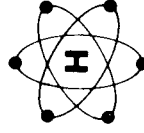




Operating Guide to **GRAFPAD**



A Hegotron Group Company

CONTENTS.

Introduction.	1
G4.	2
To get started.	3
G5.	4
How to use the Grafpad.	4
Switching On.	5
Co-ordinates.	6
Page Size.	7
Units.	7
The Cursor.	8
Accuracy.	9
Selecting Menu options.	9
Object Menu.	10
Drawing Menu.	16
Symbol File.	18
Sections.	20
Point Menu.	21
Zoom Menu.	23
Pan Menu.	24
Rotate/Slant Menu.	25
Copy Menu.	26
Set Menu.	28
Grid and Snap.	31
Page Size Menu.	32
Status Menu.	33
Plot Menu.	34
Additional Commands.	35
Keyboard Commands.	36
Index.	38

Grafpad 3 Digitiser Tablet and CAD Programme.

What is Grafpad 3?

Grafpad 3 is a unique low cost Digitiser Tablet and powerful Computer Aided Draughting system for use with the 'Amstrad' PCW 8256 and 8512, PC 1512 and IBM PC and compatible Microcomputers. Together they form a complete draughting system for use by Engineers, Electronic Designers, Architects and anyone involved in making drawings, schematic diagrams, technical illustrations etc.

Hard copy of all drawings is made directly to a Dot Matrix Printer a quality of print that will be more than adequate for most purposes. The size of printed output can be varied from A5 to A0 at will. Any part of the drawing can be selected for output to the printer or to a range of plotters.

Grafpad 3 Features.

- * Draws arcs, circles, rectangles, triangles, lines easily to Relative, Absolute or Polar co-ordinates.
- * Powerful on screen Zoom and Pan commands
- * Symbols and sections can be created, stored and retrieved.
- * Text in standard or user defined fonts.
- * User choice of Drawing units; microns, mm., inches, feet, metres, kilometres or miles.
- * Automatic or User defined Grid and Snap facilities.
- * Rotate and Tilt commands
- * Automatic Dimensioning between points
- * Snap to End, Middle and Intersection of lines.
- * Pen and Layer selection.
- * Comprehensive Disc Filing commands.
- * All commands and Text entered directly from the Digitiser Tablet. Just point the Pen at the Command, Letter or Number on the Pad and depress the Pen Switch.

Two-Dimensional Draughting

The basic elements of any drawing are points, lines, arcs, circles and boxes. A sheet of drawing paper or the monitor screen are examples of two-dimensional surfaces. Therefore all drawings have to be created in two-dimensional drawing elements. It is possible with Grafpad 3 to use any or all of these basic drawing elements to build up such a drawing. With very little practise this can be done faster than by conventional draughting methods, with the facility to manipulate parts of the drawing by copying, rotating etc.

A window or zoom facility can be used to fill the screen with a portion of the drawing. This can be compared to using a magnifying glass to enable fine detail to be examined or modified. Zooming in on a detail does not modify or alter the drawing.

Text, in standard or user defined fonts and sizes can be added to the drawing.

Shapes can be created and defined as symbols to be stored and then recalled to the drawing at will.

A delete command is available to electronically erase detail. This is one area where C.A.D. scores over the traditional methods, leaving no sign of line or text erasure in the quality of the final printed or plotted output.

Drawings can be outputted to printer or plotter, or stored on disc to be retrieved at a later time. The drawing can be recalled and modified with later design changes. After modification it can be stored away as a new drawing or used to update the original stored drawing.

G4. For Amstrad POW 8256 and 8512 Computers

=====

"G4" refers to the program supplied with the "Grafpad" to run on the AMSTRAD 8256 or 8512 Microcomputers. The "G4" program will sign on with its version number (currently V1.008)
The program disc will contain the following files:
G4. COM The program. Type "G4" to run it.

LOGIC. DWG A sample library of Logic symbols. This should be copied into a file called SYMLIB.DWG (the default library) for automatic access.

There will also be some same drawing files with the extension "DWG" and a Symbol Menu called "LOGIC.MNU".

The "G4" program is not supplied with the CP/M runtime system so it is necessary to use it in conjunction with the CP/M PLUS disc supplied with your computer.

TO GET STARTED

Begin by Formatting two new Discs using the DISCKIT utility program on your CP/M Disc. After formatting the Discs it is advisable to VERIFY the discs.

Next made a copy of your G4 Master disc. Use "Copy" on your CP/M disc and follow the screen instructions. Check that the G4 Master disc is "Write Protected", to avoid any possibility of accidental erasure or corruption.

You will now have a working copy of the G4 program. However, to use this program, first insert the CP/M disc in to the drive, press the SPACE BAR and wait for the "A" to appear. Remove the CP/M disc and insert the working copy of G4 that you have just made. Type "G4" and press "RETURN". The program will now load, the screen will clear and a rectangle will be drawn with a message to "Calibrate (Zero) the Pad." Point the Pen at the Bottom Left corner of the Pad drawing area and press the "Z" key on the Micro Keyboard. This will calibrate the Grafpad.

It is possible to reduce the number of operations by copying the CP/M system program on to your copy G4 disc. Insert the CP/M disc in to the computer and when the "A" appears, type "DIR" and RETURN. The screen will now show all the files on your disc. Now type "PIP B:=A:PIP.COM" on to your G4 disc. When the "A" reappears, type "PIP B:=A:J11CPM3" and file on to your G4 disc. You will now be able to run your G4 program drawing files. Now insert your new G4 disc in to the computer, press the key. If the files have been copied correctly, the program will load and the "Zero" message will appear.

Note:

The CP/M system file on your disc may not be called J11CPM3 but it will have the file extension ".EMS" after it. Use that file name when typing "PIP B:=A:*****.EMS"

 G5 Drafting Software for PC-DOS/MS-DOS.

G5 is supplied with a short Interface Card which should be plugged into a spare expansion slot inside your computer. The tablet plugs into the 15-way connector on the back of this card.

The G5 distribution disk contains only driver modules, sample drawings and an INSTALL program. It does not have the G5 program or an operating system, these are put on to the working disk.

To create the working disk.

1. Use your system disk to format a new disk (use FORMAT A:/S or B:/S to include the operating system). Also copy over any .SYS or .BAT files you are using (not needed by G5, except for the Hercules card which requires the line "DEVICE=ANSI.SYS" in the CONFIG.SYS file).
2. Put the G5 distribution disk in drive A, type INSTALL and follow the instructions. The G5 program will then be created. The program has to be written to the new working disk in the same drive.
3. The working disk is now ready, however you may also like to copy over the sample drawings (*.DMG) and user menu (*.MNU) from the distribution disk.
4. To start G5, put the working disk in drive A, wait for the system to load if necessary, and type G5. The data disk asked for can be the same disk, or a separate data disk. G5 will use the same drive for the data disk until told otherwise.
5. G5 will support these different screens:
 1. IBM Colour Graphics Adaptor 200x640 2 colour.
 2. IBM Enhanced Graphics Adaptor 350x640 16-colour.
 3. Hercules Graphics Card 348x720 mono.
 4. Amstrad 1512 Screen 200x 640 16-colour or greyscale.

And currently these printers/plotters.

1. Epson MX80 series dot printers.
 2. Roland DXY 800
 3. COMX PL-80.
 4. Plotmate A3M with HP-GL ROM (A3 size.)
 5. Hitachi 672 Graph Plotter. A3 HPGL.
- G5 requires PC/MS-DOS 2.0 or later, with a minimum of 192K RAM (384K if the dot printer driver is used), and at least one 360K floppy disk drive. Hard disk users are recommended to copy to the hard disk and run the program from there.

 HOW TO USE THE GRAFPAD.

Read this section carefully. It is to help you to understand and appreciate the way to use the Grafpad to its best advantage before attempting to start a drawing.

 The Menu Overlay.

The active area of the Grafpad is divided into two parts, the Menu area and the Drawing area. The use of the Pad is dependant on using both sections correctly to achieve the best results.

 The Grafpad Pen.

To draw with the Grafpad you use the Pen to point to the appropriate command in the Menu area and press the Pen switch to select that command. The Pen is then positioned in the Drawing area to select the point which the line or shape is to start.

 The Pen Switch.

The switch on the Pen is used in two ways, to select a command from the Menu and to Start or End the operation of that command. To select a command, point the Pen at the desired box in the menu area and press the Pen switch. The Pen nib must touch the pad at the command selected. The Status line at the top of the drawing will indicate the requirement of the command. The Pen is then used to point to the position of the start of the selected function and the switch pressed to start and to complete a command.

