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COMPUTER ■ BOOKS

3D Graphics Drawing Board

3D Graphics Drawing Board

GLENTOP

Manual for C64 & C128 users



COMMODORE 64 & 128

Board

3D Graphics Drawing Board

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1. Getting Started

Simple drawing - a rectangle and a line

2. Quick Guide

A Summary for the impatient

3. Drawing in 3D

Perspective

Basic Cube

Pyramid and Cylinder

4. Creating an Image

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5. Altering a Drawing

Moving, Zooming, Stretching

Turning and Twisting

Erasing

6. Saving, Loading and Printing

COMMODORE 64 & 128

50 Graphic Symbols Book

GRAPHIC

SYMBOLS BOOK

3D Graphics Drawing Board

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JANUARY 1986

This manual has been written expressly to illustrate specific teaching points. It is not warranted as being suitable for any particular application. Every care has been taken in the writing and presentation of this manual but no responsibility is assumed by the author or publishers for any errors or omissions contained herein.

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Cambridge

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3D Graphics Drawing Board

3D Graphics Drawing Board enables you to create a vast variety of pictures on your computer screen. You can save them for future use, combine them to form new pictures, and print them out.

Simple drawings are very easy to produce. Complicated ones require a little more skill, but you will soon acquire that ... and it is fun learning to use the program.

What can you do with 3D Drawing Board?

Once you have learnt to use it you can produce almost anything. You can draw cartoons, Christmas cards, or book illustrations. You can also handle more difficult technical work - architectural drawings, CAD - the sky's the limit.

3D Graphics Drawing Board

...will of course allow you to edit and save drawings. The software is available on a number of platforms including Windows, Macintosh and Amiga. You can also use the software on a number of other platforms including the Atari ST and the Commodore Amiga. The software is available on a number of other platforms including the Atari ST and the Commodore Amiga. The software is available on a number of other platforms including the Atari ST and the Commodore Amiga.

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What can you do with 3D Graphics Drawing Board?

Once you have learnt to use it you can produce almost anything. You can draw outdoors, Christmas cards or book illustrations. You can also create more detailed illustrations and architectural drawings. CAD - the software is available on a number of other platforms including the Atari ST and the Commodore Amiga. The software is available on a number of other platforms including the Atari ST and the Commodore Amiga.

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Chapter 1

STARTING

In this first chapter, we show you how to load the program and how to produce simple drawings. Everyone should work through Chapter 1. Then, if you are impatient, you can find a summary of all the controls in Chapter 2.

OR you can go on to Chapter Three and follow the instructions step by step.

The Joystick

Plug in your joystick. You use the joystick for almost everything.

Does your joystick have an 'autofire', as well as the ordinary firing buttons? If so:

SWITCH OFF THE AUTOFIRE BUTTON

THIS IS IMPORTANT, the Drawing Board will **NOT** work with the autofire button switched **ON**. If at any time you find it has stopped working, check and you will probably find that you have accidentally switched the autofire on.

Just switch it off again and everything will run.

If you have no joystick you can run the program from the keyboard – see page 23

Loading the Program

Start with your COMMODORE switched on, showing the familiar blue display screen.

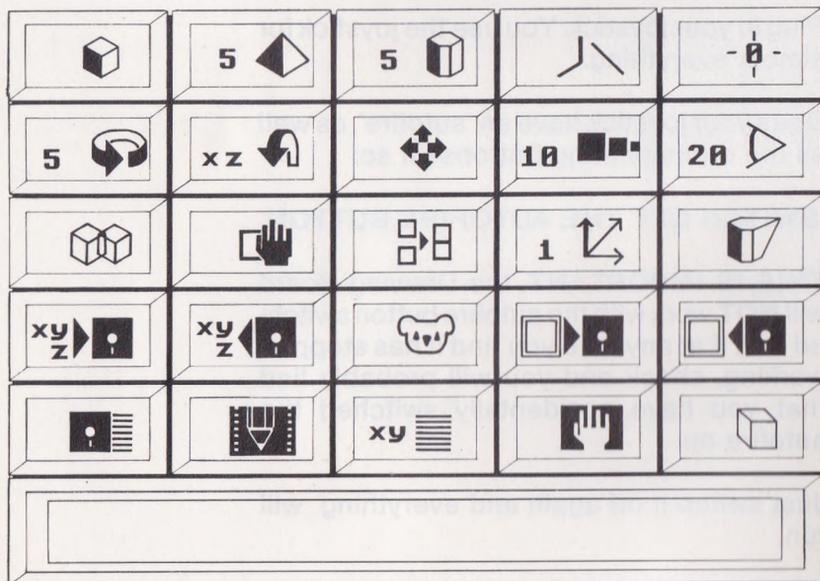
Put in the disc and type:

LOAD "HIRES3",8

When the screen says READY, type:

RUN

After a pause, a panel of twenty-five control buttons will appear on the screen.



THINGS TO NOTICE

- One of the buttons (top lefthand corner) is highlighted in white.
- The screen has a green border.
- Each button has a different picture.
- There is a message panel at the bottom of the screen.

The Demonstration

The disc contains a demonstration of the program for you to watch, if you wish.

When you load the program, do not move the joystick. Instead, simply press the <RUN/STOP> key. The program will then run through its demonstration until you press <CTRL>.

Don't try to use this as a teaching aid - just start to get a feeling for the program.

Highlights and Traffic Lights

The white highlight on the control panel indicates which of the 25 command buttons you are using.

The coloured border is one of the three 'traffic lights' which the program uses. The green, as you might expect, means 'go ahead', the amber means 'starting work' and the red means 'wait'.

The highlight will move from button to button as you move the joystick. Try it. If anything goes wrong, see 'Possible Mistakes' on page 11.

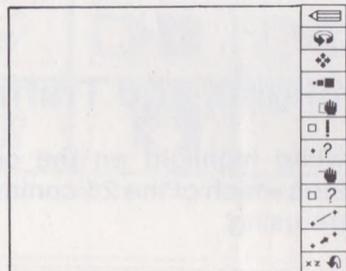
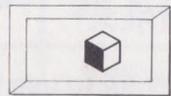
For the technically-minded:

<i>green</i>	-	<i>waiting</i>
<i>amber</i>	-	<i>expects data</i>
<i>red</i>	-	<i>executes calculations</i>

Starting Work – The Blackboard

Return the highlight to the top lefthand corner (which is the control button for a **rectangle**).

Press the button on the joystick and the next spectacular thing will happen. The screen changes to show the -blackboard@ on which you are going to draw.



THINGS TO NOTICE

- On the right there is a secondary menu of 12 items, again each with its own symbol.
- The screen has a green border.
- Beside the menu is a white arrow, which you can shift up and down with the joystick. Try it.
- There is a message panel at the bottom of the screen showing x,y,z values and s - the "subpart" number. (You do not need to worry about these yet.)

POSSIBLE MISTAKES

If you move the joystick to the right, you will find yourself back in the main menu. If you find you have done this, go back to the 'hand' on the previous page, and have another try.

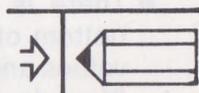
If you are in the main menu and you move the joystick diagonally, instead of at right angles, you may unexpectedly find yourself looking at the blackboard.

This is a feature of the drawing board which will be useful later. For the present, just move the joystick to the right if you need to come back to the main menu.

P.S. DON'T FORGET, AUTOFIRE STOPS THE PROGRAM.

Now back to the Blackboard.

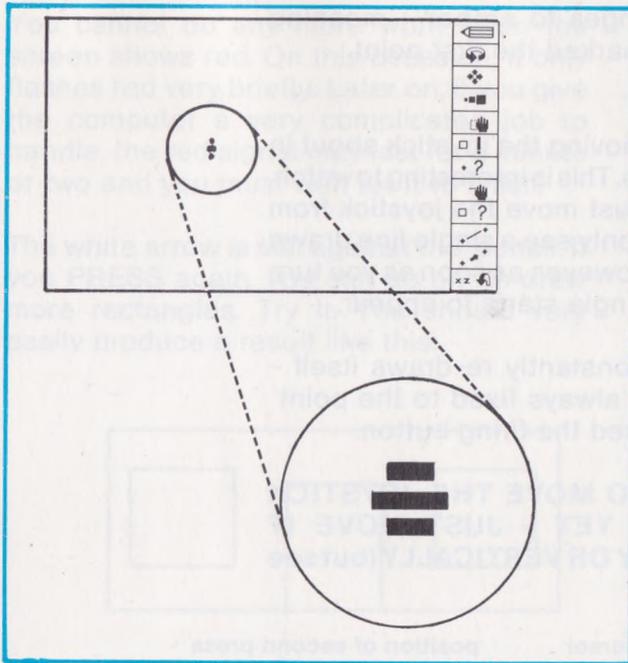
Make sure the arrow is pointing to the first item of the menu - the pencil - and press the fire button on the joystick.



(In future, when you need to do this, we will simply put 'PRESS FIRE'.)

THINGS TO NOTICE

- The arrow disappears.
- The pencil is highlighted in **white**.
- The border round the screen is still **green**.
- The **CURSOR** appears in the middle of the screen.



Move the cursor around with the joystick. (You will see the figures at the bottom of the screen changing as you do so, showing how far you have moved from the **origin** at the centre.)

You have not drawn any lines yet.

Remember that the white highlight was on the very first button, which has a picture of a cube. This allows you to draw a box as well as a rectangle, but we are going to start with the rectangle because it is simpler.

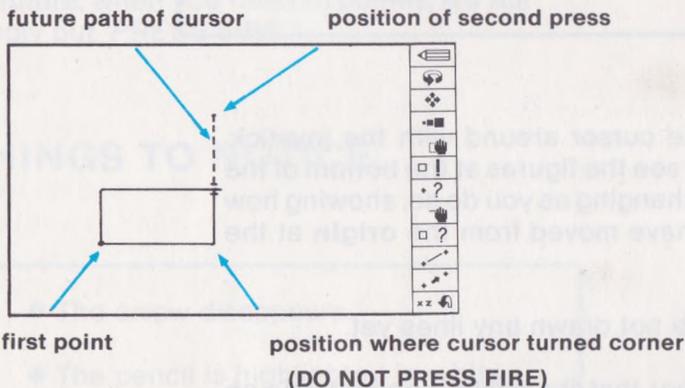
When you are ready to start drawing, PRESS FIRE.

The border changes to **amber** - meaning that you have marked the first point.

Experiment by moving the joystick about in various directions. This is interesting to watch. As long as you just move the joystick from side to side you only see a single line drawn on the screen. However, as soon as you turn a corner, a rectangle starts to appear.

The rectangle constantly re-draws itself - with one corner always fixed to the point where you pressed the firing button.

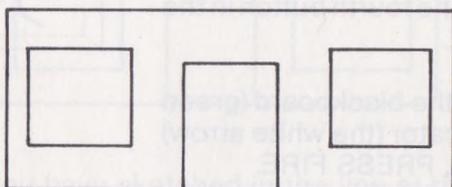
DO NOT TRY TO MOVE THE JOYSTICK DIAGONALLY YET - JUST MOVE IT HORIZONTALLY OR VERTICALLY (but see page 31).



When you are satisfied with the drawing, **PRESS FIRE**. The screen border will flash **red** and then, immediately change to the **green** 'go ahead' signal - and your rectangle is now fixed.

You cannot do any more work when the screen shows red. On this occasion, it only flashes red very briefly. Later on, if you give the computer a very complicated job to handle, the red signal may last for a minute or two and you must wait for it to finish.

The white arrow is still against the pencil. If you PRESS again, you can go on to draw more rectangles. Try it. You should very easily produce a result like this:



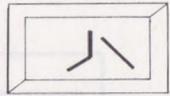
A nice house, but with no roof. To draw a line for the roof we must hop back to the main menu for a moment. You quit the blackboard display, as described earlier, by moving the joystick to the right.



POSSIBLE MISTAKE

Returning to the main menu will only work if the border shows green. If you still have amber, you have made a mistake somewhere. PRESS FIRE until you have green.

