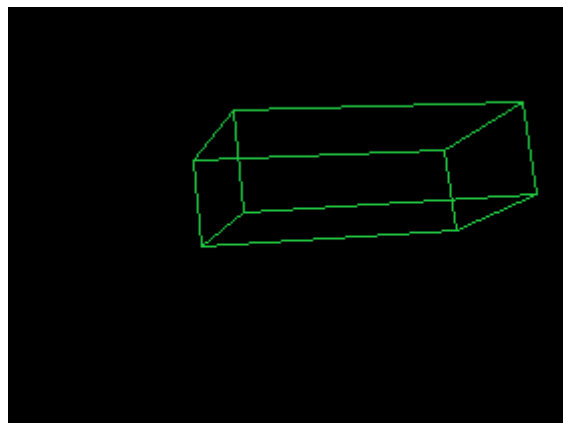


OVERVIEW:

Your image is made up of up to 300 points in a three dimensional world, with x, y and z axes positions running from -999 to +999. The image is made up of up to ten parts or structures which can be manipulated independently. Points may be joined by lines which forms the image.

- i Position up to 300 points in a three dimensional world (x,y,z axes)
[use EDIT POINTS page 11]
- ii Group the image in up to ten parts (one part is fine!) and connect points.
[use EDIT STRUCTURES page 12]
- iii Manipulate the image or parts with SHOW IMAGE page 7
- iv Save the point positions with SAVE DATA page 6
- v Save the image in a none displayable unique format with SAVE IMAGE
- vi Print the image to a dot matrix printer using an add on print routine.

**See first illustrated FIRST PROJECT on page 22
"How to build up an object" on page 18**



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Introduction

3D-World is a program that gives you the ability to create 3-dimensional pictures on your TI-99/4A. The images are in a wire frame form composed of straight lines connecting points in three dimensions.

The program allows you to:

Create a 3-dimensional object on the screen and show it.

Change the object by:

- rotation in three axes,
- shifting it in any direction,
- magnifying or making it smaller.

Make parts of the picture invisible

Move parts of the picture.

Change the color.

Move several parts of the picture.

It is also possible to save the picture to disk and make a hard-copy on your printer.

3D-World is written in TMS9900 Assembly Language which takes 9.5K* of program space. Nearly the entire 32K RAM is used by data arrays. Also about 14K of VDP RAM is used to create the picture on your screen and for DSR routines.

Although written in 9900 machine code, a large number of points will result in calculation delays. The program is made to be used without any programming knowledge.

(Amerisoft documentation claimed 8.5k here)

[**Beginners**- start at page 22 or 20 or 18...]

=====

3. Copyright - Copying of the program and manual is not permitted without the written permission of the author.

Copyright April 1983.

Program Author and Copyright: Wulf Becherer, Freiburg.

Additional printer coding by Eugen Baumgartner (name given in file DEFAULT)

=====

Hardware required- see page 16

How to LOAD AND RUN the program- see page 16

=====

The main title screen menu

From the menu, you can select the following 9 program parts:

1. LOAD DATA
2. SAVE DATA
3. SAVE IMAGE
4. SHOW IMAGE
5. EDIT POINTS
6. CLEAR POINTS
7. EDIT STRUCTURES
8. CLEAR STRUCTURES
9. EDIT COLORS

Select a part of the program by pushing the corresponding number key.

These program parts are described in the following chapters.

The program only recognizes capital letters for all inputs: keep the ALPHA LOCK key down. Keys have auto-repeat.

If you press a key which is not shown on the screen, a "BAD RESPONSE TONE" will sound to show you that you have pressed a wrong key.

If you quit before saving data your data will be lost.

1. Load Data

Load the data of an image from cassette or diskette. With (Load Data) you can also load the two demonstration files: DEMO1 and DEMO2.

Note: If you use LOAD DATA after Show Image the question "ARE YOU SURE (Y/N)?" will appear on the screen if appropriate, to remind you that you may lose your work. You may respond N or FCTN 9 to return to the old picture.

Press Y (Yes), and you can load a new picture,. The old one will be lost if not previously stored on a mass storage device.

You will be prompted for the device to load data from (cassette or diskette). Press D for disk, or C for cassette. Press FCTN 9 (BACK) to return to the main title-screen.