 Calibration

Every time the Grafpad is used the Status line will ask you to 'Calibrate (Zero) the Tablet.' Place the tip of the Pen at the bottom corner of the Tablet area, marked 'SET ZERO' and press the 'Z key' on your computer keyboard. This will calibrate the tablet and ensure that the command blocks will send the correct information to the computer. It is important that this is done each time the program is used unless you use the 'INIT' command.

SWITCHING ON."G4" (for Amstrad PCW)

Before switching on your computer, check that the Grafpad is correctly fitted to the EXPANSION connector at the rear of the Computer Monitor just below the Printer connector. Insert you disc into the Drive and follow the instructions given earlier.

"G5" (for IBM Computers and compatible Microcomputers.)

Check that the Grafpad Interface card is correctly fitted to one of the expansion slots in your computer and that the Grafpad lead is connected to the socket on the card before switching on your computer. Insert your disc into the "A" drive and follow the instructions given earlier.
THE STATUS LINE.

At the top of the Screen the Status Line is displayed. This gives you important information about the program whilst you are using it. The different commands selected will alter the information displayed.

The information at the left of the Status line will show:

- 1) The requirements of the command selected i.e. Rectangle start and endpoint or X,Y co-ordinates to be entered.
- 2) The drawing and symbol names in use.
- 3) The information at the right of the Status line will show the X and Y co-ordinates of the Cursor when at rest.
- 3) Information regarding the number of records and size of the drawing file e.g. 7/7/1K refers to
 - a) The number of records allocated in the file.
 - b) the number of records used (reduced by DELETE).
 - c) How many K of memory the file has used.

Note.

The size of a drawing file is limited by the available space on the disc used for the working drawing. The program does not check for the available working space and you should keep a watch on the Status line as your drawing progresses.

CO-ORDINATES

In the Grafpad programs, Co-ordinates are used in three ways;

- 1) Absolute or Cartesian
- 2) Relative.
- 3) Polar.

Absolute.

The Absolute co-ordinate system is based on X, horizontal and Y, vertical values for determining a point on a drawing. Any point on a drawing can be specified as an X, Y value. It is usual for the X=0, Y=0 to be located at the bottom Left corner of the drawing.

Example.

To draw a rectangle, starting at co-ordinates 0,0 and ending at co-ordinates X=100 and Y=200. Select Rectangle command. Select ABS. Enter 0,0 to request for X,Y startpoint. Select ABS. Enter 100, 200 to request for X,Y endpoint.
The rectangle will then be drawn at the co-ordinates selected.

RELATIVE.

The Relative co-ordinate system allows you to specify the of the Cursor in the X,Y directions by values of the chosen unit of measurement.

Example.

To draw the same rectangle as in the previous example i.e. 100 units by 200 units starting at co-ordinates 0,0.

Select the Rectangle command.

Select ABS. Enter 0,0 to request for X,Y startpoint.

Select REL command. Enter 100,200 to request for X,Y endpoint.

Note that using the Relative co-ordinate system enables you to use units of measurement to determine the length of your line or size of your shape.

POLAR.

The Polar co-ordinate System allows you to specify the length and angle of a line or start and end of a shape from the last cursor position.

Example.

Select Page Size. `A3`.

Select Units. mm `2`.

Select LINE command.

Select ABS. Enter 0,0 to request for X,Y Line start point.

Select POLAR. Enter 150,45 for a line 150 mm long at an angle of 45 degrees from the start point.

The entry and display of co-ordinates is in the current drawing unit.

All dimension are in real terms (1:1) regardless of the page scale.

(this merely adjusts the page size to fit the drawing) This

especially applies to text size/hatching* these values should be

re-entered when the scale is changed to ensure a consistent real size

on printout. The display of very large or very small co-ordinates

may sometimes overflow the Status line on to the next line, this is

normal.

Page Size.

The Screen should be set to represent a page size (A0 to A5) or a predetermined size (Ax) before the start of any drawing. On selecting the required page size the Status line will display the chosen size and the default scale, usually 1:1.

If a different drawing scale is required it should be set at this stage i.e. Select Scale. Enter 1:50 from the Keypad. This will set the scale for this particular drawing and should be reset together with the Page Size for each new drawing.

UNITS.

The X, Y co-ordinates, ABS, REL or POLAR are related to the unit of measurement selected i.e. Select Units, specify a number corresponding to the desired unit of measurement, 2 for mm., 7 for feet etc. A line drawn between co-ordinates 0,0 and 100,0 is equal to 100 x the selected units of measurement.

It is therefore important for a discipline to be followed upon starting a new drawing. The recommended procedure is:

- 1) Set Page Size.
- 2) Set Scale
- 3) Set Units.

THE CURSOR.

All drawing is restricted to the current page size. The cursor is turned off if it lies outside the page area. Excessive Zooming out can reduce the page to a tiny dot and the cursor is lost. Excessive Zooming in can result in the cursor movement going beyond the six significant figures of the cursor and movement can be restricted.

Using a User Grid which has been set to zero will make it impossible to move the cursor.

Entering a page size (Ax) which is negative or zooming into a back-to-front window can also cause problems.

Excessive jumping of the cursor (noise) can be due to external interference. Avoid operating the pad near strong electrical fields or on a metal surface which is not bonded to a zero potential on the pad or the computer. Performance can be improved by hitting the 'H' (HYST) key on the computer and entering a number: the default number is 3, a larger number will improve the steadiness of the cursor but may reduce the speed of the cursor movement. The command 'CNTRL N' can also be used to adjust for external noise.

ACCURACY

The computer calculates to 7 significant figures and displays 6 on the status line. Calculations involving angles are to 5 figures but angles are restricted to whole numbers (-360 to 360 degrees).

ARCS/CIRCLES are drawn as polygons with from 6 to 150 sides, according to the number of dots in the diameter when drawn on the screen; as the drawing is zoomed in and the circle covers a larger area, the sides increase. The error is small but deviation from a true circle can show up on zooming in.

For Hatching 36 sides are normally used to speed up processing, this can generate an error (the hatch lines may not quite meet the circle outline). The figure of 36 can be changed by using the 'J' keyboard command.

All drawing on the screen is accurate only to the screen resolution. There may be an error of up to one dot (sometimes annoying when it occurs on a grid) but the drawing is stored internally to its full accuracy.

Selecting Menu Options.

All commands are selected from the Grafpad. For example, to draw a rectangle you need to select the rectangle command from the OBJECT section of the Menu.

- 1) Place the Pen on the Rectangle box of the OBJECT menu.
- 2) Press the Pen switch. The Status line will ask for 'Rect start'.
- 3) Move the Pen to where you want the bottom left corner of the rectangle to be and press the Pen switch.
- 4) The Status line will now ask 'Set Rect endpoint'.
- 5) Move the Pen to where you want the top right corner of the rectangle to go and press the Pen Switch. The rectangle will now be drawn on the Screen.

Note: The start and endpoints of a command can also be set by entering the Absolute, Relative or Polar X and Y co-ordinates from the computer or Grafpad keyboard.

POINTS.

The Point Command is extremely important as it is used in 8 different ways in the program. It is used for defining Windows, setting ABS, REL, POLAR points, setting and storing points, snapping to END, MIDDLE and INTERSECTIONS of lines.

Most of the drawing commands follow a similar pattern i.e.

- a) Select a command from the Menu by pointing at it with the Pen and pressing the Pen switch.
- b) Set the start and endpoints of the shape being drawn by moving the Pen and pressing the switch to fix them.
- c) Select a new command by moving the Pen to the required box on the Menu area and pressing the switch.

Some commands, i.e. Orthogonal lines can only be completed by selecting another command or 'CANCEL'. Other commands i.e. enquiries on Status or Attributes etc. are cancelled by pressing the Pen switch a second time.

OBJECT MENU.

LINE. Function: Draws Lines.

Select the LINE command from the OBJECT menu. Press the Pen Switch. Move the Pen to set the starting point of the line. Press the Pen switch.
Move the Pen to set the endpoint of the line. Press the Pen Switch. Move the Pen to set the endpoint of the line. Press the Pen switch. To start a new line, move the Pen to the desired start point, press the Pen switch and repeat the operation.
Lines can be drawn to absolute, relative or polar co-ordinates by selecting either ENTER ABS, REL or POLAR from the Menu and entering the required X and Y co-ordinates as requested by the Status line. The Relative or Polar co-ordinate is always calculated from the last endpoint of the drawing. The END, MID POINT and INTERSECTION commands can be used for accurate joining of the start or end of a Line to another Line or Shape.