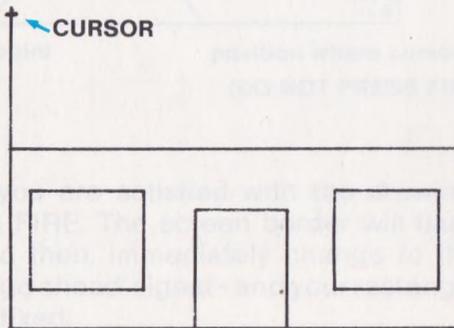
Back in the main menu, use the joystick to move the highlight to the fourth button in the top row. PRESS FIRE.



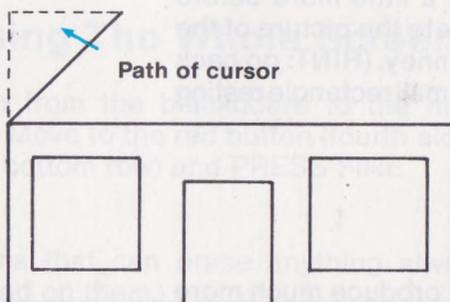
You have returned to the blackboard (green border). With the indicator (the white arrow) pointing to the pencil, PRESS FIRE.

Move the cursor to one of the top corners of the house and PRESS again.

The border turns amber and you start to draw. This time you will get a line. Move the cursor up the screen to a suitable height for the ridgepole.

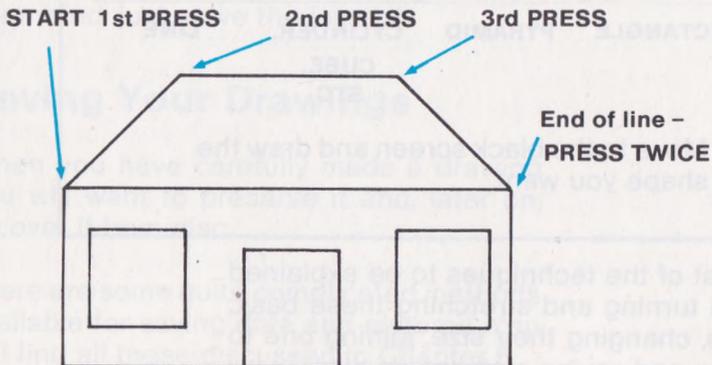


You should be moving the cursor either horizontally or vertically, but you really want a diagonal line (see page 3). If you now move the cursor sideways, the line will move to follow it, so you can draw a line at any angle.



When you have sketched in the line at the angle you want, PRESS FIRE.

That section of the line is now finished, but the border remains amber, so you can go on drawing. Draw a horizontal line, PRESS FIRE and then draw another diagonal line down to the right upper corner of the house.



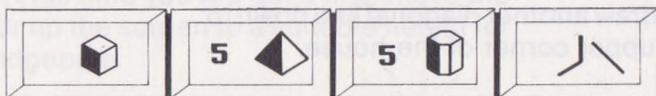
The line of your roof has gone as far as you need. To fix it, you now PRESS FIRE twice without moving the cursor. The screen goes red and then green. You have finished your first simple drawing.

If you wish to practise a little more before going on - try to complete the picture of the house by adding a chimney. (HINT: go back to page 16 and draw a small rectangle resting on the roof.)

Summing Up

3D Drawing Board can produce much more elaborate drawings and manipulate them in complicated (and interesting) ways, but the starting technique is always the same.

- You select one of the first four buttons,



RECTANGLE

PYRAMID

CYLINDER,
CUBE,
ETC

LINE

- Move to the black screen and draw the shape you want.

The rest of the techniques to be explained involve turning and stretching these basic shapes, changing their size, joining one to another, and saving pictures on disc.

Saving and Erasing

So far we have shown you how to draw, but not what to do if you have made a mistake; nor what to do if you want to keep your drawing.

Erasing The Whole Screen

Return from the blackboard to the main menu. Move to the red button (fourth along in the bottom row) and PRESS FIRE.



(Buttons that can erase anything always have red on them.)

The program makes sure at this point that you cannot rub out something you really want to keep. After you have pressed, the border gives a special display of flashing red and amber lines and asks you:

sure?

PRESS FIRE again if you are sure and the whole drawing disappears; if you change your mind, just move the joystick.

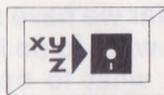
Saving Your Drawings

When you have carefully made a drawing you will want to preserve it and, later on, recover it from disc.

There are some quite complicated methods available for saving data and pictures. You will find all these discussed in Chapter 6.

● SAVE DATA

Highlight the button (first in the fourth row) and PRESS FIRE.



You get the screen message:

all subpart

Subparts are explained in Chapter 4. For the moment, to save the whole drawing, PRESS FIRE.

You get the screen message:

save: ●

Type in the file name you have chosen. The drawing board will accept names of up to 15 letters and will happily accept spaces.

Press RETURN.

(If you want to change your mind, simply press RETURN, without typing any letters on the keyboard.)

POSSIBLE MISTAKES

Do not PRESS FIRE unless you definitely want to save the drawing. You cannot stop the process once it has started.

DO NOT MAKE A TYPING ERROR

You cannot delete while you are typing in a file name, so once you have typed in a name you are stuck with it.

You have now saved the drawing you made on disc. To get it back you have to use the next command.

LOAD DATA

This command recalls a data file.

You highlight the button in the usual way and PRESS FIRE.



As with the 'SAVE' button above, you get the message:

all subpart

PRESS FIRE.

Type in the name of the file and press RETURN.

Using the Joystick

3D Drawing Board is normally controlled by the joystick. You only use the keyboard for putting in file names and checking the directory. Skillful handling of the joystick is thus necessary for efficient production of drawings. It works like this:

- On the main menu, you use the joystick to move the highlight. Move it horizontally or vertically, in small steps, with quick little jerks. In this way you will avoid running off the edge of the menu and into another row.

- When you are in the main menu and you move the joystick **DIAGONALLY**, something quite different happens. You will find you have moved to the blackboard, so that you can see what you have drawn or use the secondary menu. This feature enables you to work very fast, but you may find that you need to practise diagonal movements.

You give a quick little jerk and the blackboard appears. Hold the joystick in the diagonal position momentarily, or you may slip back again. Any of the diagonal directions will work, but it is probably easiest to pull the joystick towards you.

- Remember, when you are manipulating the white arrow on the secondary menu, a movement to the **RIGHT** will take you back to the main menu.
- A diagonal movement of the joystick, when you are using the blackboard, gives you a movement in the **z** plane, i.e. you are moving the cursor on the drawing closer to, or further away from you.
- Very often, especially if you have not set the '**PERSPECTIVE**' button, there will be no visible movement of the cursor on the screen from this diagonal movement. So it is important to watch the value for **z** which is given below the blackboard. (You can estimate the **x** and **y** values - left and right, up and down - by eye, but this is not so easy with **z**.)

- When using some of the buttons, you have to move the cursor around the drawing until it is on a particular point. At first it may seem to dance about in a rather disconcerting fashion.

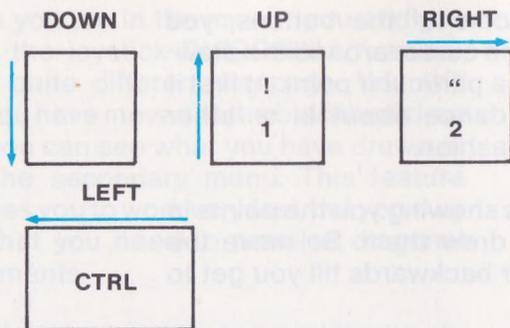
Remember, it is showing you the points in the order you drew them. So move the stick forward or backwards till you get to the right one.

- Even when you are working fast, make sure you use the fire button with a certain amount of care. It is possible to spoil a drawing by not pressing when you meant to or pressing it twice when you only intended to press once.
- Don't forget that, if the program stops working, you have probably knocked the autofire button on by mistake. Just switch it off and Drawing Board will work as before.

Using the Keyboard

3D Drawing Board has been designed to be controlled with a joystick. This is the fastest and simplest way, and this manual assumes that this is what you will be doing. However, if you do not have a joystick, it is still possible to operate the Drawing Board.

Five keys can be used to substitute for the joystick.



The four keys in the top lefthand corner of the keyboard can be used to control the movement of the highlight, the indicating arrow and the cursor in the same way as the joystick.

The space bar is the equivalent of the FIRE button.

Two keys can be used together for diagonal movement. Like the diagonal movement of the joystick, this can be used to move from the main menu to the secondary one; or to project a drawing into the third dimension, i.e. to give a 'z' value.

It is particularly useful to remember that:

pressing 1 and 2 together

will take you from the main menu to the blackboard. Also, when you are there, remember that:

pressing 2

will bring you back to the main menu.

Noises Off

If the sound on your monitor is turned on, you will get several sound effects which can be helpful in operating the Drawing Board.

When you move the highlight on main the menu, the indicating arrow on the secondary menu, or the cursor on the blackboard, you hear a tone which is slightly different for each of the x, y and z directions.

When you press the firing button, you a much higher-pitched 'ping', so that there is no doubt that you have actually given the command.

You will hear all these sounds if you run the demonstration.

A Quick Summary for the Impatient User

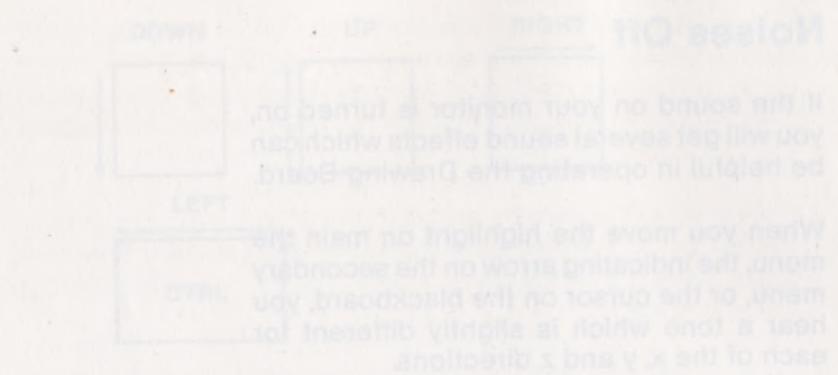
It may be that you will tire of reading very simple instructions and would prefer to work things out for yourself by trial and error. Or you may have had a lot of experience with computer graphics and feel that you don't need much instruction.

The next chapter is a summary of the two menus and what they do.

You can work from this summary alone from now on if you wish. But we warn you that there may be as many errors as trials if you do. The controls for 3D Drawing Board are very elaborate.

For those who prefer to work step-by-step, the thorough explanation continues in **Chapter 3**.

The summary, in fact, is best used for reference **after** you have worked through the manual.



When you press the **Noise On** button, an alert tone sounds and the cursor moves to the **Drawing Board** area. This allows you to hear the sound of the cursor moving across the screen. The **Drawing Board** area is highlighted in the diagram.

You will hear all these sounds if you run the **demo** command. Press **Esc** to return to the **main** screen.

A Quick Summary for the Impatient User

This chapter is a summary of the two manuals and what they contain. It is intended for those who want a quick overview of the system. The next chapter is a summary of the two manuals and what they contain. It is intended for those who want a quick overview of the system.

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You can work from this summary alone from now on if you wish. But we warn you that there may be as many errors as there are in this summary. The controls for the **Drawing Board** are very simple. For those who prefer to work step-by-step, the following explanation continues in Chapter 3.

The summary, in fact, is best used for reference after you have worked through the manual. It is not intended to be read from front to back.

Chapter 2

3D DRAWING BOARD – QUICK GUIDE

A Summary for the Impatient User

Loading

Switch off autofire, put in disc and type:

LOAD "HIRES3",8

When screen says READY, type:

RUN

Main menu displayed - global commands.

Demonstration

To run the demonstration program, press <RUN/STOP>. To end the demonstration, press <CTRL>.

Joystick

One button highlighted in white. Move highlight with joystick. PRESS FIRE button to activate command.