Load Data from **Cassette:**

The question "ARE YOU SURE ?" will appear. Press N or FCTN 9 (BACK) to return, otherwise the computer' asks you to start the cassette operations as described in the User's Reference Guide.

After loading, the main title screen joint the points with lines appears again. You can then show the image with option SHOW IMAGE. The error statements are the same as those in the Users Reference Guide when using the OLD statement.

Load data from **Diskette:**

Type in the file name (up to 10 characters). Pressing FCTN 9 (BACK) at any time will make the program return to the main title screen. Pressing FCTN 3 (ERASE) will clear your input.

The file name can contain any ASCII character from CHR\$ 33-95. but without "." (period). The device is always DSK1.

Possible errors when loading:

BAD DEVICE NAME.	WRITE PROTECTION
BAD OPEN ATTRIBUTE	ILLEGAL OPERATION
OUT OF SPACE	END OF FILE
DEVICE ERROR	FILE ERROR

If an error appears with diskette handling, the old data is not lost. Try again. With an error occurring while reading a cassette, old and new data are mixed up where there is new data in memory until the error had appeared. The rest of memory space will contain the old data.

2. Save Data

In general Save Data works like (Load Data), only here data will be saved in memory image format (3072 bytes).

Data in memory will not be lost or changed.

3. Save Image

Save Image allows you to save a picture to a mass storage device for later use.

For a printed copy of your screen image, refer to page

If you try to use Save Image without having a picture in the computer's memory, "I CAN'T DO THAT" will appear on your screen. In this case press ENTER or FCTN 9 (BACK).

Only the image will be saved. Colors are not saved.

A picture will be saved in 64 data records in an "INTERNAL, SEQUENTIAL, FIXED 97" file. To read this data with a Basic program, you have to open a file in the same way in INPUT mode and then read the data, which is organized in 64 strings (A\$). You will need to edit the string with the help of string commands to generate the necessary printer codes.

Some more information about the picture data:

A picture consists of 192 rows and 256 columns (Bitmap Mode), that means $192 \times 256 = 49,152$ points.

One record = 3 pixel rows of 256 pixel columns = 3×256 bits = 768 bits = 96 bytes.

A screen of 192 pixel rows is saved three rows at a time = 64 records.

Of the records of length 96 bytes, each byte consists of the first 8 pixels (row 1, column 1 (top left); Row 1, column 2; Row 1, column 3..... row 1, column 8). The 2nd byte forms the next 8 pixels (row 1, columns 9 to 16), the last byte finally form the 8 pixels of row 3, columns 249 to 256.

The first byte of the second data set is then formed from pixel rows 4, pixel columns 1 to 8. This part of the program does not change data in memory.

4. Show Image

*If no image has been defined the screen will be black- use BACK to return to menu.

This part of the program allows you to inspect the object defined by its specified points, and to modify it, modifying only the viewed image not the defined structure.. You also can view an axis in your picture.

The color of the background, the axis, and the object can be changed with (Edit Colors).

At any time you can return to the main title screen by pressing FCTN 9 (BACK).

SHOW IMAGE will display the object (either the base object if you are using this part of the program for the first time or image object that you have already created with this part of the program.

You can return to the main selection list at any time by pushing BACK.

In SHOW IMAGE there are three different operating modes:

modify (page 8) , on/off1 (page 9) and on/off2 (page 10) modes.

A note about axes. In three dimensional space there is no agreement about which is the x, y and z axis- and when you can rotate an image about three axes it becomes rather hard to keep track of.

When you design your image, the initial blank screen in front of you has the X axis from left to right, increasing in value to the right; the Y axis from bottom to top, increasing in value as it goes up, and the Z axis is the one going from you through the screen into the distance with the value increasing as it becomes more distant.

Show Image - MODIFY MODE

Allowed keys 1-0, SHIFT 1-0, QWERTASDF, CLEAR, BACK:

BACK - Return to the main selection list

CLEAR- Back to the initial picture produced by the point and structure data.

F: Toggle the ON/OFF1 mode of operation (see p9)

D: Toggle the ON/OFF2 mode of operation (see p10)

S: Fixes the displayed image so that you can use "Save Image".

Any further modification of the picture eg rotation, clears this command.

A: Turn the axis display on or off. One axis may be invisible because you are looking at it straight on.