SKETCH. Function: Draws Freehand Lines.

Select the SKETCH command from the OBJECT menu. Press the Pen switch. Move the Pen to the starting point for drawing. Keep the Pen switch depressed and start to draw with the Pen. Release the switch when you stop drawing and before you lift the Pen from the pad. To recommence drawing move the Pen, replace it on the pad and press the pad and press the switch. Then start the drawing again. Note: If the SNAP GRID is operative the starting point of the freehand line will be effected by the grid but not any other part of the drawing.

ORTHOGONAL LINES. Function: Draws Vertical, Horizontal or 45 degree angle lines.

Select the ORTHOGONAL Line command from the OBJECT menu. Press the Pen switch. Move the Pen to the required starting point of the line, Press the Pen switch. Move the Pen either in a horizontal or vertical direction. The line drawn will automatically be straight. To set a new start point, release the Pen switch, move the Pen to the new point and press the switch again.

Lines can be drawn to absolute, relative or polar co-ordinates by selecting ENTER ABS, REL or POLAR as described in the LINE drawing command.

The ORTHOGONAL command is particularly useful when used in conjunction with the GRID and SNAP commands.

RECTANGLES. Function: Draws Rectangles.

Select the RECTANGLE command from the OBJECT menu. Press the Pen switch. The STATUS line will ask for the start point. Move the Pen to the start of the rectangle, which should be its bottom left corner. Press the Pen switch to set the start point. The STATUS line will ask for the endpoint. Move the Pen to set the opposite corner. Press the switch to set the rectangle. The start and stop points of the rectangle can be set by using the ENTER ABS, REL or POLAR commands.

Once drawn the rectangle can be rotated, tilted or manipulated as desired.

Example.

Select RECTANGLE from the command menu. When the Status line asks for 'Rect Lower Left' enter ABS and Input 10,10 to the X,Y question. The Status line will ask for 'Rect Upper Right'. Try entering the following alternatives.

- 1) Select ABS and enter 200,000. A rectangle will be drawn 190 units long and 190 units high.
- 2) Select REL and enter 190,190. The same rectangle will be drawn.
- 3) Select POLAR and enter 200,45. A rectangle will be drawn where the diagonal is 200 units long at an angle of 45 degrees.

CIRCLE. Centre and Point. Function: Draws Circles.

Select the CIRCLE: Centre and Point command from the OBJECT menu. Press the Pen switch.

The STATUS line will ask for a centre point. Move the Pen to the centre of the required circle and press the Pen switch.

The Status line will ask for a point on the circumference of the circle. Move the Pen to the desired radius and press the Pen switch. A radius R can be specified directly by using ENTER REL then R,0 or R from the keypad. All circles can be scaled (effectively changing the radius, scaled X or Y (generating ellipses) and rotated (angled ellipses)).

CIRCLE.2 Points. Function: Draws Circles

As for previous Circle command but the STATUS line asks for two points at each end of the diameter.

CIRCLE.3 Points. Function: Draws Circles

As for first Circle command but the STATUS line asks for three points on the Circle circumference. The three points should not be in a straight line.
The Circle will be drawn anticlockwise from the first point selected.

TEXT. Function: Enables Text to be written.

Select the TEXT command from the OBJECT menu. Press the Pen switch. The STATUS line will ask for the Text. the text is inputted directly from the computer keyboard or by selecting the individual letters with the Pen from the Grafpad and pressing the Pen switch. At the end of the text press the RETURN key or select ENTER on the Grafpad.

The STATUS line will ask for the position point. Move the Pen to the desired point and press the Pen switch. At the end of the text press the RETURN key or select ENTER on the Grafpad.
The STATUS line will ask for the position point. Move the Pen to the desired point and press the Pen switch. Once positioned the text can be rotated, tilted, scaled etc.

Example.

Select TEXT from the command menu. Point the Pen at the Grafpad Keyboard and enter in, pressing the Pen switch at each character, "12345 LF (for Line Feed) QWERTY LF (Line Feed) ASDF" and then ENTER.

The Status line will then ask you for 'TEXT POSITION'. Move the Pen over the Grafpad until the block on the screen which represents your text is positioned at the desired point. Press the Pen switch. The Text block will now be fixed. If the size of your text is to small to read, move to the SCALE menu and select '2'. The text will be redrawn at double its previous size. If required repeat this again until the text is the correct size. At this stage you could also try to rotate the text. Move the Pen to ROTATE menu, select +90 and press the Pen Switch. The text will now be rotated by 90 degrees. Now select 'ENTER' on the 'ROTATE' menu and answer 42.5 to the 'ANGLE' request.

The standard text font is defined in a 6x6 mm area inside an 8(h)x10(v)mm box. The character is centred within this box. The 'TEXT SIZE' commands will stretch the 8x10mm box to the size specified and of course will affect the character itself.. The default box size is 5x5mm (i.e. the character will appear 3.75x3mm).

There are currently no commands to alter the aspect ratio (6.8 and 6:10).

Defining a new TEXT FONT.

The program allows for the definition of user defined text fonts. Each character is defined as a Symbol with a unique name -dl- where d is the font number ('1' to '9') and l is the character (eg "JA" for a capital A in font 1).

The character must be defined in an 8mm wide by 10mm high box. The lower left corner of the character box is taken to be co-ordinate (-1,-2); i.e. (0,0 is the character base for a standard character).

The symbols defining the character should be defined and stored in a special library, then loaded into a drawing using 'LOAD SYMBOL' then <name of font library>:/ALL
Any characters not present and not available using the normal symbol commands will be drawn as standard characters.

Note:

A character can only be defined using the standard drawing constructions but not other text symbols.

ARC. Centre, Point and Angle. Function: Draws Arcs.

Select the ARC command from the OBJECT menu. Press the Pen switch. The STATUS line will ask for Point 1 or Centre point.. Move the Pen to the required position and press the Pen switch. The STATUS line will ask for Point 2, which sets the radius and the start of the Arc.. The STATUS line will then ask for Point 3 which sets the angle or end of the arc.
ARC Angles are calculated anticlockwise from the Start point of the Arc.

ARC. Three point Arcs. Function: Draws Arcs.

Select the ARC command from the OBJECT menu. Press the Pen switch.

The STATUS line will ask for Point 1 or the Start of the Arc.. Move the Pen to the required position and press the Pen switch. The STATUS line will ask for Point 2 and the Point 3. The Arc will then be drawn counter clockwise joining the three points.

SYMBOL. Function: Draws Symbol called from file

Select the **SYMBOL** command from the **OBJECT** menu. Press the Pen switch. The **STATUS** line will ask for the symbol name. The symbol should be in the current drawing file. If not, the current library file is searched and when found, the symbol is loaded. Move the Pen to place the symbol in the required position and press the Pen switch.

The source file for a new symbol can be specified directly. i.e.

File name: Symbol name.

Example.

- 1) LOGIC: LS00
- 2) OFFICE:CHAIR

DIMENSION. Function: To Dimension between two points.

This draws 3 lines, 2 arrows and a piece of text. The arrow/text size will depend on the current text setting. The text is repeatedly halved in size until it fits into the available space. Since the dimension may output to six figures, it may sometimes be better to delete the text (it will already be positioned) and insert a more suitable message. The text may be turned through 180 degrees to keep it orientated correctly to the drawing. Trailing zeros are trimmed from the dimension text. The arrows used are special constructions and are not otherwise available.

Select the **DIMENSION** command from the Menu. Press the Pen switch. The **STATUS** line will ask for Point 1. Move the Pen to the start of the shape to be dimensioned and press the Pen switch. The **STATUS** line will ask for Point 2. Move the Pen to the end of the shape to be dimensioned and press the Pen switch. The **STATUS** line will ask for the Height. This is the height of the Dimension line above the shape or line being dimensioned and is the point at which the line will be drawn and the dimension figures printed. The dimension line will be drawn parallel to the position of Points 1 and 2, so if a horizontal or vertical line is required it is important to ensure that Points 1 and 2 are carefully positioned. It may be easier to accurately place these two points by using the **END POINT** command on the Menu to snap the dimension point to the end of the line to be measured. It will be necessary to select this command separately for each point.