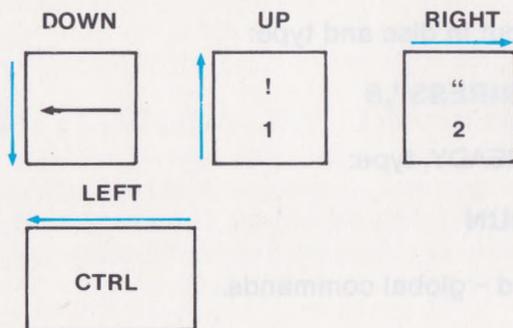
BROWN patch instead of white highlight indicates last drawing button activated, (still operative).

DIAGONAL jerk on joystick moves to secondary menu. When in secondary menu, move joystick **right** to return to main menu.

When drawing, **diagonal** movements of joystick alter z values.

Keyboard Commands

These can be used as well as joystick at any time.



Press 1 and 2 together, or CTRL and 1 together, for the equivalent of a diagonal movement of the joystick.

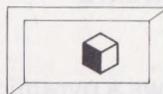
THE SPACE BAR IS EQUIVALENT TO THE FIRE BUTTON

MAIN MENU (Global commands)

The First Row

RECTANGLE

Draws a rectangle by defining two opposite corners.



1. Move highlight to button
2. PRESS FIRE to move to blackboard and secondary menu
3. Move arrow to pencil
4. PRESS FIRE
5. Move cursor to first corner
6. PRESS FIRE
7. Draw first side
8. Turn corner (DO NOT PRESS FIRE)
9. Draw second side
10. PRESS FIRE

CUBOID OR PARALLELOPIPED

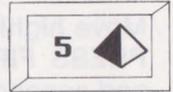
Draws a cuboid by defining two opposite corners. Note that one movement of cursor must be in z direction (i.e. diagonal movement of joystick).

1. Move highlight to button
2. PRESS FIRE to move to blackboard & secondary menu

3. Move arrow to pencil
4. PRESS FIRE
5. Move cursor to first corner
6. PRESS FIRE
7. Draw first side
8. Turn corner (DO NOT PRESS FIRE)
9. Draw second side
10. Turn corner (DO NOT PRESS FIRE)
11. Draw third side
12. PRESS FIRE

PYRAMID

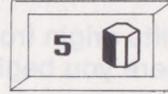
Draws a pyramid with any number of sides - from 3 to 50 - on a horizontal base.



1. Move highlight
2. PRESS FIRE
3. Adjust parameter - number of sides (3 to 50) Joystick forwards +, backwards -
4. PRESS FIRE to move to blackboard & secondary menu
5. Move arrow to pencil
6. PRESS FIRE
7. Move cursor to centre of intended base-line
8. PRESS FIRE
9. Move cursor horizontally to draw base
10. PRESS FIRE (Cursor returns to marked centre point)
11. Move cursor to fix apex of pyramid (in any direction: x, y, or z)
12. PRESS FIRE

PRISM (CYLINDER, CUBE ETC)

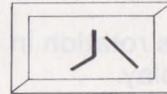
Anything from 3-sided to 50-sided figure with parallel sides, horizontal base.



1. Move highlight
2. PRESS FIRE
3. Adjust parameter (3 to 50)
4. PRESS FIRE to move to blackboard & secondary menu
5. Move arrow to pencil
6. PRESS FIRE
7. Move cursor to centre of intended base-line
8. PRESS FIRE
9. Move cursor horizontally to draw base
10. PRESS FIRE (Cursor returns to marked centre)
11. Move cursor to fix opposite end-face of prism (in any direction: x, y, or z)
12. PRESS FIRE

LINE

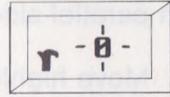
Draws a free-form line, in sections.



1. Move highlight
2. PRESS FIRE to move to blackboard & secondary menu
3. Move arrow to pencil
4. PRESS FIRE
5. Move cursor to beginning of line
6. PRESS FIRE
7. Draw first section of line (in any direction: x, y or z)
8. PRESS FIRE
9. Draw next section of line, PRESS FIRE...and so on until line is completed
10. DOUBLE PRESS FIRE at same point to finish

TEMPORARY ORIGIN

Shifts origin from centre of screen to place where you begin drawing.



1. Move highlight
2. PRESS FIRE

This switch is a **toggle**, set until you change it again.

Every time you draw from now on, values become zero when the first point of the new drawing is marked.

The Second Row

ROTATION

Sets rotation in degrees and rotates entire display.



1. Move highlight
2. PRESS FIRE
3. Adjust angle (1 to 90) Value set also controls rotation in secondary menu
4. PRESS FIRE to move to blackboard; amber border; secondary menu not yet available
5. Rotate entire screen display with joystick

The xy plane is plane of screen. Two possible directions of rotation allowed.

Screen variables given:

“beta” - y axis rotation
(joystick side to side)

“gamma” - x axis rotation
(joystick forward or back)

No immediate rotation about z-axis

To obtain this effect, rotate gamma=90, PRESS FIRE. Activate rotation command again, having reset principal axes.

RESET HORIZONTAL

Mark three points - plane so defined becomes xz plane.



Useful for joining two parts of a drawing.

1. Move highlight
2. PRESS FIRE to move to blackboard; amber border; secondary menu not yet available
3. Move cursor with joystick
4. PRESS FIRE

REPEAT 3 & 4 TWICE

Automatic result, once plane is defined; whole screen affected.

MOVE

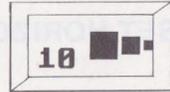
Move whole display in any direction: x, y or z



1. Move highlight
2. PRESS FIRE to move to blackboard; amber border; secondary menu not yet available
3. Move cursor; entire screen display will follow it
4. PRESS FIRE to fix in new position

ZOOM

Magnifies or shrinks whole display

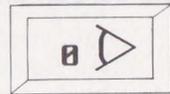


1. Move highlight
2. PRESS FIRE
3. Adjust zoom (1% to 50%)
4. PRESS FIRE to move to blackboard; amber border; secondary menu not yet available
5. Move joystick forward to magnify entire screen display, or backward to shrink it
6. PRESS FIRE to fix size of drawing

CAUTION: DO NOT SHRINK DISPLAY DOWN TOO FAR. If you make an object less than about half a centimetre wide, you will lose it. Do not magnify excessively either.

PERSPECTIVE

Changes viewing angle.



1. Move highlight
2. PRESS FIRE

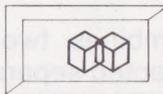
3. Adjust angle (0 to 30) Moves to blackboard

Automatic result; affects everything already on the screen, and everything drawn thereafter.

The Third Row

COPY

Makes one copy, slightly displaced, of latest drawing or selected subpart.



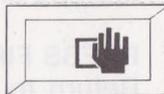
1. Move highlight
2. PRESS FIRE to move to blackboard; amber border; secondary menu not yet available

Last item drawn flashes; use this or select a previous subpart with joystick; these flash in reverse drawing order.

3. PRESS FIRE (Copy is made and arrow moves automatically to 'local move')
4. PRESS FIRE
5. Move cursor to separate copies if required
6. PRESS FIRE

ERASE SUBPART

1. Move highlight
2. PRESS FIRE to move to blackboard; amber border; secondary menu not yet available

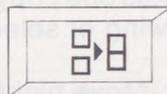


Last item drawn flashes; use this or select a previous subpart with joystick; these flash in reverse drawing order.

3. PRESS FIRE (Screen asks "SURE?")
4. PRESS FIRE (If you have changed your mind, do not press fire but move the joystick instead.)

COMBINE

Combines two subparts; each must be selected separately. You can only combine two subparts at a time. You cannot split them once combined.



1. Move highlight
2. PRESS FIRE to move to blackboard; amber border; secondary menu not yet available

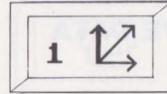
Last item drawn flashes.

(This will be the first object selected by the program for combination. To change the selection, select a previous subpart with the joystick. The items flash in reverse drawing order.)

3. PRESS FIRE
Item selected no longer flashes; select another with joystick (flash in reverse drawing order).
4. PRESS FIRE
Return to main menu. Subparts have been re-numbered.

SCALE

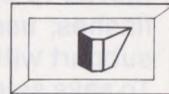
Changes scale used on blackboard



1. Move highlight
2. PRESS FIRE
3. Adjust the scale parameter
Move joystick forward to increase, back to decrease
4. PRESS FIRE

STRETCH

Changes the position of one point of a drawing; drawing re-forms.



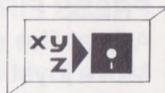
1. Move highlight
2. PRESS FIRE to move to blackboard and secondary menu
3. Move cursor to selected point
4. PRESS FIRE
5. Move cursor again, in any direction - x, y or z. Figure will stretch to follow cursor
4. PRESS FIRE to fix

NOTE: This command will stretch any part or any subpart, whether current or not. A lot can be done with this.

The Fourth Row

SAVE DATA

1. Move highlight
2. PRESS FIRE. Screen message:
all subpart
3. To save whole screen, PRESS FIRE
4. Type in file name and press RETURN



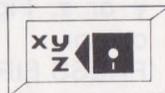
OR

4. Move joystick right to 'subpart'
Moves to blackboard; last item drawn flashes; use this or select a previous subpart with joystick.
5. To save selected subpart, PRESS FIRE
6. Type in file name and press RETURN

LOAD DATA

Recalls any picture saved as data; free to work on; full screen wipes blackboard.

1. Move highlight
2. PRESS FIRE. Screen message:
all subpart
3. PRESS FIRE to re-load whole file
4. Type in file name and press RETURN

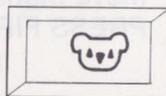


OR

4. Move joystick to right to 'subpart'
5. PRESS FIRE to re-load subpart
6. Type in file name and press RETURN

SAVE KOALA

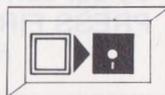
1. Move highlight to Koala
2. PRESS FIRE
3. Type in file name and press RETURN



SAVE PICTURE

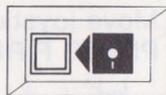
Saves any picture as an UNALTERABLE UNIT. If recalled, cannot be modified or moved.

1. Move highlight
2. PRESS FIRE
3. Type in file name and press RETURN



LOAD PICTURE

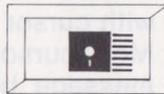
1. Move highlight
2. PRESS FIRE
3. Type in file name and press RETURN



The Bottom Row

DIRECTORY

1. Move highlight
2. PRESS FIRE Message panel shows first file name
3. To run through directory, keep pressing RETURN; press F1 to stop PRINTING/



PLOTTING

1. Move highlight
2. PRESS FIRE. Screen message:
printer plotter
3. To send to printer, PRESS FIRE.
Screen message:
mps-801 mps-802
4. Select correct device with joystick
5. PRESS FIRE. Screen message:
normal enlarge
6. Move joystick to select
7. PRESS FIRE

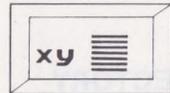


OR, to send to plotter

3. Move joystick to right and PRESS FIRE.
Screen message:
normal enlarge
4. Move joystick to select
5. PRESS FIRE

LIST CO-ORDINATES

Lists the co-ordinates of any point on the blackboard



1. Move highlight
2. PRESS FIRE to move to blackboard,
with cursor on last drawing
3. Move cursor from point to point. Screen
message below blackboard shows x
and y co-ordinates, number of point
and number of subpart

4. When finished, PRESS FIRE to return to main menu

TOTAL ERASURE

Erases the whole drawing from the blackboard.



1. Highlight red button in the bottom row.
2. PRESS FIRE. Display of flashing red and amber lines. Screen message:

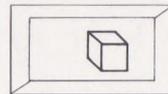
sure?

3. PRESS FIRE if sure. Whole drawing disappears.

OR, if you have changed your mind, move the joystick.

REMOVE LINES

Will remove 'hidden lines' automatically, or manually remove parts of lines. Automatic process is only suitable for convex shapes.



1. Move highlight.
2. PRESS FIRE. Screen message:
auto manual
3. PRESS FIRE for automatic line removal

OR

4. Move the joystick to right
5. PRESS FIRE for manual to move to blackboard with amber border.
6. Move cursor

7. PRESS FIRE. Screen message:

draw

8. Move cursor to draw line. (PRESS FIRE without move will bypass draw.)
9. PRESS FIRE. Screen message:

remove

10. Move the joystick and erasure will follow

YOU NEED NOT DRAW OR ERASE THE WHOLE LINE when using this method. You can stop at any intersection.

