R O B O   1 5 0 0   O P E R A T I O N S   G U I D E

ROBO 1500 OPERATIONS GUIDE

C O N T E N T S

PREFACE

This manual explains how to install and operate the ROBO 1500
Computer Aided Drafting System. The manual assumes that you have
set up your Apple II computer and disk drives and have some
basic familiarity with the terms used.

How this manual is organised

CHAPTER   1   INTRODUCTION   Presents an overview of the system;
                                Describes minimum equipment needed
                                and discusses optional equipment.

CHAPTER   2   INSTALLATION   Provides instructions for the
                                installation of all standard and
                                optional equipment.

CHAPTER   3   OPERATION   Describes the main aspects of the
                                system and how to operate it.

CHAPTER   4   FUNCTIONS   Presents full instructions on the
                                use of all system functions.

APPENDIX A   THE LIBRARY   Explains how the Library system
                                works, how you should organise your
                                library, and how to format the
                                disks.

APPENDIX B   ERRORS   Lists error conditions and how to
                                recover from them.

How to use this manual

Read Chapter 1 first to familiarise yourself with the overall
function and capabilities of the system.

Read Chapter 2 when you are ready to set up the system.

Read Chapter 3 when you get the system going for the first time.

Chapter 4 describes the use of all the system functions and can
be used both as an introduction to the use of the system and
subsequently as a reference source.

If you encounter an error when using the system, refer to
Appendix B, which tells you how to recover from it.

CHAPTER 1   INTRODUCTION

This chapter introduces the ROBO 1500 System; it explains what
equipment is needed and what extra equipment can be added to get
the most out of the system.

CONTENTS

1.1.   THE ROBO 1500 SYSTEM

<u>What it is</u>

The ROBO 1500 System is a powerful and sophisticated Computer
Aided Drafting package which can be installed in any Apple
IIplus or Apple IIe computer.

The package is composed of a Controller unit with Interface
module, a 'RoboRAM' card (128K), the System Master software, an
Introductory Library disk, a further special Template Library
disk, and this manual.

The Controller unit, a custom-designed joystick, serves as the
drawing instrument and also gives commands to the system.
Minimal use is made of the computer keyboard, except for the use
of text in drawings and for the specification of precision
numeric data.

The system is easy to learn and easy to use, and requires very
little computer knowledge. Nevertheless, the experienced
designer or draftsman will find a powerful and flexible set of
facilities when using this system.

<u>What it does</u>

The ROBO 1500 System can be used for the production, storage and
maintenance of a large range of drafting and other graphical
material for the following typical applications -

*   Architecture
*   Building
*   Civil Engineering
*   Mechanical
*   Panel work
*   Packaging

In addition, this system is well suited to the following
applications covered by other products in the ROBO range -

*   Electrical   *   Presentations
*   Chemical   *   Plan Charts
*   Fluid Power   *   Forms & Pages
*   Planning   *   Illustration
*   Layouts   *   View Foils
*   P.C.B.   *   Slides

1.2.   MINIMUM SYSTEM

The minimum equipment required to operate the system comprises
two elements, the HOST COMPUTER and the ROBO 1500 package.

Host Computer

APPLE IIe Computer, or APPLE IIplus Computer upgraded to 64K RAM
APPLE Disk Drives (2), DOS 3.3, including Disk Controller Card
MONITOR Monochrome or Colour

ROBO 1500 Package

Custom 3-axis Controller with Interface module
RoboRAM Card (128K)
System Master Disk (2 copies)
Intro Library Disk and Template Library Disk
User Manual

1.3.   FULL SYSTEM

The minimum system described above can be extended with the
addition of the following components:

Plotter and/or Printer
Digitizer Tablet
'Accelerator'

Video Display options are also reviewed below.

Plotters

Essential for high quality finished artwork, plotters come in a
variety of shapes and sizes. Main distinguishing features are
price, paper size, plotting speed, accuracy, line quality,
number and type of pens.

Plotter driver software is available for many drafting plotters
and is supplied as a seperate software product. This software
provides many advanced features including scaling, control of
colour, line weight and line style, and the ability to select
any detail of the drawing and position it anywhere within the
plot area.

Printers

Useful for quick proofing of artwork, many printers operate with
this system. No additional software is required, but the printer
interface card must include a 'Graphics Dump' facility.

Digitizing Tablets

The system supports the use of a digitizing tablet as an alter-
native form of input, allowing you to enter existing artwork.
No additional software is required.

'Accelerator'

These cards significantly improve the performance of the system.
For professional use, particularly where complex tasks are to be
performed, the use of one of these cards is highly recommended.

FULL SYSTEM (Cont.)

Video Displays

There is a wide range of video displays available which can be used with the system.

For professional use, important features are stability of the display, low distortion and (if not monochrome) colour quality. For prolonged use, Video Monitors are always preferable to TV receivers, and are therefore recommended.

Listed below are the main types of display, starting with the least expensive:

i.   Monochrome TV Receiver, using an RF modulator.

ii.   Monochrome Video Monitor. Better than (iii) for technical line work, unless colour essential.

iii. Colour TV Receiver. A PAL Colour card is required if using the Apple IIplus (not IIe).

iv.   Composite Colour Video Monitor. A PAL Colour card is required if using the Apple IIplus (not IIe).

v.   RGB Colour Video Monitor. Requires an RGB Interface card.

vi.   Video Projectors; available in several formats.

CHAPTER 2   INSTALLATION

To install the various components of the system, and to perform essential trimming and configuring, follow the instructions presented in this chapter.

CONTENTS

2.1.   CONTROLLER INSTALLATION

This requires no technical knowledge, but it does need care.

1   Make sure that the computer is switched off.

2   Remove the top cover of the computer.

3   The Controller lead is fitted with a special connector
       - the 'Interface Module'.

       Insert the Interface Module in the 16-pin (games) socket at
       the right rear corner of the computer's main circuit board.
       Before insertion, check that the pins are straight and
       aligned with the socket. When inserting, ensure that the
       triangular marker on the Interface Module points towards
       the <u>front</u> of the computer.

4   The Controller lead also includes a single wire breakout.

       Identify the 4-pin auxiliary video connector beside the
       games socket, and insert the single wire on the pin
       illustrated below. Note that the pin position depends on
       the version of the computer being used.
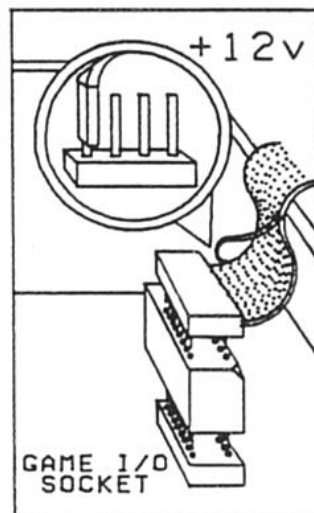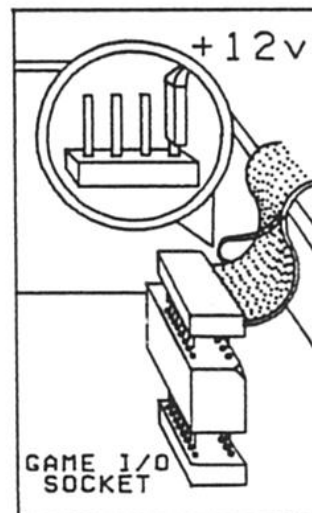
APPLE II +   APPLE II e

2.2.   CARD INSTALLATION

The APPLE Disk Drives, and other peripheral equipment used with
the computer, require controller or interface cards to be
installed on the main circuit board. Additionally, the ROBO 1500
System requires a total of 192K RAM, which is provided by the
installation of memory expansion cards.

Before you start, make sure that the computer is switched off
Also ensure that you have read the manufacturer's instructions
fully.

All cards are inserted such that the components face right, when
viewed from the front of the computer.

The card arrangement set out below for both essential and
optional cards is as recommended, but if it conflicts with your
preferred layout, you can tell the system what is where by
performing 'CONFIGURE SYSTEM', described in Section 2.6.

Cards : Essential

Slot   Card

* 0   16K RAM Board / 'Language Card'
  3   RoboRAM Board (128K)
  6   Disk Controller Card

* Required for APPLE IIplus only. Slot 0 is at the left when
  viewed from the front of the computer.

Cards : Optional

Slot   Card

  1   Printer interface (with 'Graphics Dump')
* 2   Plotter interface (RS232 Serial)
  4   Digitiser interface
  5   'Accelerator'
  7   R.G.B. Video interface

* Full instructions on the installation of drafting plotters are
  provided with the Plotter Software, available seperately.

2.3.   DISKS

The SYSTEM MASTER

2 Copies of the SYSTEM MASTER, containing the system software,
are supplied. One copy is intended for immediate use and the
other is a back-up copy, which should be stored in a clean, dry
environment clear of strong magnetic fields and other hazards.

The INTRO Library Disk and TEMPLATE Library Disk

Also included in the package is 1 Copy of the INTRO Library
Disk, which contains a variety of pre-drawn material, and 1
copy of a TEMPLATE Library Disk, containing further pre-drawn
material.

Since the sample Library Disks, unlike the System Master, are
copyable, you should make back-up copies of them before using
the system. See 'Disk Back-up' below.

LIBRARY Disks

Library Disks are used to store all the drawings and graphics
which you create when using the system. The included sample
Library Disks are themselves normal Library disks.

There are three types of Library Disk, designated by Volume
Number -

VOL 1 - 12   Compiler - for interim assembly of drawings
VOL 13 - 253   Source   - for permanent storage of symbols,
                              components and 'modules'
VOL   254   Archive   - for permanent storage of finished
                              work

You can establish up to 63 different SETS of Library Volumes
1 - 254.

Library Disks, and their formatting, are described fully in
Appendix A - 'The Library'.

Disk Back-up

To copy a disk, follow the instructions given in the 'DOS User's
Manual' provided with the Disk Drives.

Because considerable effort can go into generating drawings, and
because your time is valuable, get into the habit of producing
regular back-ups of your Library Disks.

2.3.   DISKS (Cont.)

Which Drives ?

SYSTEM MASTER : in DRIVE 1 - throughout the session
LIBRARY DISKS : in DRIVE 2 - can be changed during a session

Handling Disks

Floppy disks can be easily damaged by improper handling - Please
bear these points in mind :

*   Avoid touching the exposed surface of the disk
*   Do not remove a disk from a drive which is still running
*   Keep clear of magnetic surfaces (e.g. certain tablets and
    plotters)
*   Store carefully

Media

The APPLE Disk Drives use standard 5 1/4 inch single-sided,
single-density floppy disks. Although any compatible disk can be
used, we recommend the use of good quality disks.

2.4.   LOADING THE SOFTWARE

Having installed all the hardware components of the system, you
can proceed to load the software.

1   Start with all the equipment switched off.

2   Switch on the video monitor.

3   Insert the System Master disk in <u>Drive 1</u> , insert a
         Library disk in <u>Drive 2</u> and close the disk drive flaps.

4   Switch on the APPLE Computer. The disk drive will run
         briefly and a Title Page is displayed. When loading is
         complete, the System Menu is presented :

5   Please read and continue from the next Section, 'Trimming
         the Controller', if this is the first time the system is
         being used.

6   Otherwise, in normal use, select Option 1, 'Run Drafting
         Program'.

         If the wrong disk has been inserted in Drive 2, a message
         is displayed, requesting that you insert a Library Disk
         in Drive 2 and to press RETURN to proceed.

The 'Configure' and 'Set up' options (5 to 9) are described in
the remainder of this chapter.

The 'Format' options (2 to 4) are dealt with in Appendix A.

2.5.   TRIMMING THE CONTROLLER

Although the Controller is accurately calibrated when manu-
factured, component values in the computer can vary slightly;
this may cause anomalies in the readings from the three control
axes.

These variations can be rectified very simply by adjusting the
trimmers on the underside of the Controller. This is a one-time
procedure which need not be repeated if the Controller remains
connected to the same computer.

Adjust the trimmers in the sequence presented, using the small
screwdriver provided.

1   Select Option 6 from the System Menu. Wait briefly while
     the Trimming diagram is displayed.
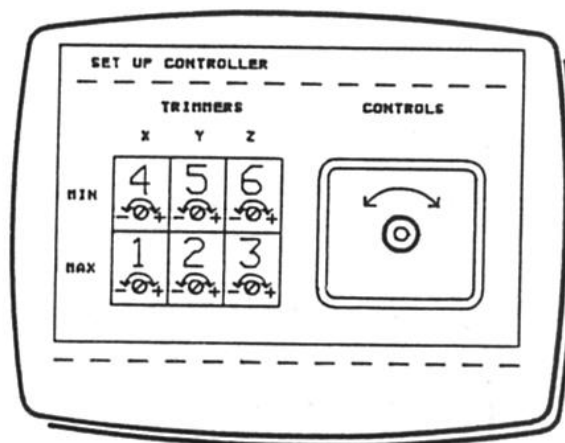
2   The diagram depicts, on the left, the trimmers as seen from
     the underside of the Controller, and on the right, the
     control axes viewed from above. The two lines of text at
     the bottom present the instructions, with key words
     displayed in reverse.

3   Follow the prompts to complete the sequence of six
     operations, pressing RETURN after each step.

     CAUTION ° Make the adjustments in very small steps. The
     correct procedure is to achieve the 'OK' state as the axis
     control just reaches its limit of travel.

2.6.   SYSTEM SET UP

In Section 2.2 we describe how to set up the hardware additions
and options. Here we show how to tell the software which options
are being used. It is important that the system is configured
before you Run Drafting Program, otherwise the system will
assume the default recommended layout specified in Section 2.2.

Although the procedures described below need only be performed
once when initially setting up the system, the selections can be
re-specified at any future time to accomodate any changes in
your system configuration.

There are 4 relevant selections on the System Menu -

Option 5 : CONFIGURE SYSTEM
       7 : SET UP PRINTER
       8 : SET UP DIGITISER
       9 : SET UP DISPLAY

Each of these procedures are described in detail below.

