T-SQUARE

2D DRAFTING SYSTEM

DESIGNER'S REFERENCE MANUAL

RELEASE 1.5

AUGUST 1981

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# FREFACE

This manual describes the functions and operations of the T-SQUARE 2D Drafting System which operates under the UCSD Pascal operating system utilizing the SIGGRAPH CORE-79 compatible graphics extension package provided by TERAK. The system requires a TERAK 8510/a processor, Houston Instruments or Summagraphics disitizer, Houston Instruments DMP-7 11"x17" plotter and optionally a TERAK 8512 expansion unit and printer. The hardware and software has been integrated by T&W Systems, and is available from TERAK, or from sales agents or from T&W directly.

For information about the operating software and the hardware see the following publications:

Publication No. Description

Company

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SOFTECH TERAK	60-0046-001	UCSD Pascal version II.0 UCSD PASCAL VII.0 SIGGRAPH CORE-79

TERAK 50-0000-001 Model 8510/a Installation Instructions
TERAK 52-0002-001 Video Display and 24K Memory System
User Reference Guide
TERAK 52-0006-001 8532-2 Keyboard Specifications and Use
HOUSTON INSTRUMENTS HI Pad User Manual

HOUSTON INSTRUMENTS IMP-7 Plotter User Manual

NOTE: All above documentation is supplied with the turnker T-SQUARE.

# T-SQUARE 2D DRAFTING SYSTEM DESIGNER'S MANUAL Release 1.5

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# SECTION 1 - GENERAL INFORMATION

# 1.1 SYSTEM INTRODUCTION

The T-SQUARE 2D Drafting system is designed to build up a symbolic drawing using a digitizer and Keyboard for input, a graphics screen for review and editing the drawing, and an X-Y plotter for placing the drawing on bond, vellum or mylar. The system can be used to build up cells (or files) of complex symbols or figures from primitive objects and text and then to combine the cells into complete drawings.

The T-SQUARE - 2D Drafting System is designed to produce high quality, high resolution drawings utilizing a low cost, medium resolution raster scan graphics CRT. This means that the resolution on the drawing iis better than the resolution on the screen. The screen is used to roughly see how the drawing will look so the drawing can be edited. Innovative techniques are used throughout to accomplish the objective of responsive high quality output from a low cost system. Some examples include representing a wide variety of object text sizes by parallel lines while the actual text is displayed in a window; intricate drawings made up of cells of recognized patterns; a window feature that allows creation and editing of a small portion of the drawing; a shift and scale function that allows working on a small portion of the physical drawing at one time.

# 1.2 SYSTEM ORGANIZATION

The 2D system is organized around a graphics file system. A designer using 2D can create graphics files, edit those files and merge the files on the graphics screen. When complete, the image appearing on the graphics screen can be sent to the plotter, scaled or unscaled; shifted or unshifted.

To start the system, the designer executes "20". From there on, the functions of 2D are evoked by entering the key letter of the command from the menu which appears at the top of the screen.

The following diagram outlines the "tree" of commands within the 2D system, shows the hierarchy of menus and serves as an index. Note that all menus are in alphabetical order. Please

DRJECTS

QUIT

#### read the notes accompanying the drawing. 2D (3) DIG OBJECTS EXPANDS PLOT SEND TEXT QUIT CELL FILER VIEWS MINION ADD (1) MODIFY 1(2) 1 COPY GET ADD ARC ADD AMOUNT Į. NAME DIMENSIONS ERASE COPY COPY CENTER . . ; IMAGE QUIT CIRCLE HANDLE EDIT ERASE 1 i i 1... SAVE GUIDE GUIDE ERASE ERASE FLIP 1 1 MOVE VIEWS LINE GUIDE GUIDE GRID 1 ; ; DOM NEW WHAT LINESTYLE SIZE INVERSE 1 5 ; ! QUIT POLYGON MOVE MOVE LINESTYLE ! 1 QUIT RECOVER NAME NAME MIRROR SCALE RECTANGLE QUIT QUIT NEWNAME ; 3 VIEWS TRACKER RECOVER RECOVER REDRAW VIEWS SCALE SCALE TEXT . 1 VIEWS WHAT SELECT---1 1 WHAT <,> ALL <,> CELL DESELECT

# NOTES:

- (1) When "O" picked from main menu, system is automatically in "ADD".
  Use of commands "MOD" or "ADD" switches from modify to Add.
- (2) System is automatically in "ADD" on first entry.
- (3) The digitizer can be used to select a choice from most of the menus. Simply place the digitizer cursor over the word on the menu, and press the button on the cursor.

# 1.3 BASIC COMPUTER CONCEPTS

A computer receives information (input), processes the information, and puts out the information (output). For the 2D Drafting System, the computer uses data provided by the designer to produce a drawing.

Data can be entered to a computer in various ways. The 2D Drafting System is designed to utilize a disitizer for the majority of data entry. A disitizer is an electronic device that records the X-Y location of a point. This way, the designer can use the medium of input most familiar rather than a typewriter keyboard. The keyboard is used for a few 'commands' to the computer, as well.

