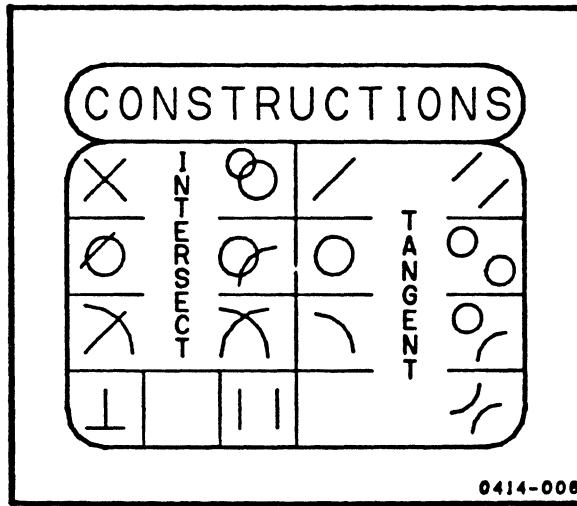


Figure 10.1 - Digitizer Menu: Constructions

INTERSECTION

At times you may want to draw an entity that contains a point at which two other entities intersect. This is provided through the INTERSECT constructions which will draw entities with points at the intersection of two lines, a line and a circle, a line and an arc, 2 circles, a circle and an arc, or two arcs. Any point of any geometric entity (except fillets) can be identified as the intersection of two other (intersecting) entities. The examples given provide a variety of types of points, eg., center points, start points, end points, etc.

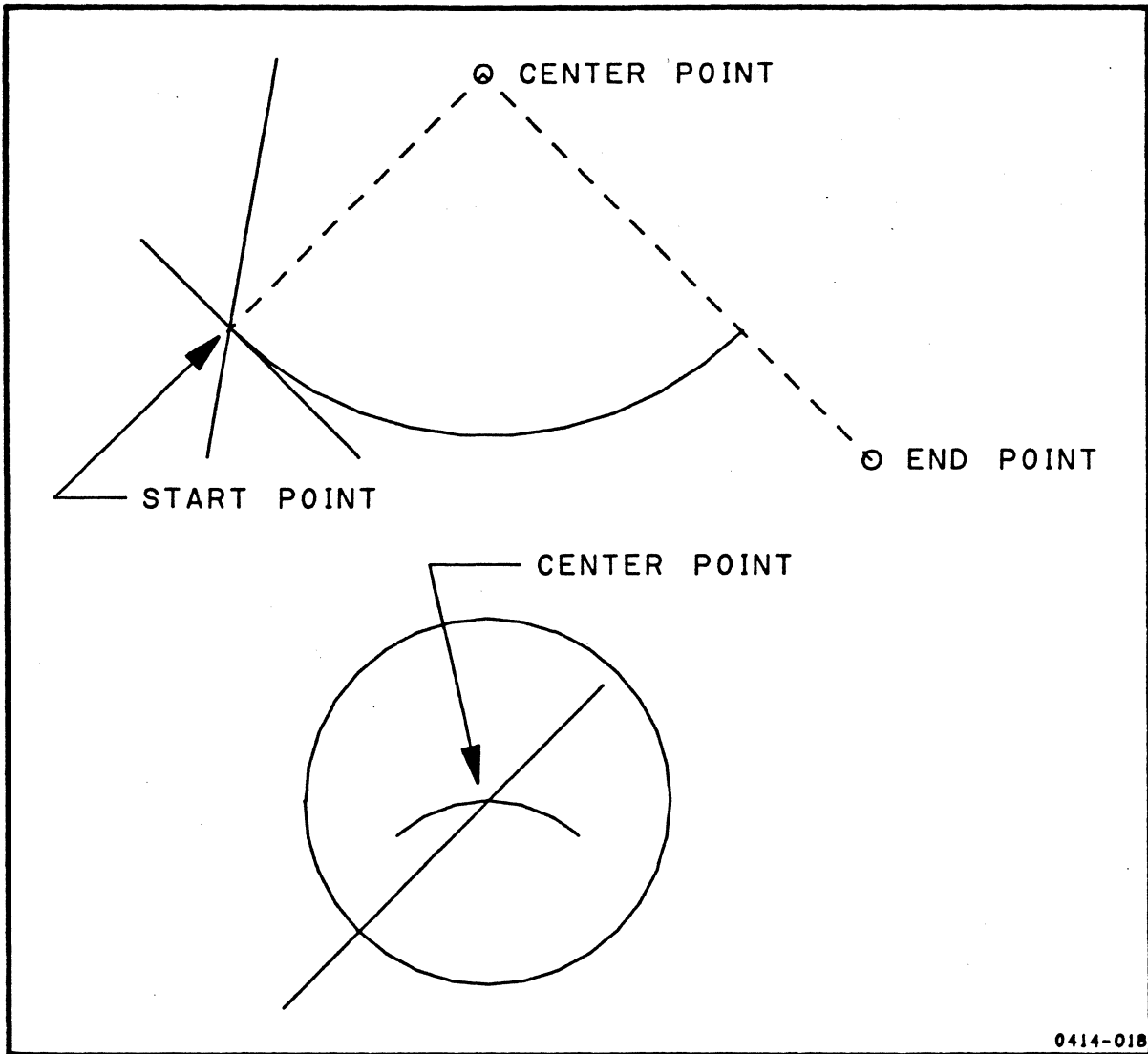


Figure 10.2 - Locating An Input Point At An Intersection

LINE - LINE INTERSECTION

To draw a line with an endpoint at the intersection of two other lines, first enter the start point by any other means (digitize, keyin, LOCATE, GRID, etc). Then digitize the LINE-LINE INTERSECT box on the CONSTRUCTIONS menu. The following prompt will appear:

FIRST LOCATE THE LINE[INTERSECT:LINE-LINE][CURSOR:LINE-PT.2]

Digitize one of the two intersecting lines. You will now receive the prompt:

NEXT LOCATE THE LINE [INTERSECT:LINE-LINE][CURSOR:LINE-PT.2]

Digitize the second of the two intersecting lines. A line will be drawn from the point you first identified to the exact intersection of the two lines. If the two lines did not intersect, you would have received this message.

ERROR NO INTERSECTION. TRY AGAIN.

NOTE

With LINE-LINE INTERSECTION only, either the start or the end point, but not both may be located at the intersection of two lines. The other point may be located at any other type of intersection.

LINE - CIRCLE INTERSECTION

To draw a line with a start point at the intersection of a line and a circle, first digitize the geometric line option. Then digitize the LINE-CIRCLE INTERSECT box on the CONSTRUCTIONS menu. The following prompt will appear:

FIRST LOCATE LINE [INTERSECT:LINE-CIRCLE][CURSOR:LINE-PT.1]

Digitize the intersecting line. You will then be prompted to identify the circle.

NEXT LOCATE CIRCLE [INTERSECT:LINE-CIRCLE][CURSOR:LINE-PT.1]

Digitize a point on the circle close to the desired intersection. (If there is only one intersection, still digitize a point close to the intersection. The computer cannot easily determine whether there is one or two intersections and will, in its calculations, act as if there are two intersections.) Enter the end point by any other means (digitize, keyin, LOCATE or even LINE-CIRCLE INTERSECT). A line will be drawn from the exact intersection of the line and the circle to the point you identified later. If the line and circle did not intersect, you would have received this message.

ERROR NO INTERSECTION. TRY AGAIN.

LINE - ARC INTERSECTION

To draw a circle with a center point at the intersection of a line and an arc, first digitize the CENTER POINT-START POINT CIRCLE box on the GEOMETRY menu. Then digitize the LINE-ARC INTERSECT box on the CONSTRUCTIONS menu. The following prompt will appear:

FIRST LOCATE THE LINE[INTERSECT:LINE-ARC][CURSOR:CENTERPOINT]

Digitize the intersecting line. You will then be asked to identify the arc.

NEXT LOCATE THE ARC [INTERSECT:LINE-ARC][CURSOR:CENTER POINT]

Digitize the intersecting arc close to the desired intersection. (If there is only one intersection, still digitize a point close to the intersection. The computer cannot easily determine whether there is one or two intersections and will, in its calculations, act as if there are two intersections.) Next enter the start point by any means (digitize, keyin, etc). A circle will be drawn with the exact intersection of the line and arc as a center point and the point later identified as the start point. If the line and arc did not intersect, you would have received this message.

ERROR NO INTERSECTION. TRY AGAIN.

NOTE

Spline points cannot be located at LINE-ARC INTERSECTIONS only. The calculations are currently incorrect and if the attempt is made, the point used will be tangent to the arc and ignore the line.

CIRCLE - CIRCLE INTERSECTION

To draw an arc with an endpoint at the intersection of two circles, first digitize either of the ARC options that have endpoints. Enter the required points (center and start or start and arc) by any means. When you receive the prompt for the endpoint, digitize the CIRCLE-CIRCLE INTERSECT box on the CONSTRUCTIONS menu. The following prompt will appear:

FIRST LOCATE CIRCLE[INTRSECT:CIRCLE-CIRCLE][CURSOR:ENDPOINT]

Digitize one of the two intersecting circles near the intersection you want for the endpoint. (Of the two available intersections, the one closest to the point digitized on the first circle will be the one chosen.) You will then receive the prompt:

NEXT LOCATE CIRCLE[INTRSECT:CIRCLE-CIRCLE][CURSOR:ENDPOINT]

Digitize the second of the two intersecting circles. An arc will be drawn using the points you first identified with the endpoint at the exact intersection of the two circles. If the two circles did not intersect, you would have received this message.

ERROR NO INTERSECTION. TRY AGAIN.

CIRCLE - ARC INTERSECTION

To draw a closed spline with a point at the intersection of a circle and an arc, first digitize the CLOSED SPLINE box. Enter the first three points by any means. Then digitize the CIRCLE-ARC INTERSECT box on the CONSTRUCTIONS menu. The following prompt will appear:

FIRST LOCATE CIRCLE[INTERSECT:CIRCLE-ARC][CURSOR:SPLINE-PT.4]

Digitize the circle close to the intersection you desire for an endpoint. (If there is only one intersection, still digitize a point close to the intersection. The computer cannot easily determine whether there is one or two intersections and will, in

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its calculations, act as if there are two intersections.) You will then receive the prompt:

NEXT LOCATE THE ARC [INTERSECT:CIRCLE-ARC][CURSOR:SPLINE-PT.4]

Digitize the arc. Enter the fifth point by any means. A spline will be drawn through the points you first identified through the exact intersection of the circle and arc and the last point back to the first. If the two lines did not intersect, you would have received this message.

ERROR NO INTERSECTION. TRY AGAIN.

ARC - ARC INTERSECTION

To draw a line with an endpoint at the intersection of two arcs, first enter the start point by any means. Then digitize the ARC-ARC box on the CONSTRUCTIONS menu. The following prompt will appear:

FIRST LOCATE THE ARC [INTERSECT:ARC-ARC][CURSOR:LINE-PT.2]

Digitize one of the two intersecting arcs near the desired intersection. (If there is only one intersection, still digitize a point close to the intersection. The computer cannot easily determine whether there is one or two intersections and will, in its calculations, act as if there are two intersections.) You will then receive the prompt:

NEXT LOCATE THE ARC [INTERSECT:ARC-ARC][CURSOR:LINE-PT.2]

Digitize the second of the two intersecting arcs. A line will be drawn from the point you first identified to the exact intersection of the two arcs. If the two lines did not intersect, you would have received this message.

ERROR NO INTERSECTION. TRY AGAIN.

PERPENDICULARITY

To create a line exactly perpendicular to an existing line, first enter the start point. Then digitize the PERPENDICULAR box of the CONSTRUCTIONS menu. The following prompt will appear.

INDICATE THE LINE [PERPENDICULAR LINE] [LINE PT.2]

Digitize any point on the line to which you wish to draw a perpendicular line. The computer will calculate where the start point will connect to the line for an exactly perpendicular lines.

NOTE

If the indicated line does not extend to where a perpendicular line would meet it, the start point will connect to the indicated line's endpoint.

If you had tried to draw something other than a line using perpendicularity, you would have received an error message.

PERPENDICULAR AND PARALLEL MAY ONLY BE USED FOR LINES.

If you had digitized the PERPENDICULAR box before entering the start point, you would have been told:

THE START POINT MUST FIRST BE SPECIFIED.

PARALLEL

The PARALLEL box allows you to create a line parallel to an existing line. Choose one of the geometric line options and enter the start point. Any of the line options are available, but if you choose an axis lock option, the axis lock will override the tangency, and it is unlikely that the line will be tangent. Then digitize the PARALLEL box from the CONSTRUCTIONS menu. You will receive the following prompt.

INDICATE THE LINE [PARALLEL LINE] [LINE PT.2]

Digitize the approximate endpoint. The computer will perform the calculations to make the line exactly parallel to the closest line to which it is nearly parallel.

