

## VU-3D

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Loading time: 4 minutes 15 seconds

Load name must be typed in lower case letters.

VU-3D is a sophisticated three-dimensional design and display program. Using simple commands, create seemingly three-dimensional objects (or sets of objects), and look at those objects from any angle and distance. Also, color and shade the objects, choosing the direction from which the light source will strike the object. Upon completing an object, save it on tape to reload at a later time, or copy the screen display to an attached printer.

TO LOAD: Press LOAD "vu3d", start the cassette recorder, and press ENTER. The program loads in 4 minutes 15 seconds and starts automatically.

TO USE: The menu asks you to select either

1. CREATE A NEW FIGURE, or
2. LOAD A DATA FILE (from a cassette)

Each of these options is explained in detail in these written instructions. First, use option 1 to create a figure you can save on tape and later load (using option 2) from that tape. Until you do so, of course, there is no data file to load.

NOTE: There is an example program following VU-3D on the same tape. It is the same as VU-3D, except it comes equipped with a finished data file - a representation of a goblet. It will be useful at some point to load this program (press LOAD "example" and load it the same way you did the original). Experiment with some of the options we describe. Using the Modify option below, for example, examine the goblet in its various stages of creation.

Type 1 (press ENTER) to begin creating an object. Watch the "drawing board" on which you design your object. Before you begin, let's try something else - press the Q key on your TS2000. Before you is the program's MAIN MENU, from which you may select any of the options - including the two options given above, now listed as options 3 and 4. Selecting 3 or 4 is exactly the same as selecting 1 or 2 in the abbreviated menu above.

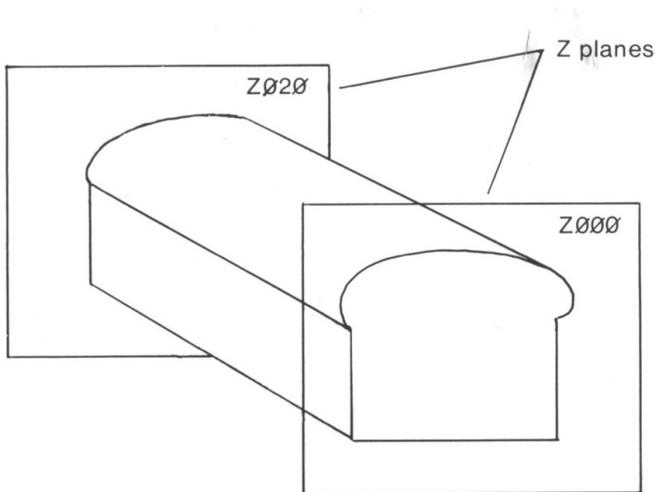
1. MODIFY A FIGURE
2. ABANDON
3. LOAD A DATA FILE
4. CREATE A NEW FILE
5. SAVE A DATA FILE
6. DISPLAY
7. CHANGE COLORS

We explain each option in the order you most likely use them, rather than the order they appear on the menu. Let's go back to the "drawing board" and create a figure - type 4 and press ENTER. Always remember to press ENTER when selecting an option from the menu.

4. CREATE A NEW FIGURE: At the top of the screen is a three line banner containing the commands you use in this option. Each of the commands is activated by pressing the first letter in the command - for example, press O to "open," or begin working on a figure. Try it.

Open: Press O. Now you're ready to begin creating an object. There is a cursor in the middle of the work space. Look at the bottom of the screen and observe a data line. The X and Y numbers are the coordinates of the cursor relative to the X and Y axes at the left and bottom edges of the screen. The Z number refers to the "Z plane" (to be explained). Notice the banner at the top of the screen now contains a new set of commands for you to use. This general format - a workspace with a banner of commands above and a data line below - is standard throughout the program.

In VU-3D, create a figure by taking slices or cross sections through the figure as many as needed, one after another in sequence - and storing these slices in the computer's memory. Each slice is called a "Z plane." Think of a Z plane as being like a slice of bread. Just as 20 slices of bread might make up a loaf, so might you construct a figure using 20 Z planes. In fact, as an example, let's design a loaf of bread.