Q: Shows at top left the speed factor of rotation to be performed:

1= 1 degree or 1 point

2= 10 degrees or 10 points

3= 45 degrees or 50 points

4= 90 degrees or 100 points.

W: Change to step 1. E: Change to step 2. R: Change to step 3. T: Change to step 4.

1: Turn around X-axis. 2: Turn around Y=axis. 3: Turn around Z-axis.

SHIFT 1 Turn back around X-axis.

SHIFT 2 Turn back around Y-axis.

SHIFT 3 Turn back around Z-axis.

4 Move on X-axis towards you (to the the positive)

5 Move to the right.

6 Move up.

SHIFT 4 Move away from you on X-axis.

SHIFT 5 Move to the left.

SHIFT 6 Move down.

7 Extension on X-axis (by 10%)

8: Extension on Y-axis.(by 10%)

9 Extension on Z-axis.(by 10%)

SHIFT 7 Reduction on X-axis.(by 10%) (division of coordinate values by 1.1)

SHIFT 8 Reduction on Y-axis.(by 10%) (division of coordinate values by 1.1)

SHIFT 9 Reduction on Z-axis.(by 10%) (division of coordinate values by 1.1)

0 Extension in all directions by 10%.

SHIFT 0 Reduction from all directions.

When modifying the object, the co-ordinates of the points are always between -2000 and + 2000. If a change causes a point to be outside this range the change is not performed. The computer also outputs the Bad Response Tone to indicate errors.

Show Image - ON/OFF MODE 1

In this mode you can define up to 10 parts of the picture and turn them on and off separately.

On the right side of the screen you can see which of the 10 parts are on and which are off.

Part 1 is at the TOP.

A filled block is an ON part, an empty block is a switched off part.

The on/off definition of the parts is stored even after leaving this mode of operation or the program part "SHOW IMAGE".

Allowed keys (combinations) 1,2,3,4,5,6,7,8,9,0,A,S,D,F, CLEAR, BACK

FCTN CLEAR, FCTN BACK, A,S: The same as CHANGE MODE- (see page)

1,2,3,4,5,6,7,8,9,0 Switching on or off the individual structures.

F Switch to the CHANGE or MODIFY mode (page 8)

D Change to the on/off2 mode of operation

====

Show Image - ON/OFF MODE 2:

Similar to ON/OFF MODE 1, here the parts list appears at the left side of the screen.

You can turn the part blocks 1-0 on or off by pushing the corresponding number keys.

During this process, nothing is changed from the current picture.

By using this option you can then move a part of the picture or you can extend several parts by "freezing" parts of the picture.

Switching on or off: If a part is switched off, it is not moved in change mode. For example, you can change a part individually by turning off all other parts.

The on/off definition in this mode of operation is maintained even after leaving program SHOW IMAGE.

Permitted keys (combinations) 1,2,3,4,5,6,7,8,9,0,A,S,D,F,clear,back

CLEAR,BACK,A,S: the meaning of these keys (combinations) is the one they have in the change mode (see page)

1,2,3,4,5,6,7,8,9,0 Switching on or off the structure in question.

D: Switching to the change or modify mode (see p8)

F: Activation of the on/off1 mode of operation (see p9)

5. Edit Points

This program allows you to create up to 300 different points on your screen (#0-#299).

The entry of each point is:

ENTER SPACE NNN SPACE NNN SPACE NNN ENTER where NNN=co-ordinate.

Return to MENU with BACK

The "SURE" question may appear: Press Y and point #0 appears on the screen.

The input is two elements, the point number, and the point co-ordinates.

N for point number, whilst the co-ordinates are: X: ... Y: ... Z ...

Allowed keys: 1, 2, 3, 4, 5, 6, 7, 8, 9, 0. + /

S, D, SPACEBAR, ENTER, FCTN 9 (BACK), FCTN 3 (ERASE).

Attention: Illegal codes are not accepted and the computer will respond with the "BAD RESPONSE TONE". For example, you cannot enter a negative point number. You will also hear this tone if you try to move the cursor beyond its limits.

First you have to key in the number of the next point.

Key	Meaning in Edit Points
FCTN 9 (BACK)	Back to main title screen
FCTN 3 (ERASE)	Erase your input
SPACEBAR or +	Next number or next co-ordinate
/	Prior number or prior co-ordinate
0-9	Any number.
S	Cursor to the left.
D	Cursor to the right.