After input, the information is stored on a removable recording media called a 'floppy' disk. A floppy disk is a thin piece of mylar encased in a protective paper jacket with a surface that can be magnetized to represent data.

The computer can process the data stored on the floppy disk to produce various output. Data can be output by displaying it on a screen, writing on the surface of another floppy (copying the floppy), printing on a typewriter device called a 'printer' or by graphically drawing lines on a mechanical drafting machine called a plotter.

The T-SQUARE consists of 6 basic components: The display monitor ("CRT" or "screen"), the Keyboard, the box-like device which houses the floppy disks and the computer, a disitizer, a printer and a plotter as illustrated on the cover of this brochure.

The display monitor is used to display both text and graphics. The Keyboard is used for entering information into the computer. Information on these is available in the referenced manuals.

The rocker switches on the front of the box-like devices labeled 8510 control the computer, screen, keyboard and disitizer. The printer has a separate on-off switch as does the plotter.

To start up the computer, switch on the rocker switches and printer and plotter switches then mount the floppy disks in the slots as indicated with the label up and the recording window toward the back of the box. The computer will automatically start up and display further operating instructions on the screen. If it is necessary to restart the system, push the rocker switch at the top. This causes the computer to restart without restarting the disk drives, etc. This method of restarting (called 'BOOTING') is much easier on the computer and floppys then turning the power on and off.

Reasonable but not extraordinary care of floppys is required. Good practice is to keep the floppys away from extremes of heat and dust or scratchy materials. Do not put your fingers on the magnetic recording surface. Keep the floppys in the paper envelope and in a box when not in use.

# 1.4 UCSD PASCAL Operating System

1.4.1 Introduction
The UCSD PASCAL operating system is utilized by the T-SQUARE. The operating system was developed at the University of California at San Dieso and is now distributed by TERAK and SOFTEK. Detailed documentation is available from both these companies. Also, the documentation is supplied by T&W Systems with the turnkey T-SQUARE.

When the T-SQUARE is 'BOOTED' the following UCSD command will appear at the top of the screen:

Command: E(dit, R(un, F(ile, C(omp, L(ink, X(ecute, A(ssem, D(ebus,?

Welcome

UCSD Pascal

Current date is

This is the main UCSD prompt line. The options offerred are chosen by typing the upper-case letter preceding the left parenthesis. The most important commands are E(dit, F(ile, and X(ecute.

"X" for X(ecute is typed wherever a T-SQUARE program is to be used. The program name is requested by the following query line.

Execute what file?

Type the program name followed by <RETURN>. Incorrect spelling can be corrected by backspace prior to <RETURN>.

1.4.2 UCSD File Management
The designer can run the UCSD file management program

called Filer by typing the letter "F". The Filer can (1) display a list of names of the files on a disk, (2) copy files from one disk to another, (3) rename files, (4) remove files, (5) rearrange files and check for damaged areas on the disk. The filer prompt line is long and requires two alternate lines. Switch between by typing "?".

Filer: G(et, S(ave, W(hat, N(ew, L(dir, R(em, C(hns, T(rans, D(ate, Q(uit [A];

Filer: B(ad-blks, E(xt dir, K(rnch, M(ake, F(refix, V(ols, X(amine, Z(ero [A];

Here is how to use the most important Filer commands. The others can be found in the UCSD reference manual:

- 1. D(ste -- Typins "D" permits the designer to reset the date on the disk. Follow the prompt instruction.
- 2. E(xtended directory -- Typins "E" followed by either #4 <RETURN> or #5 <RETURN> lists the names of all the files and free areas on the disk (either #4 or #5) drawing both their position and size in blocks.
- 3. T(ransfer -- Typing "T" permits copying individual files or collections of files from one disk to another or to a different position on the same disk. It also permits copying the entire contents of one disk to another disk as is required for backup.
- 4. R(emove -- Typins "R" enables removins a file, ie to delete the filename from the disk directory.
- 5. Z(ero -- Typins "Z" allows the designer to initialize a new disk or to reinitialize (clean off) an old disk. A new disk must be initialized before it is first used.
- 6. B(ad -- Typins "B" enters the bad block search mode. The system will ask which volume. Answer #4 <RETURN> for the lower drive and #5 <RETURN> for the upper.
- 7. K(rnch -- Typins "K" enters the disk compression mode. This mode is used to collect all the free areas on the disk to one single area. A bad block search should be performed before this command.

1.4.3 The UCSD Editor

The E(dit option may be selected from the main UCSD prompt line to create or revise text files. Text files can be created by the designer to contain any typed information and then sent to the printer via the PRINTOUT program described elsewhere.

To create a text file: type "E" to start the UCSD Editor. The following promptline will appear.

! >Edit:
! No work file is present. File?

THE STATE ST

This presents three options: enter the name of an existing text file which is to be edited, create a new text file, or exit the editor by simultaneously pressing the 'ESC' key and the 'RETURN' key.