Look at the data line at the bottom of the screen; the cursor is 120 positions in from the left edge of the screen, and 72 positions up from the bottom of the screen. Move the cursor around the workspace using the arrow keys - 5, 6, 7, and 8 (if you hold down the CAPS SHIFT key at the same time, the cursor moves more slowly) - and watch the coordinates at the bottom of the screen changing. The Z plane hasn't changed; however, it's still waiting for you to draw the first section of your figure (the end slice of the loaf of bread). Move the cursor again, to the position you wish to start drawing. Then press S (for Start).

You have defined the coordinates of the beginning of the first line of your figure. Move the cursor to the end position of the line. Press L (for Line) and a line is drawn between the start position and the present position. Move the cursor to the next position and press L again. Another line is drawn from the previous position to the new current position. If you

wish to give the loaf of bread the standard rounded top, use the CAPS SHIFT key with the arrows to move a click or two at a time to draw a number of shorter lines, approximating a curved line. (The same with the "part" on the side of the loaf). If you wish to remove a line while drawing a figure, press D (for Delete) to erase the last line drawn. Press D again and the second to last line drawn is erased. Again, and the third to last line will go, and so on. Continue drawing lines until you just about complete the first slice, then press E (for End) to close the figure. This automatically draws a line from the cursor position to the original start position. The first slice is now complete. Having completed the figure, you return to the beginning of the Create option.

If you wish to delete the line drawn after pressing E to close the figure, you will be unable to do so and may have to start from the beginning. To do this, you need the Abandon option on the MAIN MENU. It is a good idea, for reference, to keep track of the various position coordinates on a piece of paper. It is also a advisable to plot a drawing on graph paper and note the coordinates entered into VU-3D.

Select the Open command again, move the cursor to an unused portion of the workspace, and begin another figure (or a hole inside an existing figure). You can open a new figure now on the Z 000 plane, or later on a subsequent Z plane. The lines of a figure may never cross and two separate figures may never intersect. The TS2000 will detect any attempt to do so and will not permit it. If this happens, simply move the cursor to a position where such an intersection will not occur. Such is the case if the line drawn with the End command intersects an existing line.

Figure: Press F. With the CREATE option, several figures can be included in a "scene" at the same time. With the commands Magnify and Reduce, and by using the arrow keys, each of these figures can be magnified, reduced, or moved separately. This is done with the aid of the Figure command. By pressing F, select - one after the other - each of the figures in the scene. The currently selected figure is shown with dotted lines, rather than the solid lines of the other figures.

Magnify: Press M. A figure drawn with the Open command, or repeated by moving to a subsequent Z plane, may be magnified by pressing the M key as many times as necessary (or by holding the key down) to achieve the size you desire. The figure remains the magnified size as you travel through subsequent Z planes, or until you again magnify or reduce it.

Reduce: Press R. This works in exactly the same way as Magnify, except the figure becomes smaller.

Arrow keys (5, 6, 7, and 8): A figure is moved using the arrow keys but you still won't be able to intersect lines on the same Z plane. Pressing the CAPS SHIFT key with the arrow keys will slow the movements and increase the ability to bring objects closer.

Next Z: When you have constructed the figure, or figures, in the first Z plane to your satisfaction, move to the next Z plane by pressing the N key. Continue to press N until the desired value of Z is displayed in the data line at the bottom of the workspace. For our loaf of bread, this might be in the neighborhood of 025 to 030 - no magnification or reduction is necessary. On the other hand, if we were constructing another figure - like the glass in the accompanying EXAMPLE program - more adjustments must be made as you travel through the Z planes. The figures from the previous Z plane are repeated in each new Z plane (unless completed using the Close option below) and if left unadjusted retain the

previous shape. (This will be instantly clear if you load the EXAMPLE program, and examine the construction of the glass, Z plane by Z plane, using the MODIFY option. You might want to do that now.)

If there are a number of objects in a scene, any one of them may be completed on any Z plane (except the first) using the Close command. Similarly, a new object may be started on any Z plane using the Open command again. Holes, or the hollowing of objects, can be devised by using Open and drawing one figure entirely inside another. For example, a mug can be constructed by drawing a many-sided polygon in the first plane, moving to the next plane by pressing N, and drawing a smaller polygon within the first one. The rim of the mug is then extended by moving to a further Z plane, then closing the object. You can place two or more objects very close to each other to form a composite - for example, a mug with a handle can be devised from two objects.

