

GRAPH/NET Computer Integrated Design System

VU/NET 3-D Perspective Simulation

Version 0.h

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Graphic Horizons, Inc.  
60 State Street  
Boston, MA 02109  
617-396-0075

## VU/NET 3-D Perspective Simulation

### Introduction

The VU/NET program set allows the designer or renderer to rapidly examine a large number of different interior or exterior perspective views of a project. You may choose specific viewpoints, or watch a sequence of views demonstrate the visual impact of moving around the project. You may choose to display the hidden lines, or to display only the facing walls. You may choose to display the wire frame only, or to tone the walls to give greater substance to the perspective. You may choose to display the shadows cast by the project, anywhere in the world, any month of the year, any time of day. Those shadows may be in outline form, or toned. Or, you may choose not to display the project in perspective at all, but to examine it in plan or elevation at various scales.

This powerful program can be used during all of the different stages of project development. During the early schematic design stage, it allows the designer to examine the visual impact of various massing alternatives on a given site. Many alternatives can be stored in the computer, and the same sequence of views may be requested for each, to give a truer basis for comparison. As the project gains in detail, the architect may add detail to the perspective. You may use stored library elements, such as trees, cars, furniture, to rapidly develop a detailed perspective. Or you may enter new project-specific elements into the system rapidly and easily, to increase the library of three-dimensional elements available for future projects.

As various two-dimensional floor plans are developed in the DRAFT program, these may be automatically converted into the VU/NET 3-D format, and displayed in perspective, using the DRAFT3D Program. This enables the architect to obtain a "roof off" view of the interior of the project. You can thus assess what a certain layout will feel like to the individual walking down a corridor, entering a room, using the spaces. Similarly, a three-dimensional view may be stored for display in the DRAFT program, using the VU2D Program.

The renderer can rapidly and easily examine hundreds of perspective views before selecting the one that displays precisely what he wishes to illustrate. This view can then be enlarged or reduced until it is the precise size of the desired rendering, and plotted. The plot serves as an underlay for the rendering, releasing the renderer from the drudgery of calculating the three-point perspective, and ensuring that the final rendering is not a disappointment.

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### Starting the VU/NET Program

To start the VU/NET program running, first make sure that you are working in the VUNET area of the disk. If you start the program but are not in the proper disk area, VU will not be able to find your files. To get into the VUNET area of the disk, type the following command on the keyboard and then hit the RETURN key. (NOTE: you should have already turned on the computer, entered the date and time if necessary, and logged in.)

```
PATH :VUNET
```

The computer will respond with a message telling you that a new path has been set, so that any files accessed from now on will be read from the VUNET area of the disk.

Now you must tell the computer that you wish to run the VU program. You do this by typing the following command on the keyboard, and then hitting the RETURN key:

```
VU
```

There will be a short pause while the computer calls up the program, and then the screen will clear, and the VU/NET menu system will appear on the screen. VU uses the GRAPH/NET screen oriented menu system, to minimize the amount of keyboard entry, and to reduce eye, neck and shoulder strain caused by continuously looking from the screen to a menu pad in another location. All of the VU commands will appear on the screen. The commands are structured so that you select from a Master Menu first, and that selection causes an appropriate sub-menu to be displayed with further choices.

The menus appear on the lower third of the screen, while the upper two-thirds is reserved for the display of the drawing file. On the left-hand side of the screen is the VU/NET Master Menu, which contains the major options. To the right of that is the VU/NET Action Menu, which will contain the sub-menus. On the far right is the Dialogue Window, which prompts you for responses, and displays coordinates and comments.

If the program does not run when you type in VU, make sure you set the path to the VUNET area. If you did, and it still will not run, call your systems manager.

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### The Master Menu

When the VU program has started running, the MASTER MENU options will appear, and the following message will appear in the Dialogue Window:

VU Version 0.h

This Version Number identifies the software release with which you are working. Always include it in any communications you may have about the program with GHI, either to report bugs, or to request modifications.