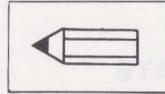
11. PRESS FIRE where you want the erasure to stop
12. SINGLE PRESS FIRE to return to number 6 above. DOUBLE PRESS FIRE to end

THE SECONDARY MENU

Local Commands: Apply to One Drawing Only

DRAW

Only 256 points possible on screen.



1. Move white arrow to pencil
2. PRESS FIRE. Pencil highlighted, border still green
3. Move cursor to beginning
4. PRESS FIRE. Border becomes amber
5. Move cursor:

A). Drawing Rectangle or Cuboid

Rectangle is drawn automatically. Do NOT PRESS FIRE at corners. Move cursor around until figure is complete, then PRESS FIRE.

Move joystick diagonally to give z value for cuboid. Only PRESS FIRE when figure is complete.

B). Drawing Pyramid

N.B. Move to CENTRE of base line. Draw base line and PRESS FIRE. Move cursor to apex - any direction, x, y or z. PRESS FIRE.

C). Drawing Prism - same as Pyramid

D). Drawing line

Draw first section of line. Move cursor in any direction, x, y or z; line drawn at any angle. PRESS FIRE.

Draw next section of line and PRESS FIRE.

Repeat as required.

PRESS FIRE TWICE without moving cursor to complete line.

ROTATE

1. Move arrow to second button
2. PRESS FIRE
3. Move joystick horizontally or vertically. Drawing rotates
4. PRESS FIRE when in right position



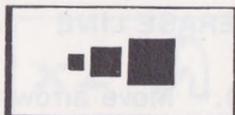
MOVE

1. Move arrow to third button
2. PRESS FIRE
3. Move cursor in any direction. Drawing will follow cursor
7. PRESS FIRE when in right position



ZOOM

1. Move arrow to fourth button
2. PRESS FIRE
3. Move joystick forward to magnify, backward to reduce. Do not reduce below 0.5cm
4. PRESS FIRE when right size



TEMPORARY HIDE

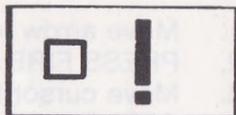
1. Move arrow to fifth button
2. PRESS FIRE



Previous drawings will disappear while you are drawing. Note that this is a toggle; it will continue to operate until you turn it off by repeating the above procedure.

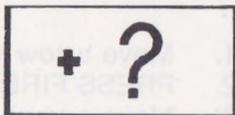
FIX SUBPART

1. Move arrow to sixth button, which is green when available
2. PRESS FIRE. Button turns red



CHOOSE POINT

1. Move arrow to seventh button
2. PRESS FIRE
3. Move cursor to another subpart
4. PRESS FIRE



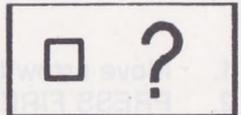
ERASE LINE

1. Move arrow to the red hand (eighth button)
2. PRESS FIRE. Border goes amber
3. Move cursor to correct position
4. PRESS FIRE. Screen remains amber
5. Move cursor to the other end of the line you want to erase
6. PRESS FIRE



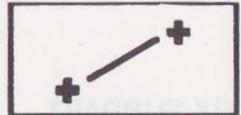
CHOOSE CURRENT SUBPART

1. Move arrow to ninth button
2. PRESS FIRE. Subparts will flash as joystick is moved
3. PRESS FIRE to fix choice



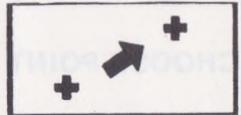
JOIN POINTS

1. Move arrow to tenth button
2. PRESS FIRE
3. Move cursor to first point
4. PRESS FIRE
5. Move cursor to second point
6. PRESS FIRE

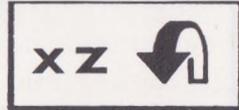


MOVE POINT

1. Move arrow to eleventh button
2. PRESS FIRE
3. Move cursor to first point
4. PRESS FIRE
5. Move cursor to second point
6. PRESS FIRE



RESET HORIZONTAL



1. Move arrow to last button
2. PRESS FIRE
3. Move cursor to point
4. PRESS FIRE
5. Move cursor to another point
6. PRESS FIRE
7. Move cursor to another point
8. PRESS FIRE. Result automatic

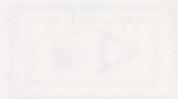
Remember, though, that that section is also meant for reference. Later, Chapter 2 will be the most convenient place to find the details of a command you may have forgotten.

Viewing Angle

So far, you have drawn everything as if it was in front of you, held in your hand at eye level. When we come to draw 3D shapes, the addition of perspective will make your drawings appear much more real, even while they are being drawn. Here is the command:

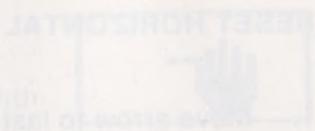
◆ PERSPECTIVE (Roll menu)

Move to the second row, fifth button, which has a 0 in the corner. PRESS FIRE. You do not move to the blackboard as you would expect. Instead, the number on the button changes to white on a black background. You alter this number by moving the joystick forwards or backwards. (We suggest you try a value of 20.) PRESS FIRE.





1. Move arrow to the right button
2. PRESS FIRE. Border goes amber
3. Move cursor to correct point
4. PRESS FIRE. Screen remains amber
5. Move cursor to the other point
6. PRESS FIRE



1. Move cursor to another point
2. PRESS FIRE. Result automatic
3. PRESS FIRE
4. Move cursor to point
5. PRESS FIRE
6. Move cursor to the other point
7. PRESS FIRE
8. PRESS FIRE. Result automatic

CHOOSE CURRENT SUBPART

1. Move arrow to ninth button
2. PRESS FIRE. Subparts will flash as joystick is moved
3. PRESS FIRE to fix choice



JOIN POINTS

1. Move arrow to tenth button
2. PRESS FIRE
3. Move cursor to first point
4. PRESS FIRE
5. Move cursor to second point
6. PRESS FIRE



MOVE POINT

1. Move arrow to eleventh button
2. PRESS FIRE
3. Move cursor to first point
4. PRESS FIRE
5. Move cursor to second point
6. PRESS FIRE



Chapter 3

DRAWING IN 3D

We interrupted the detailed explanation of 3D Drawing Board to give a Summary in Chapter 2. Some people may wish to work with this alone, but most beginners will find it easier to continue with our step-by-step instructions.

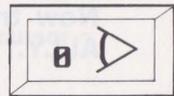
Remember, though, that that section is also meant for reference. Later, Chapter 2 will be the most convenient place to find the details of a command you may have forgotten.

Viewing Angle

So far, you have drawn everything as if it was in front of you, held in your hand at eye level. When we come to draw 3D shapes, the addition of perspective will make your drawings appear much more real, even while they are being drawn. Here is the command.

● PERSPECTIVE (Main menu)

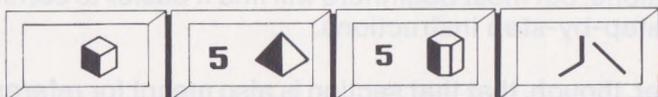
Move to the second row, fifth button, which has a 0 in the corner. PRESS FIRE. You do not move to the blackboard as you would expect. Instead, the number on the button changes to white on a black background. You alter this number by moving the joystick forwards or backwards. (We suggest you try a value of 20.) PRESS FIRE.



Everything already on the screen and everything drawn from now on will be affected.

3D Shapes

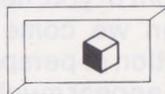
You can draw four different shapes, controlled by the first four buttons in the top row of the main menu.



So far, you have only used the first and the fourth buttons, and you have only drawn 2D figures.

● CUBE

Now we will explore the 3D possibilities of that first button. Proceed exactly as before. Highlight the button, and PRESS FIRE.



Arrive at the blackboard, select the pencil, and PRESS FIRE. Move the cursor until you are ready to start drawing, and PRESS FIRE, marking the first point.

Now try to move the joystick **DIAGONALLY**.

If you watch the message panel you will see the z-values change. You can estimate the position of the cursor by eye pretty well in the x and y directions - not so easily in the third dimension.

(Hint: if you find the diagonal movement of the joystick difficult to control, try using the keyboard. Press 1 & 2 TOGETHER or arrow and CTRL TOGETHER.)

Now continue. You have marked the first point and experimented with moving along the z axis.

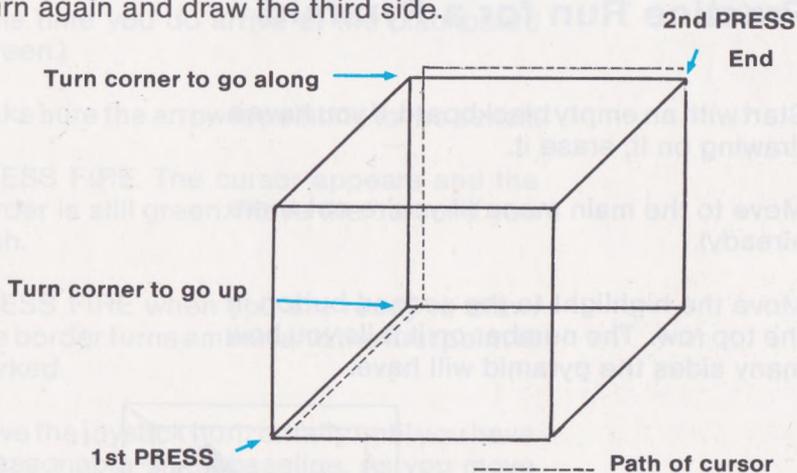
Draw the first side in any direction.

Do not PRESS FIRE.

Turn a corner and draw in a second direction.

Do not PRESS FIRE.

Turn again and draw the third side.

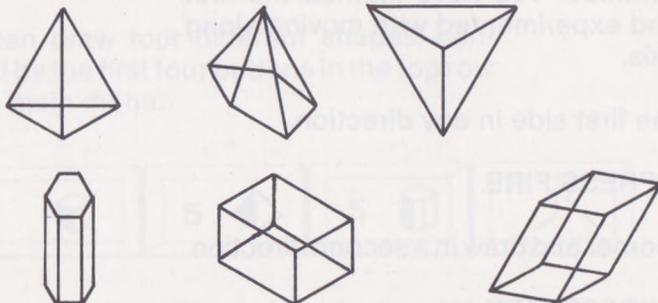


Again, as in Chapter 1, the figure follows the cursor, and continually re-draws itself. You should find the perspective effect helpful.

Finally, PRESS FIRE. You see the brief red flash, then the border returns to green.

Pyramid and Cylinder

Now you draw each of the other two shapes, which complete the set of possibilities.

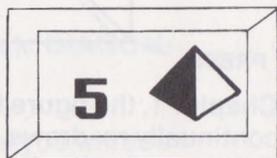


Practice Run for a Pyramid

Start with an empty blackboard. If you have a drawing on it, erase it.

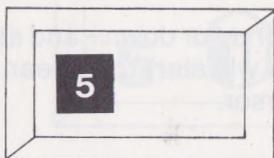
Move to the main menu (if you're not there already).

Move the highlight to the second button in the top row. The number on it tells you how many sides the pyramid will have.



PRESS FIRE.

You do not move to the blackboard immediately. Instead, the number on the button changes to white on a black background, as it did on the perspective button.



Now you can alter the number by moving the joystick forward or backward. Try it. Any value will do for your trial run.

PRESS FIRE again.

(This time you do arrive at the blackboard screen.)

Make sure the arrow is pointing to the pencil.

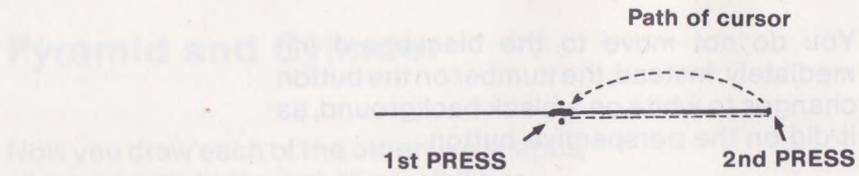
PRESS FIRE. The cursor appears and the border is still green. Move the cursor if you wish.