**Close:** To complete an object, press the F key to select the figure in question (if there are more than one) and press C to Close or complete it. You may continue to develop other objects in the scene (assuming they haven't previously been closed) by moving through further Z planes. Upon Closing a figure, you are asked whether the top of the object should be left open - press Y for yes, or N for no. If, for example, the figure is a solid cube, you will want to close it; if it is an empty box, you will want to leave it open. In the latter case, selecting the DISPLAY option makes lines visible to the eye that wouldn't be visible if the object were solid.

**Quit:** Press Q to return to the main menu. Any objects not completed using Close will automatically be closed by using this command. DO NOT use this command until you are certain you have completed the object or scene - once you press Q, you cannot return to CREATE to add an object or to make major adjustments (though you can make adjustments in size using the MODIFY option on the main menu).

6. **DISPLAY:** Once you have created an object, or a set of objects, using the CREATE option - or loaded a data file from cassette using the LOAD option - display the object in three-dimensional perspective. There are three types of three-dimensional display: 1) a wire line diagram, 2) a hidden line diagram, and 3) a shaded solid diagram. Each of these displays provides a full three-dimensional perspective.

You may view the object from any position in space, either inside or outside the object, and from any angle and any distance. To better understand the geometry of the DISPLAY option, imagine yourself standing on the surface of a sphere with the object in the center of it. The commands of DISPLAY allow you to move around the surface of the sphere, as well as make the sphere larger or smaller.

On first selecting this option, you see a three-dimensional wire line perspective of the object. Choose the angle and distance of observation with the commands of the new banner at the top of the screen. They are:

**Far:** Press the F key to zoom away from the object and view it from a greater distance. If you press CAPS SHIFT at the same time, you move more slowly away from the figure.

**Near:** Press N to zoom in on the figure and observe it at a closer distance. If you continue to press N, the observation point may actually move inside the object.

Arrow keys (5, 6, 7, and 8): Using our sphere metaphor, if you press an arrow key, the effect would be the same as if you were to walk around the sphere in the direction of the arrow. If you press the CAPS SHIFT key at the same time as you press an arrow key, you walk more slowly around the object, thereby positioning yourself with greater precision.

Magnify: Press the M key to magnify the object. In this case, unlike Near, the figure is magnified without increasing the perspective effect.

Reduce: Press R to make the object smaller. As with magnify, the size of the object is changed without changing the perspective effect.

Picture: This is actually an option within an option. Once you have determined the magnification, angle of observation, and perspective of the object or objects in your scene, press the P key to select from three types of three-dimensional representation. This option also provides you with the ability to copy your finished product to a printer, as well as save the screen display on cassette. Notice when you press P a new banner of commands is made available to you. Let's take a look at them:

Hidden line: Press H to produce a hidden line diagram of the figure on the screen. Only those edges or lines which the observer can see from the present vantage point will remain. The lines typically hidden in an actual physical object are erased.

Shade: Press S. Shade those faces of the object the observer can see (those surfaces normally hidden from the observer's view are eliminated in this representation). The lightness of the shading of each face is determined by a combination of diffuse ambient light and by "diffuse reflection" from a single light source. After pressing S for Shade, the command banner changes and asks you to place the light source. Press A, C, or B for above, center, or below, respectively. The banner changes again and asks you to press L, C, or R to further position the source to the left, center, or right.

Color: Press C. The background color and color of the object, as well as the colors of the screen border, banner, and banner ink, may be chosen by responding to a succession of prompts in the command banner. Answer these prompts by pressing the appropriate keys — 0 through 7 (the colors appear above the numbers) - on the TS2000 keyboard.

Print: If you have a printer attached to the TS2000, press P to produce a hard copy of the screen display.

Keep: After selecting one of the three-dimensional displays, press K to save a copy of the screen display on cassette. Make sure the MIC port on the TS2000 is connected to the MIC port on the recorder. A prompt at the bottom of the screen asks you to enter a name for the object. Type it in and press ENTER. Start the tape in RECORD mode and press any key. When the pattern of horizontal saving lines ends, you are returned to the program and may continue using it. At this point, you may choose another three-dimensional display to store. This command differs from the SAVE option on the MAIN MENU. SAVE stores on tape the complete data file of the object, while Keep simply saves the screen image, which can later be loaded from cassette without first loading the VU-3D program. Press

LOAD "the title" SCREEN\$

(SCREEN\$ is a single command, located beneath the K key on the TS2000.)