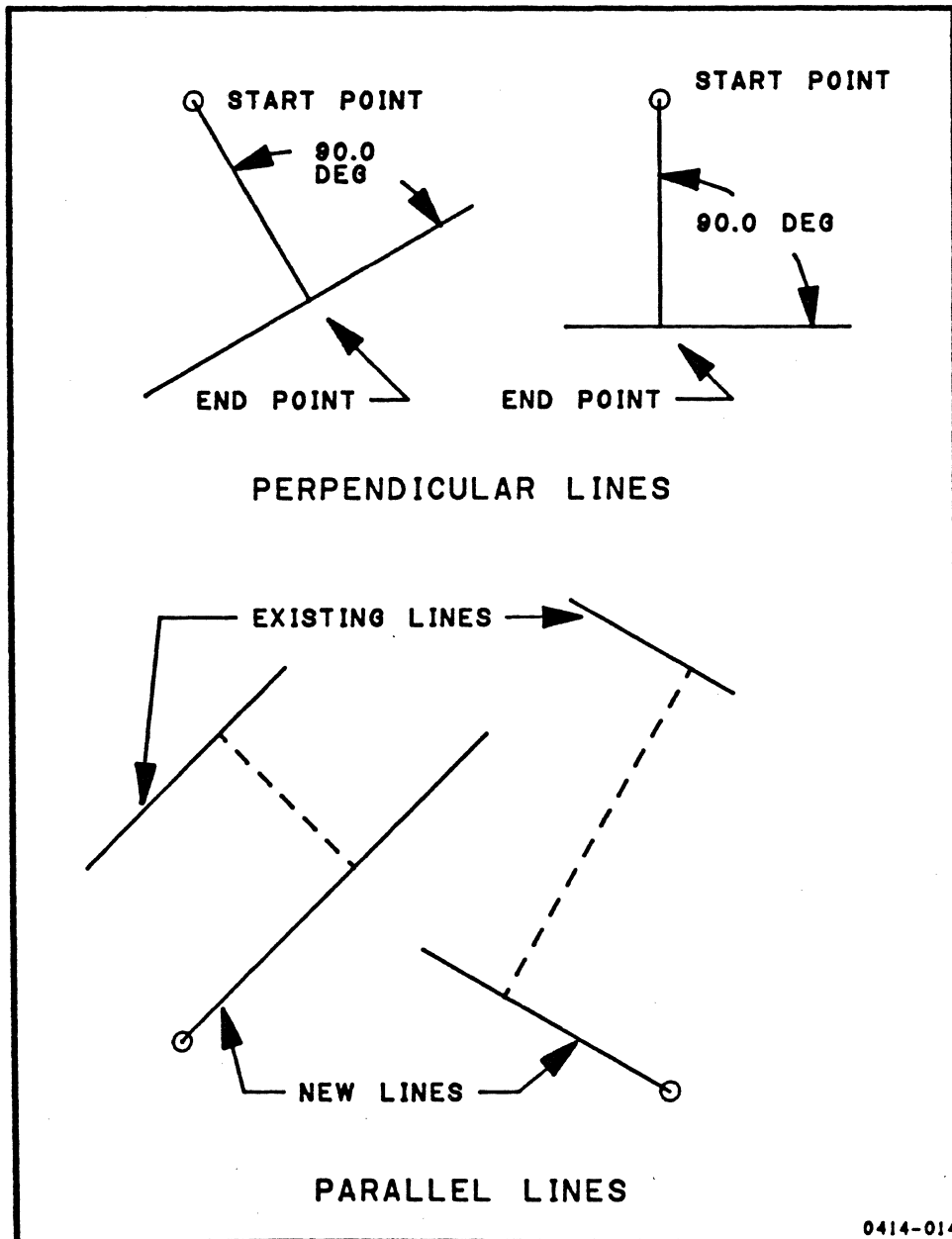


Figure 10.3 - Perpendicular And Parallel Constructions

TANGENCY

MINN-DRAFT can create entities tangent to a line, a circle, an arc, two lines, two circles, a circle and an arc, or two arcs. Points, lines, Center Point-Circle Point circles and Center Point-Start Point-Endpoint arcs can be created tangent to another entity. (Circles and arcs that are tangent to two lines, however, are computed with different input than any of the GEOMETRY menu circles and arcs.)

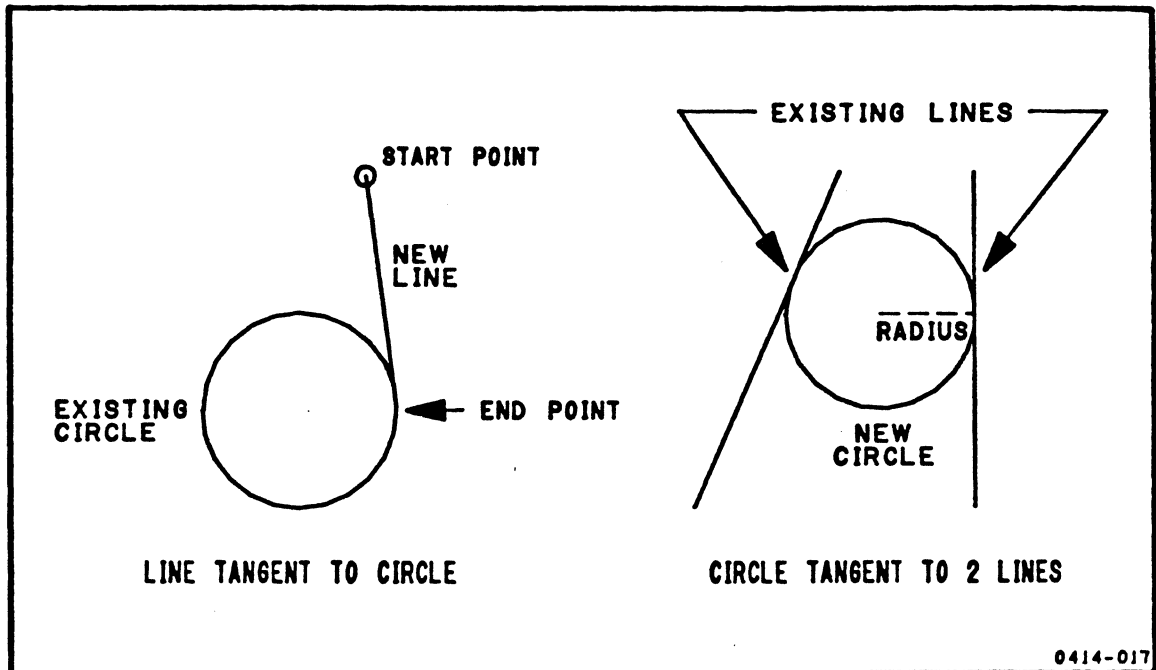


Figure 10.4 - Constructing A Tangent Entity

TANGENT TO A LINE

Circles and arcs can be created tangent to a line. To create a circle tangent to a line, digitize the CENTER POINT-START POINT CIRCLE option and enter the first requested point. Then digitize the TANGENT TO A LINE box of the CONSTRUCTIONS menu. The system will respond with the following.

INDICATE THE LINE [TANGENT TO A: LINE][:START POINT]

Digitize any point on the line you want tangent to the circle you're drawing. The system will then draw the circle using the center point you first entered and the radius that allows it to be tangent to the line you specified. Prompts are similar in creating an arc tangent to a line.

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If you try to digitize this option with another circle or arc option, or use it to enter the center point, the system will respond with:

TANGENCY NOT VALID FOR THIS POINT

Neither lines nor splines may be created tangent to a line. Attempting to do so will result in the following error message.

THIS OPTION NOT VALID FOR DRAWING LINES {or SPLINES}

NOTE

MINN-DRAFT defines tangency such that an endpoint may be considered tangent to a circle if it is located at the circumference, even if, were it extended, it would intersect the circle. This definition also applies to arcs.

TANGENT TO A CIRCLE

Lines, circles and arcs can be created tangent to a circle. As with TANGENT TO A LINE, only the CENTER POINT-CIRCLE POINT CIRCLE and the CENTER POINT-START POINT-ENDPOINT ARC may be used with tangency. With lines only the endpoint may be tangent. Any of the line options are available, but if you choose an axis lock option, the axis lock will override the tangency, and it is unlikely that the line will be tangent. Both the POINT-POINT and the CHAINED line options will create lines with tangent endpoints. Following are examples for an arc tangent to a circle and a line with its start point tangent to a circle.

Digitize the CENTER POINT-START POINT-ENDPOINT ARC box on the GEOMETRY menu. Enter the center point when requested to do so; then digitize the TANGENT TO A CIRCLE box on the CONSTRUCTIONS menu. MINN-DRAFT will ask you to identify the circle.

INDICATE THE CIRCLE[TANGENT TO A: CIRCLE][:START POINT]

Digitize any point on the circle. The system will ask for the endpoint in its normal manner. When the endpoint has been entered, MINN-DRAFT will draw the arc, centered at the center point, beginning at the exact point tangent to the circle, to the

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endpoint specified.

To draw a chained line tangent to a circle, digitize the CHAINED LINE box on the GEOMETRY menu and enter the start point. When asked for any second point, digitize the TANGENT TO A CIRCLE box on the CONSTRUCTIONS menu. You will be prompted for the circle.

INDICATE THE CIRCLE[TANGENT TO A:CIRCLE][CHAINED-LINE PT.2]

Digitize a point on the circle close to where you expect your line to be tangent. Enter additional chained line points in any manner (CURSOR, LOCATE, GRID, etc.), including TANGENCY and INTERSECTION.

As with TANGENT TO A LINE the first point requested may not be the tangent point. If you try to enter one of this point the system will respond with:

TANGENCY NOT VALID FOR THIS POINT

Lines may have their endpoints, but not their start points, tangent to a circle.

Splines may not be created tangent to a circle. Attempting to do so will result in the following error message.

THIS OPTION NOT VALID FOR DRAWING SLINES

TANGENT TO AN ARC

Lines, circles and arcs can be created tangent to an arc. As with TANGENT TO A LINE, only the second requested point may be the tangent point. The CENTER POINT-CIRCLE POINT CIRCLE and the CENTER POINT-START POINT-ENDPOINT ARC are available, and any of the line options are available, but if you choose an axis lock option, the axis lock will override the tangency, and it is unlikely that the line will be tangent. Both the POINT-POINT and the CHAINED line options will create lines with tangent endpoints. Following are examples for a circle tangent to an arc and a line with its endpoint tangent to an arc.

Digitize the CENTER POINT-START POINT CIRCLE box on the GEOMETRY menu. Enter the center point when requested to do so; then digitize the TANGENT TO AN ARC box on the CONSTRUCTIONS menu.

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MINN-DRAFT will ask you to identify the arc.

INDICATE THE ARC [TANGENT TO A: ARC] [:START POINT]

Digitize any point on the arc and MINN-DRAFT will calculate the distance from the center point to the arc and use that as a radii to draw the circle.

To draw a line tangent to an arc, digitize the POINT TO POINT LINE box on the GEOMETRY menu and enter the start point. When asked for the endpoint, digitize the TANGENT TO AN ARC box on the CONSTRUCTIONS menu. The system will ask you to identify the arc.

INDICATE THE ARC [TANGENT TO A: ARC] [LINE - PT.2]

Digitize a point on the arc for your approximate endpoint. The system will draw a line from the start point to an endpoint that is exactly tangent to the arc.

Once again the first point requested may not be the tangent point. If you try to enter a start point the system will respond with:

TANGENCY NOT VALID FOR THIS POINT

Splines may not be created tangent to an arc. Attempting to do so will result in the following error message.

THIS OPTION NOT VALID FOR DRAWING SPLINES

TANGENT TO TWO LINES

Circles and arcs may be drawn tangent to two existing non-parallel lines. First digitize the type of entity (CENTER POINT-CIRCLE POINT CIRCLE or CENTER POINT-START POINT-ENDPOINT ARC). Then digitize the LINE-LINE TANGENT box of the CONSTRUCTIONS menu. For circles, the following prompt will appear.

FIRST LOCATE THE LINE [LINE-LINE TANGENCY] [CIRCLE: CENTERPOINT]

Digitize one of the two lines that is to be tangent to your circle. You will then be prompted for the second line.

NEXT LOCATE THE LINE [LINE-LINE TANGENCY] [CIRCLE: CENTERPOINT]

Now digitize the other line you wish tangent to your circle. The computer will next want to know the radius for the circle.

[TYPE IN RADIUS]

When the radius is entered, MINN-DRAFT will draw a circle with the desired radius, located so that it will be tangent to both requested lines. Prompts for arcs are similar. However, the arc will always open toward the divergent ends of the lines. The two lines must not be parallel, or the following error message will appear.

ERROR--NO TANGENCY. TRY AGAIN.

Also, if the radius entered is larger than half the distance between the divergent endpoints, the circle may be located tangent to their intersection (even if the intersection is not drawn).

Only circles and arcs may be tangent to two lines. Error messages will result from trying to draw lines or splines tangent to two lines.