Attention: While keying in the co-ordinates **ENTER** has a special function: Scrolling the screen, point number plus 1, and back to the point input field.

Co-ordinates ranging from -999 to +999 are allowed.

6. Clear Points

Use this part of the program to reset all 300 points to zero at the same time.

To protect against accidental loss you will be asked to confirm with a "SURE?" query.

Answer Y to proceed.

7. Edit Structures (eg picture parts)

This part of the program allows you to connect points you have edited before in (Edit Points). It is common to omit entering a line or two.

You may first be asked to confirm by the query "SURE?" - press Y to confirm.

The computer will ask you for the structure number (0-9).

FCTN 9 (BACK) moves you back to the main title screen. Any digit key will choose one of the structures.

If you have selected one of the structures, a screen mask appears consisting of 10 rows by 6 columns equal to 60 fields. A single field still consists of 3 characters. The second and third characters must be a number or blank.

Each different field can be one of 3 types:

1. An empty field : Has no meaning and consists of three spaces.
2. A numeric field: It has a number between 0 and 299 (= number of points created before). The program will draw a line from one point to the next fixed point. This will continue until a new start point is defined with a Move field.
3. A move field : Means a new start point for drawing lines from one point to the other using numeric fields.

Allowed keys

1, 2, 3, 4, 5, 6, 7, 8, 9, 0.

S, D, M, FCTN 9 (BACK), FCTN 3 (ERASE), FCTN 2 (INSERT), FCTN 1 (DELETE).

Illegal operations are not accepted and answered with a "BAD RESPONSE TONE".

Key	Meaning in Edit Image Parts
-----	-----------------------------

FCTN 3 (ERASE)	Clears the field (set to 3 spaces) where the cursor is located..
----------------	--

FCTN 9 (BACK)	Back to the Image Part number query.
---------------	--------------------------------------

FCTN 1 (DELETE)	Deletes the field the cursor is in; all following fields change.
-----------------	--

FCTN 2 (INSERT)	Insert a new field; all following arrays change, field 60 is lost.
-----------------	--

S	Move one field to the left.
---	-----------------------------

D	Move one field to the right.
---	------------------------------

M	The MOVE command.
---	-------------------

0-9	Input of a number.
-----	--------------------

Attention: All numbers have to be keyed in with three digits! For example, for a three-digit number, one is considered to be 001.

8. Clear Structures -

Will clear all 10 image parts at once.

To clear one or several structures use the Edit Structures mode where DELETE has auto-repeat.

You will need to confirm the SURE? query with a Y to proceed.

=====

9. Edit Colors

This program parts allows you to change the colors of your image (SHOW IMAGE mode).

First the foreground, then the background, and lastly the axis.

Allowed keys 1, 2, 3, 4, 5, 6, 7, 8, 9, 0.

A, B, C, D, E, F, ENTER, FCTN 9 (BACK).

Meaning of the keys:

Key	Meaning in Edit Colors
FCTN 9 (BACK)	Back to the main title screen. No data will be lost.
ENTER	Terminates the input of every color number. Switches from foreground to background then axis colour then back to the selection list.
0-9, A-F	Input of the color number in hex. The color name is displayed on the screen bottom.

PRINTING AN IMAGE

Allows you to print a screen image to a dot matrix printer.

The disk file PRINTERNAM is written by the Extended Basic program DEFAULT and is initially PIO.CR - this should be amended if required using the program DEFAULT.

[Program DEFAULT has the program author name given of Eugen Baumgartner].

When you load the 3D World program you may also enter the PRINTER routine and the data for your specific printer.

The PRINTER DATA for your specific printer will be loaded if you wish as you load the program- If you load the program with the Extended Basic LOAD program, this will prompt you for your printer type.

Another way to load your printer data:

Using Editor Assembler module,. LOAD option 3, first type:

i DSK1.3D [ENTER]

ii Next type: DSK1.xxxxx, where xxxxx is the PRINTER DATA you have selected for your printer.

Example: For the Epson and Star printers you would type:

DSK1.STAR ENTER

iii then type in the program name: WORLD0 ENTER

To execute the print command from SHOW IMAGE mode, simply press the P key and your screen image will be transformed to paper. Note: You must have an image on the screen to use this command.

The printed picture in some cases will be somewhat distorted when compared to the screen display.