Typing <RETURN> creates a file. The editor can be used for writing letters, memos, specifications, computer programs and the like.

Typing a filename followed by <RETURN> moves an existing text file into memory for editing. To edit the file "COMMAND", for example, type the following:

#5:COMMAND <RETURN>

The main Edit command line will now appear at the top line of the screen:

DEdit: A(dist, C(py, B(lete, F(ind, I(nsrt, J(mp, R(place, Q(uit, X(chns, Z(ap

A portion of the text file will be displayed on the screen. The cursor shows where the next change to the file can take place.

The cursor can be moved by any of the following Keys:

TAB
BACKSPACE
RETURN
SPACE

- .1. Cursor control arrows -- The Keys with arrows move the cursor in the direction indicated one space at a time.

  Hold the Key down for multiple moves.
- Backspace moves the cursor one space to the left. Hold the key down for multiple moves.
- 3. <TAB>, <SPACE>, and <RETURN> move the cursor toward the next tab position. <TAB> moves it to the next tab stop, -<SPACE> moves it by one space, <RETURN> moves it to the beginning of the next line. The direction (forward or backward) depends on the set direction. Hold the key down for multiple moves.
- 4. To set direction for tabbins, enter ">" to move forward and "<" to move backward.

Kews described in 1. through 3. can be repeated. Type the number from the top of the Kewboard and then the Kew. For example, "5BACKSPACE" will cause a backspace of 5 characters.

The cursor can also be moved by the following:

J(ump -- Type "J" to enter this mode. After prompt
line, type "B" to so to the beginning of the file,
type "E" to so to the end of the file, or type <ESC>
to leave the mode.

Three commands are useful for changing text: Insert, Delete, and exchange.

1. Insert — Text is inserted in the file at the position of the cursor. Type "I" and then the text. If inserting characters, note that the new characters will be inserted between the character where the cursor is and the preceding character. Type <ETX> to accept an insertion and <ESC> to abort the insertion. 2. Delete -- The procedure for deletins text is similar to that for insertins text. After typins "D", characters will be deleted by typins the space bar and lines will be deleted by typins <RETURN>. Type <ETX> to accept a deletion and <ESC> to abort.

3. eXchanse — This command is used to replace characters with different characters. eXchanse only works within a line. Position the cursor to the beginning character to be replaced. Type <ETX> to accept an insertion and <ESC> to abort.

Text created through Editor may be formatted using the Adjust command. The Adjust command is designed to make it easy to indent. Position the cursor at the line to be adjusted before entering the Adjust mode. The Adjust prompt line will ask for L to left adjust, R to right adjust, C for centering or arrows for moving the line a character at a time. Enter <ETX> to accept changes and exit the mode.

To leave the Editor, type "Q" for quit. The Quit prompt line will ask for "U" to save the workfile, "E" to exit without saving, "R" to so back to Editor, "W" to write to a file to be named and then exit.

# SECTION 2 SETTING UP A DISK

# 2.1 Introduction

To use the system, it is usually best for each designer to have a copy of the system and the designer's own files on his/her own diskette. This keeps the master intact and gives each designer flexibility. This section describes how to get started by setting up the designer's disk.

# 2.2 Procedure

To set started, set the master copy of 2D Draftins from your supervisor and a good blank diskette. Copy the 2D system to the blank diskette as described in Section 1 under "FILER". Your new diskette will now contain all of the programs and utilities you will require to create and plot your drawings and text.

As your organization uses 2D, there will be a natural growth of the collection of graphics files. By cleverly naming files, it's rather easy to index the graphic files to the names. Then, in the future, to make a new drawing a quick scan of the index can lead a designer to a past file which will aid in making a new drawing. Any existing graphics file can be transferred to the designer's new diskette without disturbing the master. This can lead to very rapid and efficient creation of graphics files and in fact, is the basis for the main productivity gains provided by any 2D drafting system.

# SECTION 3.0 USE OF COMMANDS

# 3.1 Introduction

After setting up the working diskette as described above or by modifying the existing file as described in detail in the next section, the designer is ready to begin creating a new graphics file. The following paragraphs in this INTRODUCTION describe generally how the system works so the COMMANDS in the following section will be more easily understood.

Assume you are starting a drawing from scratch. Load the disk, and "boot" the system. Then execute "2D" to enter the 2D Drafting system. At this point the graphics buffer in central memory is blank and the graphics screen is blank.

Choose O(bjects from the main 2D menu by touching the letter 8 on the Keyboard. You need not hit return, just the letter (NOTE: in most cases, the designer can choose from the menu by means of the digitizer. Simply place the crosshairs over the selection, and press the button). The system will automatically put you in "A(dd" objects. You can now draw a figure on the screen by choosing any of the seometric primitives such as ARC, BAND, CIRCLE, etc. If you make a mistake on an object, choose "Mod" or hit the space bar to switch over to the MODIFY OBJECTS menu. The objects on the screen are represented by a list in memory. You can advance forward ">" or backwards "<" through the list to find the object you wish to modify. Then choose the appropriate function such as C(opy or E(rase. Use the disitizer to move it or copy it to a different location.