THIS OPTION IS NOT VALID FOR DRAWING LINES {or SPLINES}

If you enter the first requested point and then select LINE-LINE TANGENT you will be given an error message.

DUAL TANGENCY MUST BE SELECTED WHEN ENTERING THE START POINT

TANGENT TO TWO CIRCLES

Lines may be drawn tangent to two existing circles. first digitize a geometric line option, and enter the start point. Then digitize the CIRCLE-CIRCLE TANGENT box on the CONSTRUCTIONS menu. The following prompt will appear.

FIRST LOCATE THE CIRCLE[CIRCLE-CIRCLE TANGENCY][LINE-PT. 1]

Digitize one of the two circles you wish tangent to the line you are drawing, near where you expect the tangent point. You will then be prompted for the second circle.

NEXT LOCATE THE CIRCLE [CIRCLE-CIRCLE TANGENCY][LINE-PT. 1]

Digitize the second circle near where you want the tangent line. A line will be drawn from the start point which, is tangent to the first circle, to the point where it is tangent on the second circle.

If you enter the start point and then select CIRCLE-CIRCLE TANGENT you will be given an error message.

DUAL TANGENCY MUST BE SELECTED WHEN ENTERING THE START POINT

Circles and arcs cannot now be created tangent to two existing circles, but this feature will be added in a later revision. Trying to do so will cause the following message to appear.

NOT YET IMPLEMENTED

Because of the complexity of the curve, splines cannot be created tangent to two circles through CONSTRUCTIONS. Trying to do so will give an error message.

THIS OPTION IS NOT VALID FOR SPLINES

TANGENT TO A CIRCLE AND AN ARC

Lines may be drawn tangent an existing circle and arc. Digitize a geometric line option. Next digitize the CIRCLE-ARC TANGENT box on the CONSTRUCTIONS menu. The system will respond as follows.

FIRST LOCATE THE CIRCLE [CIRCLE-ARC TANGENCY] [LINE PT. 1]

Digitize a point on the circle near where you expect the line to be tangent. MINN-DRAFT will ask you to identify the arc.

NEXT LOCATE THE ARC [CIRCLE-ARC TANGENCY] [LINE PT. 1]

Digitize a point on the arc near where you expect the line to be tangent. MINN-DRAFT will draw a line from the start point, which is tangent to the circle, to the endpoint where it is tangent to the arc.

If you enter the start point and then select CIRCLE-ARC TANGENT you will be given an error message.

DUAL TANGENCY MUST BE SELECTED WHEN ENTERING THE START

Circles and arcs cannot now be created tangent to an existing circle and arc, but this feature will be added in a later revision. Trying to do so will cause the following message to appear.

NOT YET IMPLEMENTED

Because of the complexity of the curve, splines cannot be created tangent to a circle and an arc through CONSTRUCTIONS. Trying to do so will give an error message.

THIS OPTION IS NOT VALID FOR SPLINES

TANGENT TO TWO ARCS

A line may be drawn tangent to two existing arcs. First digitize a geometric line option. Next digitize the ARC-ARC TANGENT box on the CONSTRUCTIONS menu. The system will ask for the first arc.

FIRST LOCATE THE ARC [ARC-ARC TANGENCY] [LINE PT. 1]

Digitize the first arc close to where you expect it to be tangent to the line you're drawing. The system will then ask for the second arc.

NEXT LOCATE THE ARC [ARC-ARC TANGENCY] [LINE PT. 1]

Digitize the second arc close to where you expect it to be tangent to the line you're drawing. The system will then draw the line from the start point, which is tangent to the first arc, to the tangency point on the second arc.

If you enter the start point and then select ARC-ARC TANGENT you will be given an error message.

DUAL TANGENCY MUST BE SELECTED WHEN ENTERING THE START POINT

Circles and arcs cannot now be created tangent to two existing arcs, but this feature will be added in a later revision. Trying to do so will cause the following message to appear.

NOT YET IMPLEMENTED

Because of the complexity of the curve, splines cannot be created tangent to two arcs through CONSTRUCTIONS. Trying to do so will give an error message.

THIS OPTION IS NOT VALID FOR SPLINES

SECTION 11

OUTPUT

The OUPUT Main Selection Menu option allows a one, two or four view drawing to be plotted, printed or viewed on the graphics screen. A size must be specified for the output drawing. If the output is not directed to a plotter or printer, the drawing will be scaled to fit the screen. Sizes available are "A" size (8 1/2" x 11"), "B" size (11" x 17"), "C" size (17" x 22") or "D" size (22" x 34") sheet.

When OUTPUT is selected the following command line appears.

LAYOUT PREVIEW ZOOM NUDGE BORDER TITLE SAVE GET DELETE OUTPUT QUIT

To access a desired option, type the first letter of that operation followed by <RETURN>.

NOTE

All responses must be made from the keyboard. No input will be accepted from the digitizer keypad.

The Bookkeeping options cannot be changed at this time. Bookkeeping should be set up before output is attempted. In particular, the desired output device should be configured and title block information should be correct in Bookkeeping. Also the output device should be physically connected to the system and powered on. If the Bookkeeping is not correct, you must leave the OUTPUT menu and enter the Bookkeeping option (see Section 12).

Before a drawing can be plotted, printed or viewed on the screen, it must be arranged on the paper or "laid out" and the border and title block chosen if desired. Once the drawing is laid out, it should be PREVIEWed to ensure it is correct.

The NUDGE option can be used to move the drawing, or parts of it, around on the paper or screen. ZOOM can be used to increase or decrease the size of the drawing. BORDER and TITLE attach a border and a title block, respectively, to the layout. Each time a change is made, the drawing should be PREVIEWed to note the

effects of the change. When the drawing is in final order, it can be OUTPUT to a plotter, a printer or the Terak screen. Additionally, layouts may be SAVED, DELETED or listed (GET).

LAYOUT

Before a drawing can be output, a layout must be made. When L<RETURN> is typed, the prompt received depends on the output device which has been configured in the Bookkeeping Section of the Main Selection Menu. (See Section 12.)

If the drawing is to be output on a HILOT, DMP-29, or a DMP-40 plotter or the C. Itoh printer the following prompt will appear.

WHAT SIZE DRAWING DO YOU WANT?

A SIZE = (8.5 X 11")

B SIZE = (11 X 17")

A OR B? *

Enter the proper paper size followed by a <RETURN>.

If the DMP-41 plotter has been configured as the output plotter, the following prompt will appear.

WHAT SIZE DRAWING DO YOU WANT?

A SIZE = (8.5 X 11")

B SIZE = (11 X 17")

C SIZE = (17.00 X 22.00")

D SIZE = (22 X 34")

A, B, C, OR D? *

Enter the proper paper size followed by a <RETURN>.

If the DMP-42 plotter has been configured as the output plotter, the following prompt will appear.

WHAT SIZE DRAWING DO YOU WANT?

A SIZE = (8.5 X 11")
B SIZE = (11 X 17")
C SIZE = (16.54 X 23.39")
D SIZE = (24 X 36")
TYPE M FOR MECHANICAL SIZES

A, B, C, D, OR M? *

If you enter M<RETURN> the following prompt will appear.

WHAT SIZE DRAWING DO YOU WANT?

A SIZE = (8.5 X 11")
B SIZE = (11 X 17")
C SIZE = (17.00 X 22.00")
D SIZE = (22 X 34")

A, B, C, OR D? *

Your response to the size prompt for any output device will cause an outline indicating the sheet of paper to be drawn on the screen. The system will then list the number of drawing views available and their names.

1: <name>
2: <name>
.
.
.
<n>:BLANK

NOTE

The last view listed will be called "BLANK" and allows you to plot a blank view. For

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example, if a drawing consists of three named VIEWS, all three can be plotted by using BLANK as the fourth view.

The following prompt will then appear.

HOW MANY VIEWS DO YOU WANT PRINTED? (1,2 OR 4)

Enter the number of views to be displayed (1, 2 or 4 and <RETURN>). Numbers will appear on the paper outline on the screen, indicating the region the views can appear in. If you specify four views, the numbers 1-4 will appear, one in each corner of the outline. If you choose two views, the numbers 1 and 2 will appear, 1 in the upper left corner and 2 in the upper right corner.

The system will then respond with the following prompt:

ENTER THE NUMBER OF THE VIEW TO BE DISPLAYED IN REGION 1 *

The same prompt will continue, changing the number each time, up to region 4, if four views are to be plotted. The Output options will then be redisplayed.

If you enter the number of a view that has not been created, the system will show an error message and return to the Output options command line.

After the system asks for placement of the views in the regions, it will prompt

Do you want perspective? (Y/N)

If you answer Y, it will respond

Enter the distance from the eye to the screen:

The distance must be larger than 1. The lower left corner of the drawing will be used as the single vanishing point.

PREVIEW

Once the drawing has been laid out with the previous option, the PREVIEW option may (and should) be selected to check the appearance of the drawing before it is plotted. This option will repaint the screen and return to the Output options command line. No changes can be made.

Modification of a drawing or any single view is performed using the NUDGE option (for repositioning) or the ZOOM option (for enlarging or reducing a view). The PREVIEW option should be selected after changes have been made in order to view the results.

ZOOM

The ZOOM option allows the entire drawing (if it is all one view) or separate views to be ZOOMed IN or OUT. The system will prompt with the following:

LOCATE VIEW

Digitize any point within the correct region. Then Minn-Draft will draw a small diamond in the center of the region and ask if it has identified the correct region.

IS THIS THE CORRECT VIEW QUADRANT? (Y/N) *

When Y<Return> is typed the system will ask whether you wish to enlarge or reduce the view.

1. ZOOM IN 2. ZOOM OUT ENTER 1 OR 2

If 1<RETURN> is entered, the system will respond as follows:

ZOOM-IN
PLEASE TYPE IN THE MAGNIFICATION FACTOR
?

Choose a magnification factor, for example 2<RETURN>. The system will respond with the following:

INDICATE CENTER OF INTEREST. STRIKE ANY KEY WHEN DONE

Indicate where the focal point of the view should be by positioning the crosshairs on the desired area. The point you digitize will serve as the center of the object to be ZOOMed. When you strike a key on the keyboard or digitize that point, the Output option command line will be displayed.

If the drawing contains several views, you will first be asked to identify which view to scale. Only one view can be scaled at a time. The drawing must be PREVIEWed to view the results of the ZOOM.

Note

If the scaled view size is too large to fit in the regions, it will be cut at the edges of the regions.

NUDGE

The NUDGE option will move any view or the whole drawing if there is only one view. For example, the drawing may not be centered on the page. Or, if there are separate views, one of them may not be located in the best position in regards to the other views. The NUDGE option allows you to move the views within their regions.

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With multiple views the system will first prompt with the following:

LOCATE VIEW

Digitize a point somewhere near the view to be moved. A small diamond will appear in the center of the indicated region and the system will respond as follows.

IS THIS THE CORRECT VIEW QUADRANT? (Y/N) *

N<RETURN> will redisplay the Output option command line.
Y<RETURN> will display the Starting and Ending position prompts and then the Output option command line.

NOTE

The point for locating the view may be selected anywhere in the correct quadrant. It does not need to be placed on or near the view in that quadrant.

Next, or to move a drawing containing only one view the system will prompt with the following:

LOCATE STARTING POSITION

Digitize the point on the view you wish to have serve as a reference point. This point will become the center of interest. For example, a drawing might be located to the left of the center of the paper. To move the drawing into the center, digitize a point in the center of the figure. When this has been done, the following prompt will appear.

LOCATE ENDING POSITION

Digitize the point to which you wish to move. The "center of interest" or starting point will be relocated to the point you just digitized and the Output option command line displayed.

BORDER

To display and print a border around the drawing, the BORDER option should be chosen. The following prompt will be displayed.

DO YOU WANT TO HAVE A BORDER DISPLAYED (Y/N) *

If Y<RETURN> is entered, a border approximately .1" to .5" in size (depending upon the output device) will be drawn when the drawing is OUTPUT. The border will not show on the screen until it is PREVIEWed.

TITLE

The TITLE option allows a title block to be displayed in the lower right corner of the drawing. Current title block information is listed for verification; the Bookkeeping Main Menu option allows this information to be modified.

When the PREVIEW option is chosen after the TITLE, no text will be displayed in the title block. This reduces REPAINT time. The text will be printed when plotted. However, if output is to the screen, title block information will not be shown.

NOTE

The Bookkeeping options cannot be changed at this time. You must leave the OUTPUT command line and enter the Bookkeeping option (see Section 12.)

If you have entered a Title Block & Border for a previous layout, they will automatically appear on the rest unless turned off.

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SAVE

Enter the layout name in 6 or less characters. One may save a maximum of 10 layouts for each data file.

GET

GET lists the layouts saved and their names.

```
1 <name>
2 <name>
.
.
.
<n><name>

Enter the layout number (1-n)
```

The system will repaint the requested layout and then redisplay the command line.

DELETE

DELETE lists the layouts saved for the current drawing and their names.

```
1 Name
2 Name
.
.
.
n Name

Enter the layout number to be deleted (1-n)
```

The system will delete the requested layout and then redisplay the command line.