Example.
Draw a Rectangle of any size. Select **'DIMENSION'**. The **STATUS** line will ask **'POINT 1'**. Select **'ENDPOINT'** and move the small box that will appear until it is close to the Top Left corner of the rectangle and click the Pen switch. The **STATUS** line will ask for **'POINT 2'**. Select **'ENDPOINT'** again and move the box to the Top Right corner of the rectangle and click the Pen switch. The **STATUS** line will ask **'HEIGHT'**. Move the Cursor vertically upwards a short way and click the Pen switch. The Dimension lines and Text will be drawn at that point. If the Text is too small to see, then select **'2.0'** on the **SCALE** menu and increase the size of the text and if necessary use the **MOVE** command to reposition it. Use the **REDRAW** command to clean up any holes left in the drawing.

FILLET. Function. To join the intersection of two lines with an arc.

This command draws a smooth arc joining two lines. The lines must have been drawn consecutively and you should be positioned at the first of the lines. If the lines are the last item drawn before calling the **Fillet** command, then the cursor can be positioned to the last drawn line. The end of the lines will be adjusted to match the required arc. The program will ask for a fillet radius - the radius of the arc. A value of **'0'** will join the lines without a radius. Values which are too large or a negative value can cause queer effects.

Example.

Select **LINE** from the Drawing menu, enter **ABS** and start line at 20,20. Select **POLAR** and enter 200,30. A line will be drawn 200 units long at an angle of 30 degrees. The **STATUS** line will ask for another **LINE ENDPPOINT**. Select **POLAR** and enter 200,150. A second line will be drawn at an angle of 150 degrees from the first line. Now select the **FILLET** command and enter 30 to the request for the **FILLET Radius**. The Screen will now redraw the lines with a smooth radius instead of the sharp angle in the previous drawing.

HATCHING. Function. To fill an area with 45 degree lines.

This command allows certain types of area to be filled with lines at 45 degrees. An area to be filled must be enclosed by line segments which are joined at the endpoints.

On selecting the **HATCH** command with the Pen, a window must be defined enclosing the area to be hatched. The program will then ask for the **HATCH Pitch**. This is the horizontal distance between the hatch lines (the actual spacing is equal to 0.7071 x hatch pitch). The default setting is 10mm. Enter a number from the keyboard and then Enter. You will need to enter the **HATCH Direction** - hit **ENTER** or, \ for the standard hatch, (you will find it on the Grafpad keyboard), / for lines in the other direction or **'X'** for Crosshatching.

There is a limit of how many lines can be specified in the window and how many lines can be stored. This is approximately 100 in each case. Complex areas can be hatched in several operations. The Program will ask for the area to be scanned. Move the Cursor to the bottom Left or Right of the area, depending on the direction of the Hatch pattern, press the Pen switch and move it slowly over the area to be Hatched. Any lines missed can be redrawn by bringing the Cursor back over the missing points. Pressing the **SPACE** bar during this process will reverse the logic so that lines disappear when passed over (to eliminate mistakes).

Hatch lines at angles other than 45 degrees can be achieved by first rotating the object area, hatching and then reversing the rotation. Due to the limitations of the Hatch algorithm it may sometimes be necessary to add or remove a hatch line.

DRAWING MENU

NEW. Function. To discard current Drawing.

This command will discard the current drawing and start a new drawing file. This is equivalent to a CLEAR SCREEN operation.

DEFINE SYMBOL. Function. To define Symbol name for SYMBOL Menu.

The SYMBOL MENU can hold the names of the 64 user defined symbols which can be selected with the Pen and positioned in the usual way. It is usual to draw a representation of the symbol in the menu box for easy reference. i.e. LOAD a Symbol File from disc and DEFINE each symbol to an appropriate box in the SYMBOL MENU area. Example.

In order to define the SYMBOL MENU it is of course necessary to have a file containing the symbols. Make a list of the names given to the symbols when they were saved to the Symbol file. Select the 'DEFINE' command in the 'DRAWING' menu. The Status line will ask you to 'Select Item'. This means that you must point the Pen at the block on the 'SYMBOL MENU' that you wish to contain the name of your symbol. The Status line will then ask '() Redefine Y or N?'. If a symbol name is already stored in that block it will be shown in the brackets. If you wish to redefine that block then answer 'Y' to the question. You will then be asked for the Symbol name. Enter this from the Grafpad keypad or the Computer keyboard. The name of your symbol will now be defined to that block. Carry on and define symbols to a number of blocks until you have built up the menu you require.

Now go to the 'SAVE MENU' command and give your menu a name. It will then be saved to disc for future use.

SAVE SYMBOL MENU. Function. To save SYMBOL MENU

After a Symbol Menu has been defined it should be saved by selecting the SAVE MENU command. The Status line will ask for the name of the Symbol Menu. Use a name which will have some relevance to the Menu and input it using the computer keyboard or the Grafpad keypad. The file will now be saved to disc with the file extension. MNU.

Entering the name 'INIT' for 'SAVE Menu' will also save all current parameters; zero point, line types, plotter parameters, page parameters etc. as well as the current user menu. More importantly, the INIT.MNU file is then automatically searched for and loaded whenever G4/G5 starts (it is not loadable via 'LOAD MENU').

LOAD SYMBOL MENU. Function. To load SYMBOL MENU.

This command is used to load a Symbol Menu from the disc for use in your drawing. On selecting this command the Status line will ask for the Symbol menu file name. Input this from the computer keyboard or Grafpad keypad.

LIST DRAWING. Function. To list all Drawing files on the current drive.

Selecting this command will list all the drawing files you have on the disc in the current drive. The Status line will display the Current Drive i.e. "DRIVE (A)". If this is the correct drive press "Enter" on the keyboard or the Grafpad keypad. If the drawings are on drive B then input "B" and "Enter."

ERASE DRAWING. Function. To ERASE a Drawing file.

This command is used to Erase or Clear from the disc a file that is no longer required and to make room for other drawing files. Select this command and input the correct file name when asked for by the Status line. The computer will then erase the file from the disc.

LOAD DRAWING. Function. To LOAD a new Drawing file.

This command will discard a current drawing file and load an existing drawing from the disc. The new drawing is then displayed on the screen. If the current file may be required again make certain that it has been saved to disc before loading a new file.

SAVE DRAWING. Function. To SAVE current Drawing to disc.

This command will save the current drawing to disc. It is essential to do this at reasonable intervals to protect the drawing against accidental corruption. The drawing is stored during the program on the RAMDISC of the PCW 8256 and could be damaged by mains failure etc.

SYMBOL FILE

The SYMBOL and SECTION facility is a very powerful feature of your Grafpad program. It enables you to create a drawing or part of a drawing as a Symbol or a number of symbols as a Section and insert them into your drawings at will.

Each drawing file consists of a MAIN drawing and a series of descriptions of any Symbols used. A Symbol is a pre-defined shape or sub-drawing which has been given a unique name and stored on disc for recall into your drawing or used in a Symbol Library for use in other drawings. This enables it to be used as easily as a primitive object i.e. a line/circle/etc.

Symbol descriptions are generally stored in library files to be accessed as required. To use a Symbol it is necessary to load its description i.e. its name, into the Drawing.

The Symbols Menu allows new symbols to be created and old symbols to be edited. The blank SYMBOL Menu allows each box to be associated with the name of a symbol to allow instant access to commonly used symbols.

Various user defined menus can be created, saved and loaded for different program applications.

Each Symbol can be placed into the main drawing by positioning its reference point. This reference point is the lower left corner of its enclosing outline.

There may sometimes be problems in aligning a key part of the Symbol to match up with the destination grid i.e. input connections of a Logic Gate. This can be overcome by pressing the 'K' on the Computer Keyboard. This will offset the position slightly to align to the grid.

SAVE SYMBOL. Function. To Save a defined SYMBOL

This command is used to save a defined Symbol to another Drawing or to a Library Symbol file.

Example.

On selecting this command the Status line will ask for the File: Symbol name i.e. LOGIC; LS00 or OFFICE:CHAIR. This will store the Symbol into the desired file.

LOAD SYMBOL. Function. To load the description of a SYMBOL.

This command is used to load the description of a Symbol from another Drawing or Library Symbol file, if it does not appear in the Main drawing. The character '/' is allowed in a Symbol name. LOAD SYMBOL will recognise the special name ';/ALL' as meaning 'load all symbols from the file.'

Example.

You may be using a file called "CIRCUIT" and wish to use symbols from another file called "Logic". The program will recognise the name "LOGIC;/All" and load all the symbols in the "LOGIC" file for use in your "CIRCUIT" drawing.