Choose G(uit to leave the objects section, and then choose T(ext from the main menu to add text. Text can be moved, scaled and copied just like graphics objects.

Now store the screen imase on the disk by choosins F(iler from the main 2D menu and S(ave the disk workfile (NOTE: a valid string name of up to 8 chars, may be used). Now the file can be called back through the G(et instruction. The file is now a CELL, and can be moved in aggregate by referring to the CELL name and using the commands under C(ell option from the main menu.

The V(iews choice from the ans of the menus allows the manipulation of the fisure(s) such as taking a mirror imase. The G(rid instruction under the VIEWS menu allows putting a quadrille set of suidelines on the screen to provide for the lining up objects and fisures.

The P(lot instruction on the main menu sends the fisure which is currently on the screen to the attached plotter.

The S(end instruction on the main menu will send a facsimile of the screen to a printer if the system is outfitted with a printer with a graphics option.

The W(indow function on the main menu allows "blowing up" a portion of the figure shown on the screen, and showing that in a larger scale on the full screen for working purposes.

The E(xpand function on the main menu allows the designer to view the drawing at the original screen level at which he started.

The following paragraphs give detailed descriptions of each of the commands in the 2D system. It is convenient to cross reference to the figure in 1.2, that is the index of menus and commands, as the following paragraphs are read.

# 3.2 CELL

# 3.2.1 Purpose

The purpose of CELL is to allow movins, corsins and otherwise manipulating large numbers of symbols at one time. CELLs are also useful for storing complex figures to be used as components of future drawings.

# 3.2.2 Function Selection

When a sraphics file is returned to memory by executing the G(et command in the F(iler, all of the objects and text that were stored in the file are considered a "cell" by the 2D system. The collected objects and text can then be operated on as a unit through the cell commands. The NAME command under the OBJECTS menu can be used to include a primitive in a given cell name. More than one cell can exist at a time in memory.

All of the followins commands can be exited at any time by pressing the <ESC> key or the sequence <ESC><RET>. To envoke a command, key a letter on the menu that is shown before the parenthesis.

# 3.2.3 Data Entry

#### NOTE:

Most options in the C(ell subprosram require the entry of a cell name. This is necessary so that the system knows which cell to modify. Once the cell name has been entered, the system will perform the task. When the cell name is entered, the current cell name is chansed to this name. If a cell needs to be modified (C(opy, M(ove or S(cale), then a box that outlines the perimeter of the cell will blink. Use this box to modify the cell, i.e., to move a cell move the box with the cursor or to scale a cell scale the box with the cursor.

Note also that any time a cell needs modification you must enter the cell's name. The system will write out the defaulted current cell name, and allow you to use this defaulted name or type in your own. If you wish to use the defaulted current cell name, then simply hit the <RET> key only at the time that you are prompted to enter a cell name.

#### C(opy:

Enter the name of the cell you wish to copy (<RET> only will default to the current cell name). To the question "NEW CELL?" enter the name of the cell that you are about to create. Do not enter the name of the cell that you are copying from, otherwise the system will endlessly copy the original cell.

Use the disitizer to cors the cell (note flashing box around the cell) to a different location. Move the cursor on the disitizer to the desired location and then press the button.

# E(rase:

Enter the cell that you wish to erase (<RET> only will

default to the current cell name). The system will remove all of the objects in the cell from the screen. They will not be redrawn. See R(ecover.

# I(mase:

The system will respond with the prompt "mirror, flip - <SPACE BAR> tossles". To MIRROR an imase means to rotate the image around a vertical line. To achieve this effect, simply hit the space bar until a vertical line is blinking on the screen. Move the line to the position about which the cell is to be mirrored, and press the button. To FLIP an image means to rotate the image around a horizontal line. Asain, hit the space bar until a blinking horizontal line appears on the screen. Move the cursor to position the line about which the cell is to be flipped.

#### G(uide:

If chosen, centerline crosshairs will appear on the screen. Move the crosshairs to the desired location and press the button to place the crosshairs. Note that the crosshairs are a suide only and will not appear on the plotted drawing. Nor will they appear when the screen is redrawn.

#### M(ove:

Enter the name of the cell you wish to move (<RET) only defaults to the current cell name). This command allows moving an entire cell of symbols and text from one location of the screen to another location. Note the box around the cell. Move the cursor to move the cell. Press the button to locate the new position.

# Q(uit:

Returns to main menu.

## R(ecover:

Works with E(rase. Enter the cell name that you wish to recover. The cell will then appear if it exists. Answer "Y" if you wish to recover, "N" if not and "Q" to leave.