OUTPUT

When the drawing has been laid out to your satisfaction, it may be output to the screen display, plotter or dot matrix printer using the OUTPUT option from the OUTPUT command line. Type O<RETURN> and the system will respond with the following:

OUTPUT OPTION

TO WHICH DEVICE IS THE FILE BEING OUTPUT?

- (1.) TERAK SCREEN
- (2.) PLOTTER
- (3.) PRINTER

INPUT 1-3/ ANYTHING ELSE TO QUIT

?

When the output device is specified, the system will respond with one of the following:

PLOTTING, PLEASE WAIT (for the plotter option)

PRINTING, PLEASE WAIT (for the printer option)

REPAINTING (for the screen option)

NOTE

- If a drawing is output to a device that is not currently hooked up to the system and configured in Bookkeeping (see Section 12), the system will respond with an error message and return to the Output command line. The plotter or printer will have to be connected properly and configured using the Bookkeeping option.

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If this happens, type Q<RETURN> to quit the Output command line options. The system will redisplay the Main Menu Selections. You may then enter Bookkeeping to make necessary changes.

- To interrupt a plot or print, type any key. To continue the plot or print, press <RETURN>; to terminate the operation, type T<RETURN>.

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NOTES

SECTION 12

VIEWS

The Main Selection Menu VIEWS option contains all the commands necessary for

- 1) displaying a previously stored view of a figure
- 2) manipulating it until a desired new view is obtained (e.g., rotating it, enlarging or reducing it, selecting which overlays are to be displayed, etc.)
- 3) storing a manipulated view under a new name
- 4) deleting a named view.

NOTE

Only keyboard input is accepted for VIEWS. No input from the digitizer keypad will be accepted.

When the VIEWS option is selected, the following command line appears.

LIST ERASE DISPLAY SCALE ROTATE OVERLAYS FILE QUIT

The first letter of the desired operation should be typed in followed by <RETURN>.

LIST

To list the available views, type L<RETURN>. The views will be listed as below.

1 <name>
2 <name>
. <name>
. <name>
. <name>
n <name>

Each VIEW name is associated with a corresponding number. No manipulations or even display of a VIEW can be done with this

operation. It only serves as a reference list of VIEWS that are created.

ERASE

ERASE allows you to delete a named, saved VIEW. When E<RETURN> is entered, the available VIEWS are listed as in the LIST operation. The following prompt also appears.

ENTER THE NUMBER OF THE VIEW TO BE DELETED *

To delete a VIEW, type the corresponding number followed by a <RETURN>. The VIEW will be deleted and the Operations command line will be redisplayed. There is no chance to see the VIEW before it is deleted with this operation. Be sure to DISPLAY (see below) a VIEW before deleting it.

DISPLAY

To check a VIEW before deleting or any modification, use the DISPLAY operation. The available VIEWS will be listed as in LIST and ERASE. Enter the number from the left column and press <RETURN>. The screen will say "REPAINTING" and the chosen VIEW will be displayed. No manipulations can be performed, but the displayed VIEW becomes the current VIEW, and may then be manipulated using the SCALE or ROTATE operations. The VIEW Operations command line will be redisplayed.

SCALE

SCALE allows you to change the size of the current VIEW. When S<RETURN> is typed the following prompt will appear.

1. ZOOM-IN 2. ZOOM-OUT ENTER 1 OR 2

These function in the same manner as the ZOOM-IN and ZOOM-OUT commands on the Digitizer Menu. See Section 5 for further details.

ROTATE

ROTATE allows you to change the viewing angle of the current VIEW. When R<RETURN> is typed the following prompt will appear.

1. ABSOLUTE 2. RELATIVE ENTER 1 OR 2 *

The ROTATE operation functions in the same manner as the ROTATION commands in the Screen Functions Section of the Digitizer Menu. See Section 5 for further details.

OVERLAY

OVERLAYS allows you to change the working or displayed layers of the current VIEW. When O<RETURN> is typed the following prompt appears.

LAYERS

-
1. CHANGE WORKING LAYERS
 2. CHANGE DISPLAYED LAYERS
 3. LIST LAYER INFORMATION
 4. QUIT

ENTER 1-4 *

This operation functions in the same manner as the LAYERS option from the Main Selection Menu. See Section 5 for further details.

FILE

FILE allows you to save the current VIEW as a named VIEW. When a VIEW has been displayed and then manipulated, it is STILL stored as it appeared originally (under its original name) and can be copied, or FILEd, as it now appears on the screen under a new name. This operation functions in the same manner as the NAME VIEW option in the Special Functions Section of the Digitizer Menu. See Section 5 for further details.

QUIT

QUIT exits the VIEWS option and redisplayes the Main Selection Menu. It must be selected to exit the VIEWS option.

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NOTES

SECTION 13

BOOKKEEPING

The Bookkeeping option of the Main Selection Menu is used to reset various system defaults. For example, the number of decimal places to the right of the decimal place is assumed to be three whenever any dimensioning is done. If some value other than three is desired, select Bookkeeping to make the change.

Bookkeeping is option 4 on the Main Selection Menu. When 4<RETURN> is entered from that Menu this group of Bookkeeping options is displayed for selection.

- BOOK-KEEPING -

1. TITLE BLOCK INFO	6. COORD. AXES DISPLAY
2. UNITS AND SCALE	7. CELL LIBRARY
3. FILE HEADER	8. SYSTEM CONFIGURATION
4. BELL LOUDNESS	9. HIT WINDOW DIMENSION
5. DIMENSION CHARACTERISTICS	10. QUIT

ENTER (1 - 10) *

Each option is selected by entering the number corresponding to the option desired followed by a <RETURN>. These options are described in the following pages.

NOTE

Either 10<RETURN> or just <RETURN> can be used to exit the Bookkeeping Menu. If an incorrect option is entered, use the Backspace key to remove it and retype the correct one.

TITLE BLOCK INFORMATION

This option allows you to enter text information for a drawing title block, including part name, drawing number, the author's name, the organization the person works for or belongs to and the drawing date. When TITLE BLOCK is selected, the following appears.

<u>TITLE BLOCK INFORMATION</u>		
[PART NAME	: <filename>]
[SHEET #	: NONE]
[AUTHOR	: NONE]
[SCHOOL	: NONE]
[DATE	: <date>]

1. PART NAME
2. SHEET NUMBER
3. AUTHOR
4. SCHOOL
5. DATE
6. QUIT

SELECTION (1-6) ?

"None" and the date the file was created will automatically appear the first time the TITLE BLOCK information is displayed. After you alter the information, it will remain unchanged until it is modified again.

1. PART NAME

Typing 1<RETURN> displays the following prompt:

TYPE IN THE DRAWING NAME (UP TO 14 CHARACTERS)	
[CURRENT DRAWING NAME = <filename>]	NEW DRAWING NAME =

Type in the part name and press <RETURN>. You may use up to 14 characters and the name need not begin with a letter.

2. DRAWING NUMBER

Typing 2<RETURN> displays the following prompt:

TYPE IN DRAWING IDENTIFICATION NUMBER (UP TO 14 CHARACTERS)	
[CURRENT SHEET NO. : NONE	NEW SHEET NO. :

Type in the number and press <RETURN>. You may use up to 14 characters and the drawing number need not begin with a letter.

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3. AUTHOR

Typing 3<RETURN> prompts you with the following:

```
TYPE IN YOUR NAME (UP TO 14 CHARACTERS)
[CURRENT NAME:  NONE                ] YOUR NAME:
```

Type in your name and press <RETURN>. You may use up to 14 characters and the drawing number does not have to begin with a letter.

4. ORGANIZATION

Typing 4<RETURN> displays the following prompt:

```
TYPE IN YOUR SCHOOL NAME (UP TO 14 CHARACTERS)
[CURRENT NAME:  NONE                ] YOUR SCHOOL:
```

Type in the name of your school and press <RETURN>.

5. DATE

Typing 5<RETURN> displays the following prompt:

```
[CURRENT DRAWING DATE = <date> ]
DO YOU WANT TO CHANGE TO TODAYS DATE (Y/N) ?
```

Y<RETURN> will change the date on the drawing from when the file was originally opened to the current date. The date will be changed to the one that was entered when the system was booted, provided you entered a date at that time.

You may change all or any combination of these options. The correct option number and <RETURN> should be typed in for each option you wish to change.

6. QUIT

Typing 6<Return> or just <Return> will exit out of TITLE BLOCK and redisplay the Bookkeeping Menu.

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UNITS AND SCALE

The UNITS option enables you to choose the type of measurement that will apply to drawings. The system assumes units of inches, but this may be reset to millimeters, centimeters, meters or feet. When number 2 is selected (UNITS option), the UNIT menu appears.

TYPE OF DRAWING

1. MECHANICAL
2. ARCHITECTURAL
3. OTHER
4. QUIT

ENTER DRAWING TYPE (1-4) *

Choose which type of drawing is to be used and type its number and a <RETURN>.

1. MECHANICAL

Typing 1<RETURN> displays the following prompt:

CURRENT UNITS ARE INCHES

AVAILABLE UNITS:

- 1: INCHES
- 2: FEET
- 3: MILLIMETERS
- 4: CENTIMETERS
- 5: METERS

ENTER NEW UNIT TYPE (1-5) *

Inches is the default; you may select 2-5 for the specific units desired. (Enter 3<RETURN>, 4<RETURN>, etc.) This message then appears.

CURRENT SCALE FACTOR= 1.0000

DRAWING SCALE:

HOW MANY <units> EQUAL 1 INCH ON THE SCREEN ?

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The scale factor represents how many inches currently make up the chosen unit. Eg., if the current unit was inches and you chose feet, the scale factor will be .0833; if the current unit was feet and you choose inches, the scale factor will be 12. Type in the new scale factor (what you type in will equal one screen inch) if you wish to change it. You should press <RETURN> if you wish the scale factor to remain at 1:1.

If the unit chosen was metric, the request will be for centimeters.

When the units are typed in the following will appear on the screen.

```
DIMENSION LABEL TYPE:  
1: DECIMAL  
2: FRACTIONAL  
  
ENTER DESIRED LABEL TYPE (1-2) *
```

Enter whichever type of label type you prefer and press <RETURN>. Decimal labels are the system default.

2. ARCHITECTURAL

Typing 2<RETURN> displays the following prompt.

```
UNITS  
1: ENGLISH (FEET AND INCHES)  
2: METRIC (CENTIMETERS AND MILLIMETERS)  
  
ENTER DESIRED UNITS (1-2) *
```

If you choose the ENGLISH option (1<RETURN>) the following prompt appears.

ENGLISH ARCHITECTURAL SCALES:

- 1: 3/32" = 1'-0"
- 2: 1/8" = 1'-0"
- 3: 3/16" = 1'-0"
- 4: 1/4" = 1'-0"
- 5: 3/8" = 1'-0"
- 6: 1/2" = 1'-0"
- 7: 3/4" = 1'-0"
- 8: 1" = 1'-0"
- 9: 1-1/2" = 1'-0"
- 10: 3" = 1'-0"

ENTER SCALE (1-10) *

Enter the desired scale factor and <RETURN>. This will set the scale. The Bookkeeping Menu will be redisplayed.

The METRIC option (2<RETURN>) will give

METRIC ARCHITECTURAL SCALES:

- 1: 1 CM = 1 METER
- 2: 2 CM = 1 METER
- 3: 4 CM = 1 METER

ENTER DESIRED SCALE (1-3) *

Enter the desired metric scale factor and <RETURN>.

3. OTHER

The third option lists the same available units as does the MECHANICAL option. The Current Units are set to meters though and one meter equals one inch on the screen unless you change it.

Typing 4<RETURN> or pressing the <RETURN> will return you to the Bookkeeping Menu.

NOTES

Units should be selected only once at the outset of a new file before any drafting has been done. Changing the units while drafting is in progress produces erratic results.

If an extremely large scale factor is typed in (for example, 100,000), the system will

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respond with an error message and will give the scale factor prompt again.

The Current Unit will be whatever you last enter from any one of the menus. Ie., if you change to meters and then go to another file and want feet, you will have to reset it to feet. The default is the last entered unit.

FILE HEADER

A file header is text or other commentary entered to describe the drawing in a file.

Type 3<RETURN> (FILE HEADER). The system responds with the following:

```
FILE HEADER:
  NONE
WOULD YOU LIKE TO TYPE IN A NEW HEADER (Y/N) *
```

Type Y<RETURN>. The system then prompts the following:

```
ENTER THE FILE HEADER
(TYPE JUST THE RETURN KEY TO END HEADER INPUT)
```

?