Configure System

1   Select Option 5 from the System Menu. The following screen
     is displayed :


```
CONFIGURE SYSTEM
—  —  —  —  —  —  —  —  —  —  —  —

     PRINTER INTERFACE        8 B
     PLOTTER INTERFACE        8
     ROBO-RAM CARD            3
     DIGITISER INTERFACE      8
     ACCELERATOR              8
     DISK CONTROLLER          6
     VIDEO INTERFACE          8



—  —  —  —  —  —  —  —  —  —  —  —
     PRESS <ESC> TO RETURN TO MENU
     ENTER SLOT NUMBER AND PRESS <RETURN>
```

2.6.   SYSTEM SET UP (Cont.)

2   The screen displays the 'default' layout as described in
        Section 2.2.

        If the default slot number for the Card is correct, just
        press RETURN and proceed to the next item.

        Otherwise, enter the correct slot number for the card and
        press RETURN. Note that you cannot assign more than one
        card to a particular slot.

3   When you have specified all Cards, the System Master disk
        is set up for the configuration entered and the System
        Menu is re-displayed.

        If you use ESC to return to the System Menu before you
        have specified all the slots, you must re-select this
        option and complete the full sequence before the system
        can be used.

Set up Printer

First ensure that the cable is properly connected between the
Printer and the Printer Interface card, and that any special
switch settings on the Interface card have been applied. Refer
to the documentation supplied with your printer and/or printer
interface if in doubt.

The set up operation described below simply tells the system
which type of card is being used, so that the correct codes can
be sent to perform 'graphics printing'.

1   Select Option 7 from the System Menu. A screen is presented
        listing the supported printer interfaces.

2   Press the option number for your printer interface.

        Note that the last option ('User Defined') allows you to
        enter the Control Character String for other types of
        printer interface card. Consult the documentation provided
        with the interface card for the relevant codes.

3   Having made your selection, the System Menu is re-displayed

2.6.   SYSTEM SET UP (Cont.)

Set up Tablet

1   Select Option 8 from the System Menu. A screen is presented
      listing the supported Digitising Tablets.

2   Press the option number for your selection.

3   Having made your selection, the System Menu is re-displayed

NOTE The 'Houston' Digitiser tablet will not operate if an
      'Accelerator' card is installed.

Set up Display

Many types of Monitor and R.G.B. Video interface can be used
with no special handling. However, certain types of display
interface do need to be treated differently by the system. For
these special cases, the interface type needs to be specified.

1   Select Option 9 from the System Menu. A screen is presented
      listing the special display interfaces.

2   Press the option number for your display interface.

3   Having made your selection, the System Menu is re-displayed

NOTE : If you subsequently revert to a 'normal' display
        interface, use 'Set up Display' to tell the system that
        a normal interface is now present.

Disk Protection

Having completed the installation of the hardware and the
configuration of the system, be sure to apply a Write Protect
Tag to the System Master disk. This will protect the disk
against accidental over-writing.

CHAPTER 3   OPERATION

This chapter introduces the main aspects of the system and the
way in which it is operated.

CONTENTS

3.1.   THE SCREEN

First load the software and 'Run Drafting Program'.

The procedure for loading the software is described fully in
Section 2.4. In summary :

1   Start with the Apple computer switched off.

2   Insert the System Master disk in Drive 1.
        Insert a Library disk in Drive 2.

3   Switch on the Apple computer. The Title Page is displayed
        followed by the System Menu.

4   Select Option 1 - Run Drafting Program.

When the program has been loaded, a screen is displayed with a
block of labels down the right hand side (the 'Menu') and
various symbols along the bottom (the 'Palette').

This screen is your working environment - all drawing is
performed on the blank area (the 'Work Page'), and you select
different commands and operations from the Menu and Palette.
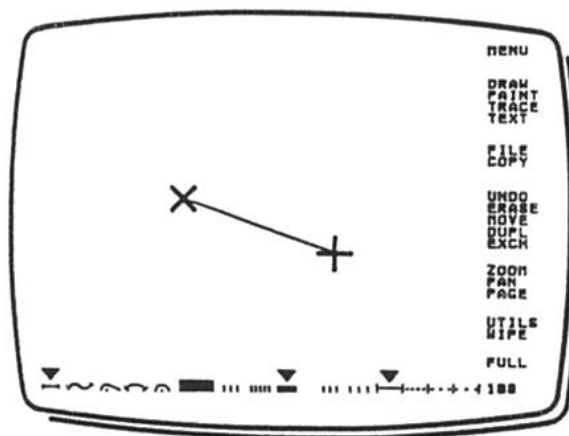
3.2.   USING THE CONTROLLER

The Controller is designed to be used as an extension from the
computer console, so that you can make yourself comfortable and
concentrate on the screen. Try to operate the controls by touch,
keeping your eyes on the screen, and you will soon be using the
controller as naturally as a pencil.

Controller Commands

The controller is used both as a drawing instrument and as the
means of giving commands to the system and selecting options.

In general, the controls function as follows :

The stick   ('XY') - controls the position of the 'cursor'
                           by up/down, left/right or diagonal
                           movement.

The knob   ('Z')   - controls variable values, e.g. size,
                           rotation, etc.

Left Button   ('L')   - selects a menu command

Right Button   ('R')   - releases the 'cursor' from the work
                           page

Top Button   ('T')   - executes a command

Left & Right   ('L+R') - exits a menu command

Left & Top   ('L+T') - selects and performs the UNDO and WIPE
                           commands
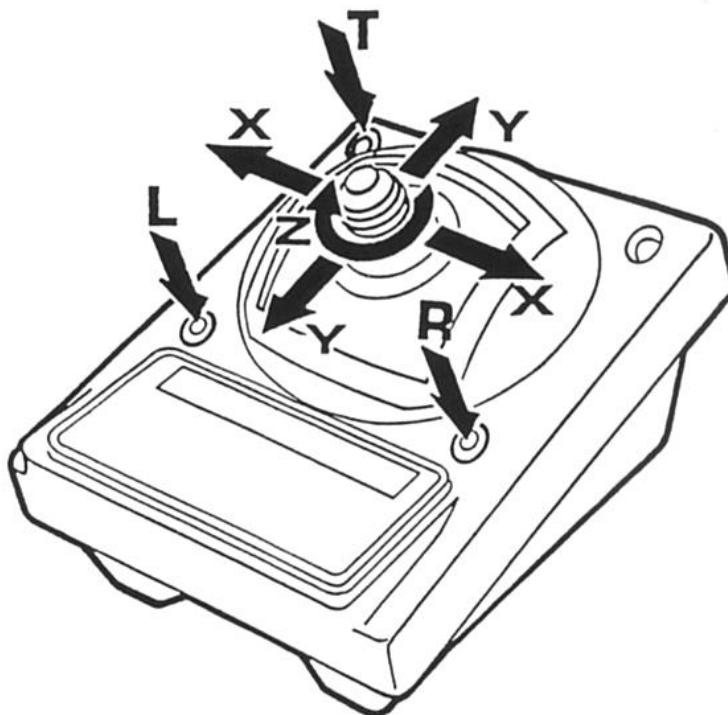
3.2.   USING THE CONTROLLER (Cont.)

Command Abbreviations

The following abbreviations for Controller operations are used throughout the remainder this manual :

ROTATE Z   - Rotate control knob

L   - Left button

R   - Right button

T   - Top button

L + R   - Left & Right buttons simultaneously

L + T   - Left & Top buttons simultaneously

Controller Operation

Use one hand for 'stick' and 'knob' movements, and the other for all button presses.

The buttons are usually operated by a press and release action, although sometimes you will have to press and hold a button.

When a press and release action is used, the system accepts the instruction only when the button is released.

Cursors

On the Work Page is an 'x' and a '+' connected by a line. These are 'Cursors', and they can be moved around the screen with the Controller joystick.

The 'x' cursor is termed the Origin cursor ; it is static and defines the start point when drawing.

The '+' cursor is termed the Dynamic cursor ; it is active and defines the end point when drawing. It is also used to make selections from the Menu and Palette.

The line that connects these two cursors is 'rubber-banded' - which means that it stretches and contracts as you move the Dynamic cursor.

3.2.   USING THE CONTROLLER (Cont.)

How to 'update' the Cursor

To establish a start point when drawing, position the dynamic
cursor at the required point, and Press L to update the origin
cursor to this point.

How to 'free' the Cursor from the Work Page

To make selections with the Cursor from the 'Menu' or 'Palette',
press and hold R, and release R when the selection is made.

Menus

Functions are selected, and commands are given to the system, by
using the cursor movement to pick a function from the menu.

There are two Menus - Menu 1 and Menu 2 :

```
┌─────────────┐        ┌─────────────┐
│ MENU        │        │ MENU        │
│             │        │             │
│ DRAW        │        │ ANGLE       │
│ PAINT       │        │  -0         │
│ TRACE       │        │   0         │
│ TEXT        │        │   0         │
│             │        │  90         │
│ FILE        │        │   0         │
│ COPY        │        │   0         │
│             │        │ ORTH        │
│             │        │ N-TAN       │
│ UNDO        │        │             │
│ ERASE       │        │             │
│ MOVE        │        │ GRIDI       │
│ DUPL        │        │ GRIDII      │
│ EXCH        │        │ X  4        │
│             │        │ Y  4        │
│ ZOOM        │        │ FIND        │
│ PAN         │        │ POINT       │
│ PAGE        │        │             │
│             │        │ SCALE       │
│ UTILS       │        │ DIMN        │
│ WIPE        │        │             │
│             │        │ FULL        │
│ FULL        │        │             │
│             │        │ 100         │
│ 100         │        │             │
└─────────────┘        └─────────────┘
```

3.2.   USING THE CONTROLLER (Cont.)

Selecting a function from the Menu

1   Press and hold R and move the cursor to the 'MENU' legend
        at the top right corner of the screen.

        A flashing white box appears around the 'MENU' legend.
        Release R.

2   Press and release L to confirm the selection; another Menu
        is displayed (Menu 2).

3   Move the cursor to the left, away from 'MENU', to return
        to the work page.

4   Press and hold R and move the cursor to 'MENU'; release R;
        press and release L - Menu 1 is returned.

5   Move the cursor to the left to return the to the Work Page.
        Note that the 'DRAW' function is automatically selected,
        being the 'default' function.

The procedure for selecting any Menu function is just as
described in steps 1 - 3 above, but for the moment do not try
making selections from either menu.


Memory Counter

The number displayed at the bottom of the Menu is the Memory
counter. It shows the percentage of memory remaining for
drawing. When the percentage falls below 1%, you should FILE the
drawing (See Section 4.2.1.).

3.2.   USING THE CONTROLLER (Cont.)

Palettes

Several of the functions - DRAW, PAINT, COPY and DIMN - provide
an associated palette.

A Palette allows you to make further selections within a
function. The DRAW Palette, displayed when the default DRAW
function is selected, provides different Draw modes, line types,
and line colours.
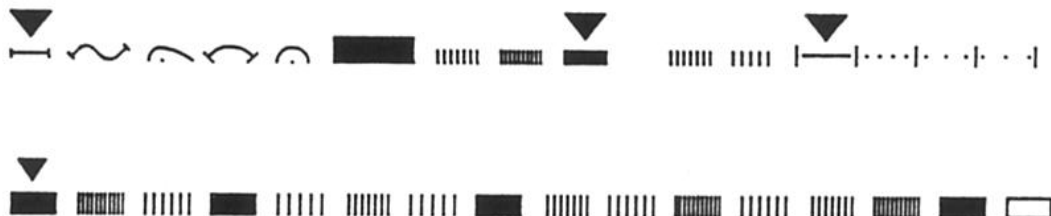
SCL 100.0   ROT   0   COMP   0   X FLIP Y ▮ |—|

M   X LEN   Y LEN LEN   ANG   0.286558 M   DP6

Selecting an option from the Palette

1   Press and hold R and aim the cursor at one of the colour
       blocks in the middle of the palette.

2   Move the cursor down to the chosen colour. The triangular
       marker jumps to the selected colour.

3   Move the cursor straight up to avoid making another colour
       selection. If you do this by accident, just repeat the
       action.

4   Release R when you are back on the Work Page.

Other selections can be made from the palette in a similar way.
Note that you don't have to Press L to make a selection from the
palette, unlike the menu.

3.3.   USING THE FUNCTIONS

System Functions

The system Functions are presented on the two menus, Menu 1 and
Menu 2. They are grouped on the menus according to their overall
uses, as follows -

Menu 1 : 'Create'   'Library'   'Edit'   'View'   'Utilities'

	DRAW	FILE	UNDO	ZOOM	UTILS
	PAINT	COPY	ERASE	PAN	WIPE
	TRACE		MOVE	PAGE	FULL
	TEXT		DUPL		
			EXCH		

Menu 2 : 'Angles'   'Grids'   'Locate'   'Numeric Control'

	ANGLE	GRID I	FIND	SCALE
	ORTH	GRID II	POINT	DIMN
	N-TAN			

The Menus can be changed by selecting 'MENU' at the top right
of the screen.

Drawing Methods

Drawings can be produced in three overall ways -

'FREE-FORM'   -   Just drawing on the screen as if on paper with
                   no construction aids such as 'ruler', 'compass'
                   or 'protractor'.

                   Sections 4.1. to 4.5. describe how to use the
                   main functions of the system in free-form mode.

'PRECISION'   -   As 'Free-form', but using GRID, ANGLE and POINT
                   Locks, which provide aids to drawing
                   construction.

                   Sections 4.6. to 4.8. describe the use of the
                   precision functions, which can be used in
                   conjunction with the main functions.

'SCALED'   -   As 'Precision', but enabling all components of
                   the drawing to be defined numerically by using
                   the SCALE and DIMN functions.

                   Section 4.9. describes the use of the SCALE
                   function, which enables the main and precision
                   functions to be used in Scale Mode.

3.3.   USING THE FUNCTIONS (Cont.)

Function Summary

'Create'

DRAW, PAINT, TRACE, and TEXT - provide all the facilities
necessary to generate new drawings and graphics.