PRESS FIRE when you are ready to draw. The border turns amber, and the first point is marked.

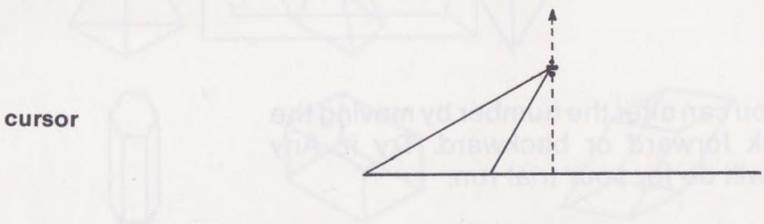
Move the joystick horizontally until you have a reasonable-sized baseline. As you move the cursor, the baseline doubles.

PRESS FIRE.

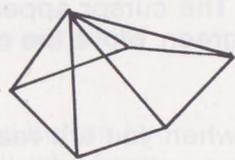
Now you see a new thing. The cursor jumps back to the middle of the baseline you have just drawn.



Move the cursor up or down - and as you do so the pyramid will start to appear, with its apex at the cursor.



Experiment. If you move the apex sideways as well as up or down, you can get a slanted pyramid.



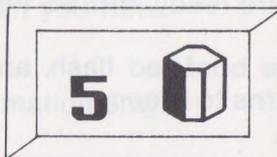
Finally, PRESS FIRE. You see the brief red flash, then the border returns to green.

Practice Run for a Cylinder

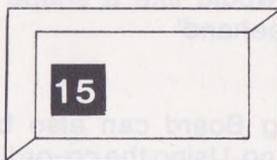
Start with an empty blackboard and move to the main menu.

Move the highlight to the third button in the top row. The number on it fixes how many sides the cylinder will have.

PRESS FIRE.



Still in the main menu, the number on the button changes from black to white. Alter it by moving the joystick forwards or backwards.



PRESS FIRE and you arrive at the blackboard.

Make sure the arrow is pointing to the pencil. PRESS FIRE.

The cursor appears. Check the cursor just as before. PRESS FIRE.

The border turns amber and the first point is marked.

Draw the baseline. PRESS FIRE.

Again, the cursor jumps back to the middle of the baseline.

Move the cursor up or down. Experiment - move sideways as well as up and down - the cylinder will slant to follow.

When you are ready, PRESS FIRE.

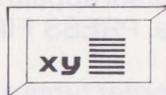
You get the brief red flash, and then the border returns to green.

Exact Drawing

So far, all our drawing has been by eye. We have looked at the screen, seen roughly where we would like a shape to be, and drawn it 'freehand'

3D Drawing Board can also be used for exact drawing. Using the co-ordinates listed below the blackboard, you can construct a design exactly. Possibly you will have the measurements already on paper.

If you are a precise draughting of this kind, you do not need any advice from us on how to proceed. But there is one further command which you may find useful.



● LIST CO-ORDINATES

Highlight and PRESS FIRE. You move to the blackboard.

The cursor can be moved from point to point. The co-ordinates of each point will be listed below the blackboard.

PRESS FIRE to turn it off when you have learned enough.

This command is used for information only.

CREATING AND USING SUBPARTS

So far, we have shown you how to draw each of the four possible shapes. Now we start to put them together, always building up elaborate designs from simpler units.

Not only do you need to work out your design in separate units, but also you must store them separately. Only by doing this will you be able to select and alter a particular unit without dragging any of the others out of shape.

The 3D Drawing Board calls these units 'subparts'. Much of the skill involved in using the drawing board comes in the handling of subparts. It is wise to store away a whole library of ready-made drawings from which you can build future designs.

This is not just a useful suggestion; it is a necessity. Computer memory being limited, you cannot make a drawing that contains more than 256 points. To build up larger designs, you **MUST** have ready-made pictures or discs to add on.

The cursor can be moved to any position on the screen by typing the co-ordinates of each point with the arrow keys on the keyboard below the blackboard.

When you are ready to finish a drawing, type **PRESS FIRE** to turn it off when you have learned enough.

You get the label that tells you the command is used for information only to enter the board.

Exact Drawing

So far, all our drawing has been by eye. We have looked at the screen, seen roughly where we would like a shape to be, and drawn it 'freehand'.

The Drawing Board can also be used for exact drawing. Using the co-ordinates listed below the blackboard, you can construct a design exactly. For this you will have the measurements already on paper.

If you are a precise draughtsman, you do not need any advice from us on how to proceed. But there is one further command which you may find useful.



◆ LIST CO-ORDINATES

Highlight and **PRESS FIRE**. You move to the blackboard.

Chapter 4

CREATING AND USING SUBPARTS

So far, we have shown you how to draw each of the four possible shapes. Now we start to put them together, always building up elaborate designs from simpler units.

Not only do you need to work out your design in separate units, but also you must store them separately. Only by doing this will you be able to select and alter a particular unit without dragging any of the others out of shape.

The 3D Drawing Board calls these units 'subparts'. Much of the skill involved in using the drawing board comes in the handling of subparts. It is wise to store away a whole library of ready-made drawings from which you can build future designs.

This is not just a useful suggestion; it is a necessity. Computer memory being limited, you cannot make a drawing that contains more than 256 points. To build up larger designs, you **MUST** have ready-made pictures on disc to add on.

CAUTION

3D Drawing Board only creates separate subparts when you tell it to do so. If you do not tell it otherwise, it will put everything you draw into the same subpart. If you make two drawings in succession they will be put together. It is too late to make them separate from the moment you put the arrow on the pencil for the second time.

Creating a Subpart

In general, the procedure is this:

Select one of the four shapes.

Move to the blackboard and PRESS FIRE, with the arrow at the pencil.

WHEN THE BORDERTURNS AMBER YOU HAVE OPENED YOUR SUB- PART.

Draw.

When you have just drawn a shape, it remains available for alteration. You can move it, turn it round, change its size and so on, until you are satisfied.

When you have made all your changes, you can:

1. Close the subpart.

2. Make another drawing - which is automatically included in the same subpart.
3. Save the drawing on disc.

If you have any doubts in the matter, **always** choose the first alternative.

If you fix the present drawing in a subpart by itself, you can come back to it later and change it some more.

If you do not close the subpart, but continue drawing, both drawings will be in the same subpart. Then any changes you make later will affect both of them in the same way.

While you have the sugar and the coffee separate you are all right, but once you have mixed them, you cannot separate them.

Summing up:

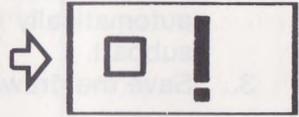
YOU CANNOT CHANGE PART OF A SUBPART.

YOU CAN ALWAYS COMBINE TWO SUBPARTS BUT, THERE IS NO WAY TO SEPARATE THEM AFTERWARDS.

Subpart Commands

Most subpart commands are found in the secondary menu - because you need the drawings in front of you when deciding what to do.

● FIX SUBPART (Exclamation mark)



This control closes a subpart.

The button itself goes through various colour changes which tell you whether or not you have closed the drawing. (Otherwise you may be in danger of tangling two drawings.)

When you first load the program and there is **nothing** on the screen, the button is red.

When you activate the pencil (for any one of the four shapes) it is still red.

When you finish a drawing by PRESSING the fire button (border returning to green) **this button changes to green**. This is a signal that it is ready to close a subpart if you wish to do so.

Move the indicating arrow to the button and PRESS FIRE.

The button goes white and then red as the subpart is created.

It remains red until you draw something else, showing that you have completed one subpart and not started on another.

Screen Messages

If you look at the screen message below the blackboard, you see the co-ordinates of the cursor x , y , & z , and a fourth variable, s (for example: " $s = 2$ ").

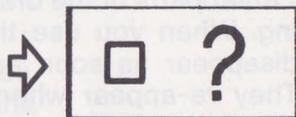
This tells you **which subpart you are now working on.**

If you move back to the main menu, you will see another message (for example: "subparts 2").

This tells you **how many subparts there are.**

The two messages need not be identical, for you can go back to work on an earlier subpart. So you may be working on subpart 5, while the main menu says: subparts 7. Make a third subpart now and you will more easily be able to see some of the tricks you can play.

● **CHOOSE CURRENT SUBPART (Blue square, question mark)**



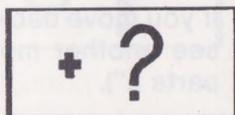
After working on several subparts, you may decide that you really need to go back to alter an earlier one.

To change to another subpart, move to this button and PRESS FIRE. The current subpart will flash on and off.

You can now make another one current instead. Move the joystick to select the one you want. (Each will flash in turn.) PRESS FIRE.

● CHOOSE POINT (Blue dot, question mark)

Move the arrow to the button and PRESS FIRE.



Move the cursor until you are sure that it is on some point of the drawing that you need to alter. (This will not always be easy if you have a very complicated group of drawings.)

PRESS FIRE.

You have now changed to a new sub-part. The s number at the bottom of the screen will show you which it is.

● TEMPORARY HIDE (red hand, dotted square)

Earlier parts of the drawing can be distracting. When you use this control, they will disappear as soon as you start drawing. They re-appear when the screen border goes green again at the end of the drawing.



THINGS TO NOTICE

- ALL the previous drawings will be hidden, even those in the present subpart.
- This button is a TOGGLE. You move the arrow and PRESS FIRE. It will continue to operate until you reset it.

● COMBINE (Main menu)

When you use this control, two existing subparts are joined together. You cannot separate them thereafter.

Decide which subparts you wish to combine.

Move the highlight to the first button in the third row and PRESS FIRE.

You move to the blackboard, with the amber border. The current subpart is flashing.

The joystick, moved **sideways**, lets you move from one to another of the subparts. You can follow the changes by reading the screen message.

When you have selected one of the two decided on, PRESS FIRE.

One of the previous subparts now flashes. Again you select the one you want with the joystick.

PRESS FIRE to combine.

General Advice

Use plenty of subparts and combine them later. If the screen message below the main menu (e.g. points : 250) shows that you are running short of memory, you can store subparts on disc, as well as whole drawings.

All the ways you can store data and pictures are explained in Chapter 6.

● ERASE SUBPART (Main menu)

This red button on the main menu (second along, second row down) erases the current subpart.

(This will usually be the latest drawing you have made, unless you have selected a different subpart).

Move the highlight and PRESS FIRE.

The display moves to the blackboard. You get an amber border. The subpart which is going to be erased flashes on and off. PRESS FIRE and you get the special display of red and amber lines with the message:

sure?

To erase, you PRESS FIRE; to change your mind, move the joystick.

Chapter 5

ALTERING THE DRAWING

You will probably not be content with your first attempt at a drawing. You will need to alter it or rub it out.

The first part of this chapter explains the ways you can modify a drawing without having to rub out. We give the easier commands first, rather than in the order in which they appear on the menu.

The second part of the chapter deals with a number of different ways of rubbing out all or part of a drawing.

Commands dealt with in this chapter

PERSPECTIVE (Main)	TOTAL ERASURE (Main)
MOVE (Main)	ERASE SUBPART (Main)
MOVE (Secondary)	ERASE LINE (Main)
ZOOM (Main)	REMOVE LINES (Main)
ZOOM (Secondary)	ERASING A FILE
STRETCH (Main)	
ROTATION (Main)	
ROTATION (Secondary)	
RESET HORIZONTAL (Main)	
RESET HORIZONTAL (Secondary)	
JOIN POINTS (Secondary)	
MOVE POINT (Secondary)	
COPY (Main)	
TEMPORARY ORIGIN (Main)	
SCALE (Main)	

The same general rule applies to all these commands: those in the main menu work on the whole screen – while the secondary commands work only on the current item.

None of them will work on an empty screen.

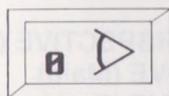
So you need to have at least one drawing on the screen. We assume that you can draw pyramids or cylinders – then we sketch the result for each of these commands.

Viewing Angle

We suggested you make use of this command in Chapter 3. Here we just recap the details and sketch for you what you might see.