S(cale:

Enter the name of the cell that you wish to scale. Note the blinkins box. The movement of the disitizer cursor moves the box representing the perimeter of the cell. Pressing the button freezes the new cell rerimeter, thus scaling the objects in the cell to the new size. Note that if there are circles or polygons in the cell, then these objects will not become distorted due to the scaling. However, they will be scaled down with the rest of the cell.

V(iews:

Jumps from the C(ell menu to the V(iews menu. See V(iews.

3.3 FILER

3.3.1 Purpose

The F(iler menu provides commands which will send graphics files from main memory to the diskette or will retrieve files from the diskette and record them in memory. More than one file can be retrieved from disk to memory to create composite figures. Any file retrieved to memory is also shown on the screen.

3.3.2 Function Selection

The F(iler submenu can be brought to the screen when in the main menu by Keying F.

The F(iler can be used at any time during the creation of a figure. The figure on the screen is undisturbed. It is recommended that a complex figure be saved several times during its creation as a backup in case of a major error. It would be easier to so back to the previous good file rather than "undo" the errors.

W(hat:

Displays the current workfile name.

#### G(et:

Retrieves a file. The system responds to the G(et selection with "Get what file?". If no files exist, the system will output the message, "Graphics file does not exist".

If the file name given by the designer does exist, then the system will respond with "Rename objects in XYZ as ABC". This allows the designer to change the cell name of all of the objects in the file XYZ to the cell name ABC (Note: if you wish to change the workfile name "XYZ" then use the F(iler option called N(ame, and if you wish to change the current cell name "ABC", then use the V(iews option N(ew). Respond with a "Y" if you wish to rename all of the object and text cell names. The system then retrieves the graphics file, places it in memory, and shows the graphic representation of the file on the screen. The file is also considered by the system as a CELL and can be manipulated as such. See C(ell menu.

#### N(ame:

Allows you to change the default workfile name. Enter a name up to 8 characters in length.

# Q(uit:

Return to main menu

#### S(ave:

The system will respond with "Save as XYZ ?". File XYZ is the default workfile name. If you wish to save as XYZ then answer "Y". If you answer "N", then the system will respond with "Save as what file". Enter the name that you would like to save it as (up to 8 characters).

V(iews:

Jumps to V(iews submenu.

# 3.4 OBJECTS (ADD)

# 3.4.1 Purpose

The O(bjects command menu provides for the creation of complex symbols from the primitive seometric figures such as circles, lines and boxes. The M(odify submenu allows copying, scaling and otherwise modifying symbols after they have been created.

# 3.4.2 Function Selection

When O(bjects is entered from the main menu, the 2D Drafting system automatically places the user in the A(dd objects mode. The specific object is then selected and will be interactively drawn on the screen as instructed through the use of the digitizer. The user can switch between adding and modifying objects by alternately selecting A(dd or M(odfy from the menu or by touching the space bar. In all commands, use of the <ESC> key returns to the menu and aborts the command. In all cases, the digitizer is used to place the characteristic points of the object by moving the cursor a corresponding distance on the digitizer and pressing the cursor button. In all commands, the system will interactively draw the object as the cursor is moved.

# 3.4.3 Bata Entry

#### A(rc:

Use the disitizer to place the two extremes of the major (or minor) axes of the arc followed by the point through which the arc is to be drawn. Note that at present, these arcs produce more of an elliptical effect.

#### C(ircle:

The first point placed is the center of the circle. The second is the radius. The system will show the circle grow or shrink interactively as the cursor is moved.

#### D(imensions:

The first point of entry from the digitizer is the handle. The second point fixes the slope of the dimension line, and acts as a rubber band dimension. The third point fixes the depth of the dimension from the handle. While you adjust the depth of the dimension, you may enter an "X","Y" or <space bar>. "X" fixes the dimension line so that it is horizontal. "Y" fixes the dimension line so that it is vertical, and <space bar> fixes the dimension line so that it is vertical, and <space bar> fixes the dimension line so that it is parallel to the line determined by the first two points.

# G(uide:

This will place a single crosshair on the screen. The crosshair is for reference in placing other symbols and will not be shown on the plotted drawing or when the screen is redrawn.

#### L(ine:

Enter beginning and end points of line. This line will only show after both points are placed.

#### M( od:

Switches to the M(odify screen so that you can modify objects. Note that the <space bar> will do the same.

#### P(olyson:

The system will respond with "Number of sides ?", e.s., entering a 5 will produce a pentason. Enter the number of sides of the desired polyson. The first point placed is the center of the polyson. The second is the radius. The system will show the polyson grow or shrink interactively as the cursor is moved.

#### Q(uit:

Returns to main menu.

# R(ectangle:

The first point is a "corner" of the rectangle. The second is the opposite corner. Press the button on the digitizer cursor to fix the size.

#### T(racker:

This function will draw a series "rubber band" lines after placement of the first point. While drawing T(racker lines, the designer can enter "X" for horizontal lines or "Y" for vertical lines or <space bar> for "rubber band" lines. When you are finished entering T(rackers enter a "Q" to save them or an <ESC> to erase them all.