'Library'

FILE and COPY - enable you to store drawings and graphics on
Library disks (via FILE) and to use stored drawings as modules
in other drawings (via COPY).

'Edit'

UNDO, ERASE, MOVE, DUPL ('DUPLicate') and EXCH ('EXCHange') -
provide the means for making corrections and amendments during
drawing and for subsequent alterations.

'View'

ZOOM, PAN and PAGE - provide different ways of viewing a
drawing. PAGE regenerates the drawing at its 'base scale'; ZOOM
allows you to select a part of the drawing and 'zoom in' (ie
magnify it) - and also 'zoom out' from a magnified view; PAN
lets you move around a zoomed (magnified) view.

'Utilities'

UTILS, WIPE and FULL - provide a set of general system
utilities.

'Angles'

ANGLE, ORTH ('ORTHogonal') and N-TAN ('Normal-TANgent') - enable
you to restrict cursor movement along defined angle paths,
thereby entering the components of a drawing in precise angular
relationships.

'Grids'

GRID I and GRID II - provide further constructional aids by
constraining cursor movement to defined Grid points.

3.3.   USING THE FUNCTIONS (Cont.)

'Locate'

FIND and POINT - provide ways of locating and locking data end
points to assist in drawing construction.

'Numeric Control'

SCALE and DIMN ('DIMensioN') - allow you to use the system in
a full scalar mode, defining all items of the drawing
numerically, and subsequently to dimension those items.

CHAPTER 4   FUNCTIONS

This chapter describes all the system Functions and shows how
they can be used to produce, edit and store your drawings.

CONTENTS

4.1.1. DRAW

*   Provides the basic drawing operations.

Operation

1   DRAW is the 'default' system function : it is
        automatically selected on loading the system and after a
        'WIPE' (system reset). Otherwise select DRAW from Menu 1.

2   DRAW is used in conjunction with the DRAW PALETTE, which
        allows you to select the Draw mode and to set the Colour
        and Line Type. The Draw modes are as follows :

        LINE and POINT
        TANGENT ARC
        RADIAL ARC
        COMPASS ARC
        CIRCLE
        NIB

        The use of the different Draw modes is described in the
        following pages.

Escape

The default Draw mode is Line/Point; to change Draw mode, select
another from the Palette.

To exit DRAW, select another function from Menu 1.

▼

4.1.1. DRAW : LINE   ┝━┥

1   Select LINE from the Palette, if not already selected.

2   Move the Dynamic cursor to the start of the line and
        update the Origin cursor to this position by pressing L.

3   Move the Dynamic cursor to the end of the required line -
        the 'rubber-band' indicates the resulting line.

4   Press T to draw the line. The line is drawn in the Colour
        and Line Type currently selected on the Draw Palette.

5   The Origin cursor automatically updates to the end of the
        drawn line.

        To continue drawing from a new origin, move the Dynamic
        cursor again and press L to update the Origin cursor to
        the new start point.

SEE   Section 4.9. For using LINE in SCALE drawing.

▼

4.1.1. DRAW : POINT   ┝━┥

1   Select LINE from the Palette, if not already selected.

2   Move the Dynamic cursor to the required point, and update
        the Origin cursor to this position by pressing L.

3   Press T to draw the point. The point is drawn in the
        Colour currently selected on the palette.

SEE   Section 4.8.2. For full precision when drawing points, use
        the POINT lock.

4.1.1. DRAW : TANGENT ARC

1   Select TAN ARC from the Palette.

        The Line 'rubber-band' is replaced by an Arc rubber-band,
        blending from the previous end-point.

2   Set the arc by moving the Dynamic cursor to the required
        end point.

3   Press T to draw the arc. The arc is drawn in the Colour
        and Line Type currently selected on the palette.

4   The Origin cursor automatically updates to the end of the
        drawn arc. To continue the arc, move the Dynamic cursor to
        a new end point and press T to draw.

5   To start a new arc in 'free space' (ie not connected to a
        previous end point), move the Dynamic cursor to the new
        start point, press L to update the Origin cursor, then set
        and draw the arc as described in Steps 2 and 3.

        If you need to establish a new direction for the arc,
        update the Origin cursor twice along the required path.

NOTE   If the arc is almost flat, it will default to a straight
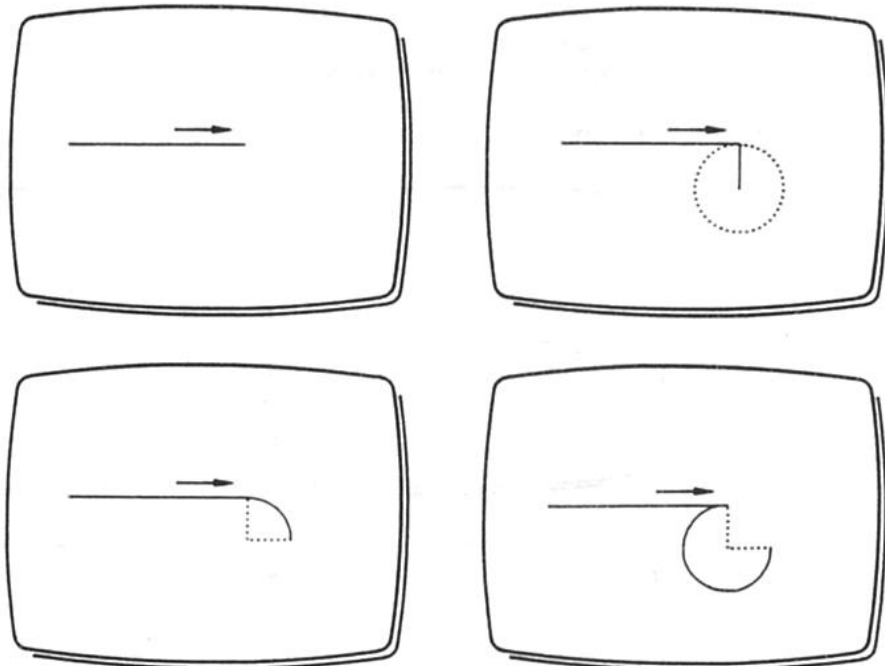   line.
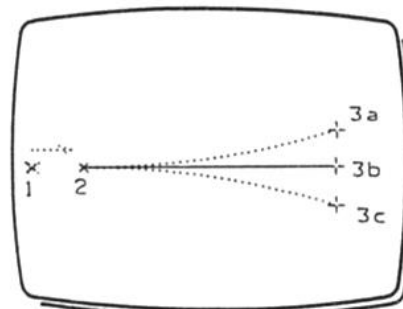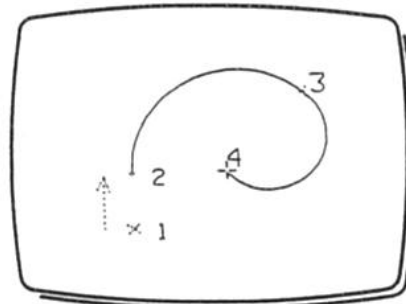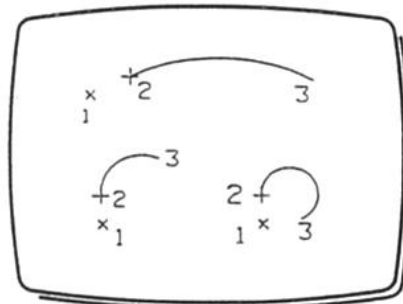
4.1.1. DRAW : RADIAL ARC

1   Select RAD ARC from the Palette.

         The Origin and Dynamic cursors are replaced by a line and
         a dotted circle. The line, at right-angles to the last
         item entered, indicates the radius of the arc and the
         circle describes the resulting circular arc.

NOTE   At this point, and at any step below, you can 'escape'
         from the Rad Arc mode by holding down R to activate the
         Dynamic cursor. This can be used to make another palette
         or menu selection.

2   Move the radius line until the required radius is
         established. Press L to set the radius.

3   Move around the defined centre to set the angle of the
         arc segment. You can press L to reverse the direction of
         the arc.

4   When the segment has been set, press T to draw the arc.
         The arc is drawn in the Colour and Line Type currently
         selected on the palette.

5   Another arc, blending from the previous, can be drawn;
         otherwise, 'escape' by holding down R as described in the
         Note above, to select another option.

SEE   Section 4.9. For using RAD ARC in SCALE drawing.

4.1.1. DRAW : COMPASS ARC

1   Select COMP ARC from the Palette.

        The Origin and Dynamic cursors are replaced by a line and
        a dotted circle. The line, emanating from the Origin
        cursor, indicates the radius of the arc, and the circle
        describes the resulting circular arc.

NOTE   At this point, and at any step below, you can 'escape'
        from the Compass Arc mode by holding down R to activate
        the Dynamic cursor. This can be used to make another
        palette or menu selection.

2   Move around the origin of the radius line to establish
        the start position of the arc, and move the radius line
        until the required radius is established. Press L to set
        the radius.

3   Move around the defined centre to set the angle of the
        arc segment. You can press L to reverse the direction of
        the arc.

4   When the segment has been set, press T to draw the arc.
        The arc is drawn in the Colour and Line Type currently
        selected on the palette.

5   Another arc, sourced from the same centre, can be drawn;
        otherwise, 'escape' by holding down R as described in the
        Note above, to select another option.

NOTE   If COMP ARC is used to draw complete circles, such circles
        will leave traces on the screen if erased. These traces
        disappear after using PAGE. Circles drawn with the Circle
        cursor will erase normally.

SEE   Section 4.9. For using COMP ARC in SCALE drawing.
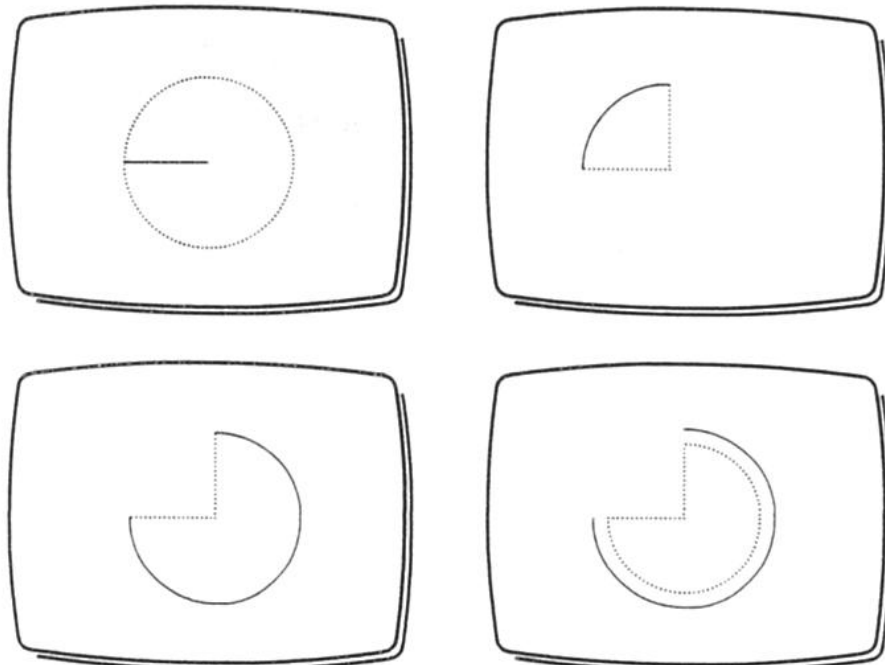
4.1.1. DRAW : CIRCLE

1   Select CIRCLE from the Palette.

        The Dynamic cursor is replaced by the Circle cursor.

2   Move the centre of the Circle cursor to the required
        origin of the circle.

3   Rotate Z to adjust the diameter of the Circle cursor.

4   Press T to draw the circle defined by the cursor. The
        circle is drawn in the Colour and Line Type currently
        selected on the palette.

        The drawn circle may not be visible until the cursor is
        moved away.

SEE   Section 4.9. For using CIRCLE in SCALE drawing.

4.1.1. DRAW : NIB

1   Select NIB from the Palette.

         The Origin and Dynamic cursors are replaced by two Nib
         cursors. The Dynamic Nib is an extendable line with a
         small marker on one end, indicating the 'active' part of
         the cursor for menu and palette selection.

         Drawing between the Origin Nib and the Dynamic Nib
         produces 'block' drawing between the two Nib cursors.

2   Adjust the Dynamic Nib width by rotating Z.

3   Adjust the Dynamic Nib angle by holding down R and
         rotating Z; release R when the required angle is set.

4   Position the Dynamic Nib at the requires start point and
         update the Origin Nib by pressing L - this establishes the
         start position, length and angle of the nib stroke.

5   Move the Dynamic Nib to the end point of the nib stroke,
         and adjust length (Rotate Z) and angle (Hold R, Rotate Z,
         Release R) if required.

6   Press T to draw the nib stroke (the area between the two
         nib cursors). The nib stroke is drawn in the Colour and
         Line Type currently selected on the palette.

NOTE   By altering Line Type, the spacing across the width of
         the nib can be varied.

7   The spacing along the length of the nib (Nib Style) can be
         altered by moving the Dynamic Nib to the Nib Indicator on
         the palette, and holding down L. Rotate Z to vary the Nib
         Indicator from 'solid' (the default state) through to a
         maximum spacing of 5 points. Release L to set the Nib
         Style.
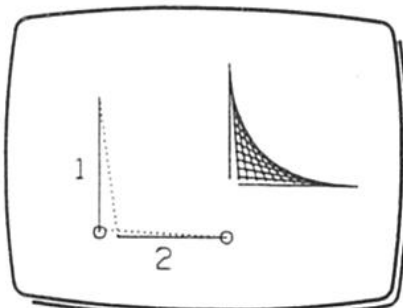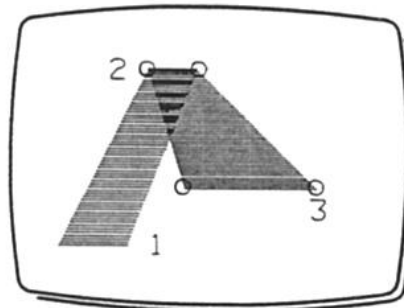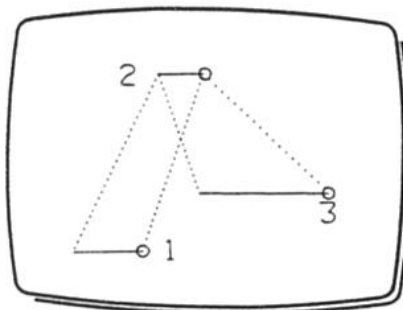
4.1.2. PAINT

*   Enables you to fill any completely enclosed area of a
    drawing with one of 16 colours.