The VU/NET Master Menu contains the following ten options:

- Fetch .VIL File
- Fetch .SAV File
- Set OPTIONS
- Set SITE
- Show OPTIONS
- INTERACTIVE
- SEQUENTIAL
- PLOT Drawing
- SAVE Drawing
- Exit

The following paragraphs will discuss in turn each of these options, and any sub-menus each may use. In order to make a selection from this or any menu, slide the puck up and down in the menu area until the black bar is over the desired option, and then press down the yellow button on the puck. That registers your selection, and results in the appropriate action, or in the appearance of the appropriate menu.

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Fetch .VIL File  
Fetch .SAV File

There are two types of display files that may be accessed by the VU program: alphanumeric files and binary files. The alphanumeric files contain the VU Input Language commands, and are stored on the disk with extension code .VIL. The binary files are created from .VIL files using the 'SAVE Drawing' command, and are stored on disk with extension code .SAV. The binary files will be read in from disk faster than the alphanumeric ones, however they are frozen and cannot be edited. You may have both a .VIL and a .SAV version of the same project on the disk at once, but be careful never to delete the .VIL file.

You may call either type of file from disk into memory by selecting the appropriate command from the Master Menu. To do this, slide the puck up and down in the Master Menu area until the black bar is positioned over either the 'Fetch .VIL File' option or the 'Fetch .SAV File' option, and then press down the yellow button on the puck. Type in the file name, without the extension code, and then hit the RETURN key on the keyboard.

If you have recalled an alphanumeric file which contains other .VIL files as components, you will see the list of those other components appear in the Dialogue Window as they are read in.

When the file is completely entered into memory, regardless of whether it is a .VIL file or a .SAV file, a message will appear in the Dialogue Window telling you how many points were read in. The current maximum number of points in each layer of a perspective is 4,000.

If the program cannot find a file of the name you enter, a message to that effect will appear in the Dialogue Window. Check your spelling, to be sure you gave the name correctly, and try again. If the VU program still cannot find the file, make sure that you are asking for the right type of file. If in doubt, ask for the alphanumeric version. If the program still cannot find the file, make sure that you are in the VUNET area of the disk, and that your file is stored in this area as well.

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Fetch .VIL File  
Fetch .SAV File, Cont.

If you have made changes to a .VIL file since the last time that you created a .SAV file, you MUST recall the .VIL file in order to see the changes, and then make ANOTHER .SAV file if you so wish. The older .SAV file will still contain the unedited version of the .VIL file. This is always the first thing to check if you recall a binary file and it does not seem to be quite up to date!

Once you have read a file in using the Fetch .VIL File or Fetch .SAV File options, you should IGNORE the filename options in both the Interactive and Sequential Menus. If you select those, and re-enter the filename, you will have to wait while the VU program reads in the VU Input Language version of the file again.

If you have already read in a .VIL file or a .SAV file, and you then select Fetch .VIL, you will see the following message appear in the Dialogue Window:

Do you want to erase the screen? -[Yes or No]

If you have a layered .VIL file, and you have already read in and displayed the first layer, you should respond No. This will result in the first layer remaining on the screen while you read in and display the second layer, which will appear superimposed upon the first. Note that it is not possible to use a .SAV file as the second or subsequent layer; you must read in a .VIL file in order to avoid erasing the screen.

If you are changing from one display file to another, you should answer Yes to this question, and the screen will be erased in readiness to display the new file.

Note that .SAV files cannot be stored or transported on floppies. These files are intended as temporary user aids, and will degenerate if you attempt to move them from one system to another. To back up or copy a display file, copy the .VIL files, and then re-create the .SAV file on the second system.

## VU/NET 3-D Perspective Simulation

### Set Options

When you start running the VU program, the program uses a set of default options to determine how to draw the display the project file. These default settings cause the program to draw in perspective every wall of the display file, with no toning or shadows.

You may change these default values by selecting 'Set Options' from the Master Menu. To do this, slide the puck up and down in the Master Menu area until the black bar is positioned over 'Set Options', and then press down the yellow button on the puck. The Options Menu will then appear in the Action Menu area. The Options Menu has the following five commands:

Projection

Drawing

Shadowing

Site

Master Menu

Each of these options will in turn produce a series of sub-menus, allowing you to completely control the parameters of the display of the file. To select one of these options, slide the puck up and down in the Options Menu area until the black bar is positioned over the desired selection, and press down the yellow button on the puck.