# 3.5 OBJECTS (MODIFY)

# 3.5.1 Purpose

Companion to OBJECTS (A(dd). Purpose is to manipulate symbols already added to the screen and memory.

# 3.5.2 Function Selection

Hit "M" key or space bar when in the OBJECTS (A(dd) menu. All the M(odify commands work on the list of items which have been added to the graphics screen and are in the computer's central memory. The object which is to be modified is blinking on the screen. Use the ">" or "<" keys to so forward or backward through the list of objects. The list is "circular" so soing forward past the last object will cause the first object to blink. Objects are added to the list in the order the objects were entered. MODIFY starts at the beginning of the list.

3.5.3 Data Entry

Note:

If at any time you wish to leave an option, and not have the object changed, then press the <ESC> key.

A( dd:

Switches back to OBJECTS (A(dd) submenu.

C( opy:

The blinking object can be "copied" to another location. The original object is undisturbed. Use the disitizer cursor to move the object and the button on the cursor to place it.

N(ame:

Allows you to change the blinking objects cell name to that of the curent cell. Note that performing this function automatically advances you to the next object. This allows you to default many objects without many keystrokes. Also note that when an object is created, its cell name becomes that of the current cell name.

E(rase:

Erases the blinking object from the screen. See R(ecover.

G(uide:

Places a crosshair on the screen for reference. Move the cursor to move the suidelines. They will not be plotted or redrawn.

H(andle:

This "handy" option allows you to swap the starting points of LINES, RECTANGLES and DIMENSIONS with their ending points. The handle is very useful for scaling a line, e.s., a line is scaled from only one of the endpoints. Sometimes it would be nice to scale from the other

endpoint. So, to do this you must be blinking the object whose handle is to be changed, and select the H(andle option. Now scaling the line can be done from the other endpoint rather than recreating another line.

#### L(inestyle:

Allows you to change the blinking objects linestyle to that of the system's default linestyle. Note that performing this function automatically advances you to the next object. This allows you to default many objects without many Keystrokes. Also note that when an object is created, its linestyle becomes that of the default linestyle.

## M(ove:

The blinking object can be moved to any location by moving the cursor. Press the cursor button to freeze the object in its new position. The object will blink as it is moved. The original object will be some once the button is pressed. Compare this command to C(opy which is like a move but leaves the original object intact.

#### Q(uit:

Returns to main menu.

#### R(ecover:

The system will find all of the objects that have been previously been erased and blink them one by one. Respond with "Y" and the object erased will be returned to the screen. "N" skips. Q(uit returns to the M(odify menu.

## S(cale:

The blinking object can be scaled larger or smaller. The object being scaled increases or decreases as cursor is moved. Press the button to fix its size.

V(iews:

Switches to V(iews menu.

W(hat.:

Displays the blinking object's cell name and linestyle.

F(orward or "<" or ".":

Moves pointer backwards through the list of objects in a circular fashion.

B(ackward or ">" or ",":

Moves pointer forwards through the list of objects in circular fashion.

3.6 PLOT

3.6.1 Purpose

This function sends to the plotter the figure residing in central memory and displayed on the graphics screen. NOTE: only those objects visible on the screen will be plotted. The system will clip any objects not within the plotter boundaries (e.g. plot while windowing).

3.6.2 Function Selection

From the main menu, press the Key "P".

3.6.3 Data Entry

The system will respond with:

"Place paper, hit <RET> when reads, <ESC> aborts"

The system waits for the operator to place paper in the plotter and to hit the RETURN key before continuing. If the operator made a mistake entering the PLOT program the <ESC> key returns control to the main menu.

Next the system asks if the image should be scaled when sent to the plotter. NOTE: the following option involving plotter scaling is currently not available on the Houston Instrument's DMF-7 plotter.

N skips the scaling and shifting functions and immediately begins to plot the image in normal size, ie the whole screen approximately covers 10" high on paper by 13.3" wide (to maintain the screen aspect ratio).

If Y is entered, the system will ask for the factor for scalins. The factor 1.0 represents the normal display size. Then, for example, 0.5 would draw the image about 5" high by 6.67 inches wide.

If scalins was requested, the system then asks SHIFT X or Y?

Enter the amount by which the figure is to be shifted on paper relative to the lower left corner.

As an example, scaling a figure by 0.5 and then shifting X by +6.67 and Y by +5.0 will put the image in the upper right hand corner of the page.

After the shift factors are input the system will immediately start to plot.

#### 3.7 SEND

#### 3.7.1 Pupose

SEND is used to send the screen image to an ortionally attached printer which is equipped with a graphics option.

# 3.7.2 Function Selection

Enter S from main menu. If the system is connected to a sraphics printer such as a Paper Tiser 440, enter "Y" and the system will use the high density matrix print option to print a facsimile of the screen on the printer. Note that this is a low resolution form of graphics. Also, it prints exactly what is on the screen without interpretations.

#### 3.8 TEXT

#### 3.8.1 Purpose

Allows placing text on the screen and then to move, copy, scale and edit the text.