Enter the message. A "?" will be displayed at the beginning of each new line. Example:

```
? THIS IS A DRAWING OF A<RETURN>
? MOUNTING BRACKET FOR AN ACCELEROMETER,<RETURN>
? PROJECT #32 FOR THE MACHINE CLASS<RETURN>
?<RETURN>
```

When the second <RETURN> is entered in a row, the system will display the complete file header as below:

```
THIS IS A DRAWING OF A
MOUNTING BRACKET FOR AN ACCELEROMETER,
PROJECT #32 FOR THE MACHINE CLASS
WOULD YOU LIKE TO TYPE IN A NEW FILE HEADER (Y/N) *
```

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Enter N<RETURN> to redisplay the Bookkeeping Menu and file your header.

NOTE

While still on the line of input (before you press the <Return> key) the BACK SPACE key can be used to correct mistakes.

Each time an old file with a file header is brought into the DRAFTING option, its file header will be displayed before the Main Selection Menu appears.

BELL LOUDNESS

Each time a point or a Digitizer Menu selection is digitized, the system sounds a bell. This option allows the loudness and length of the tone of that bell to be altered.

When the BELL LOUDNESS option is chosen the following message appears.

```
BELL PITCH:  LOW=1   HIGH=10
PLEASE TYPE IN THE DESIRED PITCH (1-10) *
```

Type a number between 1 and 10 followed by a <RETURN>. The system will prompt with the following:

```
BELL DURATION:  SHORT=1  LONG=10
PLEASE TYPE IN THE DESIRED DURATION (1-10) *
```

Type a number from 1 to 10, followed by a <RETURN>. The bell will then sound with the parameters chosen and the system will display the following prompt.

```
IS THIS ACCEPTABLE?  (Y/N)
```

If Y<RETURN> is entered, the system will redisplay the Bookkeeping Menu and file the bell sound.

If N<RETURN> is entered, the prompts will be redisplayed for you to choose again.

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If a duration or pitch number larger than 10 is entered the system will display an error message prompting you to select an acceptable number.

NOTE

The bell option does not work with color systems.

DIMENSION CHARACTERISTICS

This option enables you to change the current characteristics of the dimensioning text. When DIMENSION CHARACTERISTICS is selected Bookkeeping, the following appears.

```
DIMENSION CHARACTERISTICS

[CURRENT DIMENSION HEIGHT      = 0.125 ]
[NUMBER OF PLACES TO RIGHT OF DECIMAL = 3 ]
[CENTERLINE LINE LENGTH       = 1.25 ]
[CENTERLINE DASH LENGTH      = 0.10 ]
[ARROWHEAD TYPE               = TYPE 1 ]
[TEXT LOCATION                 = IN LINE ]

1. CHANGE DIMENSION HEIGHT
2. CHANGE DIMENSION PRECISION
3. CHANGE PROPORTIONS OF CENTERLINE
4. CHANGE ARROWHEAD TYPE
5. CHANGE TEXT LOCATION
6. QUIT

SELECTION (1 - 6) ?
```

The above dimension characteristics are the system default values. You may change all or any combination of them.

1. DIMENSION HEIGHT

Type 1<RETURN> and the following prompt will appear on the screen.

```
NEW DIMENSION HEIGHT =
```

Type a new height between .01 and 9 followed by a <RETURN>. An entry smaller than .01 or larger than 9 will display an error prompt and give the "NEW DIMENSION HEIGHT = " prompt again.

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2. CHANGE DIMENSION PRECISION

Type 2<RETURN> and the following prompt appears.

NEW VALUE, RIGHT OF DECIMAL =

Type in a value between 0 and 5. If the number is smaller or larger, an error message will appear on the screen and the "NEW VALUE" prompt will reappear.

3. PROPORTIONS OF CENTERLINE

Type 3<RETURN> and the following prompt appears.

NEW LENGTH OF LONG LINE =

Type a new length between 0 and 4 followed by a <RETURN>. A negative value or one larger than four will result in an error message.

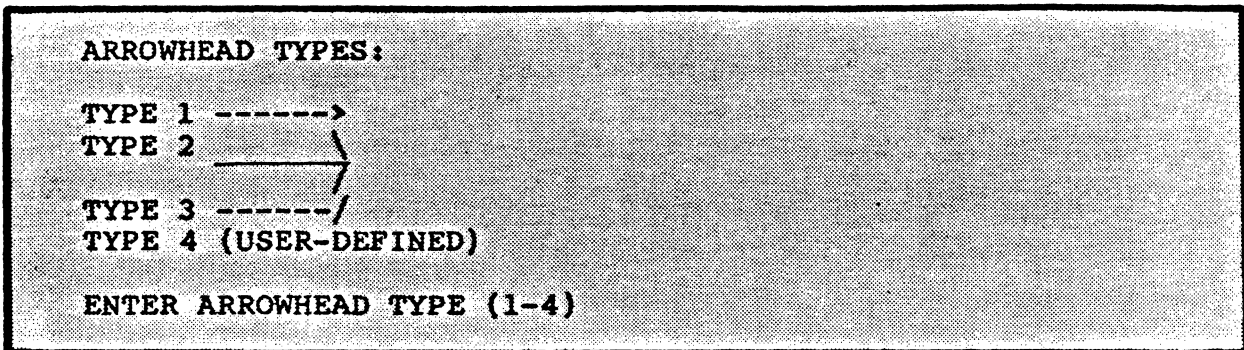
If a value is entered for the long line, you have a chance to change the dashed line. When the long line has been changed, you will receive this prompt.

NEW LENGTH OF SHORT LINE (DASH) =

The length entered (between 0 and 1 followed by a <RETURN>) must be a positive number; a negative number or one larger than 1 will result in an error message. Once the short line length is entered, the Bookkeeping Menu will be redisplayed.

4. ARROWHEAD TYPE

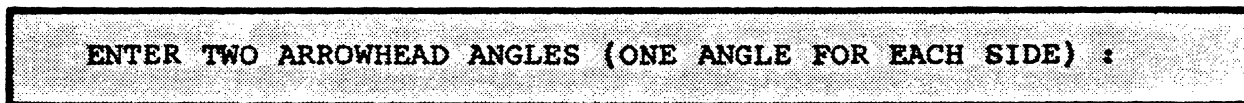
You have the choice of four types of arrowheads with option 4. Three are displayed and the fourth is user-defined. When option 4 is chosen the following prompt is displayed.



The 3 pre-defined types of arrowheads will also be shown on your screen.

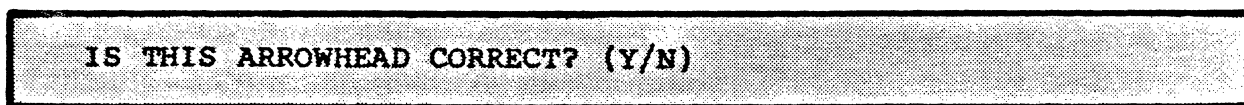
Typing 1, 2 or 3 followed by a <RETURN> will cause that type of arrowhead to be used for dimensioning.

To create an arrowhead, choose 4<CR>; the system will prompt with the following:



You may then type two angles between 0 and 180 degrees, separated by a comma and followed by a <RETURN>. The first angle will define the angle of the top line of the arrowhead; this angle will begin at the arrowhead line and be drawn upwards in the second quadrant. The second angle will define the angle of the bottom line of the arrowhead; it will begin at the arrowhead line and be drawn downwards in the third quadrant. They essentially run backwards from what you would expect.

When the two angles have been entered, the following prompt will be displayed.



A display of the user-defined arrowhead will also be shown. Y<RETURN> will file the arrowhead and redisplay the DIMENSION CHARACTERISTICS Menu. Only entering one angle will cause an error message and a return to the "Enter 2 Arrowhead Angles" prompt.

N<RETURN> will redisplay the DIMENSION CHARACTERISTICS Menu.

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5. TEXT LOCATION

Type 5<RETURN> and the following prompt will appear.

TEXT LOCATION:

1. IN LINE
2. ON LINE

ENTER LOCATION: (1 OR 2)

Enter 1<RETURN> to place dimensions in the dimensioning line or 2<RETURN> to place them above the dimensioning line. The DIMENSION CHARACTERISTICS Menu will be redisplayed.

6. QUIT

6<RETURN> or just <RETURN> will return you to the Bookkeeping Menu.

Each time you enter a new dimension for text, the system will redisplay the Dimension Characteristics List with the changes made and give you the SELECTION prompt again.

COORDINATE AXES DISPLAY

As part of a normal drawing, when an ABSOLUTE or RELATIVE ROTATE option is being used, the current position of the X-Y-Z coordinates appears in a corner of the screen. The COORDINATE AXES DISPLAY option allows you to disable/enable that portion of the screen display.

When 6<RETURN> is entered, this message appears.

DISPLAY COORDINATE ORIENTATION (Y/N) *

Enter Y<RETURN> or N<RETURN>, as desired.

CELL LIBRARY

This option allows you to display the cell directory or add or delete a cell from a library.

When a cell is created, this option may be used to enter the cell into the Cell Library (see Section 7).

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Enter 7<RETURN> and the following prompt appears on the screen:

```
          - CELL LIBRARY -  
  
1. LIST CELL DIRECTORY  
2. DELETE CELL  
3. ADD CELL  
4. QUIT  
  
ENTER (1-4) *
```

LIST CELL DIRECTORY

When 1<RETURN> is entered the system will display the following prompt:

```
          -- CELL DIRECTORY --  
  
CELLS 1-10          CELLS 11-20          CELLS 21-30  
  
1. EMPTY 0 LINES  11. EMPTY 0 LINES  21. EMPTY 0 LINES  
2. EMPTY 0 LINES  12. EMPTY 0 LINES  22. EMPTY 0 LINES  
3. EMPTY 0 LINES  13. EMPTY 0 LINES  23. EMPTY 0 LINES  
4. EMPTY 0 LINES  14. EMPTY 0 LINES  24. EMPTY 0 LINES  
5. EMPTY 0 LINES  15. EMPTY 0 LINES  25. EMPTY 0 LINES  
6. EMPTY 0 LINES  16. EMPTY 0 LINES  26. EMPTY 0 LINES  
7. EMPTY 0 LINES  17. EMPTY 0 LINES  27. EMPTY 0 LINES  
8. EMPTY 0 LINES  18. EMPTY 0 LINES  28. EMPTY 0 LINES  
9. EMPTY 0 LINES  19. EMPTY 0 LINES  29. EMPTY 0 LINES  
10. EMPTY 0 LINES 20. EMPTY 0 LINES  30. EMPTY 0 LINES  
  
0 FILES  0 LINES,  0 BLOCKS  AVAILABLE BLOCK SPACE REMAINING = 64  
  
PAUSE -- PRESS THE -RETURN- KEY TO CONTINUE
```

This is the original Cell Library configuration. All the cells are empty unless a cell library has been loaded. (This is a System Utilities: File Maintenance procedure.)

No modifications can be made with LIST CELL DIRCETORY. It provides a listing of the cells and their contents. When you have a library established, the EMPTY will be changed to the cell name and the number of lines used in the cell will be listed.

A Cell Library can consist of 64 blocks maximum. Note that a running total of the blocks used and the blocks available in each Library is available with this option.

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DELETE CELL

When 2<RETURN> is entered, the system lists the same directory and gives the following prompt:

TYPE IN THE -NUMBER- OF THE CELL TO BE DELETED
?

Type in the number for the correct cell followed by a <RETURN>. If, for example, cell 1 was chosen the system would respond as below:

DELETE CELL #<number>: <cell name> ARE YOU SURE (Y/N)?

Y<RETURN> deletes the cell and redisplayes Cell Library menu. EMPTY would then be listed for the cell name the next time the directory is listed. A new cell drawing may be stored in that cell.

N<RETURN> redisplayes the CELL DIRECTORY and the delete prompt. No deletion will occur.

If you enter the number of a cell which is empty (as all of these are in the example directory above), an error message will appear prompting you to press <RETURN>. The CELL DIRECTORY and the delete prompt will be redisplayed.

ADD CELL

This selection adds a cell to the currently loaded cell library. Add Cell should only be used when the current drawing is to be installed in a cell.

When 3<RETURN> is entered in response to the Cell Library menu, the CELL DIRECTORY is redisplayed and the following prompt is given.

CELL INSTALLATION
PLEASE ENTER THE CELL NAME (6 CHAR. OR LESS) *

Type a name for the cell followed by <RETURN>. This prompt then appears.

IN WHICH CELL SHOULD THIS PART BE STORED (1-30) *

Type a number between 1 and 30 followed by a <RETURN> and the drawing will be stored in that cell.

If you select a cell which already has a part in it the system will display the following error message:

CELL NUMBER <number> IS ALREADY OCCUPIED: TRY AGAIN

The "NAME" prompt will be redisplayed.

Entering <RETURN> or 4<RETURN> will return you to the Bookkeeping Menu.

For more information on how cells are created and used, see Section 7.

SYSTEM CONFIGURATION

The System Configuration provides a list of the current digitizer, plotter and printer types used with the system. This option is used to initially establish or change the configuration.

When the SYSTEM CONFIGURATION - option 8 is chosen the following will be displayed.