## VU/NET 3-D Perspective Simulation

### Projection

If you select the Projection option from the Option Menu, the VU/NET Select Proj. Menu will appear in the Action Menu area of the screen. The VU/NET Select Proj. Menu has the following eight options:

Perspective

Plan

North Elevation

East Elevation

South Elevation

West Elevation

Scale

Return

To select any of these options, slide the puck up and down in the Select Proj. area until the black bar is positioned over the desired projection method, and then press down the yellow button on the puck.

**Perspective:** This is the default setting, and causes the program to draw in three-point perspective.

**Plan:** This option will cause the program to draw a plan view of the display file. After selecting this command, you will see the VU/NET Set Scale Menu appear in the Action Menu area. (See Scale below.)

**North Elevation:** This option will cause the VU program to draw the north elevation view of the display file. VU assumes that North lies along the positive y axis. After selecting this command, you will see the VU/NET Scale Menu appear in the Action Menu area. (See Scale below.)

**East Elevation:** This option will cause the VU program to draw the east elevation view of the display file. VU assumes that East lies along the positive x axis. After selecting this option, you will see the VU/NET Scale Menu appear in the Action Menu area. (See Scale below.)



## VU/NET 3-D Perspective Simulation

### Projection, Cont.

**South Elevation:** This command will cause the VU program to draw the south elevation view of the display file. VU assumes that South lies along the negative y axis. After selecting this option, you will see the VU/NET Scale Menu appear in the Action Menu area. (See Scale below.)

**West Elevation:** This command will cause the VU program to draw the west elevation view of the display file. VU assumes that West lies along the negative x axis. After selecting this option, you will see the VU/NET Scale Menu appear in the Action Menu area. (See Scale below.)

**Scale:** This command will cause the VU/NET Select Scale Menu to be displayed in the Action Menu area. The default scale value is 1" = 1'. The Select Scale Menu has the following options:

- 1/4" = 1'
- 1/8" = 1'
- 1/16" = 1'
- 1/32" = 1'
- 1/64" = 1'
- Other
- Return

To select one of these options, slide the puck up and down in the Select Scale area until the black bar is positioned over the desired scale, and then press down the yellow button on the puck. The following message will appear in the Dialogue Window:

```
Current Scale: 1/1
New Scale: _____
```

After selecting the desired scale, press the yellow button down when the black bar is positioned over the Return option in order to get back to the Select Proj. Menu.

**Return:** When you have finished selecting the desired projection method, and the necessary scale factor, you should select the Return option in order to continue setting display parameters in the Set Options Menu.

## VU/NET 3-D Perspective Simulation

### Drawing

When you start the VU program running, the display parameter Drawing is set at its default value, Draw Every Wall. To change this you must select the Drawing option from the Set Options Menu. This will cause the VU/NET Select Drawing Menu to appear in the Action Menu area. This Menu has the following six options:

#### DRAW

- Every Wall
- Facing Walls
- Roof Lines

#### TOPE

- Every Wall
- Facing Walls

#### RETURN

To tell which of these options is currently in force, look in the Dialogue Window. Whatever options have been chosen will be displayed in the Dialogue Window. When you first start the VU program running and select the Set Options Menu, the only thing in the Dialogue Window will be Draw Every Wall. Later, this Window will reflect the choices you have made as to how the perspectives should be drawn.

The options in this Menu are intended to be selected in combination with each other. For example, it is possible to tell the program to draw the facing walls and roof lines, and to tone the facing walls. Or to draw every wall, but to tone only the facing walls. Or to draw facing walls and shadows, but tone only the shadows.

For many of these options, the VU program makes assumptions about how the display file was coded. If the file was not coded according to these assumptions, the display options either will not work at all, or will work strangely. These assumptions are discussed in greater detail in the paragraphs on the VU Input File, but a short discussion is appropriate here.

Only areas coded as 'walls' can be toned or shadowed; items coded using the 'draw' command cannot. Therefore, a building must be coded using the 'wall' command, not the 'draw' command, if the user wishes to tone it, or cast its shadows.

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### Drawing, Cont.