    PAINT is used in conjunction with the Paint Palette, which
    provides 16 colour choices. PAINT is 'screen- based' and
    cannot be reproduced on a pen plotter.

Operation

1   Select PAINT from Menu 1. The Paint Palette is displayed,
        replacing the palette previously in operation.

2   Select the required Colour from the Paint palette.

3   Position the cursor over the area to be painted.

4   Press T to fill the enclosed area with the Colour
        currently selected on the Paint Palette.

NOTE   An attempt to fill any area not fully enclosed will cause
        a leak of colour through the gap. Beware of the following
        conditions :

        ZOOM (See Section 4.4.1) - Areas might be opened up under
        Zoom.

        UNDO & ERASE (See Section 4.3) - After use, gaps may be
        caused in parts of the drawing. Use PAGE (See Section
        4.4.3) to regenerate the drawing intact.

        GRIDS (See Section 4.7) - When switched off, gaps will be
        caused in parts of the drawing. Use PAGE.

Escape

Select another function from Menu 1 with the Paint cursor.

4.1.3. TRACE

* Enables freehand drawing in 'Stream' mode. In this mode, a
  continuous freehand line is drawn following XY movement.

Operation

1   Select TRACE from Menu 1. A single dot cursor replaces the
      Origin and Dynamic cursors.

2   Position the cursor at the required start.

3   Hold down T and move the cursor along the required path. A
      continuous line is generated in the Colour currently
      selected on the Draw palette. Release T to stop drawing.

NOTE TRACE uses up a lot of memory and should be used
      sparingly. The system will beep when 1000 bytes of
      continuous line has been entered, and will stop accepting
      more. To continue, Release T and restart from the end
      point.

Escape

Select another function from Menu 1 with the Trace cursor.

4.1.4. TEXT

* Enables you to incorporate text in drawings.

Operation

1   Select TEXT from Menu 1. The Text Entry Screen replaces
     the Work Page.

2   Enter the text from the keyboard, terminating each
     complete line with RETURN.

3   Upper Case (ie Capitals) is shown by 'inverse' display.

     APPLE II plus
     To switch from Upper Case to Lower Case, press ESC.
     To revert to Upper Case, press ESC again.

     APPLE IIe
     Use the SHIFT key to alter between Upper and Lower Case.

4   You can edit the text block by using the following keys :

     CTRL W - Cursor Up   or   ↑ - Up
     CTRL Z - Cursor Down   ↓ - Down
     CTRL A - Cursor Left   ← - Left
     CTRL S - Cursor Right   → - Right

     CTRL I - Insert
     CTRL D - Delete Character
     CTRL X - Delete Line
   * (Apple IIe only)

5   When you have entered and formatted the line or block of
     text, press L & R to revert to the Work Page. The Text
     cursor, configured to the text entered, is displayed.

6   The solid line on the bottom of the Text cursor indicates
     the orientation of the text block, which can be rotated in
     steps of 90 deg (0,90,180,270), by pressing L.

4.2.4. TEXT (Cont.)

7   The size of the Text cursor can be adjusted, by rotating
         Z, through the following range :

         Scale :   4, 2, 1, 1/2, 1/4
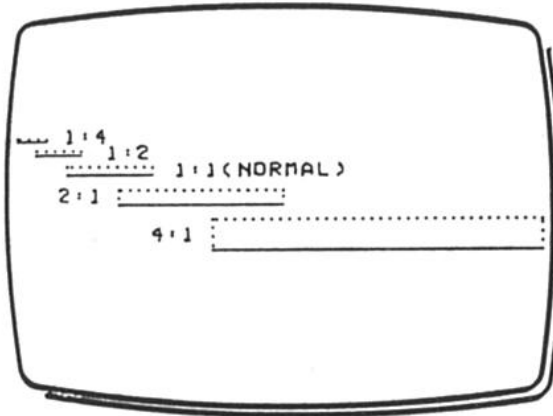
8   When the position, size and rotation of the Text cursor
         has been set, press T to draw the Text in the Colour
         currently selected on the Draw palette.

NOTE   Text which is too small to be legible at any given scale
         is displayed as a dot pattern to indicate its presence.

         Similarly, any text greater than 8 times base scale (via
         ZOOM) will not be displayed, although still held in
         memory.

NOTE   In addition to the standard text characters, the system
         provides some additional characters for use in technical
         and architectural drawings. These Special Characters,
         together with the keys which generate them, are as follows

         Keyboard   Text

                @   £   - Pound sterling

         CTRL C   °   - Degrees
         CTRL O   ø   - Diameter
         CTRL T   ±   - Tolerance
         CTRL V   <   - Dimensioning arrow
         CTRL B   /   - Dimensioning marker

SEE   Section 4.9. For the use of TEXT in SCALE drawing.

Escape

 Press L & R together.

4.2.1. FILE

* Stores the contents of the Work Page on a Library Disk.

Operation

1   Select FILE from Menu 1. The current (last used or
        default) Library Index is displayed with an active File
        cursor. The figure on the right side of the Index shows
        the percentage of space remaining on the disk.

        If another Library Index is required, press R for the next
        index, or L for the previous one.

2   Position the cursor over a box.

        An existing 'file' can be overwritten by a new drawing if
        it is no longer required, and is then permanently erased
        from the Library disk. If this is attempted, a prompt
        requests confirmation before proceeding.

3   Press T. The data is transferred to the Library disk, then
        an 'icon' of the drawing is generated in the box. If you
        want to suppress the generation of a file icon, press the
        keyboard SPACE BAR.

4   When filing is complete, the Text Entry Screen is
        displayed, allowing you to label the filed drawing.

        The size of the label depends on the index format :

        64-box index   -   12 characters (3 lines of 4 chars.)
        16-box index   -   54 characters (6 lines of 9 chars.)
         4-box index   -   216 characters (12 lines of 18 chars.)

        The label overwrites the 'icon' of the drawing and does
        not form part of the data; it is for your reference use.

Escape

        When you have entered the label, press L & R to apply the
        label and revert to the Work Page.

        If you do not want to add a label, just press L & R when
        the Text Entry Screen is displayed, to exit to the Work Page.

4.2.2. COPY

* Enables you to retrieve a filed drawing from a Library Disk
  and to include it in a new drawing.

Operation

1   Select COPY from Menu 1. The current (last used or
      default) Library Index is displayed, with an active Copy
      cursor.

      If another Library Index is required, press R for the next
      index, or L for the previous one.

2   Position the cursor over the box containing the required
      drawing.

NOTE You cannot Copy from an Archive Library Disk.

3   Press T to select the drawing. The Work Page is
      re-displayed and the Copy palette selected.

      The Copy palette provides the options available with COPY

SCL 100.0   ROT   0   COMP   0   X FLIP Y ■ |—|

SCL   (Scale)   - The scale of the Copy can be set
                         between 4% and 100% of original size,
                         in steps of 0.5%.

ROT   (Rotation)   - The Copy can be rotated through 360
                         degrees in 5 deg. steps.

COMP (Compression) - The Copy can be rotated through the
                         X and/or Y planes in 1 deg. steps.

FLIP (X & Y)   - The Copy can be 'mirrored' in the
                         X and/or Y axes. The 'T' marker at
                         the centre of the cursor indicates
                         the two axes.

COLOUR Override   - The Colour of the original drawing
                         can be changed on Copy. All data in
                         the original is drawn in the new
                         colour.

LINE TYPE Override - The Line Type of the original drawing
                         can be changed on Copy. All data in
                         the original is drawn in the new line
                         type.

All COPY options can be used in any combination.

4.2.2. COPY (Cont.)

4   Rotate Z to set the SCL (Scale) of the Copy. To 'lock' the
         Scale, toggle the SCL indicator on the palette; toggle
         again to unlock.

5   If ROT (Rotation) required : Hold down L and rotate Z,
         release L when set. To 'lock' the Rotation, toggle the ROT
         indicator on the palette; toggle again to unlock.

6   If COMP (Compression) required : Hold down R and rotate Z,
         release R when set. To 'lock' the Compression, toggle the
         COMP indicator on the palette; toggle again to unlock.

7   If FLIP (Mirroring) required : Toggle X FLIP and/or Y FLIP
         with the Cursor; toggle again to reset.

8   If COLOUR and/or LINE TYPE Override required : Toggle the
         appropriate indicator on the palette, Hold down L and
         rotate Z until the required value is displayed, Release L
         to set. Toggle the indicator again to reset.

9   Having set the Copy parameters, position the cursor at the
         required position and press T to draw the copy.

10   Further Copies can be drawn, altering any of the Copy
         parameters before actioning, if required.

SEE   Section 4.7. For the use of COPY with GRIDS.

Escape

Press L & R together.

4.3.1. UNDO

* 'Backtracks' one step - erasing the last item entered, or
  restoring the View after a ZOOM.

Operation

1   Select UNDO from Menu 1, by pressing L & T .

2   If the previous action was a 'Create' function - a DRAW,
        PAINT, TRACE or TEXT entry, or a COPY, then that item is
        automatically erased on selection. The cursors are
        restored to their previous positions to enable a 're-try'.

3   If the previous action was a ZOOM (or PAN), then the
        drawing is restored to its previous view.

Escape

UNDO exits automatically.

4.3.2. ERASE

* Enables you to step through a drawing to delete any items
  that are incorrect or not required.

<u>Operation</u>

1   Select ERASE from Menu 1. The last item entered is
        indicated by Editing Cursors. The cursors are as follows :

        Line   - Two Editing cursors (diamond-shaped) at the
                   start and end points.
        Point   - One cursor at the point.
        Arc   - Three cursors at the centre, start and end
                   points.
        Circle - Three cursors at the centre and two
                   circumference points.
        Nib   - Four cursors at the corners of the nib block.
        Paint   - One cursor at the start point.
        Trace   - Two cursors at the start and end points.
        Text   - Text cursor enclosing the text block.
        Copy   - Copy cursor enclosing the Copy item.
                   Note : Because Copy items are treated as single
                   modules, ERASE deletes the entire Copy.

2   Press L to step back through the drawing, in the reverse
        sequence of the drawing's assembly. Each item is
        successively indicated by the Editing cursors. Release L
        when the required item is indicated.

        Similarly, press R to step <u>forward</u> through the drawing,
        in the sequence of the drawing's assembly, and release R
        when the required item is indicated.

3   When the item is indicated, press T to erase. The item is
        permanently erased from the drawing, and the Editing
        cursors move to the previous item in sequence.

        If both T and L are held down, a 'continuous erase'
        results; likewise, holding down T and R results in a
        continuous erase in the forward sequence. If all items
        are erased, the function is automatically exited.

NOTE   If the erased item is a PAINT, the colour area is marked
        with an 'X', but <u>remains on screen</u> until the drawing is
        regenerated via PAGE, ZOOM or PAN.

        Similarly, use PAGE, ZOOM or PAN to restore any partial
        erasure of underlying items after the use of ERASE.

4.3.2. ERASE (Cont.)

NOTE   If, following the use of ZOOM, the entire item is not on
         screen, use PAN to move the target item onto screen for
         erasure. Alternatively, apply a 'reverse zoom' (ZOOM,
         Section 4.4.1.).

SEE   Section 4.5.1. LOAD enables the erasure of the components
         in Library items.

Escape

Press L and R together.

4.3.3. MOVE

* Enables adjustment in the positioning of COPY items. Copy
  parameters can be changed in the process.

Operation

1   Select MOVE from Menu 1. The Copy cursor replaces the
         previous cursor and frames the last Copy item entered.
         The Copy palette replaces the current palette

2   Press T to select the Copy item for re-specification.

         The selected item is indicated with a static Copy cursor,
         and an active Copy cursor allows you to re-position the
         Copy, and, if necessary, change (and lock) any of the Copy
         parameters as described for COPY (Section 4.2.2).

3   When the Copy cursor has been re-positioned, press T to
         draw. The old Copy is erased, and re-drawn in the new
         position.

4   The same Copy item can be moved again, if necessary, by
         repeating the above procedure.

         To select a Copy item earlier in the drawing sequence,
         press L to step back through the drawing as described for
         ERASE (Section 4.3.2.). Each Copy item is indicated by a
         Copy cursor; release L when the required Copy item is
         framed. Similarly, press R to step forwards through the
         drawing, and release R when the required Copy item is
         framed.

Escape

Press L and R together.

4.3.4. DUPL (DUPLicate)

* Enables you to pick up a Copy item from the Work Page and
  draw further Copies (without going to the Library).

Operation

1   Select DUPL from Menu 1. The Copy cursor replaces the
      previous cursor and frames the last Copy item entered. The
      Copy palette replaces the current palette.

2   Press L to step back through the sequence of Copy items,
      and press R to step forward through the sequence, as
      described for ERASE (Section 4.3.2.).
      Release when the required Copy item is indicated.

3   Press T to pick up the framed Copy item. The Copy cursor
      becomes active, and, if necessary, you can change (and
      lock) any of the Copy parameters as described for COPY
      (Section 4.2.2.).

4   Press T to draw another Copy of the selected item. Further
      copies can be drawn if required.

Escape

Press L & R together.

4.3.5. EXCH (EXCHange)

* Enables you to replace Copy items on the Work Page with
  another from the Library.

Operation

1   Select EXCH from Menu 1. The current (last used or
       default) Library Index is displayed, with an active Copy
       cursor.

       If another Library Index is required, press R for the next
       index or L for the previous.

2   Position the cursor over the box containing the required
       drawing.

3   Press T to select. The Work Page is re-displayed, with
       the Copy cursor framing the last Copy item entered.
       Press L to step back or R to step forward through the
       sequence of Copy items. Release when the required Copy
       item is framed.