RENAME SYMBOL. Function. To change the Name of a Symbol.

This command is used to change the name of a Symbol in the file.

REMOVE SYMBOL. Function. To remove a Symbol from the file.

This command will remove a Symbol and its description from the List of Symbols. The function will not work if the symbol is still in use in the current drawing.

EDIT SYMBOL. Function. To CREATE or EDIT an existing SYMBOL

This command is used for the creation of a new symbol or the editing of an existing symbol.

Select this command to create a new Symbol and press the Pen switch. The STATUS Line will ask if you wish to create a new Symbol Y/N?. Type 'Y' and the screen will clear. Start to draw your Symbol using the X,Y co-ordinates 0,0 as the point of origin. When the Symbol has been drawn save it using the 'SAVE SYMBOL' command, giving the Symbol a name and the File name i.e. HOUSE:WINDOW. Save each symbol in turn to this file and when complete save the file as a drawing, using the "SAVE DRAWING" command.

To Create/Update a Symbol library:

- 1) If the library exists, load it using 'LOAD DRAWING' command; if it doesn't exist select 'NEW'.
- 2) Use 'EDIT/CREATE' to update the Symbols.
- 3) At the end, use 'SAVE DRAWING' to save the Symbol library.

LIST SYMBOL. Function. To LIST all defined SYMBOLS in the File.

This command will list all the defined symbols in the current file.

LIST LIBR SYMBOL Function. To LIST all the SYMBOLS in a specified file.

This command will list all the symbols in a specified library file. The Status line will ask for the name of the desired library file, the screen will clear and the names of all the symbols in the file will be displayed. Press the Pen switch to return to the drawing.

Entering 'USER' to this command will list the 64 symbol names in the user menu. (It is not possible to use this command to list a library if the library has been called 'USER').

EXPAND SYMBOL. Function. To allow customising of a SYMBOL.

This command is similar in action to the DRAW SYMBOL command but the symbol is split up in to its component parts to allow customising.

EXTENT SYMBOL.. Function. To Re-calculate the size of each SYMBOL.

This command will re-calculate the size of each symbol. This is done automatically whenever the SAVE command is used. It is recommended to be used after editing a symbol.

SECTION MENU.

A SECTION is an arbitrary group of items within the drawing, treated as a single item, which can be Rotated, Slanted, Moved etc. Sections can be created from a number of Symbols and then manipulated as a Symbol.

DEFINE SECTION. Function. To create a SECTION.

This command will create a section from a group of items within the drawing by defining a window enclosing all the required items. The computer will ask you to set the lower left point of the section to be defined. Point the Pen to the desired position and press the Pen switch. Then move to the top right corner and press the Pen switch. The section can now be manipulated using the other commands on the pad. If you require to use the Section in other drawings then use the command "Section To Symbol" to save it as if it were a Symbol i.e. as explained in the "Edit Symbol" command.

END SECTION. Function. To finish creating or changing a SECTION.

This command will transfer all changes made to a SECTION to each item in that SECTION. This is normally carried out automatically as required (there is no danger in not doing this)..

RESTORE SECTION. Function. To restore Section to its original state.

This command will discard any changes made to the SECTION and return it to its original state.

SECTION TO SYMBOL. Function. To form a SECTION into a SYMBOL.

This command will form a SECTION into a SYMBOL. A section can be formed into a symbol for easier and more efficient handling. The original section remains but can be deleted. The new Symbol could now be saved as explained in the "Edit Symbol" command but this will be done automatically if you remember to save the drawing.

SAVE SECTION. Function. To save a SECTION

This command will save a SECTION as an independent Drawing file. This will reposition the section at (0,0) when it generates the drawing. The drawing page size is set to Ax and is the same as the section size.

MERGE. Function. To Merge drawings.

This command will merge a specified drawing with the current drawing. This allows the destination position to be set while displaying the drawing outline. This command together with 'SAVE SECTION' allows a simple alternative to symbol handling for complex symbols.

Example.

To see the effect of this command, load the drawing called "Office" on to your screen. Select the "Load Drawing" command, enter "Office" when asked for the file name. When the drawing has loaded to your screen select the "Merge" command. When the Status line asks for the name of the file to be Merged, input "CURSOR". This will cause the computer to load the file called "CURSOR" from the disc and bring it to your screen. When the file has been recalled you will be asked to position it on your existing drawing. When the block which represents the "Cursor" drawing is on the Screen, position it on the Boardroom Table on the right of the "Office" drawing. press the Pen switch and the computer will start to draw the "CURSOR" file on the Boardroom table. As the file is large it will take some little time before it is all redrawn. When the "Merge" is completed use the "ZOOM" box command to examine the drawing to see for yourself the powerful effect of this command.

POINT MENU.

There are several ways of entering a POINT in to the drawing. The Pen can be used to point the CURSOR to a part of the drawing and press the PEN switch or select from the POINT Menu.

ENTER ABS. Function. To move cursor to absolute X,Y co-ordinates.

This command allows the cursor or line, rectangle etc to start or finish at an absolute X,Y co-ordinate entered directly from the Grafpad or Computer Keyboard. This also becomes the last point entered.

Example.

1) Select 'Line' from the Command menu. Select 'ENTER ABS' when the Status line asks for 'Startpoint'. Then enter 10,10 from the Keypad.

2) The Line will now be fixed at the Absolute co-ordinate of 10,10.

3) The Status line will now ask for 'Endpoint'. Select 'ENTER ABS' and then enter 150,100 from the Keypad.

4) The line will now be drawn to the Absolute co-ordinate of 150,100.

The Absolute command allows you to consider your screen as a piece of Graph paper and to draw on it as you would on a sheet of Graph paper.

ENTER REL. Function. To move cursor to relative X,Y co-ordinates.

The values entered for this function are relative to the last point entered.

Example.

1) Select 'Line' from the Command menu. Select 'ENTER ABS' when the Status line asks for 'Startpoint.' Then enter 10,10 from the Keypad.

2) The Line will now be fixed at the Absolute co-ordinate of 10,10.

3) The Status will now ask for 'Endpoint'. Select 'REL' and then enter 150,100 from the Keypad.

4) The line will now be drawn to a point 150 units to the right and 100 units upward.

ENTER POLAR. Function. To move the cursor to a POLAR co-ordinate.

This command will ask for the length of the Line or movement of the cursor and the angle from the last point of the drawing.

Example.

1) Select 'Line' from the Command menu. Select 'ENTER ABS' when the Status line asks for 'Startpoint.' Then enter 10,10 from the Keypad.

2) The Line will again be fixed at the Absolute co-ordinate of 10,10.

3) The Status line will ask for 'Endpoint'. Select 'POLAR' and then enter 200,30 from the Keypad.

4) The line will now be drawn 200 units long, at an angle of 30 degrees.

Notice the difference between this line and the previous two examples.

STORE A,B,C. Function. To store the position of three points A,B,C.

This command will allow one of three cursor points A,B and C to be specified and stored for recall later in the drawing. When used with the ABS function this will give reference points for use with the drawing. If used with a drawing of the Plan, Front and Side views of an object this command can be used to set the points of origin of each viewpoint.

POINT A,B,C. Function. To move the Cursor to stored point A,B or C. This command will move cursor to the positions previously defined and stored as A,B or C.

END POINT. Function. To Snap Line, Shape or Symbol to end of a Line.

Select the Line, Shape or Symbol required and then Select the END POINT command. The Object will appear with a Box at the end to be connected. Position the box close to the point of connection and press the Pen switch. The two objects will now be joined. This command should be used for accurate positioning in the "Dimension" command.

MID POINT. Function. To snap to MID POINT of a Line.

This command will snap to the MID POINT of a Line.

INTER SECT POINT. Function. To snap to the Intersection of two Lines.

This command will snap to the intersection of two lines.

ENDPOINT (MIDPOINT and INTERSECTION

These commands will not work on circles or text. They will work on arcs so that their endpoints can be picked up. For accuracy the "Zoom" command could be used together with these commands.

ZOOM Menu

The ZOOM and PAN functions are provided to display different parts of the drawing and to magnify parts of the drawing for detailed examination and drawing.

LOCATE. Function. To return to the complete drawing.

This command will return to the complete drawing from any function i.e. ZOOM, PAN etc.

ZOOM. Function. To Set a variable ZOOM window.