In order to determine which walls are 'facing' the viewer for a particular set of coordinates, the VU program assumes that the walls were coded in a counter-clockwise direction, and that any courtyards or similar spaces were coded in a clockwise direction.

To turn any of these options ON, slide the puck up and down in the Select Drawing Menu area until the black bar is positioned over the desired option, and then press down the yellow button on the puck. You will then see a message confirming the selection you have just made appear in the Dialogue Window.

To turn an option OFF, slide the puck up and down in the Select Drawing Menu area until the black bar is again positioned over the option, and then again press down the yellow button on the puck. The message will disappear from the Dialogue Window area.

The following paragraphs describe the various ways of drawing the views of a building.

**Draw Every Wall:** This is the default setting. Selection of this option causes the VU program to draw every wall of the file. You must turn this option OFF in order for the Draw Facing Walls and Draw Roof Lines options to work properly.

**Draw Facing Walls:** This option causes the VU program to draw only those walls that can be seen from a given set of view coordinates. If any portion of a wall is visible from a given viewing position, then the entire wall will be drawn. However, if the wall is completely out of the viewing field, then it will be suppressed, thus removing some of the unwanted clutter of hidden lines from the drawing. Remember that for this option to work properly, you must also turn OFF the Draw Every Wall option!

**Draw Roof Lines:** This option causes the VU program to draw the roof lines of walls that are not included in the viewing field. This is very useful for aerial views.

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### Drawing, Cont.

**Tone Every Wall:** This option causes the VU program to place a vertical tone on all of the walls, at a user-controlled interval. The default spacing for the toning is 1., however, you may set any interval you desire, both narrower and wider.

After selecting this option, the following message will appear in the Dialogue Window:

```
Current wall toning interval is 1.000
Do you want to change it? [Yes or No]
```

If you want toning spacing of 1., type No and then hit the RETURN key on the keyboard. If you want to change the spacing, type Yes, and then hit the RETURN key. Then type the new spacing interval, and hit the RETURN key again. When the spacing has been determined, the Tone Every Wall message will appear in the Dialogue Window.

**Tone Facing Walls:** This option causes the VU program to place a vertical tone on just the facing walls, at a user-controlled interval. The default spacing for the toning is 1., however, you may set any interval you desire, both narrower and wider.

When you have selected this option, the following message will appear in the Dialogue Window:

```
Current wall toning interval is 1.000
Do you want to change it? [Yes or No]
```

If you want toning spacing of 1., type No, and then hit the RETURN key on the keyboard. If you want to change the spacing, type Yes, and then hit the RETURN key. Now type in the new spacing interval, and hit the RETURN key again. When the spacing has been determined, the Tone Facing Walls message will appear in the Dialogue Window.

**Return:** When you have finished setting the drawing parameters, you should select the Return option in order to get back to the Set Options Menu.

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### Shadowing

In order to see the sun shadows cast by the building, you must set the shadow parameters. To do this, select the Shadowing option from the Set Options Menu. Slide the puck up and down in the Set Options Menu until the black bar is positioned over the Shadowing option, and then press down the yellow button on the puck. This will cause the VU/NET Select Shadow Menu to appear in the Action Menu area. The Select Shadow Menu has the following three options:

DRAW Shadows

TONE Shadows

Return

To correctly cast the shadows of a building, the VU program assumes that North lies along the positive y axis, and East along the positive x axis. If the display file has not been coded in this way, then the shadows will not be correct.

To turn one of these options ON, slide the puck up and down in the Select Shadow area until the black bar is positioned over the desired option, and then press down the yellow button on the puck. This will cause a message confirming your selection to appear in the Dialogue Window. To turn the option OFF, slide the black bar up and down in the Select Shadow Menu until the black bar is again positioned over the option, and again press down the yellow button on the puck. The message will then disappear from the Dialogue Window.

**Draw Shadows:** This option causes the VU program to draw the outline of the shadows generated by the building. (Note: The location of the building, the month, and the time of day must all be set using the Site option in the Set Options Menu.)

**Tone Shadows:** This option causes the VU program to place a tone inside the shadow outline at a user-controlled interval. The default spacing for the toning is 1., however, the user may set any interval he desires, both narrower and

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### Shadowing, Cont.

wider. If the Draw Shadows command is OFF and the Tone Shadows command is ON, then only the tones will be drawn, without the shadow outline. This may be preferred if you are viewing the shadows in perspective instead of plan, and have selected the Draw Facing Walls option, since the shadow outline might then draw the walls that otherwise would not appear.