4   Press T. The Copy item is replaced by the new selection,
       at the same Scale, Rotation, Compression, etc. These
       parameters cannot be changed in EXCH.

5   If required, another Copy item can be selected for
       replacement with the new item by repeating the procedure.

Escape

Press L and R together.

4.4.1. ZOOM

* Enables you to both expand a selected area of the drawing
  to the full size of the work page (zoom in), and also to
  contract a zoomed view into a selected area (zoom out).

Operation

1   Select ZOOM from Menu 1. The Zoom Cursor replaces the
       previous cursor.

2   Move the Zoom cursor to the centre of the area to be
       enlarged.

3   Rotate Z to set the size of the 'window' that defines the
       area for enlargement.

       As you rotate Z, the marker at the centre of the zoom
       cursor changes between '+' and 'X'. The '+' marker
       indicates 'zoom in', and the 'X' indicates 'zoom out'.

       When you zoom out, the current screen view will be
       re-displayed in the area enclosed by the zoom cursor.

NOTE   You cannot zoom out from the base page view. If
       attempted, the system issues a warning beep and ignores
       the command.

4   When the area has been selected, press T to perform the
       zoom. The display of the new view of the drawing can be
       halted by pressing the keyboard SPACE BAR.

5   If further expansion (or contraction) of the drawing is
       required, perform a further zoom as described.

SEE   Section 4.7. For the use of ZOOM with GRIDS.

Escape

Press L and R together.

4.4.2 PAN

* Enables you to display adjacent areas to a zoom view.

Operation

1   Select Pan from Menu 1. The Zoom Cursor replaces the
         previous cursor.

2   Move the cursor to include the off-screen area to be
         viewed.

NOTE   You cannot pan from the base page view. If attempted, the
         system issues a warning beep and ignores the command.

3   When the area has been selected, press T to perform the
         pan. The display of the new view of the drawing can be
         halted by pressing the keyboard SPACE BAR.

Escape

Press L and R together.

4.4.3. PAGE

* Re-displays the drawing at base page view. It can be used
  following changes or deletions to the drawing, or for
  'returning' from a zoom view.

Operation

1   Select PAGE from Menu 1.

2   The drawing is re-displayed at the base page view. The
      display of the drawing can be halted by pressing the
      keyboard SPACE BAR.

Escape

PAGE exits automatically after displaying the drawing.

4.5.1. UTILS (UTILitieS)

* Provides an additional Menu, presenting several utility
  functions.

Operation

1   Select UTILS from Menu 1. The UTILS MENU is displayed,
        with an active menu selection bar. The bar can be moved up
        and down the menu using the controller. Position the bar
        over the required option and press L to make a selection.

2   UTILS provides the following functions :

        LOAD LIBRARY   - Retrieves a drawing from a Library
                             Disk to enable modification.
        LOAD WORKPAGE   - Retrieves a drawing used as a module
                             in another drawing to enable
                             modification.

        ZOOM SAVE   - Temporarily stores a zoom view.
        ZOOM LOAD   - Retrieves the stored zoom view.

        SET TEXT SIZE   - Re-defines the absolute text height
                             when drawing in SCALE Mode.

        TABLET ON/OFF   - Enables the use of a Digitizer
                             Tablet as an alternative X-Y input.

        IMAGE FULLSIZE   - Regenerates a drawing at full screen
                             size (without Menu and Palette).
        IMAGE SAVE   - Stores the screen contents on a
                             Library disk.
        IMAGE LOAD   - Retrieves a stored screen image.
        IMAGE PRINT   - Prints the screen contents on a
                             suitable dot matrix printer.
        IMAGE CATALOG   - Lists all screen images stored on a
                             Library disk.

        BOOT DRIVE 1   - Re-boots a program disk in Drive 1.

        The use of these functions is described in the following
        pages.

Escape

Press L and R together.

4.5.1. UTILS : LOAD LIBRARY

* Enables you to retrieve a filed drawing from a Library disk
  for editing or adding further detail.

  If you have 'backed up' a drawing in progress, use this
  function to retrieve the drawing for continued work.

  This function, therefore, treats the drawing as the set of
  individual items from which it is compiled rather than as a
  single module (for which the COPY function is used).

Operation

1   Select LOAD LIBRARY from the Utils Menu. The current (last
        used or default) Library Index is displayed with an active
        selection cursor.

NOTE   This function will WIPE the Work Page when selected - if
        you want to save the current work, FILE before selection.

2   Position the cursor over the box containing the required
        drawing.

3   Press T to load the drawing. The Work Page (and memory)
        are cleared of any current drawing, and the loaded
        drawing is displayed.

Escape

When loading is complete, the system is in DRAW.

4.5.1. UTILS : LOAD WORKPAGE

* Operates in the same way as LOAD LIBRARY, but enables you to
  select a Copy item from the Work Page, discarding the
  remainder of the drawing, and to Load the item for editing
  or amendment.

  This function can be used to edit Copy items in 'composite'
  drawings which contain a number of Copy items.

Operation

1   Select LOAD WORKPAGE from the Utils menu. The Copy Cursor
       frames the last Copy item entered.

NOTE   This function will WIPE the Work Page when selected - if
       you want to save the current work, FILE before selection.

2   Press L to step back through the sequence of Copy items,
       and press R to step forward through the sequence, as
       described for ERASE (Section 4.3.2). Release L when the
       required Copy item is indicated.

3   Press T to load the framed Copy item.

       The Work Page (and memory) are cleared of the current
       drawing, and the selected Copy item is displayed.

NOTE   Having amended the selected Copy item, it can be saved on
       the Library disk via FILE; you can then re-load the
       original drawing and use EXCH to replace the previous
       version of the Copy item with the new amended version.

       If the selected Copy item contains lower levels of
       'nested' Copy items, you can repeat the process to
       isolate and extract a lower level item for editing.

Escape

When loading is complete, the system is in DRAW.
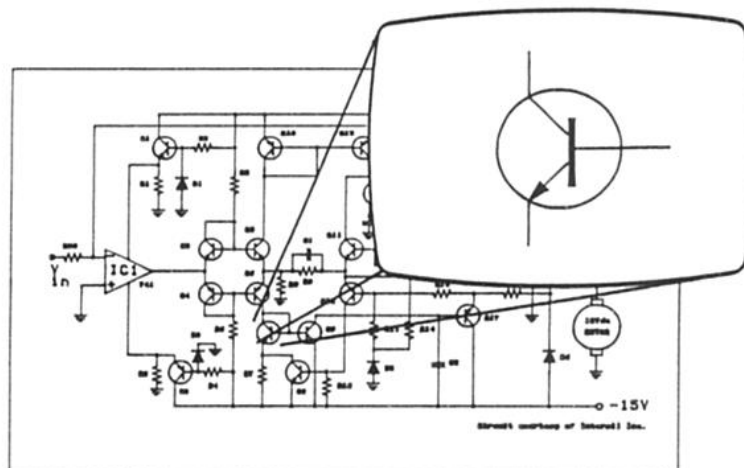
4.5.1. UTILS : ZOOM SAVE

* Enables you to temporarily store a Zoom view.

Operation

1   Select ZOOM SAVE on the Utils menu.

2   On selection, the current Zoom position and magnification
      is stored in memory.

Escape

ZOOM SAVE exits automatically.

4.5.1. UTILS : ZOOM LOAD

* Enables you to retrieve a previously saved Zoom view.

Operation

1   Select ZOOM LOAD from the Utils menu.

2   On selection, the current drawing is re-generated at the
      saved Zoom position and magnification.

Escape

ZOOM LOAD exits automatically.

4.5.1. UTILS : SET TEXT SIZE

* Enables you to re-specify the Text size when operating in
  SCALE mode (see Section 4.9).

Operation

1   Select SET TEXT SIZE from the Utils menu. A screen is
       displayed requesting Text scale and size values.

```
  _____
 /                                        \|
|    SET TEXT SIZE                         ||
|   _  _  _  _  _  _  _  _  _  _  _  _  _   ||
|                                          ||
|    ENTER PLOT SCALE        1 ·  ▓        ||
|    ENTER TEXT HEIGHT (mm)   1 ·  ▓       ||
|                                          ||
|                                          ||
|                                          ||
|                                          ||
|   _  _  _  _  _  _  _  _  _  _  _  _  _   ||
|                                          ||
|    PRESS <ESC>          TO CANCEL        ||
 _____/
   _____/
```

2   Enter, on the keyboard, the intended Plot scale of the
       drawing, terminating with RETURN.

3   Enter the absolute text size to appear when the drawing
       is plotted (eg 3.5 mm.), terminating with RETURN.

SEE   Section 4.9.1. for the use of TEXT in SCALE.

Escape

SET TEXT SIZE exits automatically.

4.5.1. UTILS : TABLET ON/OFF

*   Allows you to switch a Digitising Tablet 'on-line' or
    'off-line' if one is installed. When selected, the Tablet
    provides the same X-Y input as the standard controller.

Operation

1   Before use, ensure that the following System Menu options
        have been performed -

        (i) Configure System : slot specified for Tablet
                                      interface card
        (ii) Set up Tablet : Tablet specified.

        Then perform the 'RESET' procedure described in the
        Tablet User Manual, to establish the correct reference
        point.

2   Select TABLET ON/OFF from the Utils menu. Press L & R to
        return to the Work Page.

3   The Tablet provides the X-Y input of the controller by
        moving the stylus (or keypad, depending on the type of
        tablet) over the tablet surface, but without pressing the
        stylus down.

4   Palette selection is made by moving the stylus to the
        bottom of the tablet.

        Menu selection is made by pressing the stylus (or keypad
        button), moving the stylus/keypad in the Y-direction (at
        any X position) to the required menu option, and selecting
        with L on the controller.

5   Update the Origin Cursor by positioning the stylus/keypad
        at the required location, and pressing L on the
        controller.

6   Enter the item (line, arc, etc.) by moving the stylus or
        keypad to the required position and pressing T on the
        controller.

Escape

To switch off Tablet input, re-select TABLET ON/OFF.

4.5.1. UTILS : IMAGES

* An 'IMAGE' is the static screen display (ie mosaic of
  'pixels' on the screen) rather than the re-playable list of
  individual lines, arcs, etc. The following group of functions
  enable various operations on Images.

UTILS : IMAGE FULLSIZE

* Enables you to view the current drawing at full screen size,
  without the Menu and Palette. This view can be printed or
  photographed from the screen using an appropriate sub-system.

Operation

1   Select IMAGE FULLSIZE from the Utils menu.

2   On selection, the Menu and Palette are removed, and the
      current drawing is re-generated at full screen size.

3   Press T to directly select IMAGE SAVE (see below), which
      enables you to store the full size image on disk.

Escape

Press L & R together. The Menu and Palette are redisplayed, and
the drawing re-generated at base scale.

4.5.1. UTILS : IMAGE SAVE

* Allows you to store a screen image on disk. It is
  recommended that you format some disks especially for this
  purpose, using the 'Initialise disk' facility on your 'DOS
  System Master'.

  The images that you save are in the APPLE 'Picture' format,
  and are therefore fully compatible with other software
  products.

Operation

1   Select IMAGE SAVE from the Utils menu.

2   Enter a name for the image, for subsequent reference,
      terminating the entry with RETURN.

Escape

IMAGE SAVE exits automatically.

4.5.1. UTILS : IMAGE LOAD

* Allows you to re-load a previously stored Image from disk,
  for viewing or printing (see IMAGE PRINT below).

Operation

1   Select IMAGE LOAD from the Utils menu.

2   Enter the name of the required Image, terminating with
      RETURN. (You can review the Image names on the disk via
      IMAGE CATALOG, described below).

3   The selected Image is displayed on the screen.

Escape

IMAGE LOAD exits automatically.

4.5.1. UTILS : IMAGE PRINT

*   Allows you to print the screen contents on a suitable
    dot-matrix printer.

Operation

1   Before use, ensure that the following System Menu options
        have been performed -

        (i) Configure System : slot specified for the Printer
                                    interface card
        (ii) Set up Printer : correct Printer interface card
                                    specified.

2   Select IMAGE PRINT from the Utils menu.

3   Follow the prompt to align the printer paper. Press
        RETURN when ready.

4   The screen contents is printed.

NOTE   Most printer interface cards which support the necessary
        'Graphics Dump' option, enable a wide range of
        manipulation to the image being printed. Refer to the
        manual supplied with the card for the 'Command Codes' for
        these facilities. Use the 'USER-DEFINED' option on 'SET
        UP PRINTER' to achieve the required effects.

Escape

IMAGE PRINT exits automatically on completion of the print.

4.5.1. UTILS : IMAGE CATALOG

* Allows you to review the contents of a disk containing
  Images, and to delete any unrequired images.

Operation

1   Select IMAGE CATALOG from the Utils menu.

2   On selection, the Image Catalog is displayed.

3   To delete an image, press T and enter the name of the
        image when prompted.

Escape

IMAGE CATALOG exits automatically.

4.5.1. UTILS : BOOT DRIVE 1

*   Allows you to re-load the System Menu to perform any
    functions provided there, or to 'boot' another software disk
    - for instance, the PLOTTER SOFTWARE disk.

Operation

1   Select BOOT DRIVE 1 from the Utils menu.

2   On selection, a prompt requests you to insert the required
      software disk in Drive 1, and to press T when ready.

Escape

This function exits from the system.

4.5.2. WIPE

   * Clears the current drawing from the screen <u>and memory</u> , and
     resets all system defaults.

<u>Operation</u>

   1   Select WIPE from Menu 1,   <u>by pressing L & T.</u>

   2   On selection, the screen is cleared, and any drawing in
         memory is erased. All system defaults are restored.

<u>Escape</u>

WIPE exits automatically.

4.5.3. FULL

* Removes the current Palette from the screen to allow
  drawing over the full vertical range.

Operation

1   Select FULL from Menu 1 or Menu 2.

2   On selection, the current Palette is removed.

Escape

Re-select FULL to replace the current Palette.