## 3.8.2 Function Selection

Choose "T" from the main menu. The system will automatically so into the A(dd text option if there is currently no text on the screen.

Text is displayed in a window under the command line and its size and position is represented by two parallel lines on the screen. This allows placing and editing text which exceeds the capacity and resolution of the low resolution screen being used.

# 3.8.3 Data Entry

If any command is erroneously selected, press (ESC) and the system will abort the menu choice and return to the TEXT menu. The text is kept in a list. When any text modifying command is selected, the current text will blink. Use > to move forward through the list and < to more backwards. Only blinking text can be modified. The text is also kept in circular buffer just as objects.

#### A( dd:

Place the center of the first character of text using the digitizer. Type the desired text (up to 80 characters) in the window displayed under the command line.

If a typins error is made while enterins new text, backspace and enter the correct text. After text is entered, touch RETURN and the system will return to the TEXT menu.

#### C(opy:

Blink the text to be copied. Move the disitizer to the correct position of the new text. Press the cursor button when reads for placement.

# E(dit:

COMP.

Allows use of the Keyboard to chanse text that was previously entered. Type in the new text over the old text.

## E(rase:

Erases a previously entered text from the screen. If the last text is erased, the system automatically switches to the A(dd text mode. See R(ecover.

# G(uide:

Crosshairs appear on the screen and can be moved to be placed with the cursor and then used as suidelines for lettering. The crosshairs are not plotted or redrawn.

# S(ize:

This option allows you to default the blinking text's character height and width to that of the system's default text height and width. The text will be erased and redrawn with the new width and height defaults. You can change these defaults in the V(iews option called T(ext. Note that when a text is created, its width and height are set to the system defaults.

# M(ove:

Allows moving text from one position to another. "Blink" through the list of text until the desired text is reached. Then use the cursor to move the parallel lines which represent the text to the new position.

#### N(ame:

Allows you to change the cell name of the blinking text to the curent cell name. Note that when a text is created, its cell name defaults to the current cell name.

#### Q(uit:

Return to the main 2D menu.

#### R(ecover:

This will ask to restore any text erased . A secondary menu will be displayed. Enter Y(es if text is to be restored, N(o to continue movins forward through the list but do not restore this text, Q(uit to leave R(ecover.

# S(cale:

This allows increasing the height or width of the text. Blink through the text list. At the desired text, use the cursor to "pull" the text to the right to make it longer or "pull" it up to make characters higher.

# W(hat:

This will display the blinking text's cell name.

B(ackward or "<" or ",":

Pressins this key causes the system to move backwards through the list of text.

F(orward or ">" or ".":

The system will move forward through the list of text.

# 3.9 VIEWS

#### 3.9.1 Purpose

V(iews is a catchall of miscellaneous functions that operate on the image which is currently in memory and on the screen.

# 3.9.2 Function Selection

VIEWS can be entered from all submenus by touching the "V" key when the system is waiting for a command. V(iews returns to the current menu whenever it is exited.

#### 3.9.3 Data Entry

#### A(mount:

This option allows you to see just how many objects and text that you have created in your workfile. You may want to keep an eye on this number so that it does not set too close to the number of objects that you entered at the besinning of the program. Note that this number includes any erasures that you might have made to the file.

#### C(enter:

When evoked, this function will cause the system to show a point at the "center" of all primitive objects i.e. circles, arcs, and boxes for use as a suide.

#### E(rase:

This option will erase the entire screen and position pointers to be ready for a new database. Caution should be exercised here. When evoked, this function first responds: Are you sure? If "YES" is entered, the entire screen and memory is erased.

NOTE: there is one recovery option for this erasure. It is as follows. Immediately Q(uit the program from the main menu. Go to the system filer, and chanse the name of "2B.WRK.DATA" to "2DTEMP.DATA". Now run the 2D program, and so to the program filer and call in the file "2DTEMP.DATA". Your picture should be there. We suggest that you save this file immediately, and remove

"2DTEMP.DATA" from the disk.

#### F(lip:

Rotates entire picture about the horizontal centerline of the screen. Note: this function will flip all objects of the picture. If there are more than 100 objects and text in the picture, then a prompt of "Are you sure" will be displayed. This is to protect the designer in case of error, and save him wait time.

#### G(rid:

Places a quadrille mesh on the screen to be used as a suide but not be plotted. The X increment and Y increment will be requested by the system. The increments should be expressed in "pixels" or "raster points". There are 320 pixels in the X direction and 240 pixels in the Y direction. Therefore the x-axis limits of entry are 0..319, and the y-axis limits are 0..239.

#### I(nverse:

Will chanse the screen from white to black or black to white.

# L(inestyle:

This allows you to set the system default linestyle. Valid numbers range from 0-7. Linestyles are not shown on the screen due to the low resolution. Rather, they are only shown on the plotted output.

#### M(irror:

Rotates entire picture about the vertical centerline of the screen. This option will mirror all objects in the picture.