SYSTEM CONFIGURATION:

[CURRENT DIGITIZER TYPE	=	NONE]
[CURRENT PLOTTER TYPE	=	NONE]
[CURRENT PRINTER TYPE	=	NONE]

- 1: CHANGE DIGITIZER TYPE
- 2: MENU ALIGNMENT
- 3: CHANGE PLOTTER TYPE
- 4: CHANGE PRINTER TYPE
- 5: QUIT

SELECTION (1-5)?

If the system is not yet set up, all these options will be NONE.

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CHANGE DIGITIZER TYPE

If you have a new system you will be prompted for DIGITIZER TYPE at the time your first DATA FILE SPECIFICATION is entered. The digitizer can be changed at any other time thereafter.

To change the digitizer type, type 1<RETURN> and the following menu will appear on the screen.

WHICH DIGITIZER WILL BE USED:

1. -GTCO- DIGITIZER
2. -HIPAD- DIGITIZER
3. -TERAK- DIGITIZER
4. NONE

ENTER (1-4) *

Type the number corresponding to the type of digitizer your system has and <RETURN>. 4<RETURN> may be used to reset the system as a new system to teach students how to configure their systems.

If you are changing the digitizer type after the initial configuration, the System Configuration Menu will be redisplayed at this point.

If you are configuring your system for the first time, the system will lead straight into the next option, Menu Alignment.

MENU ALIGNMENT

A MENU ALIGNMENT must also be done when the digitizer type is selected at the first system startup. Menu Alignment can also be redone separately when a new menu overlay is placed on the digitizer.

When a picture is placed on the digitizer active drawing area to be traced, this option should be used to ensure that horizontal lines are straight on the digitizer surface.

When 2<RETURN> is chosen from the System Configuration Menu, the following prompt will appear.

IS A HORIZONTAL ALIGNMENT REQUIRED (Y/N) *

Type Y<RETURN>. The following box will appear on the screen.

HORIZONTAL ALIGNMENT

DIGITIZE LEFT AND RIGHT POINTS

Pick a point on the Menu on the left end of a horizontal line and digitize it, then digitize a point on the right end of the same line.

When you have input the two lines, the box under MENU ALIGNMENT will show the line. If it is smooth and straight, without any part jagged, the menu is perfectly aligned. If not, the two points were not perfectly horizontal. Readjust the menu. The following prompt will appear.

TRY THE ALIGNMENT AGAIN? (Y/N) *

If the menu is not straight, type Y<RETURN>. This will display the MENU ALIGNMENT box again and allow a new try.

If you are satisfied with the alignment, type N<RETURN> and the following prompt will appear.

NOW DIGITIZE THE MENU ALIGNMENT POINT

Digitize the small cross in the area marked MENU ALIGNMENT POINT. This cross is located under the section of the Digitizer Menu marked OPERATIONS.

Once this has been done, the System Configuration Menu will reappear.

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CHANGE PLOTTER TYPE

When 3<RETURN> is entered, the following prompt will appear on the screen.

WHICH PLOTTER WILL BE USED:

- 1: HI-PLOT DMP-5 DMP-7
- 2: BAUSCH & LOMB DMP-29
- 3: BAUSCH & LOMB DMP-40
- 4: BAUSCH & LOMB DMP-41
- 5: BAUSCH & LOMB DMP-42
- 6: NO PLOTTER WILL BE USED

ENTER PLOTTER TYPE (1-6) *

(If your plotter is a Houston Instruments PC-595 or DMP-51, select option 4. If your plotter is a Houston Instruments PC-695, select option 2. If your plotter is a Houston Instruments DMP-52, select option 5.)

Type the appropriate number followed by a <RETURN>. A plotter must be chosen before a drawing can be output to the plotter (see Section 10). If no plotter is configured, an error message will appear at the time of output and you will be directed to use this option to configure one.

When a Bausch & Lomb DMP-29 is configured the following prompt will appear.

PEN SPEED SELECTION

- (1.) 1 INCH PER SECOND
 - (2.) 2 INCHES PER SECOND
 - (3.) 4 INCHES PER SECOND
 - (4.) 8 INCHES PER SECOND
 - (5.) 16 INCHES PER SECOND
- INPUT 1-5/ ANYTHING ELSE TO QUIT

?

Type the appropriate number for the speed followed by a <RETURN>. If no number is chosen (ANYTHING ELSE is used to quit), the system will default to the fastest pen speed when the drawing is output to the plotter.

If the Bausch & Lomb DMP-41 or DMP-42 is configured, the

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following prompt will appear.

```
PEN SPEED SELECTION  
  
(1.) 1 INCH PER SECOND  
(2.) 2 INCHES PER SECOND  
(3.) 4 INCHES PER SECOND  
INPUT 1-3/ ANYTHING ELSE TO QUIT  
  
?
```

Type the appropriate number for the speed followed by a <RETURN>. If no number is chosen (ANYTHING ELSE is used to quit), the system will default to the fastest pen speed when the drawing is output to the plotter.

NOTE

The chosen Pen Speed Selection will remain as long as you remains in MINN-DRAFT. When MINN-DRAFT is exited and the System Menu redisplayed, the Pen Speed Selection will automatically default to the fastest pen speed. If another option is desired, it will have to be set each time you are ready to output in MINN-DRAFT.

CHANGE PRINTER TYPE

When 4<RETURN> is entered, the following prompt will appear.

```
WHICH PRINTER WILL BE USED:  
  
1: C.ITOH  
2: NONE  
  
ENTER PRINTER TYPE (1-2) *
```

Type a 1 or 2 followed by a <RETURN>. A printer must be chosen before a drawing can be output to the printer (see Section 10). If no printer is configured, an error message will appear at the time of output and you will be directed to use this option to configure one.

Minn-Draft currently only outputs to a C.Itoh printer. The option NONE can be entered by an Instructor in order to teach students how to configure their systems.

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QUIT

Entering a <RETURN> or 5<RETURN> will exit this option and return to the Bookkeeping Menu.

HIT WINDOW DIMENSION

A Hit Window is a small box used in the Minn-Draft System to identify entities which are the boundaries for crosshatching. When you request crosshatching, you will be asked the number of entities forming the boundary, then asked to identify them. When you move the crosshair to digitize each one, a hit window of the size chosen here will be used for identification.

When 9<RETURN> is typed from the Bookkeeping Menu, the following prompt will appear.

```
DIMENSION OF HIT WINDOW = 0.1250
CHANGE DIMENSION? (Y/N) *
```

The original default value for the hit window is 0.125. If you wish to change that size, type Y<RETURN> to the above prompt. The system will respond with the following prompt:

```
ENTER HIT WINDOW DIMENSION *
```

The size of the hit window must be between .0625 and 1.0. You may type in any number between those limits. Type the new size for the hit window and press <RETURN>. The system will repeat the first prompt with the new size of your hit window as below:

```
DIMENSION OF HIT WINDOW = <new size>
CHANGE DIMENSION? (Y/N) *
```

If you wish to change the size again, type Y<RETURN> and type in the new size when prompted.

When you have determined a proper hit window size, type N<RETURN> to this prompt and the Bookkeeping Menu will appear.

The new hit window size will remain as your new default value. To change the size in a different file, you will need to use this option again.

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QUIT

When 10<RETURN>, or simply <Return> is typed in response to the Bookkeeping Menu display, Bookkeeping is exited and the Main Selection Menu is redisplayed.

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NOTES

APPENDIX A

OVERVIEW OF SYSTEM MENU OPTIONS

Each option on the System Menu is accessed by typing the corresponding number from the System Menu followed by <RETURN>. Each option is discussed in the following manner:

- Procedure Name - the option number and name are identified as they appear on the System Menu
- Procedure Purpose - the option's function is defined
- Procedure Steps - user actions/system responses are documented for each option

SYSTEM MENU

Procedure Name: 1) Run MINN-DRAFT

Procedure Purpose:

This option activates the Minn-Draft program.

Procedure Steps:

Refer to the rest of the Terak Minn-Draft User's Guide for information on how to use the Minn-Draft program.

The complete System Menu is given below for reference.

```
MINN-DRAFT SYSTEM MENU

1)  Run MINN DRAFT
2)  System Utilities
3)  System Shutdown

Enter Choice (1, 2, or 3 and <RETURN>)
```

Minn-Draft is built hierarchically; the following outline shows the menu hierarchy with selection numbers.

- 1) Run MINN DRAFT
- 2) System Utilities
 - 1) Disk Directories
 - 1) CELL Libraries
 - 2) DATA Files
 - 3) BACKUP Files
 - 4) Files on the DATA Disk
 - 2) File Maintenance
 - 1) Load a CELL Library
 - 2) Store a CELL Library
 - 3) Copy a DATA Disk
 - 4) Restore a DATA File
 - 3) DELETE Files
 - 1) Delete CELL Library
 - 2) Delete DATA File
 - 3) Delete BACKUP File
 - 4) Compress Disks
 - 5) Backup Disks
 - 6) Disk Preparation
 - 1) Format & Verify SS/SD Floppy Disk
 - 2) Format & Verify SS/DD Floppy Disk
 - 3) Format & Verify DS/DD Floppy Disk
 - 4) Verify a Floppy Disk
- 3) System Shutdown

SYSTEM MENU

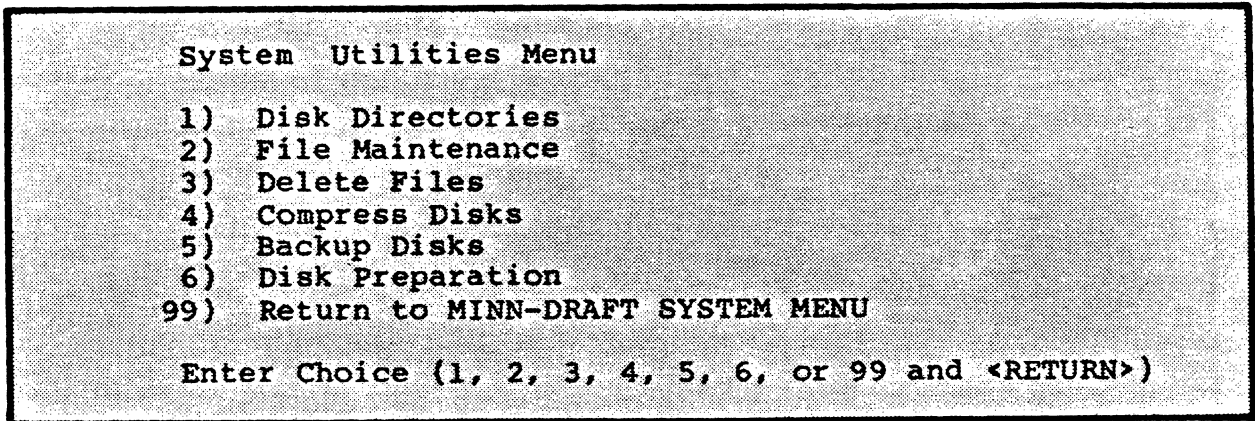
Procedure Name: 2) System Utilities

Procedure Purpose:

This option allows you to perform maintenance procedures such as copying files, backing up disks, deleting files and accessing the disk directories.

Procedure Steps:

- 1) Type 2<RETURN> for the System Utilities Menu. The following menu will appear.



Each of the above options will be described on the following pages.

System Utilities:

Procedure Name: 1) Disk Directories

Procedure Purpose:

This option enables you to display a listing of the CELL, DATA or BACKUP files (or all three together) contained on the Minn-Draft Data Disk. You should consult this list before copying or deleting files (see pages A-9 and A-11).

Procedure Steps:

- 1) Type 1<RETURN> from the System Utilities Menu. The following menu will appear.

```
1) CELL Libraries
2) DATA Files
3) BACKUP Files
4) Files on DATA DISK
99) Return to SYSTEM UTILITIES MENU
```

Enter Choice (1, 2, 3, 4, or 99 and <RETURN>)

- 2) Type the correct number for the type of files you wish to see.

If you choose option 1 (1<RETURN>), the system will list only the files with the extension .CEL (the Cell Libraries) which are found on the Data Disk.

If you choose option 2 (2<RETURN>), the system will list only the files with the extension .DAT (the Data Files) which are found on the Data Disk.

If you choose option 3 (3<RETURN>), the system will list only the files with the extension .BAK (the Backup files) which are found on the Data Disk.

Choosing option 4 (4<RETURN>) will list all the files, regardless of their extensions, which are found on the Data Disk.

The files will be listed for you as follows:

```
      <filetype> ON DATA DISK
      <filename>, <file size>, <creation date>
<total blocks used>, <free blocks>, <contiguous free blocks>

      Press <RETURN> to continue
```

The descriptive phrases listed above will be replaced on your system by actual filenames and numbers. For instance, choosing option 1 (CELL Libraries) might show the following listing:

```
      CELL Libraries on DATA Disk
PARTS.CEL      64      30-OCT-84
74 blocks used, 2168 free blocks, 2168 contiguous free blocks
      Press <RETURN> to continue
```

- 3) After reviewing the list, press <RETURN> to redisplay the System Menu. No changes can be made with this option; it is for viewing only.
- 4) To return to the System Utilities Menu, type 99<RETURN>.