● PERSPECTIVE (Main menu)

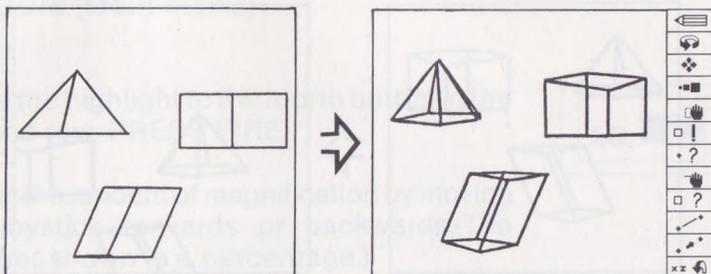
Start with one or two cylinders and a pyramid, then move to the main menu.



Move to the second row, fifth button, which has a 0 in the corner. PRESS FIRE.

The number changes to white on a black background. Alter it with the joystick. PRESS FIRE.

You arrive at the blackboard – to find that your drawings, untouched by you, have magically altered:

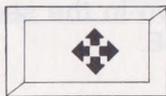


To see the full effect, use the LOCAL MOVE in the secondary menu (see below). As you move around the screen the drawing will visibly alter its proportions - as if you were looking down into a teacup and then looking up at the saucer.

Modifying a Drawing

● MOVE (Main menu)

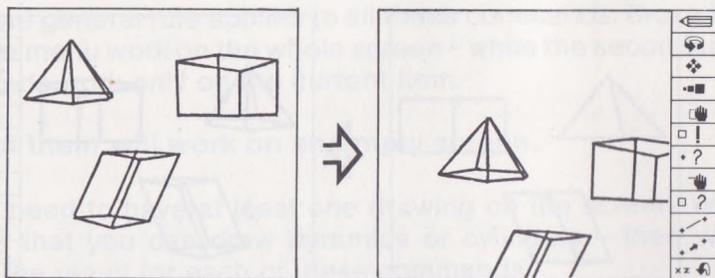
Start from the blackboard.
 Draw one or two cylinders and a pyramid.
 Go back to the main menu, move the highlight to the middle button in the second row and PRESS FIRE.



Arrive at the blackboard with the border amber. (The cursor is on the last point-marked.)

Move the cursor. The entire screen display will follow it.

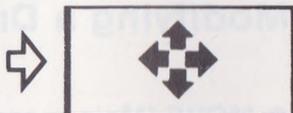
PRESS FIRE to fix it in the new position.



That was the way to move everything on the screen. More likely, though, you will only want to move one part of a drawing.

The local move (on the secondary menu) affects the current subpart only.

● MOVE (Secondary menu)



Start from the blackboard.

Move the white arrow to the third button down in the secondary menu and PRESS FIRE.

The cursor appears. Move the cursor - the drawing you made will follow it.

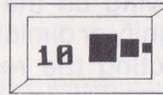
PRESS FIRE to fix it in the new position.

Zooming

It is very easy to change the size of a drawing on a computer drawing board.

● ZOOM (Main menu)

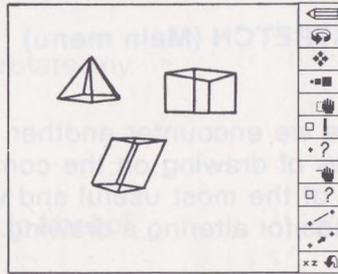
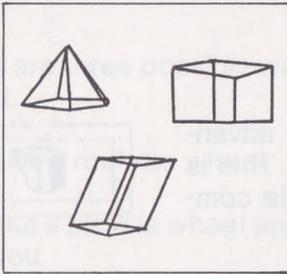
Move the highlight to the fourth button in the second row. PRESS FIRE.



Adjust the amount of magnification by moving the joystick forwards or backwards. (The number shown is a percentage.)

PRESS FIRE.

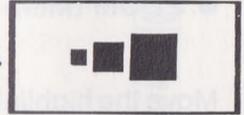
Push the joystick forward and the entire screen display will magnify; pull the joystick back and it will diminish. As usual, you PRESS FIRE to fix it.



CAUTION: IF YOU SHRINK YOUR DISPLAY DOWN TOO FAR, THE PROGRAM WON'T ALLOW IT. If you make the display less than about half a centimetre wide, you will lose it. You may even have to switch off and start again - losing all the work you have just done. You can also get into trouble if you make it very large.

● ZOOM (Secondary menu)

Drawing on the computer, you can easily magnify or diminish part of a drawing, without affecting the rest. This is very difficult to accomplish in normal drawing.



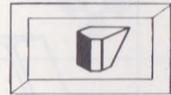
Use the zoom button in the secondary menu to affect the last item only.

Move the arrow and PRESS FIRE, then use the joystick just as before.

The cautions on the previous page still apply.

● STRETCH (Main menu)

Here we encounter another of the advantages of drawing on the computer. This is one of the most useful and versatile commands for altering a drawing.



Moving a point on any part of any drawing on the screen causes it to stretch into a new shape.

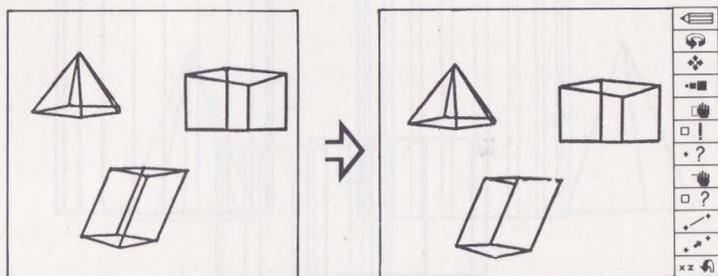
Highlight the fifth button, third row and PRESS FIRE.

Arrive at the blackboard. The cursor is limited to moving from one to another of the points on your drawings - but is not limited to any one drawing.

Move to any point you want to change and PRESS FIRE.

Move the cursor again and that point will follow it, stretching the figure behind it. PRESS FIRE to fix the new shape.

You will see something like this:



Twisting and Turning

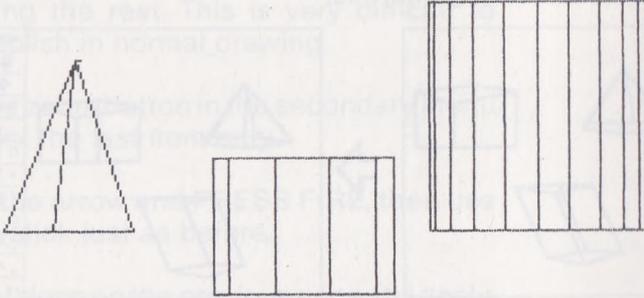
There are three possible ways to rotate any object:

1. like a roulette wheel
2. like a bicycle wheel unrolling in front of you
3. like a catherine wheel

3D Drawing Board lets you use the first two with no difficulty, but the third will require a little more explanation.

● ROTATION (Main menu)

Start with two cylinders and a pyramid, then



move to the main menu. Move the highlight to the first button in the second row. PRESS FIRE.



The number on this button fixes how much you turn with a movement of the joystick. It is given in degrees - 90 gives a full quarter turn.

Alter it a few degrees with the joystick - to 15, or 20. Then PRESS FIRE.

You arrive at the blackboard as you expect, but with a difference. The message panel usually shows the co-ordinates of the cursor - but now it does not.

Instead, you see:

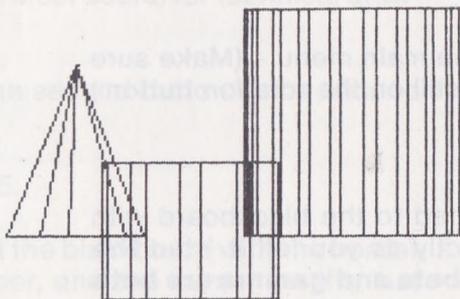
beta: 00000 gamma: 00000

'beta' corresponds to moving the joystick backwards or forwards; x axis rotation.

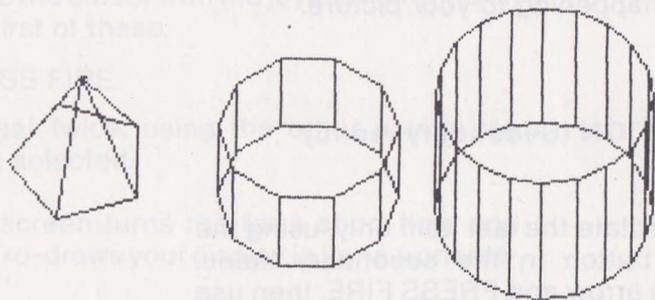
'gamma' corresponds to moving the joystick from side to side; y axis rotation.

Now experiment with these two movements.

Roulette wheel – y axis rotation



Bicycle wheel – x axis rotation



In both cases, PRESS FIRE to fix as usual.

Catherine wheel – z axis rotation

This time things are a little more difficult.

Move the joystick until you get

beta: 00000 gamma: 00090

PRESS FIRE.

You return to the main menu. (Make sure the highlight is still on the rotation button.)

PRESS FIRE.

You have returned to the blackboard with the display exactly as you left it - but **the values of both beta and gamma are both now 00000**. This means, that from the point of view of the screen, you have reset the principal axes.

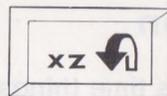
Now use the joystick in the side to side beta movements and you will see the third type of rotation happening to your picture.

● ROTATION (Secondary menu)

You can rotate the last item only, using the rotation button in the secondary menu. Move the arrow and PRESS FIRE, then use the joystick just as before.

● RESET HORIZONTAL (Main menu)

In many ways this is the most powerful command of all.



You choose any three points. The program takes the plane that they define as the new horizontal plane.

It is perhaps most useful for technical drawings.

Highlight the second button in the second row.

PRESS FIRE.

You arrive at the blackboard with the border already amber, and the cursor on the last point of the last drawing.

Select any three points in your mind's eye – they can be on three different drawings if you wish.

Move the cursor with the joystick until it is on the first of these.

PRESS FIRE.

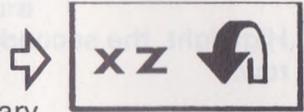
Repeat twice, using the other points you have selected.

The screen turns red for a short time and then re-draws your display in its new orientation.

This result is automatic.

You can select any plane - any kind of slant will be accepted. But be wary - you may find your new horizontal makes your drawings look very strange.

● RESET HORIZONTAL (Secondary menu)



Move to the lowest button in the secondary menu. PRESS FIRE.

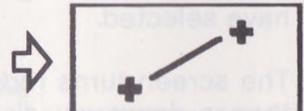
Mark the three points in turn just as before.

PRESS FIRE.

The result is automatic.

Notice that with this secondary command you no longer have access to any but the last drawing.

● JOIN POINTS (Secondary menu)



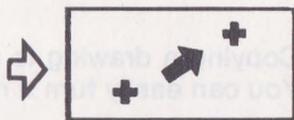
This command draws a line between any two points in an existing drawing.

Move the arrow to the tenth button in the secondary menu. PRESS FIRE

Move the cursor to the first point. PRESS FIRE.

Move the cursor to the second point. PRESS FIRE.

● MOVE POINT (Secondary menu)



This command is used to join one subpart to another on the screen. It does not make them into one subpart, but simply moves one of them to a new position. You can still separate them again.

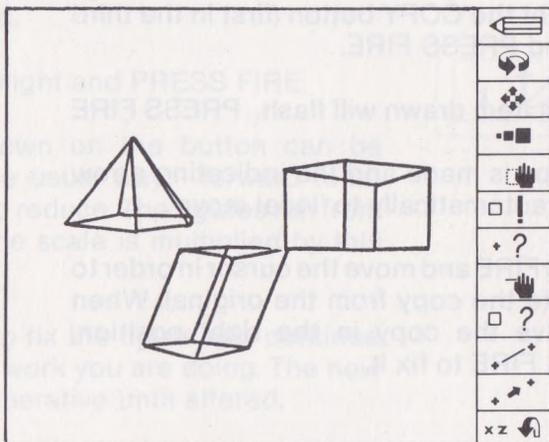
Move the arrow to the eleventh button and PRESS FIRE.

Move the cursor to first the first point.
PRESS FIRE

Move the cursor to the second point (on another subpart).