When you select the Tone Shadows option, the following message will appear in the Dialogue Window:

```
Current toning interval is 1.000
Do you want to change it? [Yes or No]
```

If you want toning spacing of 1., type No, and then hit the RETURN key on the keyboard. If you want to change the spacing interval, type Yes, and then hit the RETURN key. Now type in the new spacing interval, and hit the RETURN key again. When the spacing interval has been determined, the Tone Shadows message will appear in the Dialogue Window.

Return: When you have finished setting the options for the shadows, you must return to the Set Options Menu, to set the proper parameters for the shadows or to return to the Master Menu to view the display file.

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### Site

In order for the VU program to determine the sun shadows cast by a given building, it must know the location of that building, the month of the year, and the time of day. To set these, select the Site option from the Set Options Menu. To do this, slide the puck up and down in the Set Options Menu area until the black bar is positioned over the Site option, and then press down the yellow button on the puck. This will cause the Select Site Menu to appear in the Action Menu area. The Select Site Menu has the following five options:

- U. S. Cities
- Latitude
- Month of Year
- Time of Day
- Return

To select only of these options, slide the puck up and down in the Select Site area until the black bar is positioned over the desired option, and then press down the yellow button on the puck. The appropriate sub-menu will then appear in the Action Menu area.

**U. S. Cities:** The latitudes of nine cities across the United States have been entered into the VU program so that the user does not need to look them up. To display the menu of these cities, you must select the U.S. Cities option from the Select Site Menu. The Select Site Menu will disappear, to be replaced by the list of available cities.

- Atlanta
- Boston
- Chicago
- Denver
- Houston
- Los Angeles
- Miami
- San Francisco
- Seattle

Return

Select the desired city and then select the Return option. This will return you to the Set Site Menu.

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### Set Site, Cont.

Latitude: If you want to cast the shadows for a city other than those listed in the U.S. Cities above, you may set a specific latitude. To do this, select the Latitude option from the Set Site menu. You will then see the following message in the Dialogue Window :

What is the site latitude?

Type it in, and then hit the RETURN key on the keyboard.

Note that you MUST enter the decimal point after you type the site latitude.

Month of Year: The sun shadow patterns are quite different depending on the month of the year. However, there are some pairs of months which cast the same pattern. Select the Month of Year option, and a sub-menu will be displayed with the possible options:

December 21  
Jan/Nov 21  
Feb/Oct 21  
Mar/Sept 21

Apr/Aug 21  
May/Jul 21  
June 21

Return

Select the desired month and then select the Return option.

Time of Day: The final shadow parameter that you must set in order for the shadows to be cast correctly is the time of day. Select the Time of Day option, and the following menu will appear:

Local Time  
6:00 AM  
9:00 AM  
12:00 Noon  
3:00 PM  
6:00 PM  
Other  
Return



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Set Site, Cont.

Select the desired time. If you select the Other option, you will see the following message appear in the Dialogue Window:

Please enter time of day  
using a 0000 to 2400 clock.

Type in the desired time, using a 24 hour clock, and hit the RETURN key on the keyboard. If you select a time at which the sun is not above the horizon during the month previously selected, an error message will appear in the Dialogue Window. Select another time in the same way as above. Then select the Return option.

Return: When all of the site parameters have been set, you must return to the Set Options Menu.

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### Show Options

The Show Options command causes all of the selected options to be printed out in the Dialogue Window. This enables you to review the shadow settings and the perspective drawing parameters to see if they are still set appropriately. After the options have been printed out, you are returned to the Master Menu automatically, so that you can proceed to producing the drawings, or go back to Set Options to adjust the parameters.

To select this option, slide the puck up and down in the Master Menu area until the black bar is positioned over the Show Options command, and then press down the yellow button on the puck.