4.6.1. ANGLE

* Enables you to set two angle 'locks', X and Y, in degrees,
  minutes and seconds.

Operation

1   The top group of three numerals beneath the 'ANGLE'
        legend denotes the X degrees, minutes and seconds
        respectively; the lower group denotes the Y values.

2   Move the cursor to the 'X Degrees' indicator, hold down L
        and rotate Z. The value can be adjusted in the range
        45-0-45 degrees, with the marker indicating the 'East' or
        'West' quadrant. Release L when the required value has
        been set.

3   Repeat step (2) for 'X Minutes' and 'X Seconds' if
        required.

4   Repeat for 'Y' Degrees (plus Minutes and Seconds if
        required). The degrees values is adjustable in the range
        45-90-45 degrees, with the marker indicating the 'North'
        or 'South' quadrant.

5   Select 'ANGLE', confirming with L.

6   The cursor becomes constrained along the defined angle
        paths, enabling items to be drawn and copies placed at
        the specified angle.

        Hold down R to free the cursor from the lock.

Escape

Re-select 'ANGLE' and press L, or select ORTH / N-TAN.

ANGLE
— 0
I   0
II   0
 I 90
I   0
II   0
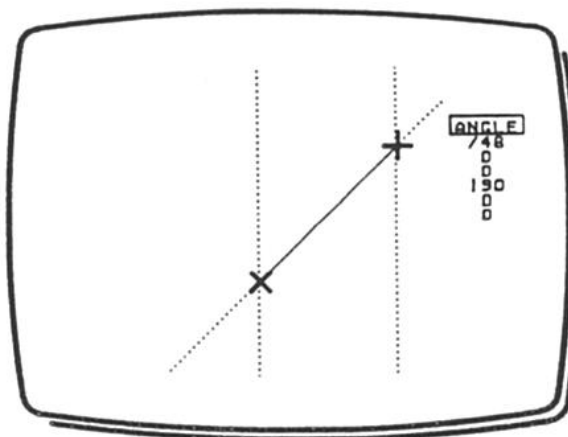
4.6.2. ORTH (ORTHogonal)

* Provides a fixed 0/90 degree angle lock. (These are the
  default values for the variable angle locks described above).

Operation

1   Select ORTH from Menu 2.

2   Once selected, the cursor can only move horizontally or
      vertically.

Escape

Re-select 'ORTH' and press L, or select ANGLE / N-TAN.
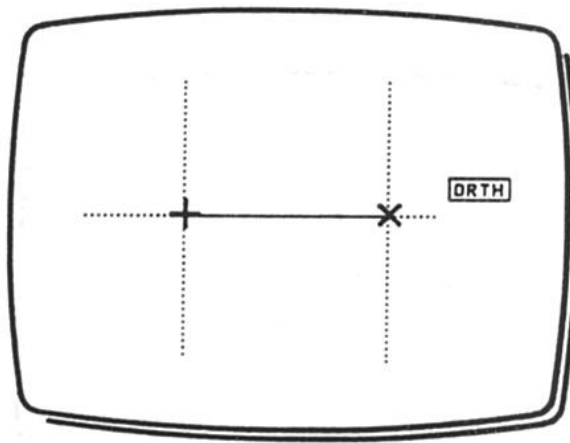
4.6.3. N-TAN (Normal-TANgent)

* Generates an angle lock tangential to the previous line
  or arc entered, plus the normal (ie 90 deg) to the tangent.

Operation

1   Select N-TAN from Menu 2.

2   The cursor becomes locked to the tangent of the last
     item entered, plus the normal to the tangent.

Escape

Re-select 'N-TAN' and press L, or select ANGLE / ORTH.
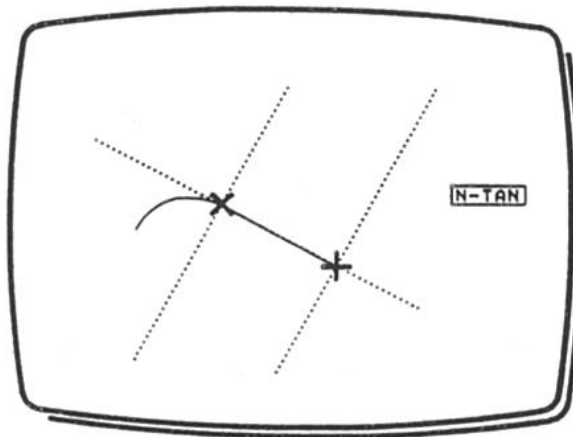
4.7.1. GRID I

*   Provides a 'default' 8 × 8 grid (ie 8 screen points, or
    pixels, square).

    It is particularly useful for the construction of schematic
    drawings.

Operation

1   Select GRID I from Menu 2. An 8 × 8 grid is displayed on
        the Work Page, with cross-hairs indicating the centre of
        the page.

2   Once selected, cursor movement is restricted to the array
        of grid points. To free the cursor from the grid, hold
        down R.

SEE   Section 4.9.1. for the use of GRID I in SCALE mode.

Escape

Re-select GRID I from the menu.
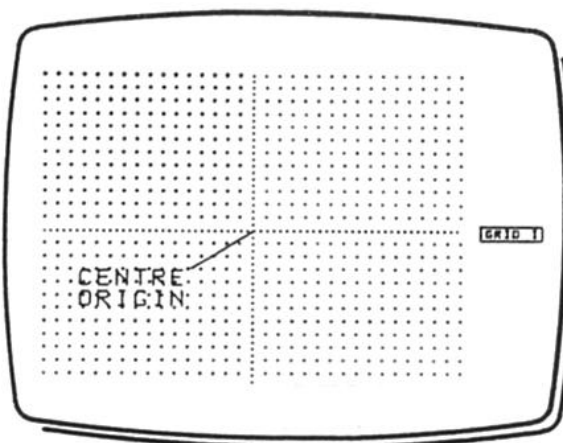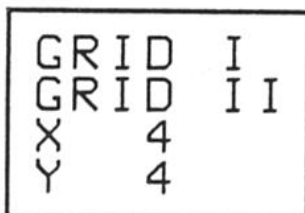
4.7.2. GRID II

* Provides a definable grid, with the X and Y (horizontal and
  vertical) grid spacings individually adjustable between 4 and
  32 pixels. The pitch of the grid can be set using an Angle
  lock.

Operation

1   Beneath the 'GRID II' legend are two numerals, indicating
        the X and Y grid spacings respectively.

        Move the cursor to the 'X' spacing value, hold down L and
        rotate Z until the required value is displayed. Release L
        to set the value.

2   Repeat for the 'Y' spacing.

3   Position the cursor at the location from which the grid
        is to be sourced.

4   Select GRID II from the Menu.

5   Once selected, cursor movement is restricted to the array
        of grid points. To free the cursor from the grid, hold
        down R.

6   If you need an angled grid, set and switch on the
        required Angle lock before you switch on Grid II.

SEE   Section 4.9.1. for the use of Grid II in SCALE mode.

Escape

Re-select GRID II from the Menu.

```
GRID  II
X 10
Y 10
```


LAST ORIGIN

ANGLE ON
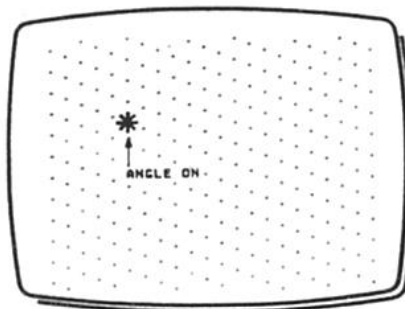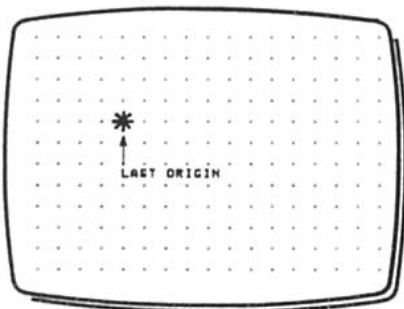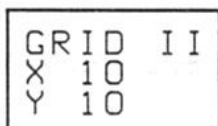
4.8.1. FIND

* Enables you to establish the Origin cursor at the exact end
  points of existing entries. It can be used to establish the
  start point of a new item or to set up an Arc or Grid.

Operation

1   Select FIND from Menu 2. The end point of the last item
       entered is indicated by an Editing cursor.

2   Step back or forward through the drawing by pressing L or
       R to identify the required point.

3   Having identified the required point, press T to update
       the Origin cursor to this point.

Escape

Press L & R together.

4.8.2. POINT

* Enables you to establish a single Point lock - similar to
  a Grid, but consisting of only one point - sourced at the
  position of the Origin cursor.

Operation

1   Update the Origin cursor to the required point.

2   Select POINT from Menu 2.

3   The Dynamic cursor becomes locked at the defined point.

      If in DRAW (LINE), you can draw a single point by pressing
      T.

4   If you need to establish two 'found' points (eg to join
      two lines), use POINT to set a Point lock at one location,
      then use FIND to establish the second point. You can then
      draw back to the first position.

Escape

Re-select POINT from the Menu.
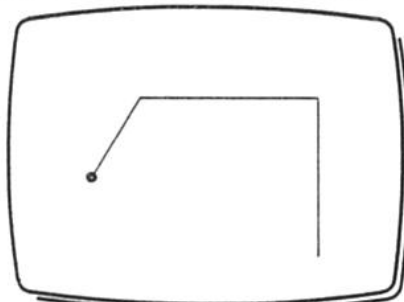
FIND 1st point - set origin   Switch POINT on.
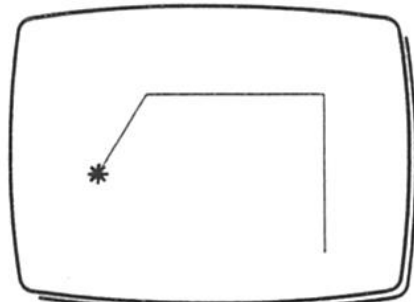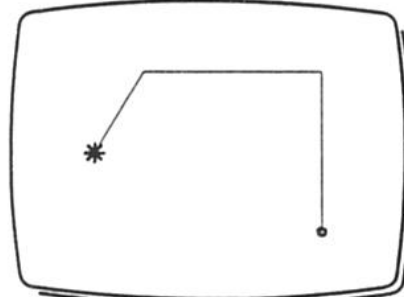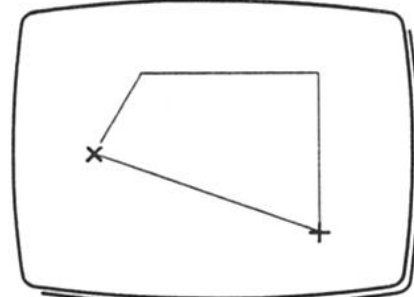
FIND 2nd point.   Line snaps to 1st point.
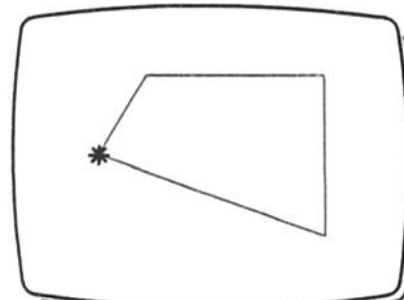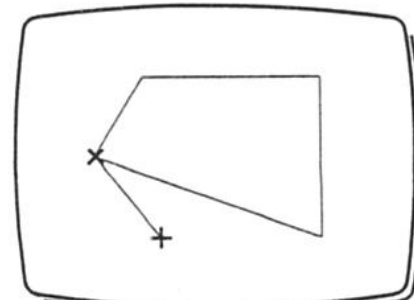
Confirm line with T.   Switch POINT off.

4.9.1. SCALE

* Enables a drawing to be produced in a true scalar fashion.
  It provides the facility to establish an absolute size for
  the Work Page, and to define all components of the drawing
  numerically via the keyboard.

Operation

1   Select SCALE from Menu 2. A screen is displayed requesting
        the Scale Page Size (ie width).

```
   SET PAGE SIZE
 ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─

   PAGE SIZE              ▮
   UNITS (MM/M/KM/IN/FT):



 ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─
   PRESS <ESC>         TO CANCEL
```

2   Enter from the keyboard the Page Size required,
        terminating with RETURN.

        A maximum of 5 figures (4 with decimal point) can be
        entered up to the following allowable maximums :

        IN - 9846   MM - 98460
        FT - 98460   M   - 984
                           KM - 984

3   Enter the Units for the value, terminating with RETURN.

        If the attempted entry is illegal, you will have to
        re-enter the value and units.

NOTE   The DIMN function (See Section 4.9.2.) uses the units
        that have been specified for the Scale Page. So, if you
        want to dimension a drawing in MM., specify the overall
        size of the Base Page in MM. Similarly for M, KM, IN and
        FT.

4.9.1. SCALE (Cont.)

4   When the Page size has been specified, the Work Page is
      redisplayed, with the following information at the top
      of the screen :

      VIEW   : current size of Work Page
      GRID   : Grid size (only displayed when GRID selected)
      LEN(gth) : Line length, dynamic display

5   As the cursor is moved, the LEN display shows the scaled
      line length.

6   To enter components of the drawing numerically from the
      keyboard, <u>either an ANGLE lock or a GRID must be active.</u>

      To select ANGLE lock, See Section 4.6.

      To select a GRID, See Section 4.7.

7   Once an ANGLE lock or GRID is set, the system will accept
      keyboard input for the specification of the data entries.

      The numeric entry is confirmed by pressing either RETURN
      or T, but the use of RETURN is preferred.

      The remainder of this section describes the use of the
      following functions in SCALE mode :

      DRAW : LINE
            RADIAL and COMPASS ARC
            CIRCLE
      TEXT
      COPY
      ZOOM / PAN
      GRIDS

<u>Escape</u>

Re-select SCALE from Menu 2.

4.9.1. SCALE : LINE

1   Select LINE, if not already active.

2   Set the start position of the Line, by updating the Origin
       cursor with L, using an Angle Lock to set the line angle.