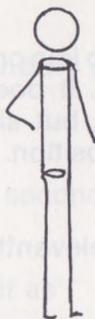
PRESS FIRE.

You can mark two points on the same subpart. Then the subpart simply moves across the screen.

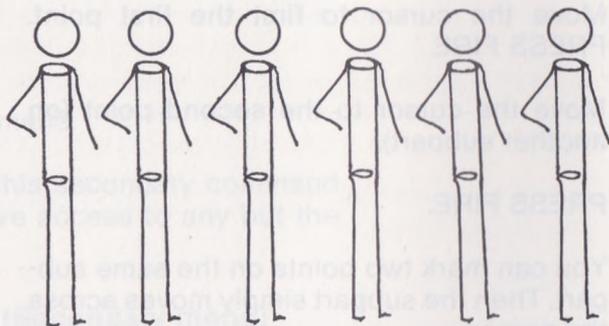


● COPY (Main menu)

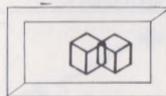
Copying a drawing is a simple matter too.
You can easily turn a man



into a crowd



Highlight the COPY button (first in the third row) and PRESS FIRE.



The last item drawn will flash. PRESS FIRE

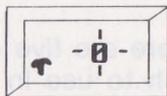
The copy is made and the indicating arrow moves automatically to 'local move'.

PRESS FIRE and move the cursor in order to separate the copy from the original. When you have the copy in the right position, PRESS FIRE to fix it.

Altering the Screen Co-ordinates

● TEMPORARY ORIGIN

Instead of having the origin at the centre of the screen, you can reposition it every time you start to draw another object.



Move the highlight to the fifth button, first row and PRESS FIRE.

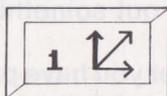
A letter 'r' (relative origin) appears on the button.

This control is a toggle which remains operative until you come back and change it (in exactly the same way as you set it.)

● SCALE

This command changes the scale used on the blackboard.

Move the highlight and PRESS FIRE.



The scale shown on the button can be changed in the usual way - forward to increase, back to reduce. The figures run from 1 to 50 and the scale is multiplied by this amount.

PRESS FIRE to fix the figure and continue with whatever work you are doing. The new scale will be operative until altered.

Erasing From The Drawing Board

Rubbing out is as important a part of the work as drawing.

There are five different methods you may wish to use in erasing material you have drawn.

● TOTAL ERASURE

The simplest method is to erase the whole screen. Everything you have drawn on the blackboard disappears.

In the main menu, highlight the red button in the bottom row. (Buttons that can erase anything always have red on them.)



PRESS FIRE.

The program makes sure that you cannot rub out something you really want to keep.

After you have pressed fire, the border gives a special display of flashing red and amber lines and asks you:

sure?

If you are sure, you **PRESS FIRE** again and the whole drawing disappears.

If you have changed your mind, you move the joystick to abort the process.

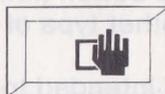
● ERASE SUBPART

The other red hand in the main menu (third row, second along) is also an 'erase'.

You can use this to erase the drawing you have just made.

(In fact, this control erases a 'subpart' - closed set of diagrams. (Subparts are discussed in detail in Chapter 5.) Left to itself, it erases the current subpart. If you have not changed the current subpart, it erases the latest drawing you have made.)

Highlight the erase subpart button, PRESS FIRE.



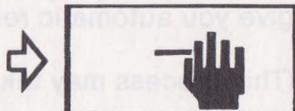
You get the blackboard, with an amber border. The subpart which is going to be erased flashes on and off.

You PRESS FIRE and get the special display of red and amber lines with the message:

sure?

To erase, you PRESS FIRE; to change your mind, move the joystick.

● ERASE LINE



This is in the **secondary menu** - the lower of the two red hands.

Move the arrow, and PRESS FIRE. The border turns amber.

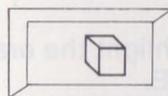
You get the limited-movement cursor, free to access any marked point on the screen.

Move it to one end of the line you wish to rub out. PRESS FIRE. The screen remains amber.

Move it to the other end of the line, PRESS FIRE, and the line disappears.

● REMOVE LINES

This button (fifth in the fifth row) gives you another type of erasure.



It is intended to remove the hidden lines in any drawing - to give it a solid three dimensional appearance. This can be done automatically, if you have a simple convex shape; or, if your drawing is complex, you have the option of directing the removal of these lines yourself.

Highlight the button and PRESS FIRE. You see in the message panel below the buttons:

auto manual

The 'auto' is highlighted, so PRESS FIRE will give you automatic removal immediately.

(This process may take a little time.)

If you move the joystick to the right and then PRESS FIRE, you get the **manual** removal of hidden lines.

This is intended for the removal of lines on figures for which the automatic method is not suitable, but you can use it for erasure in general.

Move to the blackboard; amber border.

Move the cursor to one end of the line you want to change and PRESS FIRE. Then move it to the other end of the line and PRESS FIRE.

The cursor jumps back to the first point.

You have now defined the line, but it has not yet been changed.

The screen message changes to:

draw

If you want to draw a line between these two points you can now do so by moving the cursor towards the second point.

When you have finished with that pair of points, PRESS FIRE twice at the same point. You return to the usual display; amber border, co-ordinates in the screen message.

Now start again. Define another pair of points, each end of the line you want to erase, this time and PRESS FIRE.

Screen message: draw

PRESS FIRE again.

Now you get the message 'remove'. Move the joystick carefully (you cannot backtrack) and erasure will follow it along a line towards the next point.

YOU NEED NOT ERASE THE WHOLE LINE when using this method.

PRESS FIRE when you have reached the point where you want erasure to stop. Then PRESS FIRE again to fix the diagram.

CAUTION IF YOU USE THE LINE REMOVAL CONTROL - AUTO OR MANUAL - YOU MUST IMMEDIATELY SAVE THE DRAWING **AS A PICTURE**. Otherwise, your drawing will simply revert to its original form as soon as you make any changes.

(To see exactly what is involved in saving a picture, read Chapter 6.)

● **ERASING A FILE**

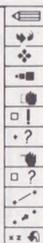
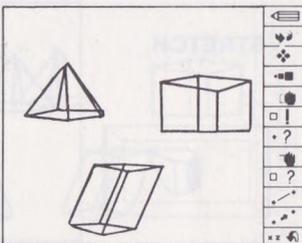
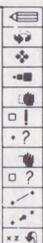
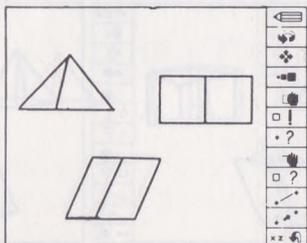
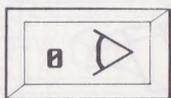
3D Drawing Board has no special method for erasing datafiles or picture files. Simply use the normal Commodore commands to delete files from your discs, i.e.

1. Turn off to quit 3D Drawing Board
2. Check the directory of the disc by typing in:
LOAD"\$",8
followed by
LIST
3. Type OPEN 15,8
4. Type PRINT#15,"S:FILENAME" to delete a file.

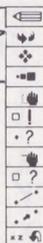
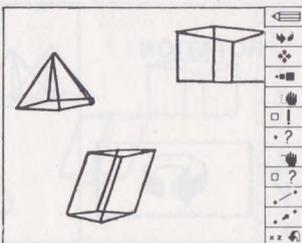
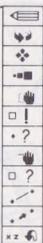
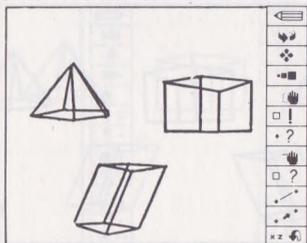
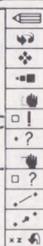
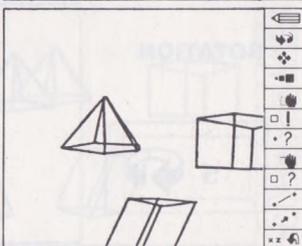
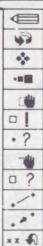
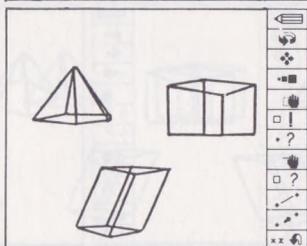
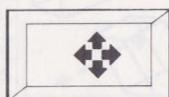
Alternatively, you can overwrite an existing file. (See Chapter 6.)

THE COMMANDS DEALT WITH IN THIS CHAPTER – HOW THEY WORK

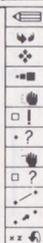
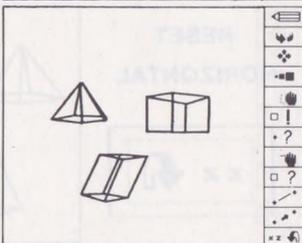
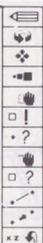
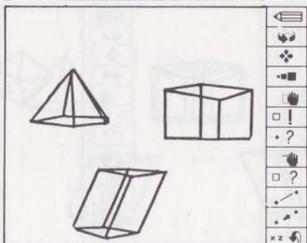
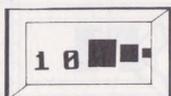
PERSPECTIVE

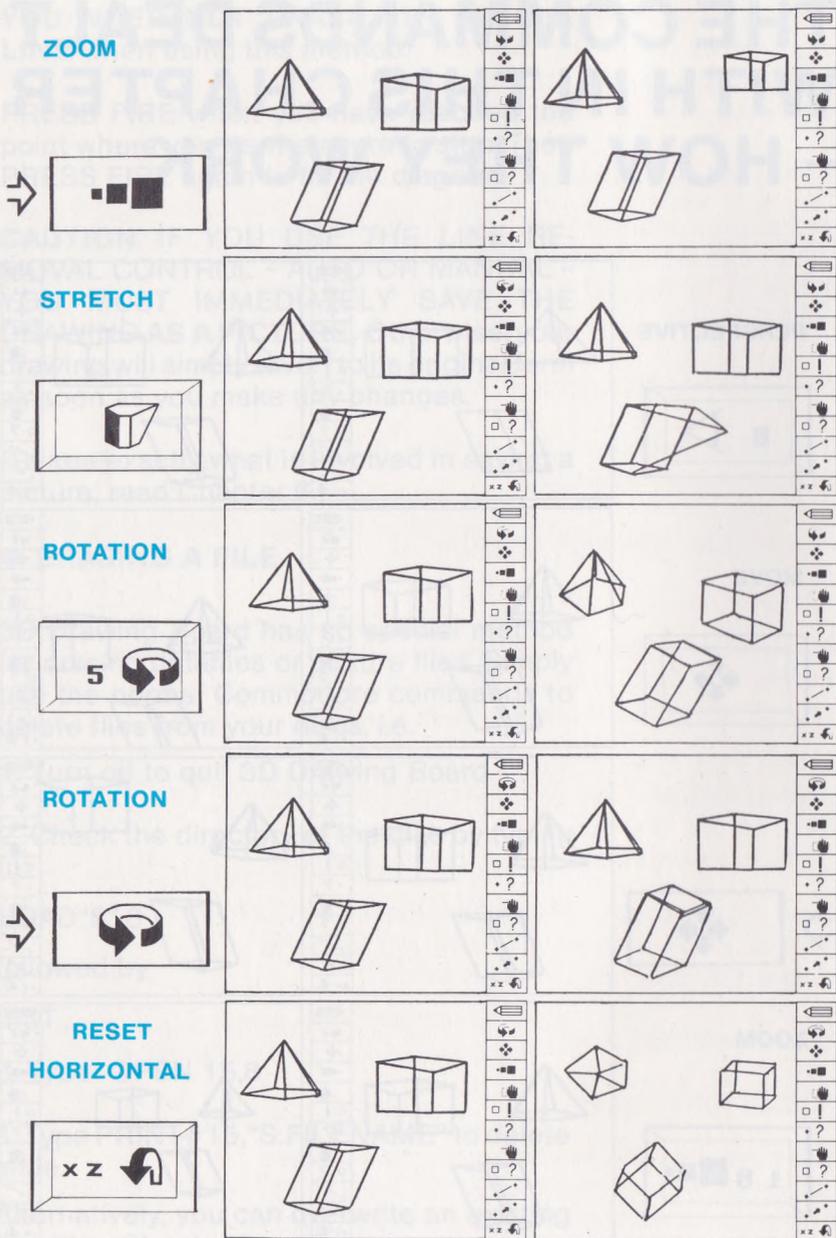


MOVE

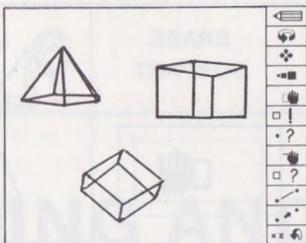
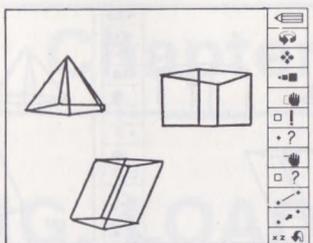
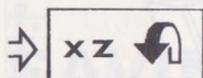