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### Interactive Mode

To display single views of a perspective on the screen, choosing the display coordinates as you go, you must choose the Interactive Mode from the Master Menu. To do this, slide the puck up and down in the VU/NET Master Menu area until the black bar is positioned over the Interactive option, and then press down the yellow button on the puck. This will cause the VU/NET Interactive Menu to appear in the Action Menu window. There are two possible variations of the Interactive Menu, one that will appear if you are in Perspective Mode, and another if you are in Plan or Elevation Mode. These two menus look as follows:

#### (Perspective Mode)

Show Values

Filename:

Center at x

Center at y

Center at z

View from x

View from y

View from z

GO

Master Menu

#### (Plan/Elevation Mode)

Show Values

Filename:

Center at x

Center at y

Center at z

Change Scale

GO

Master Menu

The differences between these two menus lie in the fact that when viewing the file in plan or elevation, the viewing point is pre-determined, so that you only enter the center point. However, in plan and elevation you must also give a scale, whereas perspective is scaleless.

## VU/NET 3-D Perspective Simulation

### Interactive Mode, Cont.

To make a selection from either of these menus, slide the puck up and down in the Action Menu area until the black bar is positioned over the appropriate option, and then press down the yellow button on the puck.

**Filename:** Before you can display a perspective on the screen, you must tell the program the name of the display file, so that it can be read into memory. If you have read in a binary version of the desired file using the Fetch .VIL File or Fetch .SAV File options in the Master Menu, then you can proceed immediately to giving view coordinates. If, however, you have not used the Fetch .VIL File or Fetch .SAV File options, you must now read in a .VIL file.

To do this, you must pick the Filename option from the Interactive Menu. Type in the filename, and then hit the RETURN key on the keyboard. The VU program assumes the file extension is .VIL, so you do not need to type the extension. If the file is not in the correct format, an error message will be printed out in the VU/NET Dialogue Window. The correctly formatted file will be read in, and a list of the names of the elements used to make up the file will be printed out in the Dialogue Window. If there is a problem inside the file, you can tell from this list approximately where to look for the error.

Once the display file has been read in, you can leave the Interactive Menu, change display options, or move into the Sequential Mode, without having to re-enter the file.

**View Coordinates:** When the file has been read in, you must tell the VU program how to display it. In perspective, six coordinates must be entered: the x,y and z coordinates of the center of the view, the point you are looking at, and the x,y and z coordinates of the viewer's position, the point you are looking from. X and y are the horizontal plane, while z is the elevation. In plan and elevation, only three coordinates must be entered, the x,y and z coordinates of the center of the view. If you do not enter a value for a certain coordinate, the program assumes that the desired value is zero.

## VU/NET 3-D Perspective Simulation

### Interactive Mode, Cont.

To enter the view coordinates, slide the puck up and down in the Interactive Menu area until the black bar is over a coordinate, press down the yellow button on the puck, type in the desired value on the keyboard, and then hit the RETURN key on the keyboard. You do not need to type a '.' after the numbers. You also do not need to enter the values in any particular order.

The 'center at' coordinates determine where the perspective file will be displayed with respect to the center of the screen. If you are using a perspective file created automatically from a floor plan, or if you coded the file with the 0,0,0 point at the center of the building, then you can start by leaving the 'center at' coordinates at 0. If, however, you coded the building and placed the 0,0,0 point at its lower left corner, then you will need to center the drawing on the screen by having a positive 'center at x' value. A good starting point is to halve the length of the building along the x-axis. You may also wish to set the 'center at z' coordinate to 5, to approximate eye level.

The 'view from' coordinates determine the viewer's position. A positive x value moves the viewer to the right along the x axis, a negative x value to the left. A positive y value moves the viewer in toward the displayed file, whereas a negative y moves him out in front of the building. Z is the viewer's elevation, so the larger the z value, the more aerial the perspective view.

**Show Values:** If you get confused as to exactly what values you have entered into the program, you may ask to have them displayed on the screen for you. To do this, slide the puck up and down in the Interactive Menu area until the black bar is positioned over the Show Values option, and then press down the yellow button on the puck. The values will appear in the Dialogue Window.

**Go:** When you have entered the desired values and checked to be sure they are what you wanted, you must tell the program to go ahead and generate the perspective. To do this, slide the puck up and down in the menu area until the black bar is over the 'Go' option, and then press the yellow button. The file will be drawn on the screen from the coordinates you selected.