This can be changed by pressing SHIFT 9 several times before pressing the P key.

The image can be restored by pressing the SHIFT 9 key an equal number of times.

The number of times will depend on your printer model.

Table for the different printers:

Printer type	File name of the data	(SHIFT)(9)
EPSON MX	STAR	once
EPSON FX	STAR	three times (some disks use filename FX80 for FX series)
SEIKOSHA GP100	GP100	twice
SEIKOSHA GP550	GP550	three times

FOR EPSON FX: After printing an image, the printer remains switched in the ELITE mode. The left margin is at position 5 and the line spacing is 8/72 inch.

AMERISOFT DISK				original
Filename	Size	Type	P	german disk files
-----	-----	-----	-	
3D	150	DIS/FIX	80	WORLD0
3DWORLD	33	PROGRAM	Y	
3DWORLE	9	PROGRAM	Y	
DDD	14	PROGRAM		N/K
DEFAULT	5	PROGRAM		WDEFAULT
DEMO1	13	PROGRAM	Y	DEMO1
DEMO2	13	PROGRAM	Y	DEMO2
GP100	19	DIS/FIX	80	
GP550	18	DIS/FIX	80	
LOAD	4	PROGRAM		
PRINTERNAM	2	INT/FIX	44	N/K
STAR	18	DIS/FIX	80	WCOPYRX80

Changed Filenames from the German disks:

WORLD0 -> 3D

WDEFAULT -> DEFAULT

WCOPYRX80 -> STAR

New files on Amerisoft disk:

LOAD for XB, allows selection of printer data file, and loads the DF80 files eg 3D and FX80 and does the starting call link. **NOTE this takes several minutes.**

1. 3DWORLD/3DWORLE to load with EdAs option 5, run Program file- much faster load.

Purpose of file DDD not known

PRINTERNAM is a data file and starts with PIO.CR

DEFAULT is XB and read/writes PRINTERNAM.

The DF80 files with printer names are loaded at program start and tell the program how to send data to your printer.

A note about axes. In three dimensional space there is no agreement about which is the x, y and z axis- and when you can rotate an image about three axes it becomes rather hard to keep track of. When you design your image, the initial blank screen in front of you has the X axis from left to right, increasing in value to the right; the Y axis from bottom to top, increasing in value as it goes up, and the z axis is the one going from you through the screen into the distance with the value increasing as it becomes more distant.

Necessary hardware configurations

TI-99/4A + Extended Basic + 32 K Memory Expansion + Disk Memory System

or

TI-99/4A + Editor/Assembler + 32 K Memory Expansion + Disk Memory System

or

TI-99/4A + Mini Memory + 32K Memory Expansion + Disk Memory System

The GERMAN VERSION was available on cassette

=====

LOADING THE PROGRAM and running it.

See note re setting up a dot matrix printer on page 14

Insert the disk in drive 1.

1. Extended Basic

1. Place the program diskette in .drive one and select EXTENDED BASIC. The program will start using the auto-load feature or you may OLD DSK1.LOAD then RUN.

Using the Extended Basic LOAD program allows you to specify your printer model and will load the required printer data.

By default the printer output will go to PIO.CR but you can change this by running the Extended Basic program DEFAULT on the disk.

.

or

2a Type the following from command level:

```
> CALL INIT [ENTER]
>.CALL LOAD("DSK1.3D") ENTER
```

2b. then if you are using a printer:

```
CALL LOAD("DSK1.xxxxx")
where xxxxx is the appropriate printer data name (eg FX80)
CALL LINK("WORLD0") ENTER
```

The program will start.

3. Editor/Assembler module:

Choose "3 LOAD AND RUN" from the main title screen. At the file name prompt enter:

DSK1.3D ENTER

If you are using a dot-matrix printer, type in the file name. If you are not using a printer proceed to the next step.

At the program name prompt enter:

WORLD0 ENTER

The program will start.

or 3b: Choose 5- Run Program: 3DWORLD

4.3. Mini Memory

Choose "1 LOAD AND RUN" from the main title screen.

At the file name prompt enter:

DSK1.3D ENTER

If you are using a dot-matrix printer, type in the file name. If you are not using a printer proceed to the next step.

At the program name prompt enter:

WORLD0 [ENTER]

The program will start.