#### N(euname:

Allows you to change the system default current cell name.

#### R(edraw:

Sometimes selective erasures, moves, and the like leave imperfect images on the screen. The REDRAW function clears the screen and then redraws the image from memory as it currently exists. NOTE: the 2D program has implemented alsorithms that clip objects if they fall off the viewing surface. This immediately becomes apparent while windowing. So, no objects or text may be accessed if they are not visible on the screen.

#### S(elect:

At some time the designer may wish to show on the screen only a portion of the cells or objects recorded in memory. This may be accomplished through the SELECT function by use of the SELECT submenu as described below. WINDOW is a similar function if the designer wishes to view a selected area of the screen. The general approach to use SELECT is to first DESELECT all images. Then, step through the cells and pull up only those cells desired.

#### A(11:

This will select all objects and text on the screen.

#### C(ell:

The system will respond with "S(elect D(eselect". When you choose, you must enter the name of the cell that is to be selected or deselected.

#### D(eselect:

This removes all objects stored in central memory off of the screen (note: they are not erased). The images can be put back selectively through the S(elect cell and S(elect objects options.

O(bjects:

This allows you to individually select objects or text to be shown on the screen.

Q(uit:

Return to VIEWS menu from the SELECT submenu.

#### T(ext:

Allows you to set the default text width and height parameters used while creating text and changing the text's size. Note: enter a floating number 0 to 80 for the width, and 0 to 60 for the height. Also note that the size of the text you create after setting these parameters will depend on your windowed state, i.e., text created one window deep with width = 2, height = 3, will be larger that text created three windows deep with width = 2, height = 3.

# 3.10 WINDOW

# 3.10.1 Purpose

W(indow allows displaying only a selected area of the screen, i.e., a selected portion of the image recorded in memory as delineated by a "window" on the screen.

# 3.10.2 Function Selection

The W(indow function can be selected from the main menu. The W(indow function should be used to work on a portion of the screen at a greater level of detail. When selected, the system will respond with "M(ove, S(cale". The blinking box will "blow\_up" the objects located within it, and clip out all other objects. You can move or scale the window by entering a "M" or "S". Note that you will not be able to get a window the exact size that you want it. This is not possible since the screen must remain proportional so as not to distort the picture being windowed.

# 3.11 EXPAND

# 3.11.1 Purpose

The E(xpand function allows you to redraw the picture at the original screen scale, i.e., unwindowed. This is used primarily to return from windowins. Expand will always return you to the "main" viewins window. At present you cannot step back by windowins down.

# 3.11.2 Function Selection

From the main menu choose "E" to select E(xpand.

# SECTION 4 APPENDIX

# 4.1 Sample Drawinss Created with the System

The following drawings were created with the 2D system and are representative of the types of drawings for which the sytem can be used.

The first drawins with the octasonal shape labled "V-101" is sussestive of a "foundation location plan" or plot plan as used in ensineering and construction. The octasons were created by the polyson function. The two concentric rectangles were created by doing one of them and then "copying" to create the other. The string of squares representing the "pipe support" was done in the same way. One string was created and then copied to the other.

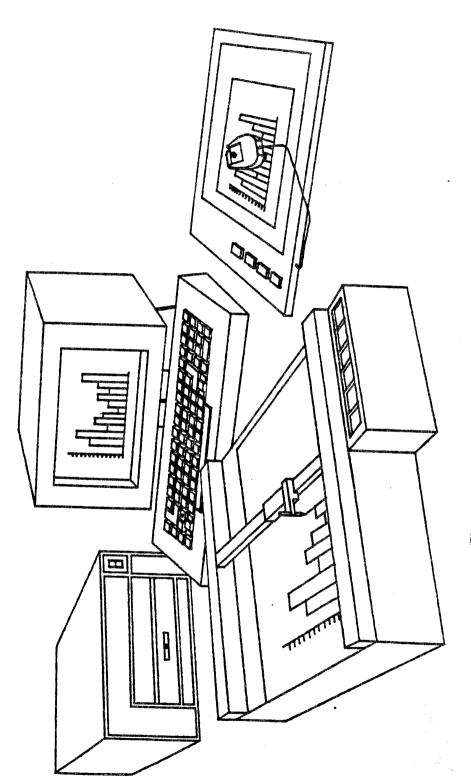
The figure labled "Stabilizer Column" is representative of a P & ID in the process construction industry. The symbol at the lower part of the drawing is representative of a pump symbol. This pump symbol was made up of a cell name "PUMP" and could be used over and over again.

The picture JCI was created for Johnson Controls Inc. It shows the capacity that the 2D program has as well as demonstrating its ability to handle electrical ladder diagrams and other similar drawings.

The T-SQUARE drawn by the T-SQUARE demonstrates that the system can produce drawings requiring fine detail.

GRAPHICS DIVISION OF TAN STSIEMS

GRAPHICS DIVISION OF 1 & M STSTEDS



T-SQUARE DRAWN BY T-SQUARE