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### Interactive Mode, Cont.

**Change Scale:** If you are viewing in plan or elevation, and the scale that you have chosen in the Projection option of the Set Options menu is too large or too small, you may change it by selecting the Change Scale option from the Interactive Menu. This will result in the VU/NET Select Scale Menu being displayed in the Action Menu area. Select the new scale, and then select the RETURN option, which will restore the Interactive Menu.

When the VU program has finished drawing the project, you may change the view just by changing one or more of the coordinates previously entered, changing either the centerpoint or the view-point, and then selecting 'Go' again. The VU program will re-use the prior values for any coordinates you do not change. In this way, you may quickly examine dozens of different views.

When the VU program is drawing the perspective, plan or elevation, it will display the pertinent projection mode, scale, and display coordinates in the Dialogue Window.

**Master Menu:** When you have finished examining the file in the projection mode currently in use, or if you wish to change some of the display parameters or to get a hard copy of a particular view, you must return to the Master Menu. To do this, slide the puck up and down in the Interactive Menu area until the black bar is positioned over the Master Menu option, and then press down the yellow button on the puck. This will return you to the Master Menu so that you can make your next selection.

## VU/NET 3-D Perspective Simulation

### Sequential Mode

To display a sequence of views of a perspective file, you must select the Sequential mode. Note that the Sequential Mode is an inappropriate selection unless you are in perspective mode, because the view from coordinates of the plan and elevation modes are fixed. Selecting sequential when in plan or elevation mode will result in the same drawing being displayed upon the screen over and over, until the center point changes or the sequence ends.

The Sequential Menu has the following four options:

- Filename
- Sequence Name
- Go
- Master Menu

**Filename:** Unless you have previously entered a display file using the Fetch .VIL File or Fetch .SAV File options in the Master Menu, or using the Filename option in the Interactive Menu, you must now tell the VU program which file you wish to look at. To do this, slide the puck up and down in the Sequential Menu area until the black bar is over the menu option 'Filename', and then press down the yellow button on the puck. Type in the filename, and then hit the RETURN key on the keyboard. The program assumes that the file extension is .VIL, so you do not need to enter this.

If the file is not in the correct format, an error message will be printed out in the VU/NET Dialogue Window. The correctly formatted file will be read in, and a list of the names of the elements used to make up the file, if any, will be printed out in the VU/NET Dialogue Window. If there is a problem inside the file, you can tell by seeing where the program stopped reading in the file from this list approximately where to look for the error. When the display file has been read into memory, the program will tell you how many 'points' are in the file. The current maximum number of points for any file is 4,000.

## VU/NET 3-D Perspective Simulation

### Sequential Mode, Cont.

**Sequence Name:** When the file has been read in, you must tell the VU program what the name of the sequence file is. The sequence file contains the instructions for the VU program as to the views you want to see, how many steps to take from one to the next, and how long to hold each perspective drawing on the screen. To enter the sequence name, slide the puck up and down in the Sequential Menu area until the black bar is over the 'Sequence Name' option, and then press down the yellow button on the puck. Type in the sequence filename, and then hit the RETURN key on the keyboard. The VU program assumes that the extension code for the sequence file is .SEQ, and therefore you do not need to type this. The program then reads in the sequence file.

**GO:** When both the display file and the sequence file have been read in to the computer memory, you can tell the VU program to start drawing the sequence of views. To do this, slide the puck up and down in the Sequential Menu area until the black bar is positioned over the Menu option 'GO', and then press down the yellow button on the puck. The file will be drawn on the screen, view after view, until the program reaches the end of the sequence. You cannot interrupt a sequence; you must either wait until the VU program has finished the sequence, or crash the program, re-start it, and then re-enter the display file and sequence file.

When the sequence ends, you may re-start it simply by moving the puck up and down in the Sequential Menu area until the black bar is again over the option 'Go', and then pressing down the yellow button on the puck. You do not need to read in the file or the sequence file again. If, however, you return to the Master Menu and change any of the display options, then you must re-enter the sequence filename. You still do not need to re-enter the display file name.