In Germany the program was also distributed on cassette with various load options.

=====

DOCUMENT PUBLISHED AS AN APPENDIX BY AMERISOFT:

How to build an object

A note about axes. In three dimensional space there is no agreement about which is the x, y and z axis- and when you can rotate an image about three axes it becomes rather hard to keep track of. When you design your image, the initial blank screen in front of you has the X axis from left to right, increasing in value to the right; the Y axis from bottom to top, increasing in value as it goes up, and the z axis is the one going from you through the screen into the distance with the value increasing as it becomes more distant.

If you do get the initial image the wrong way, just rotate it. Off we go...

How to build up an object on your 3D-World screen. As an example we use a four sided pyramid - a square base and one upper point.

Start with a plan of the object on paper or in your mind.

All three-dimensional objects without curves are suitable for the 3D-World program.

1. Set the locations of the points:

Fix the points by entering menu selection (Edit Points - p11).

Enter the three co-ordinates of each point, starting with point #0.

In our example (the pyramid) it will be the left-most point of the base square.

Its co-ordinates are (-100,0,0).

Enter this by typing:

```
ENTER (to confirm the point number),  
SPACEBAR -100  
SPACEBAR 000  
SPACEBAR 000  
ENTER
```

The second point (number 1) is the next point of the base square with the coordinates (0,-100,0).

Enter this by typing:

```
ENTER  
SPACEBAR 000  
SPACEBAR 100  
SPACEBAR 000  
ENTER
```

At this point your screen will look like this:

N:000 -> X: 100 Y: 000 Z: 000

N:001 -> X: 000 Y: 100 Z: 000

Repeat this entry procedure with the points #2 and #3 of the base square.

Their coordinates are:

(-100,0,0) and

(0,0,100)

The last point is the pyramid's top. It is located on the Z-axis and has the coordinates (0,0,100). Type this in.

Now leave the Edit Points mode by pressing FCTN 9 (BACK).

2. CONNECT THE POINTS:

Now you must build a structure out of the stored points.

This means the program must be told which of the points should be connected by straight lines.

Enter the **Edit Structure** mode (p12)

Select structure #1 to edit.

Enter the numbers of the points to be connected in a list.

A line will be drawn between two successive points in this list.

Start with point #0 by typing 000.

Draw a line to point #1: Type 001.

Connect point #1 with point #2: type 002., unchanged:

Draw the next line to point #3: type 003.

Close the base square with the connection between #3 and #0:
type 000.

From point #0 draw a line up to the top: type 004.

Draw the line down to point #3: type 003.

The next line is between #1 and the top.

You have to move the pen without drawing to point #1.

Do this by typing M. The program will fill the space with MOV.

Then type 001.

Draw the line to the top and down to point #2: type 004 002.

The pyramid is ready. Leave the mode by pressing FCTN 9 (BACK) twice.

Select Show Image (p7) and have a look at your pyramid!

More complex structures can be generated in the same manner, but, of course, using a greater number of points and some more of the 10 available structures.

Taken from Magazine article from TELEMATCH 84/11

Three dimensions, that is length, width, height. That's space.

3-D- World, that's the name of the graphics package.

The TI 99/4A has made the leap into the third dimension with success.

So let's use the menu to look at DEMO 1 (p5 LOAD, p7 Show).

What we get to see: A simple triangle on a black background.

By pressing button 1, the triangle begins to turn.

Button 2 turns the body around another axis. What a sight! The oh so simple triangle turns out to be a pyramid.

Space has three axes: x,y and z, and along any of these axes, the pyramid is completely movable.

And if you want to amend the proportions of the body then you have the ability to stretch or shrink along the x,y or z axes.

This sometimes produces weird shapes.

You can zoom in and out (enlarge and reduce) preserving the proportions.

The program 3D offers the possibility to design 10 image parts (or structures) independently of each other.

Demo 2 shows an example in the form of a house with some objects. The complete house consists of structures which can be visually switched off or switched on individually. The control is a displayed structure bar consisting of 10 blocks. The upper box corresponds to structure 1 and the last 10. To turn off the respective structure, only the equivalent number has to be keyed. Then the structure disappears from the screen, and the corresponding box of the structure bar turns black. Repressing the number turns the structure back on.

Definition of the room.