3   Position the Dynamic cursor to establish the direction of
       the line.

4   Enter the length of the line on the keyboard - the entered
       value is displayed at the top the screen - terminating the
       entry with RETURN.

       On pressing RETURN, the Line is drawn to the specified
       length.

NOTE   If you are working in FT. and IN., you must press RETURN
       when the Feet have been entered, then enter the Inches
       (with fractions expressed decimally) and again press
       RETURN.

5   If you want to update the Origin cursor by a precise
       amount, enter the required value on the keyboard, but
       press the SPACE BAR instead of the final RETURN.
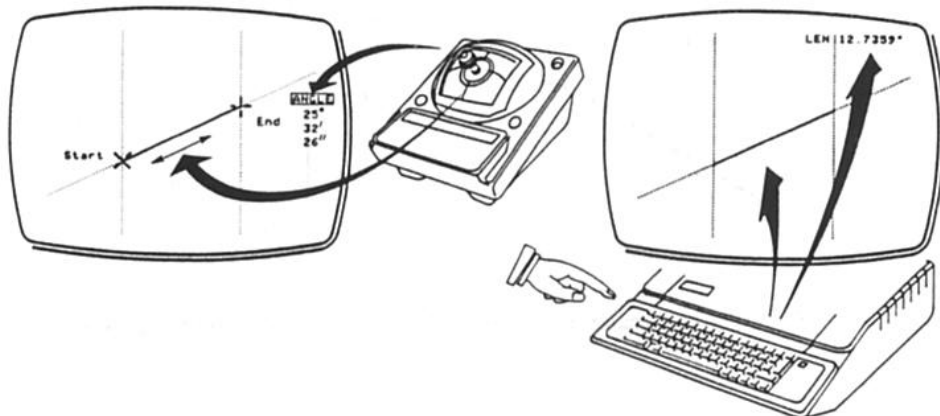
4.9.1. SCALE : RADIAL ARC / COMPASS ARC

1   Establish the start position for the arc (ie circumference
       point for RAD ARC or centre for COMP ARC), using an Angle
       Lock to set the start angle.

2   Select RAD ARC or COMP ARC from the palette.

3   Enter the required Radius on the keyboard - the value
       entered is displayed as 'RAD' at the top of the screen -
       terminating the entry with RETURN.

4   Enter the required degrees of Angle on the keyboard - the
       value entered is displayed as 'ANG' at the top of the
       screen - followed by RETURN. Then enter the Minutes and
       Seconds following each with RETURN.

       If you only require Degree precision, follow the degree
       entry with 3 presses of RETURN to skip minutes and
       seconds.

       On pressing the final RETURN, the Arc is drawn with the
       specified Radius and Angle.
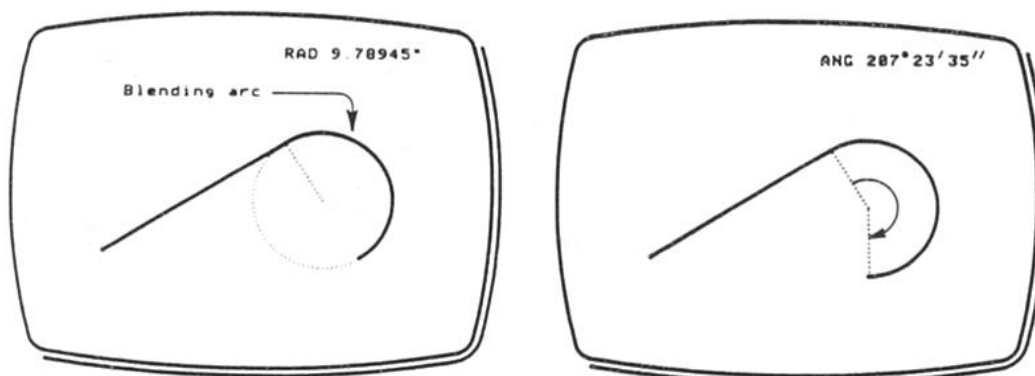
4.9.1. SCALE : CIRCLE

1   Select CIRCLE from the palette.

2   Establish the origin for the circle, using a POINT or
        GRID lock if necessary (See Section 4.8.2.).

3   Enter the required Diameter on the keyboard - the value
        entered is displayed as 'DIAM' at the top of the screen -
        terminating the entry with RETURN.

4   On pressing RETURN, the Circle is drawn with the
        specified radius.
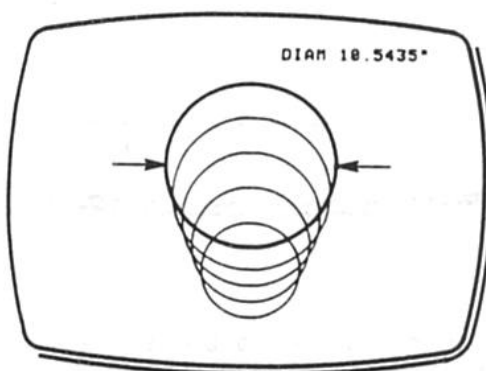
4.9.1. SCALE : TEXT

1   Select TEXT from Menu 1. If this is the first selection of
       TEXT since SCALE was selected, a screen is displayed
       requesting Text Scale and Size values.

```
 _____
|  SET TEXT SIZE                |
| _ _ _ _ _ _ _ _ _ _ _ _ _ _  |
|                               |
|   ENTER PLOT SCALE      1 · ▮ |
|   ENTER TEXT HEIGHT (MM) 1 · ▮|
|                               |
|                               |
|                               |
|                               |
|                               |
| _ _ _ _ _ _ _ _ _ _ _ _ _ _  |
|   PRESS <ESC>       TO CANCEL |
|_____|
```

2   Enter on the keyboard the intended Plot scale of the
       drawing, terminating with RETURN.

3   Enter the absolute text size to appear when the drawing is
       plotted (eg 3.5 mm.), terminating with RETURN.

       If the size requested is too small, the value entered is
       ignored, and the system returns to DRAW.

4   On pressing RETURN, the Text Entry Screen is displayed.

5   Enter the text line or block, using the editing facilities
       if required. (SEE Section 4.1.4.).

6   When the text has been entered, press L & R to return to
       the Work Page with the active text cursor.

7   Position the text as required, but note that the scale is
       locked to the size specified.

8   Press T to draw the text.

9   If you subsequently need to alter the text size, select
       UTILS : SET TEXT SIZE (See Section 4.5.1.) which enables
       re-specification of the text scale/size.

4.9.1. SCALE : COPY

If a drawing is produced in SCALE mode, is Filed, and
susequently used as a component in another SCALE drawing, the
Copy Scale ('SCL') is locked and cannot be altered.

The correct relative scale between the Copy and the Page size is
therefore maintained.

The same constraints apply to the use of the Copy Editing
functions (MOVE and DUPL); EXCH, however, cannot be used to
replace a Copy of one scale with a different Copy at another
scale - the scale of the original Copy prevails.

SCALE : ZOOM / PAN

ZOOM and PAN can be used in SCALE mode to increase the viewable
resolution of local areas of the drawing.

'VIEW', at the top of the screen, indicates the size of the
current view.

SCALE : GRID I

In SCALE mode, GRID I generates a calculated grid, spaced
appropriately according to the units specified for the Page.
The spacing value is displayed at the top of the screen.

This grid can be 'zoomed' to increase the spacing resolution.

4.9.1. SCALE : GRID II

In SCALE mode, GRID II enables you to define your own grid spacing.

1   Move the cursor to the 'X' value beneath the 'GRID II' legend and press L.

2   Type in the required Grid spacing, terminating with RETURN.

       (Use ESC to escape, if you change your mind).

3   Repeat for the 'Y' spacing.

4   Switch 'GRID II' on.

5   As in non-SCALE mode, this grid can be angled by first setting an Angle lock.

NOTE   When specifying the X and Y grid spacings, only values which generate usable grids at a given page view will be accepted. If unusable spacings would result from the value entered, the system 'beeps' and expects a new value.

       Usable spacings, in pixels, are : Minimum 3 pixels, Maximum 128 pixels.

       Unlike GRID I in SCALE, GRID II preserves the same grid spacing through Zoom. Therefore if you Zoom too far, you can end with a single Grid point on screen (like the POINT lock). Hold down R to escape.

4.9.2. DIMN (DIMensioN)

* Enables the display and dimensioning of items in a drawing
  which has been produced in SCALE mode.

Operation

1   Ensure that SCALE is selected from Menu 2.

      Select DIMN from Menu 2.

2   The last item entered is indicated by Editing Cursors (for
      a list of Editing cursors, see Section 4.3.2.).

3   You can step back or forward through the drawing with L or
      R to select another item.

4   When the required item is indicated, press T.

5   The Dimension Palette replaces the current palette.

▼

M   X LEN   Y LEN LEN   ANG   0.286558 M   DP6

6   Different aspects of the item's dimensions can be
      displayed on the palette by moving the arrowhead marker
      along the palette :

      M / I   - Metric / Imperial display switch.
                             Position arrowhead marker over and
                             press L to switch.

      XLEN   - Horizontal length.

      YLEN   - Vertical length.

      LEN / RAD / DIAM   - Line length / Arc radius / Circle
                             diameter.

      ANG   - Angle of Line or Copy from horizontal
                             / Arc angle.

      D.P.   - Decimal Places, settable between 0
                             and 6.
                             Position arrowhead marker over, press
                             L, rotate Z to select value, release
                             L.

4.9.2. DIMN (Cont.)

7   Having selected the attribute on the palette, press L.

        The Text cursor becomes active, loaded with the displayed
        value, and can be placed at the required position on the
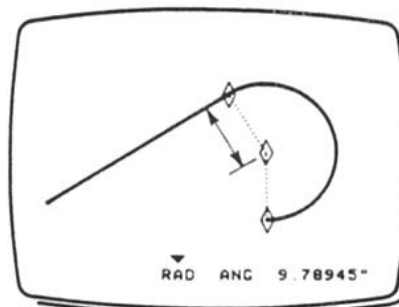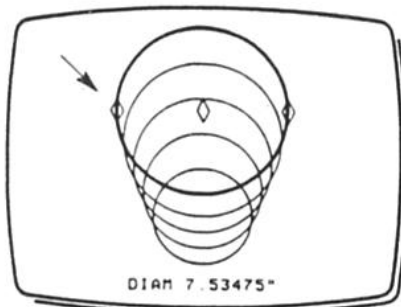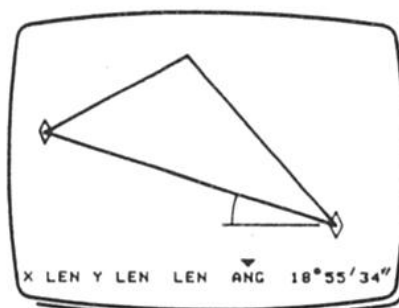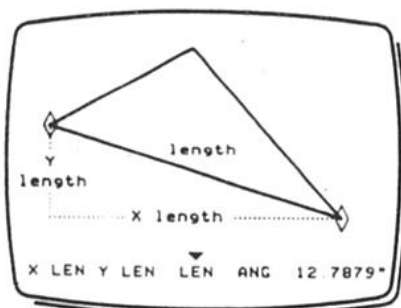   drawing.

8   The text cursor can be rotated by pressing L, and will
        align to a non-orthogonal line.

        When positioned, press T to draw the text.

9   Repeat for the next item in sequence, if required.

Escape

Press L & R together.
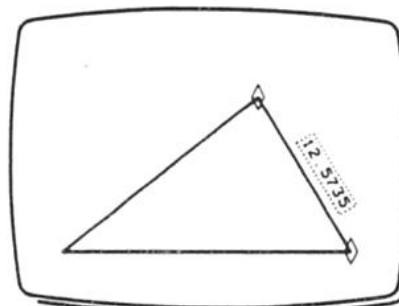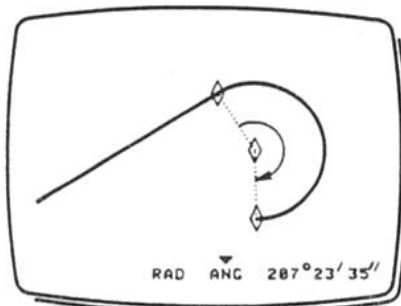
APPENDIX A   THE LIBRARY

One of the system's most powerful features is its Library for
storage and retrieval of graphic data. In the following pages,
the features of the Library are explained along with a guide to
setting up an organised Library system and instructions on
Library Disk formatting.

CONTENTS

PLEASE NOTE

Use only SOURCE DISKS unless you require a full Library
Management System - see 'Library Organisation'

A.1.   INTRODUCTION

How the Library works

The key to the Library, both for you and the computer, is the
Library Index. This gives the user a visual catalog of the
Library contents, and it also provides the means for the
computer to identify any element simply by its location on the
Index page.

When you FILE a drawing, the set of instructions relating to
that drawing is identified by the system through its location
code in the library, not by its visual appearance. This code is
generated automatically by the system when the drawing is filed.
This is not the same as the 'label' which you may assign to a
drawing via the keyboard when filing. The label is written on
the index page as a visual reminder only, and has no meaning to
the system.

The code has four elements :

SET NUMBER   - 1 to 63

VOLUME NUMBER   - 1 to 254

INDEX PAGE   - A B or C

BOX LOCATION   - 0 to 63

This coding scheme allows
the system to recognise more
than 3 million unique
Library locations.

Each box on the Index represents a specific drawing file - a
permanently stored set of instructions which can be used any
number of times to regenerate the drawing on the screen (the
Work Page) or plotter.

Miniature images, or 'icons', on the Index are a visual
directory of library contents, allowing drawings to be retrieved
without using keyboard-entered codes.

The system's internal location coding, ie File numbering, is
from left to right, and top to bottom, starting at '0'. Each
Index can be formatted with 4, 16 or 64 boxes.

A.1.   INTRODUCTION

Capacity of Library Disk

In the system, drawings are stored in a highly compressed form.
Exactly how many drawings you can store on a single disk depends
on the complexity of the drawings, i.e. how many lines, arcs,
copies, etc. A single library disk can store about 10,000 lines
and arcs.