Quit: Press Q to return to DISPLAY, or, if you are already in DISPLAY, press Q to return to the main menu.

1. MODIFY A FIGURE: Press 1. Once you have created an object or set of objects with the CREATE option, you may make minor modifications. These are limited to magnifying or reducing the figure or figures from one existing Z plane to another and moving the position of a figure using the arrow keys. Movement can be slowed with the CAPS SHIFT key. If major changes are needed, ABANDON the file and CREATE a new set of objects. Try modifying the goblet in the example program - you may be surprised at some of the startling changes possible.

2. ABANDON: Type 2 to abandon or delete the current data file to make room in the computer's memory for a new file using either the CREATE or LOAD options.

5. SAVE A DATA FILE: Press 5 to save a data file on cassette. You are asked to enter a file name, start the tape in RECORD and press any key. First load the VU-3D program, then select option 3 to load a data file.

3. LOAD A DATA FILE: Press 3 to load, from cassette, a data file that was saved using option 5 above. To do so, there must be no existing data file in the computer's memory. If there is such a file, ABANDON it before loading a new one. Then type the file name with which you originally saved the data, start the tape in PLAY, and press ENTER.

7. CHANGE COLORS: Press 7. This option works the same as the Color command with Picture, only now you set the colors before you begin creating an object. rather than after completing the object.

### **LOADING INSTRUCTIONS:**

(See Chapter 4 of your instruction manual for detailed instructions.)

1. First listen to the tape so you will be familiar with its distinct sections. The tape has a period of silence at the beginning, followed by a high-pitched, screechy noise. This is the computer program. The program is recorded twice on the cassette in case one does not load.

2. Set the volume control on the cassette deck to about 3/4 of the maximum. If you have tone controls, set the bass to minimum and treble to maximum. If you have just one tone control, set it to HIGH or MAXIMUM.

3. Rewind the tape to the beginning. Connect the EAR jack on the computer to the EAR jack on the cassette deck recorder. Make sure the plugs are clean and securely in place.

4. To instruct the computer to accept the program you must press the LOAD command and type the name of the program in quotation marks. See the instructions or cassette for the correct loading name.

5. Start the cassette deck, allow a few seconds for it to get up to speed, then press ENTER during the silence before the program begins.

6. The border of the TV screen will alternate between pale blue (cyan) and red during the time the computer is searching for the program on the tape.

7. When the program has been found, the screen border will show a pattern of lines in the same shades of blue and red, and shortly the name of the program will appear on the screen.

8. Next, as the program itself is being loaded into the computer, the border pattern will become thinner, faster moving yellow and dark blue lines.

9. When the computer has finished loading the program, one of two things will happen:

1. Most commercial programs will begin running automatically, usually with a "title screen" or instructions to the user. (A title screen may tell you that the tape is still loading, if not, you should stop the tape immediately at this point so as to be in the proper position to load the next program if you wish.) or

2. The screen will be blank, except for a 0 OK, 0:1 in the lower left hand corner. This is a report code and means that the computer has successfully loaded the program.

Stop the tape immediately. To execute the program, you press RUN and ENTER. This will start the program.

### **SOME SUGGESTIONS**

1. The volume at which the program is loaded is very important. Usually 3/4 maximum volume works best, but recorders vary and may require experimentation with the volume setting. If you have a technical background you can check the output level of your recorder's EAR/SPKR jack. It must be at least 4-volts peak-to-peak, although 5 to 6-volts peak-to-peak is best.

2. Clean and demagnetize the heads of the tape recorder. Your ears may not pick up the signal fluctuations due to magnetic flux on the tape heads, but the computer has a much more sensitive "ear."

3. The computer is very susceptible to outside interference. Working on a metal table or near electrical appliances should be avoided.

4. Occasionally, once a program has loaded, the video display will show instability. This can be corrected by adjusting the vertical hold on the television.

### **WARRANTY**

There are no warranties which extend beyond the description on the face hereof. No other warranty, whether express or implied, including the warranty of merchantability, shall exist in connection with the sale of this product. In no event shall Timex be liable for any consequential, incidental or special damages.

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