This command will call for the definition of a ZOOM window around that part of the drawing required to be examined, modified or drawn in detail. This function can be repeated as often as required. When this command is selected the Status line will ask you to set the Lower Left corner of the Zoom Window. Move the Cursor to the desired point and press the Pen switch. Then move the Cursor to the Top Right corner of the area. The window will follow the Pen and when you reach the correct point, press the Pen switch and the computer will redraw the screen so that the window now occupies the full screen, showing a magnified image of the selected part of the drawing. This can be repeated if greater magnification is required.

ZOOM IN. Function. To ZOOM IN using a fixed zoom factor.

This command will use a defined ZOOM window of a fixed zoom factor to be placed over the part of the drawing required to be examined, modified or drawn in detail. This function can be repeated as often as required.

ZOOM OUT. Function. To ZOOM OUT using a fixed zoom factor.

This command will ZOOM OUT from the centre of the screen using a fixed zoom factor.

Note: The ZOOM Factor for ZOOM IN/OUT can be changed by SET ZOOM in the SET Menu.

PREV. Function. To recall the PREVIOUS ZOOM view.

When using the "Zoom In or Out" function, this command will recall the previous zoom view.

PAN Menu

The PAN Menu allows movement of the drawing window in 8 different directions, as indicated by the arrows on the PAN Menu. Remember, it is the Screen Window that moves in the direction chosen, not the drawing. The Locate command will always bring you back to your original drawing.

PAN. Function. To allow movement of a Window over a drawing.

This command will move the viewing window over the drawing in the direction of the arrow selected in the PAN menu area.

DYNAMIC PAN. Function. To variable movement of Window.

This command is equivalent to a Variable Pan and is achieved by selecting the 'DYN' command on the 'PAN' menu, moving the Pen across the Grafpad, with the Pen switch pressed, to the point which is to be the new centre of the screen. The Pan window will follow the cursor. When the required position has been reached, lift your finger from the switch. The point can also be entered in the normal way e.g. 'POINT A,B,C' can be used to store/recall 3 different Pan views.

ROTATE/SILANT MENU.

This Menu allows the rotating or tilting of a Symbol or Section of a drawing, to be carried out by fixed degrees +90/-90, as shown on the Menu. It is also possible to enter values of Rotation by ENTER and giving the value desired. This is always relative to the current scale / etc. factor.

DYNAMIC ROTATION can be used by selecting the DYN command from the ROTATION Menu, moving the Pen, with the switch closed, until the required degree of rotation is achieved and then releasing the Pen switch.

REFLECT. Function. To Reflect an object in X or Y Axis.

This command will reflect (FLIP) the selected object in the X or Y axis.

CHANGE MENU. Function to Change Pen, Line, Layer or Fonts.

Select this command to change the setting of current Pen, Line, Layer or Font.
Example.

- 1) Using the Rectangle command, draw a fairly large rectangle on your screen.
 - 2) Select 'LINE' in the 'CHANGE' menu.
 - 3) The Status line will ask for 'Dotted Line No. 0-15'.
 - 4) Experiment by trying each number in turn and looking at the dotted line pattern for each number. Remember Lines 0 and 1 are solid lines. The same commands can be used to change the Pen number or Layer number of an object just drawn or selected by using the SELECT command.
- Changing Pen numbers can be used on a Colour Monitor or Plotter to change the colour of a line or object.

The effect of changing LAYERS is explained in the LAYER command in a later section.

Changing FONTS only applied if you have designed and stored alternative fonts to the Grafpad standard font.

CHANGE SCALE. Function. To change the X,Y scale of an object.

This command allows the X or Y dimension to be changed in a fixed scale i.e. 0.5, 2.0, by entering the required number or dynamically, by moving the Cursor over the Pad to achieve the desired change of scale.
Example.

Select Rectangle from the Command menu. Draw a rectangle on your screen of a reasonable size. Select '0.5' on the SCALE menu. The rectangle will be redrawn at half its previous size. Now select '2.0' on the Scale menu and watch the rectangle return to its original size. Select 'ENTER' again and enter 2,3 from the Keypad. Reduce the rectangle to its original size and experiment with other values.

Select 'DYN' from the SCALE menu. The Status line will display 'Dynamic Scale/Rotate.' Place the Pen on the pad so that the Cursor is over to the Left of the Computer Screen. Press the Pen switch and move the Pen from left to right across the pad. You will see the rectangle on your screen expand in size as you move the pen. When it has reached the desired size release the Pen switch to fix the new size of your rectangle. Moving the Cursor from right to left will make the object smaller. Selecting 'X' or 'Y' on the DYN Scale menu will allow you to alter the size of an object, line or text in one dimension only.

COPY MENU.

All the commands in the COPY Menu are implemented by first pointing to the object to be Copied or Moved. This is done by using the SELECT command and moving the Cursor to point to the object. Press the PEN switch. Then select the required COPY or MOVE Command.

COPY. Function. To Copy an Item, Symbol or Section.

This command will enable an Item, Symbol or Section to be selected and copied to any part of the drawing. The original object is left unchanged.

Example.

Draw a rectangle or other shape on the screen. Select 'COPY' on the COPY menu. Move the Cursor over the Pad. A block representing the object will follow the cursor over your screen. Find a position for your object and press the Pen switch. A copy of the object will now be drawn into the new position. Repeat the sequence again to draw a further copy. Select the 'CANCEL' command to come out of the Copy mode before selecting a new command.

SET REPEAT. Function. To set X, Y displacement for REPEAT.

This command will ask for X,Y and optional angle. These parameters are the amount to move X,Y (and rotate) on each repeat.

Example.

Draw a Rectangle of 30,20 units on your screen. Select 'SET REPEAT' on the COPY menu. The Status line will ask 'Repeat +X,+Y (A)'. Enter 40,30. Select 'REPT' on the COPY menu. Now pressing the Pen switch will repeat the rectangle spaced 40 units in the X direction and 30 units in the Y direction from the start of the preceding object.

Inputting an angle for the 'A' value will cause the object to be rotated by the angle given at each repeat. Try experimenting for different values and angles.

REPEAT. Function. To continuously repeat selected object.

This command assumes SET REPEAT has been selected and repeats desired object at the point selected when the Pen switch is pressed, as described in the chapter on SET REPEAT.

REPEAT M,N. Function. To repeat an object in an array.

This command allows an object to be repeated in a vertical and horizontal array for specified multiples after SET REPEAT has been set.

Example.

Draw Rectangle 30 units by 20 units. Set the 'SET REPT' command at X=30 and Y=20. Now select 'REPT M,N.' The Status line will ask 'HORIZ,VERT Multiples.' Enter 4,10. A Matrix of rectangles will be drawn on the screen, 4 across and 10 high. Try experimenting for different values. This command can be used for repeating Symbols or a part of your drawing after defining it as a section.

MOVE. Function. To move current item to a new position.

This Command will move the current selected Item or Section to a new position, deleting the original item or section. Select the Item or Section with the SELECT command and then use the MOVE command to place the Item or Section in its new position.

This command works in the same way as the COPY command but the object is moved to its new position and the old object deleted.

RESTORE. Function. To restore item to original state.

This command will restore an item to its original state after any modification has been carried out.

DELETE. Function. To erase an item from the Screen.

This command will erase the current items from the screen. The current object is marked on the screen by a square 'blob' marking the start of the object or by a dotted rectangle around the object.

Note:

Copying/moving of elementary items and symbols allows the outline to be transformed (scales/rotated etc. also CHANGED) before each positioning, but this is not allowed for Sections/Merging. Copying a Section which has been transformed will only copy the untransformed Section, even though the outline has apparently been transformed (Define a new Section around the new transformed one.) In brief, only untransformed Sections can be copied correctly.

SELECT. Function. To select item.

This command will enable selection of an item for COPY, ROTATION, SLANT etc, by pointing to it with the Cursor. It is not possible to select object which are part of a SYMBOL. This command will highlight the object selected by a dotted rectangle or by a "blob" at the start and end of a line.
Example.

Draw a number of shapes, rectangles or circles on the screen. Point the Pen to the 'SELECT' command and press the Pen switch. Move the Cursor to the start of one of the objects on the screen and press the Pen switch. The object has now been selected and will be marked either with a dotted line or two "Blobs". After selection the object can be moved, copied, rotated, changed or amended in many different ways.

PREVIOUS. Function. To select previous item.

This command will select the item drawn previous to the current item.

NEXT. Function. To select next item.

This command selects the next object for use with the COPY, ROTATION, SLANT commands.. It uses the order in which the objects were created for redrawing and previous/next selection.

If the 'NEXT' command is selected immediately after 'SELECT', the search will start at the current item (plus one). This is useful to help select one of several items clustered around one point.