In this way, complicated spatial contexts can be presented very simply and vividly. Naturally, the entire body can still be rotated, shifted, compressed, reduced and enlarged. Hidden structures can either be turned invisibly when panning, or left at their old position.

Anyone who thinks that they can now immediately go to work and bring fantastic representations themselves to the screen, unfortunately it is not so simple.

First, the pencil should be sharpened.

Each item consists of points, specified with three axes. Each point has a unique position to these axes. And this position must be defined by you.

So first record a coordinate cross, with x and y axis. Draw the z axis at an angle of 45deg and now draw the points of their intended body. Now determine and write down the distances to the x,y and z axis.

Then select **(Edit Points - p11)**.

Now you can see four columns: N,x,y,z.

N is the number column. Each point receives a three-digit number, e.g. 001.

Now the values for x,y and z must be entered.

Once all the points have been entered, the work is far from over.

How should the computer know which points to connect?

So continue with BACK in the menu and use **EDIT STRUCTURES. (p12)**

Which of the 10 possible structures is to be used? The first naturally.

A screen display of ten rows and six columns appears. Here, the numbers of the points must be entered in the order in which they are to be connected.

For example:

```
000 001 002 003 000 004
005 006 007 004 MOV 001
005 MOV 002 006 MOV 003
007
```

Entering MOV causes no line to be drawn between the points on either side of MOV.

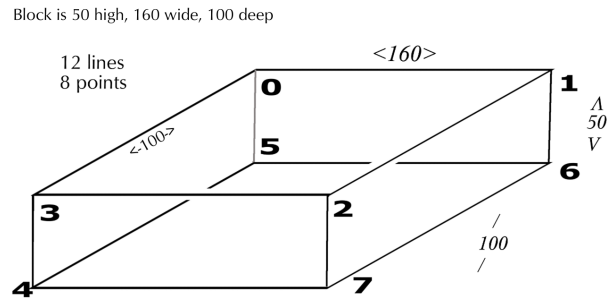
For the simple box example, only eight points were required.

How many points must be determined when figures are curved? This shows the weakness of the program. Lines at an angle are limited by the image resolution and will show a stepped structure. The color choice of foreground, Background and axis color is lost when you store the structure on disk.

FIRST PROJECT 3D WORLD

Start Here: PLAN your object- how many points and where are they in three dimensional space- you need to input the co-ordinates. Which point is to be connected to which points?

Take a simple block shape;



Point 4 is at 0,0,0 Point 3 is at 0,50,0 Point 0 is at 0,50,100
 Point 1 is at 160,50,100 Point 6 is at 160,0,100

LOAD the program-if using Extended Basic and the LOAD program it runs like this:

```

3D-WORLD
-----
PRINTER TYPES:
-----
1)FX80
2)GP100
3)GP500
4)MX80, MX100, STAR
5)NO PRINTER

ENTER PRINTER TYPE:

COPYRIGHT(C)1984 BY
AMERISDFT INTERNATIONAL
    
```

```

3D-WORLD
-----
3D-WORLD

LOADING...

COPYRIGHT(C)1984 BY
AMERISDFT INTERNATIONAL
    
```

This takes several minues

```

MAIN MENU

PRESS 1 TO LOAD DATA
2 SAVE DATA
3 SAVE IMAGE
4 SHOW IMAGE
5 EDIT POINTS
6 CLEAR POINTS
7 EDIT STRUCTURES
8 CLEAR STRUCTURES
9 EDIT COLORS
    
```

select edit points and input point co-ordinates:

```

EDIT POINTS

N:000 -> X: 000 Y: 050 Z: 100
N:001 -> X: 160 Y: 050 Z: 100
N:002 -> X: 160 Y: 050 Z: 000
N:003 -> X: 000 Y: 050 Z: 000
N:004 -> X: 000 Y: 000 Z: 000
N:005 -> X: 000 Y: 000 Z: 100
N:006 -> X: 160 Y: 000 Z: 100
N:007 -> X: 160 Y: 000 Z: 000

N:000 -> X: 000 Y: 000 Z: 000
    
```

ENTER SPACE 000 SPACE 050 SPACE 100 ENTER and repeat for each point. BACK to MENU and select STRUCTURE, choose STRUCTURE 0 and connect the points being sure to include every line (M= go to point without drawing line)

```

EDIT STRUCTURES

WHAT STRUCTURE (0-9)?
    
```

```

EDIT STRUCTURE 0

- - - - -
- - - - -
- - - - -
- - - - -
- - - - -
- - - - -
- - - - -
- - - - -
- - - - -
- - - - -
    
```

```

000 001 002 003 000 005 004 007 006 007 MOV 003
004 MOV 002 007 MOV 001 006
    
```

BACK to the MENU and select SAVE DATA.