ZOOM

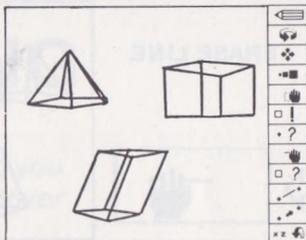
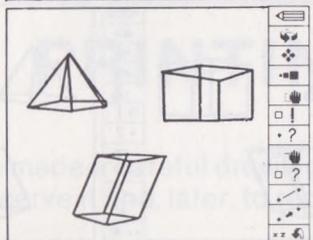
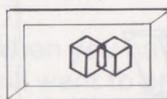




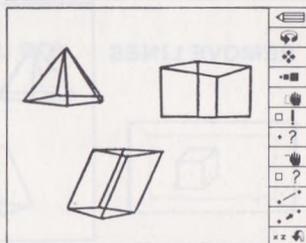
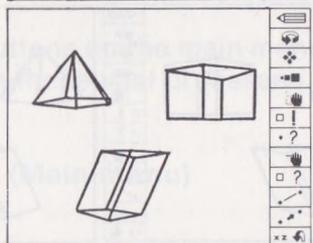
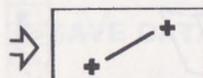
**RESET
HORIZONTAL**



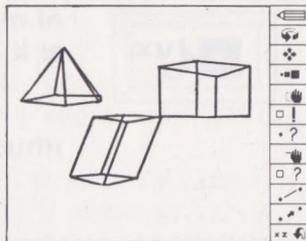
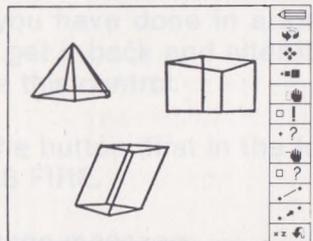
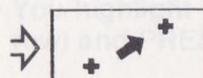
COPY



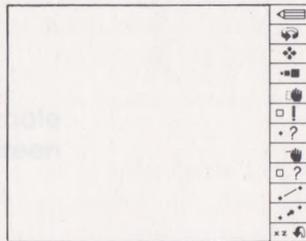
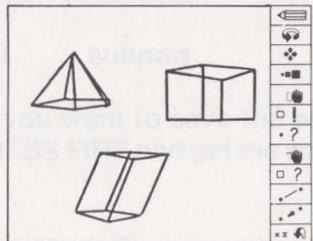
JOIN POINTS



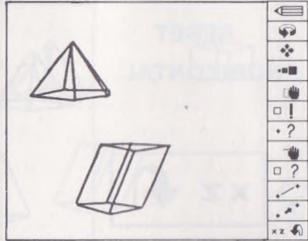
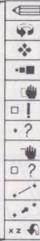
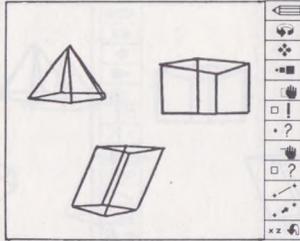
MOVE POINT



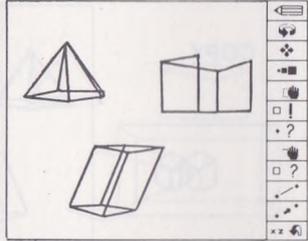
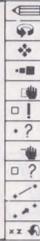
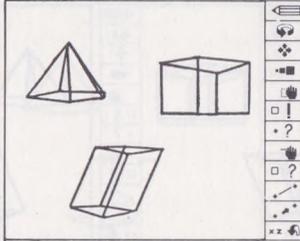
**TOTAL
ERASURE**



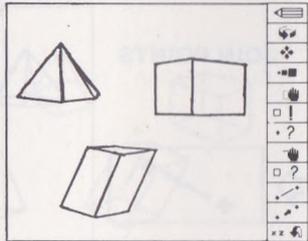
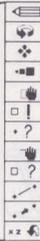
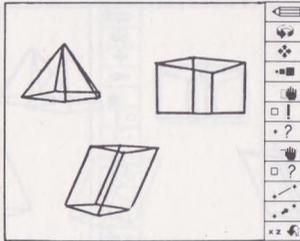
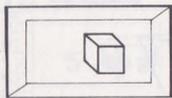
**ERASE
SUBPART**



ERASE LINE



REMOVE LINES



Chapter 6

SAVING, LOADING AND PRINTING

When you have made a careful drawing you will want to preserve it and, later, to recover it from the files.

Seven of the buttons on the main menu are concerned with these vital processes.

● SAVE DATA (Main menu)

To save work you have done in a form in which you can get it back and alter it it is essential to use this control.



You highlight the button (first in the fourth row) and PRESS FIRE.

You get the screen message:

all subpart

Let us assume you want to save the whole drawing. You PRESS FIRE and get the screen message:

save: ●

(If you have made an error and chosen the wrong button, now is the time to change your mind. Simply press RETURN, without typing any letters on the keyboard.)

Type in the file name you have chosen. The drawing board will accept names of up to 15 letters and will happily accept spaces.

Press RETURN.

POSSIBLE MISTAKES

Do not PRESS FIRE unless you definitely want save the drawing. You cannot abort the process once it has started.

DO NOT MAKE A TYPING ERROR.

You cannot delete while you are typing in a file name, so once you have typed in a name you are stuck with it.

Do not type the name of an existing file either, unless you want to overwrite it.

You use the keyboard so little with 3D Drawing Board that it is quite possible to forget to press RETURN. This is one point where pressing the fire button will not do anything.

If you only want to save one sub-part, move the joystick to the right when the first message appears.

If you then PRESS FIRE, the blackboard appears with the current sub-part flashing.

You can change to another subpart in order to save that by moving the joystick until the correct subpart is flashing. Then PRESS FIRE. You get the screen message (showing the different file symbol):

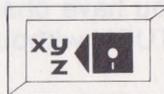
save: o

Type in a file name in the usual way and press RETURN - or just press RETURN alone to quit.

● LOAD DATA (Main menu)

With this button, you recall a data file to alter it or print it out. Note that loading a full-screen data file wipes out any work you have on the blackboard.

You highlight the button in the usual way and PRESS FIRE.



As with the 'save' button above, you get the message:

all subpart

PRESS FIRE, or move to subpart and then PRESS FIRE. Then type in the name of the file and press RETURN.

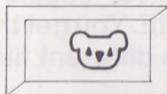
You need not type in the name of the file this time. If you just press RETURN, you will see the name of the first appropriate file on the screen, with the message:

F7 = load F1 = quit

Press RETURN again and you will see the next suitable file, and so on.

● SAVE KOALA (Main menu)

Our attractive blinking koala is only of use to those who have a Koala tablet. With this button you save a Koala file.

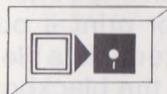


Highlight, press and type in a file name in the usual way.

● SAVE PICTURE (Main menu)

You use this command to save a picture as an unchangeable unit.

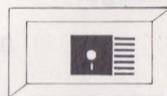
Move the highlight to the button, PRESS FIRE, type in a file name and press RETURN.



If you have changed your mind, just press RETURN without typing anything else.

● LOAD PICTURE (Main menu)

You use this command to load a picture file. Move the highlight, PRESS FIRE, type in the file name and press RETURN.



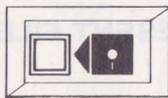
You need not type in the name of the file. If you just press RETURN, you will see the name of the first appropriate file on the screen, with the message:

F7 = load F1 = quit

Press RETURN again and you will see the next suitable file, and so on.

● DIRECTORY (Main menu)

To find out what you have in the files, move the highlight to this button and PRESS FIRE. The name of the first file will appear. To run through the directory, keep s F1.



Four kinds of files are used by the drawing board; each kind is indicated by its own symbol in the directory. They are:

- Data file
- Subpart file
- < Picture file
- ▲ Koala file

Be careful how you recall files. Some kinds of files will interfere with others if you try to combine them.

Remember that a picture file can **NEVER** be altered **IN ANY WAY**.

We have mentioned that files can interfere with one another when you load them. Here is a table showing you exactly what will happen.

HOW FILES INTERFERE WITH ONE ANOTHER

PRESENT FILE - FIRST

<p>Second wipes out first</p>	<p>First is still there! Can not combine or alter, but can be saved as picture</p>	<p>First is still there. If you do succeed in moving, you lose the picture file</p>
<p>Second wipes out first</p>	<p>First is still there. You can recall the same subpart file again. They will all be on the screen and accessible</p>	<p>First is still there. You can recall as many as you like but only the subparts will be active. Can combine with subparts.</p>
<p>Second wipes out first.</p>	<p>Second wipes out first.</p>	<p>Second wipes out first.</p>

Data File
 Picture File
 Subpart Datafile

Printing out Your Picture

Return from the blackboard to the main menu.

Move to the second button in the fifth row and PRESS FIRE.

The message at the bottom of the screen says:

printer plotter

So you now have two alternatives, according to what device you have.

To send it to a printer, PRESS FIRE.
You then get a message:

mps-801 mps-802

Move the joystick to the right or left. PRESS FIRE when the right one is highlighted.

The message changes to:

normal enlarge

Move the joystick if you want to enlarge, otherwise just PRESS FIRE.

All that was assuming you had a printer. If you have a plotter, when your original choice of printer or plotter is shown, you move the joystick to highlight plotter and PRESS FIRE. You get the message:

normal enlarge

and continue as for the printer.

MAIN MENU

RECTANGLE	PYRAMID	CYLINDER, CUBE, ETC	LINE	TEMPORARY ORIGIN
ROTATION	RE-SET HORIZONTAL	MOVE	ZOOM	PERSPECTIVE
COPY	ERASE SUBPART	COMBINE	SCALE	STRETCH
SAVE DATA	LOAD DATA	SAVE KOALA	SAVE PICTURE	LOAD PICTURE
DIRECTORY	PRINTING/ PLOTING	LIST CO ORDINATES	TOTAL ERASURE	REMOVE LINES

GLOBAL COMMANDS

SECONDARY MENU

DRAW
 ROTATE
 MOVE
 ZOOM
 TEMPORARY HIDE
 FIX SUBPART
 CHOOSE POINT
 ERASE LINE
 CHOOSE CURRENT SUBPART
 JOIN POINTS
 MOVE POINT
 RE-SET HORIZONTAL

LOCAL COMMANDS

3D Graphics Drawing Board

The 3D Graphics Board package for the Commodore 64 and 128 enables the user to create, alter and combine 3D images on the screen. This easy-to-use program is a breakthrough in graphics software. The 'screen-keyboard' menu allows simple use of the large range of facilities. Drawn using a joystick, the 3D perspective images can be quickly and easily manipulated using the zoom, rotate, scale, stretch and move options. The hidden line removal facility adds further realism to the drawings produced. The finished designs can be saved permanently on disc or output to printer or plotter.

The program allows you to produce anything from simple decorative pictures, to near professional Computer Aided Design and architectural drawings.

Specifications:

- True 3D drawing, with rotation about the x,y or z axis
- Movement of drawings in any direction
- Zoom
- Choice of whether in perspective or not
- Temporary origin and scale
- Facilities for storing data or pictures
- Hidden line removal in complex drawings while working on other parts

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