Although untypical, this limit can be reached by only one or two
very complex drawings. In this case, the library disk would be
full even though all the remaining boxes on the index pages are
empty.

A library disk can also be filled by using large numbers of
different COPIES. Each COPY needs to be logged in the library
disk's Directory and takes a minimum of 2 'sectors' of the disk.
The library disk Directory has a capacity of 200 entries, so
that a disk formatted as (64,64,64) could potentially contain
192 drawings, leaving only 8 spare directory entries for COPIES
included in some of the drawings.

A.2.   USING THE LIBRARY

<u>Library Organisation</u>

The ROBO 1500 System offers a very versatile Library system
which can provide effectively unlimited storage for your
drawings.

However, in order to avoid the possibility of conflicting
Library entries when a number of systems are used by different
users in the same organisation, <u>it is essential that the
Library is used in an organised way from the start.</u>

If you are the only user of the system, then it is less
important to employ the full Library Management organisation
detailed below providing you follow these basic rules :

*   ONLY USE <u>SOURCE</u> DISKS FOR ALL YOUR DRAWINGS, BOTH COMPLETE
    AND PARTIAL DRAWINGS

*   SOURCE DISKS ARE LIBRARY DISKS WITH VOLUME NUMBERS 13 - 253

*   NEVER USE MORE THAN ONE SOURCE DISK WITH THE SAME SET &
    VOLUME NUMBER

There are no restrictions on what can be filed or copied with
Source Disks as each item has a unique location code.

Using Source Disks alone provides more than 3 million unique
locations; if you reach the stage where you need further
capacity, you can adopt the procedures detailed below in
'Library Management'.

<u>Library Management</u>

In the system, <u>all</u> drawings are saved on Library disks. This
includes any drawing you are currently <u>compiling</u> , and also your
permanent store of <u>source</u> material such as symbols, frequently
used components or 'modules', blocks of text, typefaces, etc.

You can develop your own library disks of standard source
material, which can be freely duplicated and used throughout
your organisation - this can assist in standardising drawing
practices. Additionally, pre-drawn 'Robo' Library Disks, based
on commonly used standards, are available for many applications,
including Architecture, Electronics, Fluid power, Process engin-
eering, Business presentation, and Typefaces.

The floppy disk is a very convenient storage medium - unlike
physical drawings and microfilms, library disks store your
drawings in a compact form that can be edited, manipulated and
combined with other data. Further, a properly structured
Library disk can be a pictorial catalog - a visual bill of
materials - of all the component parts or stages leading to the
finished drawing.

A.2.   USING THE LIBRARY

Structuring your Library

Although all library disks are organised in a similar way, they
fall into three distinct categories -

'Compiler' (Vols 1   - 12)   for interim assembly and edit of
                                  drawings.

'Source'   (Vols 13 - 253)   for permanent storage and
                                  retrieval of pre-drawn source
                                  material; originated by the user
                                  or Robo-supplied.

'Archive' (Vol 254)   for permanent storage of finished
                                  drawings.
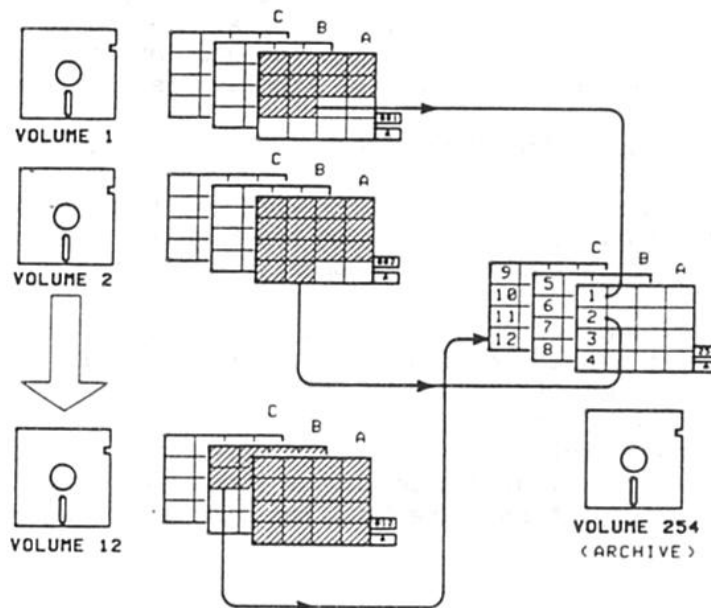
Disk Numbering

Because the Library coding uses the Volume Number as part of the
'unique' tag for any particular file, it is very important to
avoid common Volume Numbers . Otherwise, the code ceases to be
unique resulting in the danger of 'duplicate' items corrupting
your drawings.

A.2.   USING THE LIBRARY

<u>Using Compiler Disks</u>

The 12 Compiler Disks in each Set are used for the production
and assembly of up to 12 different drawings (1 per disk).
This means that, at any given time, you can work on up to 12
drawings at various stages of completion. When you have finished
a drawing, you 'archive' it, using an Archive Disk. You can then
re-use that Compiler volume number (but not the disk itself,
which should be filed away with the Archive Disk).

Every group of 12 Compiler disks relates to a given Archive
Disk. The Archive Disk can be formatted as 4,4,4 to provide 12
boxes for each of the finished drawings 1-12. Alternatively, if
you want to store additional information relating to a drawing
(modifications, plotting details, etc), you can format the
Archive disk as 16,16,16. This allows you to use one row of 4
boxes on the 3 index pages for each of the 12 drawings. More
information on the use of Archive Disks is given below.

When using Compiler disks, follow these rules :

*   Store the Compiler Disk with its related Archive Disk
*   Don't discard or re-use the Compiler disk
*   Ensure the disk is properly labelled

The Compiler disk should be formatted with 16 boxes per Index,
which should be adequate for most drawings. If you anticipate
that you will need more than 48 boxes for compilation and
editing, format the Compiler disk with at least one 64-box
index. Similarly, if you are working on a large drawing and want
more detail displayed on the index page than the 16-box format
provides, format the Compiler disk with at least one 4-box
index.

Before beginning a drawing, check for any repeated elements
which you don't have on a Source disk. Draw these first, filing
each element seperately on the Source disk. Use the index
boxes in sequence, from left to right and top to bottom. Then
develop the drawing to completion, using a FILE-WIPE-COPY
procedure, if necessary, from large 'multi-layer' drawings.

When the drawing is completed, FILE it on the Compiler disk,
then LOAD it and re-FILE it on the Archive disk.

A.2.   USING THE LIBRARY

Using Source Disks

Source Disks are used for storing common 'template' material -
schematic symbols, components, and other frequently-used part
drawings. Source material is permanent, read-only data.

This material should not be modified without a formal 'change
approval' procedure. This need not apply if you are the sole
user of the system in your organisation, and you don't plan to
trade disks with others. However, if there are multiple users in
the one organisation, all should have identical source material
eg all copies of Volume 53 should be the same in every detail.
Although the safest way of ensuring this is to have only one
disk labelled 'Vol 53', most users will want their own copy.
You can make as many back-up copies of source disks as you need,
as described in Section 2.4.

When assembling Source disks, follow these rules :

*   Where possible, use 'new data' rather than copied items from
    other source disks.

*   Never assemble source material on a disk other than the one
    on which it will eventually be permanently filed.

*   Never use as source material items taken from outside the
    'Source material domain', ie never use anything from an
    Archive disk or from a Compiler volume.

*   Apply a write-protect tag to Source disks before distribution

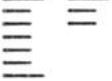A.2.   USING THE LIBRARY

Using Archive Disks

The Archive disk is intended to always be the 'safe-deposit' for
the latest version of a drawing, lika a master plan chest. If
you want to be sure of up-to-date information, it is always the
Archive disk you refer to, not the Compiler disk.

Unlike Compiler or Source disks, you cannot COPY from an Archive
disk, only LOAD.

The simplest way to use the Archive disk is on a one-to-one
relationship between the Compiler disk and the Archive index box
- where the drawing from Compiler Volume 1 is filed on Archive
index box 1, Compiler Volume 2 on Archive index box 2, and so on
up to Compiler Volume 12 on Archive index box 12. In this case,
the Archive disk would be formatted (4-4-4) to provide the 12
index boxes.

However, you may need to store additional information relating
to the drawing. In this case, format the Archive disk (16-16-16)
and follow this recommended scheme :

*   Each of the Compiler volumes (and hence completed drawings)
    occupies one complete row of an index.

*   Box 1 stores the completed drawing.

*   Box 2 stores the border, title block and other 'graphic'
    material relating to the drawing, but plotted seperately.
    (Some users prefer to include all of this with the 'Box 1'
    completed drawing).

*   Box 3 stores supplementary data such as section views, bills
    of materials, vendor information, etc. This material is in
    'plottable' form, but is not usually plotted with the main
    drawing.

*   Box 4 is never plotted : it contains plotting instructions
    (pen weights and colours, scale factors, etc), drawing
    history (modifications list, etc), and other 'housekeeping'
    and administration information.

FINISHED DRAWING	BORDER & TITLE BLOCK	OTHER DATA & DRAWINGS	HOUSEKEEPING DATA

A.2. USING THE LIBRARY

ROBO Pre-Drawn Source Disks

These disks, available from your dealer, contain commonly used
source material such as standard symbols, typefaces, etc.
They should be used in exactly the same way as your own Source
disks - namely as a common resource of read-only material.

Do not store any of your own material on a pre-drawn Source
disk.

Printing the Index page

You may find it useful to make a print of the material stored
on your Library disks, as a convenient reference of their
contents. To do this, you must have a printer (with 'graphics
dump') installed; refer to Section 1.3. for more information.

Assuming that you have a graphics printer installed, follow this
procedure :

1   Switch on the printer, set it 'On-line' and load with paper.

2   Select UTILS from Menu 1. Select SCREEN IMAGES - CATALOG.
     A list of all named screen images will be displayed. The
     first three are 'A' 'B' and 'C', the three Library indexes.

3   Return to the UTILS menu and select SCREEN IMAGES - LOAD.

4   Enter A B or C as required, then press RETURN.

5   Select SCREEN IMAGES - PRINT and follow the prompts.

6   When printed, you can repeat steps 3 - 5 for the other two
     indexes if required.

A.3. FORMATTING LIBRARY DISKS

Choosing the Index Format

You should tailor the Index format to suit your application -
Large boxes (4 per Index) for large drawings; Medium sized boxes
(16 per Index) for average complexity drawing modules and Small
boxes (64 per Index) for simpler symbols, characters, etc.

Library Disks (Compiler and Source)

Before a new unused floppy disk can be used as a library disk,
it must first be formatted. To format a library disk, follow
this procedure :

1   Select Option 2 from the System Menu. A screen is displayed
        presenting the formatting choices.

2   Insert a new disk in Drive 2 and close the drive flap.

3   Enter the SET Number (1 to 63) and press RETURN.

4   Enter the VOLUME Number (1 to 253) and press RETURN.

5   Enter the format for Index A (64, 16 or 4 boxes).

6   Repeat (5) for Indexes B and C.

7   While formatting takes place, a message is displayed
        confirming Set and Volume Number.

8   When finished, the System Menu is displayed and another
        Library Disk may be formatted if required.

Remember to label the formatted Library Disk with the Set,
Volume and Index format specified.

A.3. FORMATTING LIBRARY DISKS

Archive Disks

This is similar to Compiler and Source Library formatting. A
seperate option is given on the System Menu for convenience.

1   Select Option 3 from the System Menu. A screen is displayed
      presenting the formatting choices.

2   Insert a new disk in Drive 2 and close the drive flap.

3   Enter the SET Number (1 to 63) and press RETURN.

4   Enter the format for Index A (16 or 4 boxes).

5   Repeat (4) for Indexes B and C.

6   While formatting takes place, a message is displayed
      confirming Set Number.

7   When finished, the System Menu is displayed and another
      Archive disk can be formatted if required.

Remember to label the formatted Archive disk with the Set and
Index format specified.

APPENDIX B   ERRORS

If an Error or Warning condition occurs during operation of
the system, a message will be displayed at the bottom of the
screen.

The messages, and the recovery procedures are as follows :

1   COPY TOO LARGE

     Cause : In SCALE mode, when attempting to COPY an item,
              also drawn in SCALE mode, whose relative size is
              too large for the given Scale Page.

     Action : Either re-specify the Page size, or de-select
              SCALE and COPY under 'free-form' control.

2   DIRECTORY FULL

     Cause : Attempting to FILE when the Library Disk's
              Directory if full (all 200 entries used).

     Action : FILE onto another Library Disk.

3   DISK FULL

     Cause : Attempting to FILE when the Library Disk's space
              is exhausted (all 406 available tracks used).

     Action : FILE onto another Library Disk.

4   DISK WRITE PROTECTED

     Cause : Attempting to write to a disk which is protected
              with a Write-Protect tag.

     Action : Remove the tag and re-try.

5   FILE NOT FOUND

     Cause : File name not in DOS or System Directory.

     Action : If attempting to LOAD IMAGE, check CATALOG for
              File's presence.

6   ILLEGAL COPY

   Cause : Attempting to COPY from an Archive Disk.

   Action : Items can only be <u>Loaded</u> from an Archive Disk.

7   ILLEGAL FILE

   Cause : Attempting to FILE a drawing in the Index box
            which contains a item used in the new drawing.

   Action : Select another Index box in which to FILE the
            drawing.

8   I/O ERROR

   Cause : Attempting to access Disk which is uninitialised or
            when the Drive Door open.

   Action : Ensure correct disk present and that the Drive Door
            is closed.

9   MEMORY FULL

   Cause : Memory space for including COPY items in a drawing
            is exhausted.

   Action : If 'New Data' memory still available, complete the
            drawing without further COPY items.

10   OUT OF MEMORY

   Cause : 'New Data' memory exhausted.

   Action : FILE the drawing; COPY it back on GRID I at 100%
            SCL. Continue drawing.

11   WRONG SCALE

   Cause : In SCALE mode, attempting to EXCH item drawn at a
            different Scale to the item being replaced.

   Action : Use MOVE to adjust the item's size.