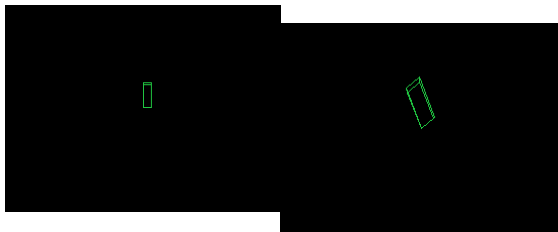
Now SHOW IMAGE from MENU, enlarge WITH KEY 0 x 6, CHANGE TURNS TO 10 DEGREES BY PRESSING E AND A 2 WILL SHOW BRIEFLY IN TOP LEFT CORNER OF SCREEN.

Initial image:

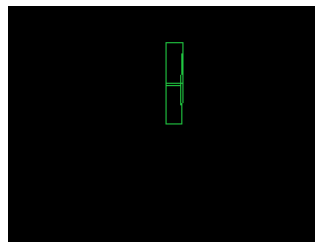
3 x key 1

3 x shift 1

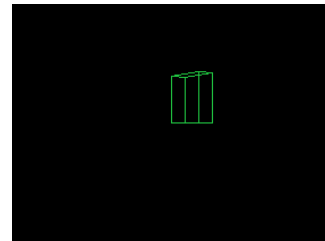
3 x shift 2



3x2

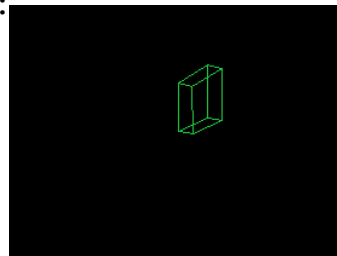


3 x 3

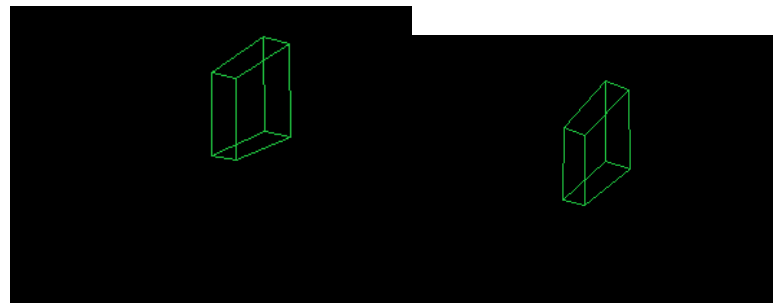


Now 15 x shift 5, 10 x shift 6 and press key 2:

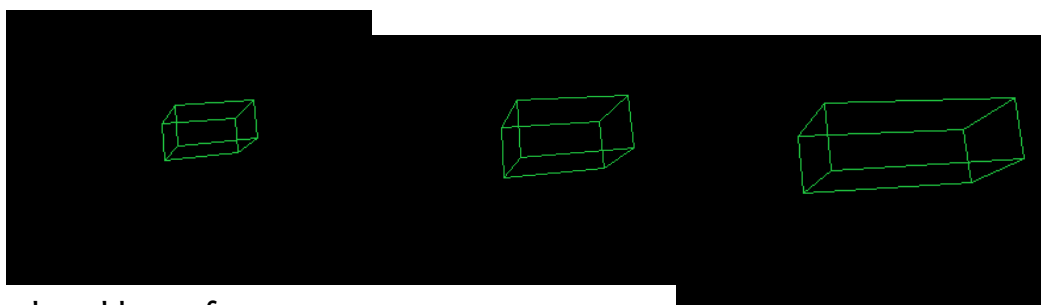
(NOTE THE INITIAL IMAGE IS STRAIGHT ON AND NEEDS TO BE ROTATED TO SEE A 3D VIEW!)



Now key R then 3 then 2 then 2:



and 17 x 4:



Play around and have fun

LOAD DATA will return you to the data as it was when you SAVED.