System Utilities:

Procedure Name: 2) File Maintenance

Procedure Purpose:

This option allows you to load or store a Cell Library, to create a copy of a data file under a new name or to restore a data file.

Procedure Steps:

- 1) Type 2<RETURN> from the System Utilities Menu. The following menu will appear.

```
File Maintenance

1) Load a CELL Library
2) Store a CELL File
3) Copy a DATA File
4) Restore a DATA File
99) Return to the SYSTEM UTILITIES MENU

Enter Choice (1, 2, 3, 4, or 99 and <RETURN>)
```

- 2) Choose the appropriate option and type its number and <RETURN>. These options will be discussed in the following pages.

System Utilities: File Maintenance

Procedure Name: 1) Load a CELL Library

Procedure Purpose:

This option is used to load a currently defined and stored cell library into the PARTS.CEL file so that it can be used during drafting. The library that is currently in the PARTS.CEL file will be overwritten, so you should be sure that you store it (see Store a CELL Library, page A-8) before loading a new library.

To create a new cell library, you must use this option to load the file EMPTY.CEL into PARTS.CEL. EMPTY.CEL is a library with no cell files so that you can create your own.

Procedure Steps:

- 1) Type 1<RETURN> from the File Maintenance Menu. The following prompt will appear on the screen:

This option makes the CELL LIBRARY available for use
Load what Library?

- 2) Type the name of the library which you wish to use. For instance, if you are creating a new library, you should type EMPTY<RETURN>.
- 3) When the library has been loaded into PARTS.CEL, the screen will redisplay the File Maintenance Menu.

You may then choose another option or type 99<RETURN> and return to the System Utilities Menu.

System Utilities: File Maintenance

Procedure Name: 2) Store a CELL Library

Procedure Purpose:

This option is used to move a copy of the cell library contained in PARTS.CEL into a new cell file. The original cell library will be maintained in PARTS.CEL until overwritten by another library. (See Load a CELL Library, page A-7.)

When a new cell library is created, the individual cell files are input into the PARTS.CEL file. They do not exist as a group, or library, until they are stored with this option.

After a library has been stored the first time, it does not need to be stored again. Only a copy of the file will be placed in PARTS.CEL when the library is loaded. (See Load a CELL Library, page A-7.)

If cell files are added to or deleted from a library after it has been stored the first time, the edited library must be stored with this option again.

Procedure Steps:

- 1) Type 2<RETURN> from the File Maintenance Menu. The system will respond with the following prompt:

This option makes a copy of the active CELL Library.
Store what Library?

- 2) Type in the name of the new cell library file to be created followed by <RETURN>. The name must be six characters or less, and must begin with a letter. For example, a library of electrical symbols might be called ELECL.

The system will copy the contents of PARTS.CEL into the new file and the File Maintenance Menu will again be displayed.

NOTE

Any stored cell file that already existed with the same name as the new file will be overwritten.

System Utilities: File Maintenance

Procedure Name: 3) Copy a DATA File

Procedure Purpose:

This option allows you to copy a data file under a different name on the same disk.

A duplicate file under a different name can then be edited to produce an entirely different drawing, using the original as a base. Common elements do not need to be redrawn.

Procedure Steps:

- 1) Type 3<RETURN> from the File Maintenance Menu. The screen will display the following prompt:

This option creates a duplicate data file with a new name.
Copy which DATA file?

- 2) Type in the name of the file you wish to copy and <RETURN>. For instance, if you wish to create a copy of the file ELEC1, type ELEC1<RETURN>. The system will respond with the following prompt:

What is the new name?

- 3) Type the new name for the file and <RETURN>. The name must be six or fewer characters in length and begin with a letter. When you have entered the new name, the file will be copied under the new name and retained under its old name. The system will then redisplay the File Maintenance Menu.

You may then choose another option or type 99<RETURN> to return to the System Utilities Menu.

System Utilities: File Maintenance

Procedure Name: 4) Restore a DATA File

Procedure Purpose:

Only data files can be used for drafting. If your system suffers a power-outage or crashes, the file you were working on may be lost or corrupted. Unless you have a backup file (automatically created when you enter drafting for an old file) you will need to recreate the file from scratch.

If you were editing a file, you can use Restore to create a new data file from the backup file; none of the information entered in the current editing session will be available, but all previous information will be included.

Restore overwrites the old file.

Since the backup file becomes the data file, there will be no backup file after this option is used. You must create one again (by entering Drafting) to ensure against further loss.

A backup file must exist for this option to work.

Procedure Steps:

- 1) Type 4<RETURN> from the File Maintenance Menu. The system will respond with the following prompt:

This option restores a DATA file from a BACKUP file.
The BACKUP file will be destroyed.
Restore which DATA file?

- 2) Type the name of the backup file and <RETURN>. For instance, if you wish to restore a file named ELECL, type ELECL<RETURN>.

When the data file has been restored, the File Maintenance Menu will be redisplayed. You can then choose another option or type 99<RETURN> to return to the System Utilities Menu.

System Utilities:

Procedure Name: 3) DELETE Files

Procedure Purpose:

This option is used to delete files on the current data disk. This makes the space the file occupies available for use by another data, cell or backup file.

Procedure Steps:

- 1) Type 3<RETURN> from the System Utilities Menu. The system will display the following Menu:

```
1) Delete CELL Library
2) Delete DATA File
3) Delete BACKUP File
99) Return to SYSTEM UTILITIES MENU
```

Enter Choice (1, 2, 3 or 99 and <RETURN>)

- 2) Type the correct number for the type of file you wish to delete.

If you choose option 1 (1<RETURN>), the system will only allow you to delete files with the extension .CEL (the Cell Libraries) which are found on the Data Disk.

If you choose option 2 (2<RETURN>), the system will only allow you to delete files with the extension .DAT (the Data Files) which are found on the Data Disk.

If you choose option 3 (3<RETURN>), the system will only allow you to delete files with the extension .BAK (the Backup files) which are found on the Data Disk.

The prompt for deletion will be listed for you as follows:

```
This option deletes a <FILETYPE>
The <FILETYPE> will be destroyed.
Delete what <FILETYPE>?
```

- 3) <FILETYPE> will be replaced by the actual type of file you have chosen, e.g., CELL, BACKUP, DATA or Files.

Enter the name of the correct file. You do not need to

indicate an extension (.CEL, .BAK, or .DAT). You did that when you selected the option from the Delete Files Menu.

The system will respond with the following prompt:

```
DELETE (Y/N) DAT:<filename>.<ext>?
```

The DAT: before the filename stands for Data Disk. This indicates that the file you wish to delete is found on the Data Disk.

Choosing option 2 to Delete the example data file ELEC1 would result in the following interaction.

```
This option deletes a DATA file.  
The DATA file will be destroyed.  
Delete what DATA file?
```

When you type in the name ELEC1<RETURN>, the system will respond with the following:

```
Delete (Y/N) DAT:ELEC1.DAT?
```

Type Y<RETURN> and the file will be deleted. The DELETE Files Menu will be redisplayed and you may choose another option or type 99<RETURN> to return to the System Utilities Menu.

Type N<RETURN> and the DELETE Files Menu will be redisplayed. The file will NOT be deleted, however. You may then choose another option or type 99<RETURN> to return to the System Utilities Menu.

System Utilities:

Procedure Name: 4) Compress Disks

Procedure Purpose:

This option is used after a Data Disk begins to accumulate a large number of drawing files, or the Data Disk has been used for a long period of time.

During normal use, the Minn-Draft program creates backup copies of drawing files. Each time a new file is created or an old file is accessed or deleted, a small amount of space is used, then freed, on the Data Disk. This leads to a condition known as "fragmentation" where many small, empty spaces exist on the disk. "Compressing" the disk forms those small spaces into one large space, releasing large areas for use by the Minn-Draft system.

When this fragmentation condition exists to the point that new files cannot be created, the system will display the following message:

```
DATA DISK FULL
COMPRESS THE DISK
DELETE SOME FILES
OR CREATE A NEW DATA DISK

PAUSE -- TYPE A RETURN TO CONTINUE...
```

indicating that the Data Disk does not contain enough open space. This message occurs when you enter Minn-Draft, option 1 on the System Menu.

Whether the message appears or not, it is recommended that a compress operation be performed periodically, particularly if system file activity is heavy and frequent.

Procedure Steps:

- 1) Type 4<RETURN> from the System Utilities Menu. The system will display the following prompt:

```
Place DATA disk to be COMPRESSED into the UPPER drive.
Press <RETURN> to continue
```

- 2) Place the data disk you wish to compress into the upper drive

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and close the door. Press <RETURN> and the following message will appear.

Compressing, please wait.....

A few seconds later, the compress operation will be complete, and the System Utilities Menu will again be displayed.

System Utilities:

Procedure Name: 5) Backup Disks

Procedure Purpose:

This option allows you to make a backup copy of your System and Data Disks. It is always advisable to be sure that you have current backup copies of these disks available. Disks can be easily damaged or destroyed and if backups are not available, the information is lost.

Procedure Steps:

- 1) Type 5<RETURN> from the System Utilities Menu. (The prompts listed are for a dual floppy system, they will vary slightly for a winchester system.) The system will respond with the following prompt:

Place disk to be copied in the LOWER drive.
Place a blank disk in the UPPER drive.

***** WARNING *****
THIS OPERATION WILL DESTROY
ALL FILES ON THE DISK
IN THE UPPER DRIVE

Press <RETURN> to continue, <ESC> to abort

- 2) Remove your System Disk from the lower drive unless you are going to copy it. Put it in its protective envelope and set it carefully aside. Place the disk to be copied in the lower drive and close the drive door.

Put a formatted blank disk of the same type as the disk to be copied in the upper drive and close the door. (For information on formatting and disk types, see Disk Preparation, page A-15.) Or put a disk you wish to write over in the upper drive and close the door. This disk must also be the same type. Press <RETURN>.

- 3) The system will respond with the following prompt:

Copy (Y/N) to DAT:?

- 4) Type Y<RETURN>. The system will begin copying the disk in the lower drive onto the disk in the upper drive. The

procedure will take several minutes. When it is finished, the system will display the following message:

Place the System Disk back in the lower drive.
Press <RETURN> to continue

- 5) If you removed the System Disk in order to copy a Data Disk, remove that Data Disk and replace the System Disk in the lower drive and close the door. Press <RETURN>.
- 6) The System Utilities Menu will be redisplayed. Remove the disk from the upper drive (unless it is a Data Disk copy which you intend to use) and replace it with a Data Disk.

System Utilities:

Procedure Name: 6) Disk Preparation

Procedure Purpose:

This option formats blank disks to be used with the Minn-Draft system. It also verifies them to ensure that they have no flaws. Any new disks that are to be used with the Minn-Draft system should first be formatted. Formatting clears the disk of any data currently on the disk and creates a directory for new information. This means that you may use an old disk for new information, but you will have to format it first, using this option. Any information which was on the old disk will be lost unless you have made a backup copy of the disk.

An option is also included which will verify your disks without formatting them. If you are getting frequent error messages, you may want to use this option to check your disk for bad blocks. If bad blocks (small segments on the disk where information has been erased, or is damaged in some way) do exist, do not use the disk for drafting.

Data and System Disks may be checked with this option. If a Data Disk contains bad blocks, use a new one. If your System Disk contains bad blocks, contact Terak Customer Service.

Procedure Steps:

- 1) Type 6<RETURN> from the System Utilities Menu. The following menu will appear.

```
1) Format & Verify Single Sided/Single Density Floppy Disk
2) Format & Verify Single Sided/Double Density Floppy Disk
3) Format & Verfiy Double Sided/Double Density Floppy Disk
4) Verify Floppy Disk
99) Return to SYSTEM UTILITIES MENU
```

Enter Choice (1, 2, 3, 4, or 99 and <RETURN>)

- 2) These options will be covered in the next pages.

System Utilities: Disk Preparation

Procedure Name: 1), 2), and 3) Format & Verify

Procedure Purpose:

These procedures will format a blank disk or one that already contains information. Any information contained on the disk will be destroyed, so be sure to check the disk for information (eg., System Utilities: Disk Directories: Files On The Data Disk) before you format it. Disks must be formatted before they can be used as Data Disks or backup disks. Formatting will establish a directory on the disk for new information. A verify procedure will also be run to check for bad blocks.

Procedure Steps:

- 1) To format your disks, choose 1, 2 or 3. The option you choose will depend on which type of disks you are using with your system.

The Master Disk Set sent with your system consists of high quality double sided, double density disks. These disks hold the most information. The Master Disks must be backed up on double sided, double density disks. Any further copies must also be double sided, double density disks. Disks must be backed up on the same type of disk.

Terak disks are identified by their labels. (See the illustration on page 3-2 of the Terak Minn-Draft Installation Guide for an example.) White labels indicate single sided, single density disks. Blue labels indicate single sided, double density disks. Yellow labels indicate double sided, double density disks. If you purchase non-Terak disks, you will need to specify which type you need.