For a normal 'NEXT' select 'CANCEL' after 'SELECT'.

SET MENU.

ATTR PEN. Function. To change Pen number stored with item.

The default Pen number is 0, which is "transparent". Other Pen numbers are from 1 to 15. Basic objects (lines / rectangles etc.) with Pen 0 are drawn using Pen 1.

The "transparent" Pen is used for symbols so that the colours of the objects making up the symbol will be shown. Selecting Pens 1 to 15 for a symbol will hide its colour. On the Screen all Pen numbers are shown as the same colour. The PLOT menu allows mapping of Pen numbers to the printer or plotter.

With the 'G5' program and a colour Monitor, changing the Pen number will draw the line or shape in a different colour on the screen. Experiment by drawing a line or shape in different Pen numbers and note the colours corresponding to each Pen.

LINE TYPE. Function. To change line style stored with item.

Line types refer to dotted line styles. Styles are numbered 1 to 15. Line 1 is a solid line. Line 2 upwards are dotted lines and get progressively coarser. Line 2 is useful, as a centre line. Line 0 is "transparent" but is printed as line 1. Try experimenting with different LINE types as suggested in the CHANGE menu section.

LAYER. Function. To change Layer number stored with item.

The concept and use of 'layers' is one that may be difficult to understand. Layers are used often by Architects, Builders, Printed Circuit board designers etc. and are a important feature of Computer Aided Draughting programs. The Grafpad program has provision for using up to 15 layers. These should be considered as 15 transparent sheets and each can be used to contain a part of your drawing and can be viewed all together, individually or in any combination. On starting your Grafpad program all 15 layers are available or "enabled". If you do not wish to see any of the layers then set the ones you wish to be "enabled" by selected the 'LAYER' command in the 'SET' menu.

Layers are numbered 1 to 15. Each item has a Layer attribute / number. There is also a Layer 0, which is similar in operation to Pen 0 and is used when the 'LAYER' function is not required. 'LAYER 0' is visible on all layers.

An Item will disappear from your drawing if its Layer number is not currently enabled.

FONT. Function. To change Font number used for Text.

Fonts are numbered 0 to 9. The standard default Font is 0. Fonts 1 to 9 are created by the user using the Symbol creation facilities.

ZOOM FACTOR. Function. To set default ZOOM window.

This command allows you to set the size of the ZOOM window. Select the command and the Status line will ask you to set the 'Lower Left Corner' and then the 'Upper Right Corner.' The size of the rectangle on the screen will be the size of the window you will place over the portion of your drawing to be magnified to the full screen size or the size of the drawing, when using the 'ZOOM IN/OUT' command.

CENTRE. Function. To set Centre point

This command is used to set the centre point of an object for scale, rotate, text operation. This is normally reset to the item position by the SELECT command.

TEXT.ON/OFF. Function. To enable/disable Text.

This command will disable the Text, so that only a box of the Text size is drawn on the screen. The Text is drawn after a REDRAW command.

GRID and SNAP.

To aid in the construction of a drawing the Grafpad program provides the powerful features of 'GRID' and 'SNAP'. These help you to easily align your objects, items or symbols to each other. Symbols drawn to a specified grid will always link up with one another.

GRID:

Auto: Turns on visible Grid with auto-spacing.

USER: Turns on visible Grid with user-defined spacing.

OFF: Turns off visible Grid.

SNAP:

Auto: Turns on AUTO GRID SNAP for co-ordinates (applies aesthetic rounding to co-ordinates with a Snap value of 0.25 or 0.2 of auto Grid).

USER: Turns on USER GRID SNAP for co-ordinates (the snap can be modified with Snap defeat keys).

OFF: Turns off co-ordinate snap.

USER GRID: Function. To display Grid at user defined intervals.

This command will display GRID set to a pre-determined interval and is switched off by the OFF command above it in the Menu area. The GRID will not be displayed if the grid interval is too small compared to the drawing scale.

USER SNAP. Function. To set SNAP to user defined values.

This command will set the SNAP to a user defined value, usually the Grid value or some fraction or multiple of the Grid setting. This command will cause the cursor to only move in steps determined by the GRID X,Y command and the Snap defeat keys.

UNITS. Function. To set dimension units.

This command is used to set dimension units for entry and display of dimensions on the screen and drawing. Before starting any drawing the Units of Measurement should be set together with the Drawing Page Size and Scale.

Example.

When this command is selected at the start of your drawing, the Status line will display;

1 micron 2 mm 3 cm 4 m 5 km 6 thou 7 ins 8 foot 9 mile

Input the number corresponding to the unit of measurement you wish to use in your drawing i.e. '2' for millimetres etc.

LIBR FILE. Function. To set default search file for Symbols.

When a Symbol file has been created or if it is required to use symbols from another drawing, use this command to instruct the computer to search in the named file for the symbol you wish to recall to the screen.

Example.

On selecting this command the Status line will ask 'Default Symbol Search File?'. Input the name of the file containing the symbols you wish to use in your drawing i.e. "LOGIC" or "OCT" for logic symbols or "OFFICE" etc. for other Symbols.

TEXT SIZE. Function. To set Horiz/Vert Text pitch.

The basic character size of the supplied text font is 5 * 5 mm. The Text box is auto-scaled to the dimensions entered with this command.

GRID XY. Function. To set User Grid interval size.

This command is to allow you to define the 'USER GRID' intervals. Enter only one number to set both the X,Y intervals to the same value. This command also resets the Grid Offset to 0.0. After setting the Grid X,Y intervals the Grid should be displayed by selecting the "User Grid" command.

The Status line will ask you to set 'GRID Interval X[Y]?'. Input only one number if the X and Y dimensions are the same, i.e. '10' for a Grid of 10 x 10.

GRID OFFSET. Function. To offset the grid origin from 0.0.

This command should be used if it is required to offset the origin of the Grid intervals.

AUTO SNAP. Function. To set SNAP to automatic setting.

This command will snap the cursor to a pre-determined point on the screen and adjust itself for different Zoom sizes. The SNAP value is usually between 1/4 to 1/5th. of the Automatic Grid setting.

PAGE SIZE MENU

When the Screen outline is first displayed it is in A3 proportions. It can be changed by the following commands. These commands only apply to the Screen drawing. Paper size of the printed or plotted output is determined by the PLOT Menu. It must be emphasised that the Grafpad program works in "real units" (i.e. not scaled up/down, not the dimensions).

When starting a new drawing it is advisable to follow the same discipline that one carried out when using a conventional drawing board i.e. set the Page size of your drawing, then the drawing Scale and then the drawing Units of measurement.

A0 - A5 PAGE SIZE. Function. To set drawing to new Page size.

This command allows the screen drawing to be set or redrawn to specified page size and proportion.

PAGE SCALE. Function. To set Drawing scale.

This command enables setting of desired drawing scale i.e. 1:50 and should be set at the start of your drawing.

STATUS MENU.

The commands in this menu show the status or setting of the various functions of the program and should be checked before each drawing and reset if necessary.

DRAWING STATUS. Function. To show Drawing/Symbol/Item name.

The Status Line will show the details of the current drawing file e.g. CCT:MAIN:SYMBOL. (Z80).

LAYER STATUS. Function. To show the current enabled Layers.

This command will show the current enabled layers i.e. the layers in which you have selected to work. The first enabled layer will be shown in brackets i.e. <2>,3,4 or 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 when all the layers are enabled.

GRID STATUS. Function. To show current Grid setting.

The STATUS line will show the current Grid and Snap settings. e.g. USER GRID 10.000 10.0000 Auto Snap 2.500 2.500. Holding the Pen switch closed will freeze the display on the Status Line until you are ready to select another command.

ATTRIBUTE STATUS. Function. To show current Pen/Line attributes.

The Status Line will show the current settings of Pen, Line, Font. Pen 00 Line 00 Font 00.

SYMBOL STATUS Function. To show default scale/rotate value for a Symbol.

The default Symbol scale will be displayed e.g. 'Scale <1.000000?>.

PAGE STATUS . Function. To show current Page size and scale.

The current Page size will be shown on the Status Line e.g. A3 PAGE, SCALE 1.00000:1.00000 at 0.00000,0.00000. Holding the Pen switch closed will freeze the display for examination.

OBJ.ATTR STATUS. Function. To show current Pen/Line/Font/Layer attribute.

This will be displayed as e.g. PEN 00 LINE 00 FONT 00 LAYER 00 .