Information can be stored on any type of disk. You may use a single sided, single density disk as a Data Disk. But you may only back up disks onto the same type of disk. A single sided, single density Data Disk must be backed up on a single sided, single density disk.

- 2) After choosing option 1, 2 or 3, the following prompt will appear on your screen:

Disk in the UPPER drive will be formatted as <DISK TYPE>
WARNING! THIS OPERATION WILL DESTROY WARNING!
ALL FILES ON THE DISK
IN THE UPPER DRIVE
Place disk in drive, press <RETURN> to continue, <ESC> to abort

- 3) Put the proper type of disk in the upper drive. (Be sure to remove your Data Disk and set it carefully aside.) When the disk to be formatted is inserted in the drive, close the drive door. If you have already put the disk to be formatted in the drive, you will need to open and shut the door latch. If you press <RETURN> and do not, the following prompt will appear.

The drive is not ready. Please verify the following:
1) Disk inserted and door latch closed?
2) Power ON?
Press <RETURN> to continue, <ESC> to abort

- 4) Check to be sure you have the disk to be formatted in the drive and close the door latch. Press <RETURN>. The system will begin formatting the disk. When the format procedure is finished, the verifying procedure will run. The following message will display.

.....:Verifying the disk in the UPPER drive.

- 5) If the disk contains no bad blocks, the system will display the following message when the verification is complete.

The disk in the UPPER drive is ready for use.
Press <RETURN> to continue

- 6) Press <RETURN> and the Format Menu will reappear. You can choose another option or type 99<RETURN> to return to the System Utilities Menu.
7) If your disk has bad blocks, an error message will appear instead of the message in Number 6 above. When this happens,

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repeat the format and verify procedure. If the error message still appears, do not OP`use the disk. Any information you store on a disk with bad blocks may be lost.

System Utilities: Disk Preparation

Procedure Name: 4) Verify Floppy Disk

Procedure Purpose:

This option will verify a floppy disk. Verifying a disk will check for bad blocks (small segments of the disk where information has been damaged or erased). If a disk contains bad blocks, you should not use it.

You can use this option to check your Data and System Disks if you have been getting error messages. If your Data Disk contains bad blocks, do not use it. If your System Disk contains bad blocks, call Terak Customer Service.

Procedure Steps:

- 1) Type 4<RETURN> from the Disk Preparation Menu. The system will display the following prompt:

Please insert floppy to be verified into the UPPER drive
Press <RETURN> to continue, <ESC> to abort

- 2) If you discover you have chosen this option by mistake, press <ESC> and the Disk Preparation Menu will be displayed.
- 3) At this time, remove your Data Disk (unless it is the disk you wish to verify) and insert the disk to be verified. Close the door latch on the drive and press <RETURN>. If you perform this step before you receive the prompt in Number 1 above, the following message will display.

The drive is not ready. Please verify the following:
1) Disk inserted and door latch closed?
2) Power ON?

Press <RETURN> to continue, <ESC> to abort

- 4) When the disk has been inserted and the door latch closed, the system will begin to check the disk. As it checks, it will display the following message:

.....Verifying the disk in the UPPER drive.

- 5) If the system detects problems, it will display error messages. When this occurs, try the VERIFY procedure once more. If the error messages appear again, do not use the disk in the upper drive. If it is a Data Disk, use a new one. If it is your System Disk, call Terak Customer Service.
- 6) If there are no bad blocks on the disk, the system will display the following message:

This disk does not contain any defects.

Press <RETURN> to continue

- 7) This indicates that your error messages are due to something else. This disk can be used. Press <RETURN> and the Disk Preparation Menu will appear. You can now choose another option or type 99<RETURN> to display the System Utilities Menu.

SYSTEM MENU

Procedure Name: 3) System Shutdown

Procedure Purpose:

This option ensures that your system is properly shut down. This is extremely important with winchester systems. If this option is not used and the winchester system is shut off and then moved, damage may result to your winchester.

If you have a winchester system, be sure to use this option before turning off the processor.

Procedure Steps:

- 1) Type 3<RETURN> from the Main Menu. (The prompts shown are those of a dual floppy system. They will vary slightly for a winchester system.) The system will display the following message:

SYSTEM SHUTTING DOWN

PLEASE REMOVE FLOPPIES FROM DRIVE
AND
POWER ME DOWN!

- 2) Remove the floppy disks (or disk, if you have a winchester system), place them in their protective envelopes and set them aside. Push the power switch on the processor unit down. The processor will shut off.

To use the system again, you must press the power switch on the processor unit upwards and insert the floppy disks again. This will display the date and time prompts.

NOTES

APPENDIX B

GLOSSARY

- ACTIVE CURSOR AREA** The area in the lower left of the Digitizer Menu which has no Menu boxes. Used to move the crosshairs or to tape drawings to be traced.
- applications program** A pre-written set of instructions that enables the user to accomplish specific tasks; drafting, word processing, accounting etc. See operating system.
- automatic dimensioning** The means by which the system automatically measures distances and places leader lines, arrowheads and Dimension Text. No user input is required except to define the Bounding Points.
- baud** Transmission rate of bits per second.
- bit** Unit by which the computer measures and transmits information. Stands for binary digit. A bit may be represented by a negative or positive electronic pulse or signal, mathematically represented as 0 or 1. Bits are used to translate numbers, letters and symbols into a code of electrical impulses that can be communicated to the computer. See byte.
- board** A flat, rectangular, usually green piece of plastic inside a computer embossed with circuits and mounted with chips that transmit data through electronic pulses. Also called a printed circuit board, printed wiring board, or card. See chip.
- boot** The act of loading a set of instructions (program) into the computer's memory.
- bounding points** The endpoints defining the length to be measured for Automatic Dimensioning.
- byte** A string of 8 bits. Equivalent to one character.
- CAD** Computer-Aided Design. The use of a computer to create a design and to display that design on a graphics screen or a computer printout. The computer is provided with data concerning the design and rules for creation of the design.

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- cell** A standard symbol drawing such as a logic symbol, a valve drawing, a wall unit drawing for a building, etc.
- cell library** A set of up to 30 related cells which are currently available in the system for use.
- center of interest** A user-specified point to be reassigned as the center of the graphics screen. Figures will be shifted in their original orientations to a new position in relation to this center point.
- chip** A small square consisting of thin films of metal with a backbone of silicon, etched with a pattern of miniscule switches in and on the silicon base. These patterns form electronic circuitry, that can contain logic for decision making, memory of instructions, and other computer functions. Also called an IC (integrated circuit).
- command** A character or string of characters entered in any manner (typed from keyboard, digitized from a menu, etc.) which requests the computer to perform a function.
- command sequence** A series of System Prompts the computer asks in order to perform a command.
- configuration** The specific combination of computer and peripheral devices at a single installation.
- coordinate** The X, Y or Z value of a specific point.
- coordinate axes** The three axes (X, Y, and Z) which are used for coordinate location.
- CPU** Central processing unit. The brains of the computer, consisting of a circuit board with specialized chips. Obtains and decodes instructions.
- crash** An instance of computer equipment becoming inoperable because of a malfunction in the equipment, an error in the program, or interruption of power.
- crosshairs** A horizontal line intersected by a vertical line (+) used to indicate the location of points on the graphics screen. Used with the Active Cursor Area of the Digitizer Menu.

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- CRT** Cathode ray tube. Also called screen display or monitor. Resembles a TV screen. The picture and/or text appearing on the CRT is made up of individual points of light.
- cursor** A blinking or flashing symbol on the screen, which marks the point at which data may be entered. Used with System prompts.
- cursor unit** A puck, pen or stylus used to locate points. See digitizer.
- data base** All of the data files of the entire system.
- default** A value or option assigned by the computer when another one has not been specified by the user.
- digitize** either 1) to move the Cursor Unit to a location on the Digitizer Menu and press the button on the puck or gently press down the tip of the digitizing pen (stylus), or 2) to move the screen crosshairs via the keyboard arrows or the Cursor Unit in the Active Cursor Area on the Digitizer Menu; when the crosshairs are in the desired location hit any key on the keyboard (except the arrow keys) or press the the puck button or stylus tip.
- digitizer tablet** A tablet which has a electronically sensitized surface. Beneath the surface is a grid of wires. When a point is located on its surface by a cursor unit, the location is stimulated electromagnetically and converted into digital coordinate (X-Y) data for transmission to the computer.
- dimension text** The actual numbers of a dimension clump rather than the leader lines or arrowheads.
- disjoined** Separated or detached. Used most commonly when the end points of two lines do not match exactly.
- disk** A magnetized platter, resembling a 45 rpm record, that serves as a recording media and storage area for information. Also called a floppy disk because of its physical flexibility, or diskette.
- disk drives** One or more slots in a hardware unit into which disks are inserted. Inside the drive, the disk spins rapidly, and the computer locates and obtains information on the disk (reads) or records information (writes) on the disk. Disk

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drives allow information to be sent back and forth between the disks and the computer. Typically two drives are used; one drive contains the system disk with the operating system and/or applications software, the second holds a disk containing data files.

- documentation** Manuals, guides or other printed matter that provide information on how to use, install, program or repair computer equipment.
- entity** A primitive figure used to create larger figures and drawings; e.g., line, point, circle, arc, spline, etc.
- floppy disk** A disk, usually 5 1/4 inches in diameter, made of a flexible piece of Mylar and coated with magnetic material to store data.
- format** To prepare a disk to accept data.
- geometric entity** A figure such as a line, point, circle, etc., as opposed to text, labels or dimensions.
- geometric input** A method of input using the Digitizer Menu to enter geometric entities.
- hard copy** A printed or plotted version of data stored in the computer.
- hardware** Physical equipment making up a computer (disk drive, printer, plotter, central processing unit, etc.).
- initialize** To set up storage locations and a file directory on a disk.
- input device** Any device used to "feed" information into the computer (keyboard, digitizer, etc.) See also output device.
- input mode** The method of entering coordinates for point location; e.g., Absolute Coordinate, LOCATE POINT ON, GRID, etc.
- insertion point** The point on a cell which will correspond to the point at which the user designates the cell should be located on the graphics screen. Called a "datum point" on some systems.

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interface	A pluglike area on the computer where printers, plotters and other devices may be attached to the computer. Also called a port. A serial port or interface receives the data in bits from the computer in a sequential manner. A standard serial interface, called RS-232, uses a twenty-five pin plug.
keyboard	A collection of buttons (also called keys) arranged in a standard pattern, usually a typewriter arrangement. Each key represents one or more alphanumeric characters, symbols, or functions. Keystrokes result in the transmission of ASCII codes to the system processor.
layer	A concept used to distinguish subdivided groups of data in a drawing. May be thought of as a series of transparencies overlaid in any order, yet having no depth.
line font	Characteristics of a line to be drawn, such as thickness, color, solid or dashed.
memory	The area in a computer where information is stored. Several different types of memory reside in a computer.
menu	A list of commands or special functions displayed on the CRT screen from which the user can choose.
operating system	A type of software that distributes the resources of a computer to various programs or tasks upon user request.
origin	0,0,0 on the coordinate axis system. Initially located at the lower left corner of the graphics screen, digitizer or plotter.
output device	A hardware component that allows the user to produce a printed or plotted hard-copy of data stored in the computer.
peripheral	Another name for an input or output device, such as keyboards, CRTs, printers, plotters, etc.
power down	To turn off the computer's processor, disk drives, and peripherals, if present.
power up	To turn on the computer's hardware.

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program	A logically arranged set of instructions defining the operations to be performed by a computer to achieve the desired results.
project	Tracing a profile into the screen, away from the user, to create a <u>3-D</u> wireframe object from a 2-D figure.
prompt	Messages displayed on the CRT screen that are the computer's response to user entries or requests. Prompts also verify and request user actions. Also called System Prompts.
reference point	A user-defined point other than the origin used to locate Delta or Delta Polar coordinates.
repaint	To redraw the display image on the graphics screen to reflect its updated status.
rotation center	A user-specified point around which the displayed drawing or object is rotated.
single line entry	Entering coordinates in a string separated by commas, rather than entering each separately in response to a prompt. E.g., 2,3,4<CR>.
software	Refers to all types of programs, operating systems and other sets of instructions that direct the computer's use of its resources.
strike point	The point on a circle where a leader arrowhead will be located.
system prompt	A message from the computer system requesting the user to enter information. See also prompt.
text	1) All system prompts and user responses appearing on the graphics screen. 2) Dimensions and labels entered as part of a drawing.
translate	Moving an image on the graphics screen without rotating the image.
winchester disk	An enclosed, rigid, 5-1/4" magnetic storage disk.
window	A rectangle drawn on the display screen outlining an area chosen by the user for magnification.
working layer	The layer on which entities are stored as they are created.

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working plane The plane on which the user is currently entering entities.

zoom To enlarge or decrease proportionally the size of the displayed entities by rescaling them in answer to system prompts.

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NOTES