PLOT MENU

The printer supplied with the PCW 8256 or 8512 computer can automatically print drawing sections up to A0 size but only A5 and A4 are possible without going to multiple sheets. The default printing size is A5, sizes A4, A2 are rotated through 90 degrees on printout. The page sizes allow for a margin so the actual plotting area is slightly smaller than the page size. Printing time is about 8 to 10 minutes per half page, this will increase as the drawing complexity becomes greater. Rough drafts of drawings can be done at A5 size to save time. The Plot works to the full resolution of the printer, 120 dots/inch horizontally and 144 dots/inch vertically. The horizontal plotting width is 8 inches. The same facilities are available using an MX80 or other EPSON compatible printer with the 'G5' program on a PC or compatible micro.

PLOT PAGE SIZE. Function. To set Page size A0-5 for a Printer. This command will set the size of the final print by the printer. Larger sizes of print out will be done in strips for pasting up later.

ASSIGN PENS. Function. To assign Pen thickness or colour.

This command will assign the Line thickness for a Pen number on the PCW 8256/8512 printer or on EPSON compatible printers in the 'G5' program. This will allow lines to be printed up to 4 pen widths thick on the 'G4' program and up to 8 pen widths on the 'G5' program. If a plotter is used this command will assign a plotter pen to a particular Pen number.

SELECT PLOTTER . Function. To select Printer of Plotter for drawing.

This command will select either a Printer or Plotter as the output device. Enter the number shown to select the correct device.

SCALE PLOT. Function. To set up scale parameters.

This command will set the parameters for a Plot to Scale. The program will ask for a scale factor that is independent of the drawing scale factor. It works on the real dimensions of the drawing and specifies how much they can be reduced/increased.

AUTO SCALE PLOT Function. To specify plot area.

This command will set up a window to allow the area to be plotted to be specified by enclosing the required area within the window, in a similar fashion to using the ZOOM window.

GO. Function. To start printer or plotter.

Before selecting the GO command, check

a) Using a Printer:

- 1) The print head is positioned at the start of the page.
- 2) The Top-of-Form is set. (Hit PTR)
- 3) That ONLINE is set.

The PCW 8256 manuals will describe how to set up for the use of continuous stationary and other features, which should be done before loading the G4 Program. The Plot can be aborted by holding down the SPACE BAR (then select REDRAW), but it will be necessary to RESET the printer.

For other printers consult the Printer Manual for the correct settings.

b) Using a Plotter:

- 1) See that the plotter arm is in the HOME position.
- 2) That the correct Pens are in position.
- 3) That the Paper is in position and flat.

Refer to the Plotter manual for further instructions.

ADDITIONAL COMMANDS.

CANCEL. Function. To cancel the current operation.

Select this command to cancel the current operation i.e. to finish drawing a line, by bringing the Pen to the command block and pressing the Pen switch. This is not necessary for all the drawing commands.

REDRAW. Function. To Redraw the screen after editing.

This command will redraw the screen after editing or deletions, making good any holes, etc. in the edited drawing.

KEYBOARD COMMANDS.

The centre of the Grafpad replicates the Computer Keyboard and can be used for Text input or answering Status Line questions. Point the Pen at each required letter or number and press the Pen switch. Switch to upper or lower case letters by using the CAPS ON/OFF and select the 'ENTER' block instead of the Carriage Return key on the Computer Keyboard. When entering text or numbers the 'LF' block on the Grafpad can be used as a Line Feed at the end of the text line.

A number of the commands are duplicated on the Grafpad and Computer keyboard to speed up the drawing process. There are some commands that are unique to the Computer Keyboard (marked *). The Pen should be touching the Grafpad when these commands are entered from the keyboard.

A Enter Absolute

C Copy

D* Distance and Angle between 2 points.

CTRL D* Change the Data drive (forces a NEW drawing on G5).
Selecting a drive and saving the 'INIT' file means that 'insert data disk' message is not shown. Unassigning drive or deleting the 'INIT' file will restore the message.

E Endpoint

H* HYST. (noise level) see CURSOR.

I Intersection.

J* Change the number of sides/circle for "HATCHING"

K* Apply cursor adjustment during SYMBOL/SECTION MOVE/COPY/ POSITION so that the SYMBOL/SECTION grid will line up with the destination grid. The Symbol or Section must have been created using a grid of the same size. (This command turns the adjustment on/off).

L Draw Line

M Move

N Used to set the permitted noise level for the Stylus (usually 40). This can be varied in cases where noise causes an unsteady cursor.

CTRL N* Same as above command.

O* Set page offset (co-ordinates of lower left corner).

P Enter Polar co-ordinates

R Enter Relative c-ordinates.

S Select.

T Draw Text.

Z* Calibrate the Pad (pen must be at `zero position.)

I to 9.0* Set SNAP defeat during `Snap to User Grid.'
Will allow cursor to move 1/1,1/2,1/3.....1/9,1/10 of the user grid interval. Enter 1 to turn defeat off.

SPACE Cancel. Also Abort for:

Hatch.

Screen Draw

Plot.

Repeat M,N.

RETURN/ENTER. Redraw.

PTP/EXIT/+/-/. Printer control. (PCW models only)

STOP* Exit to CP/M Plus (workfile left intact). (G4 program)

<ESC> Exit for G5 Program.

Alt Q* Quit. New Drawing (No confirmation requested). PCW models only.

CTRL Q* Quit. New Drawing. For G5 programs.

POINT, END.	23	STATUS, GRID.	33
POINT, INNER SECT.	23	STATUS, LAYER	33
POINT, MID.	23	STATUS LINE	6
POINTS.	10	STATUS, OBJ. ATTR.	33
POLAR.	6-7	STATUS, PAGE.	33
POLAR, ENTER.	22	STATUS, SYMBOL.	37
PREV.	24	STOP*.	6
PREVIOUS.	28	SWITCHING ON.	14
PRINTER, Using a	35	SYMBOL.	16
PTR/EXIT/+/-/	37	SYMBOL, DEFINE.	19
QUIT.	37	SYMBOL, EDIT.	19
		SYMBOL, EXPAND.	19
R.	37	SYMBOL, EXTENT.	20
RAMDISC.	17	SYMBOL, FILE.	18
RECTANGLES.	11	SYMBOL, LIST.	19
REDRAW.	35	SYMBOL, LIST LIBR.	18
REFLECT.	25	SYMBOL, LOAD.	16
REL.	6	SYMBOL, MENU.	16
RELATIVE.	6-7	SYMBOL MENU, LOAD.	16
REL, ENTER	22	SYMBOL MENU, SAVE.	19
REPEAT.	27	SYMBOL, REMOVE.	19
REPEAT M,N.	27	SYMBOL, RENAME.	18
REPEAT, SET.	26	SYMBOL, SAVE.	2
RESTORE.	27	SYMLIB. DWG	37
RETURN/ENIR.	25	T.	12
ROTATION, DYNAMIC.	37	TEXT.	13
		TEXT FONT	31
S.	18	TEXT, ON/OFF	30
SAVE a DEFINED SYMBOL.	17	TEXT PITCH, Horiz/Vert.	12,30
SAVE CURRENT DRAWING.	24	TEXT POSITION.	3
SCREEN, WINDOW.	20	TEXT SIZE.	8, 30
SECTION, DEFINE.	20	TO GET STARTED:	30
SECTION, END.	20		19
SECTION, RESTORE.	20	UNITS.	4
SECTION, SAVE.	20	UNITS of Measurement	37
SECTION, To Symbol.	27-28	USER.	5
SELECT.	26	Working Disc	23
SET REPEAT.	5	Z*	24, 29
SET ZERO.	10	Z key.	24
SKETCH.	31	ZOOM [].	24
SNAP.	32	ZOOM, FACTOR.	24
SNAP, AUTO.	31	ZOOM, IN.	24
SNAP, AUTO GRID.	31	ZOOM, OUT.	24
SNAP, USER.	31	ZOOM, PREVIOUS.	24
SNAP, USER GRID	31	ZOOM, SET.	24
SPACE.	37	ZOOM, WINDOW.	23
STATUS, ATTRIBUTE.	33		
STATUS, DRAWING.	33		

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British Micro Ltd.
 Unit Q2, Penfold Works
 Imperial Way
 Watford. WD2 4YY
 England.

Grafsales Ltd
 Unit Q2, Penfold Works
 Imperial Way
 Watford. WD2 4YY
 England.

Tel. (0923) 48222 Telex. 946024

Tel. (0923) 43942.