If you do not wish to view this file again, you may enter another file, by sliding the puck up and down in the Sequential Menu area until the black bar is over the option 'Filename', and then pressing down the yellow button. Type in the new filename, and then hit the RETURN key on the keyboard. If this file is to be viewed from the same sequence file as the previous one, you may now select the 'Go' option from the Sequential Menu. If not, you must select the 'Sequence Name' option, and enter the new sequence filename, and then hit the RETURN key on the keyboard. Then select the 'Go' option and the VU program will start to draw the sequence of views of the new file.



## VU/NET 3-D Perspective Simulation

### Sequential Mode, Cont.

Note that it is not yet possible to generate sequential perspective views of a layered display file. The sequencing portion of the VU program only allows a single display file to be displayed.

Master Menu: If you do not wish to do any further viewing in the Sequential Mode, or you wish to change the way in which the perspective is generated, to add toning or shadows, for instance, you must return to the Master Menu to make another selection. To do this, slide the puck up and down in the Sequential Menu area until the black bar is positioned over the 'Master Menu' option and then press down the yellow button on the puck. This will return you to the Master Menu, where you may either select another option or exit the program.

## VU/NET 3-D Perspective Simulation

### Plot Drawing

The Plot Drawing option allows you to make hard copies of a given perspective view. To select this option, slide the puck up and down in the Master Menu area until the black bar is positioned over the Plot Drawing option, and then press down the yellow button on the puck. This will cause the Plotter Menu to appear in the Action Menu area. The Plotter Menu has the following four options:

- Plot Device
  - File
  - H. I. DMP-42 Plotter
  - Screen (Prism 132)

#### Return

**File:** Selection of the 'File' option will cause a list of plot commands for the H. I. DMP-42 plotter to be stored on the disk. This file may then be plotted later, using the Print command.

**H. I. DMP-42 Plotter:** Selection of the 'Plotter' command will cause a pen plot to be produced immediately on the H. I. DMP-42 plotter. The plotter should be initialized, and loaded with paper and pen before this command is selected. After you have chosen the 'Plotter' command, a series of questions will appear in the Dialogue Window. You may change the scale of the plot, to make it larger or smaller. While the program is sending the plot to the plotter, you will see the hand-like pointer appear on the screen. When the hand reaches the bottom of the screen, the plot will have been completely sent into the memory buffer of the plotter, and you can continue to look at other views, or reset the view parameters.

**Screen (Prism 132):** Selection of the 'Prism' option will cause a screen dump of the drawing currently on the screen to be sent to the Prism printer/plotter. The printer will start to advance, and the hand-like pointer will appear on the screen, to indicate how far the printer has gotten. When the hand reaches the bottom of the screen, the print will be complete, and you can continue to look at other views, or to reset the view parameters.

VU/NET 3-D Perspective Simulation

Exit

To exit from the VU program, simply slide the puck up and down in the Master Menu area until the black bar is positioned over the Exit option, and press down the yellow button on the puck. This will return you to the Shell.

## VU/NET 3-D Perspective Simulation

### VU/NET File Structures

The files for display in the VU/NET program are entered in one of two ways. They may be generated automatically from floor plans developed in the DRAFT program, or they may be coded and typed in using the GRAPH/NET Text Editor. (You should read the Manual describing the Text Editor first, so that you are familiar with its use, which will not be described here.)

There are two types of files for the VU/NET program, display files and sequence files. Each will be described here. Display files created from DRAFT floor plans are formatted exactly like coded display files, to allow for easy edit if needed. See the manual on the DRAFT3D program for conversion of DRAFT floor plans into perspective display files. Once floor plans have been converted into perspective display files, they are identical to coded files, and may be modified and added to as described below.

### Coded Display Files

Display files are made up of a sequence of commands that cause the computer to either draw a line, or a wall, of a given size at a given point.

The first step in coding an object for display in VU/NET is to pick an 'origin', a point that will have the coordinates 0,0,0 and from which all other points will be measured. Any point may be selected but you must remember which point it is.

**IMPORTANT:** If you may wish to draw the shadows of the project, you must set the x, y and z axes so that the positive y axis is to the north, and the positive x axis is to the east. See 'Coding Conventions' below.

The first line of the display file is a 'Begin' command. It tells the program that you are starting a new object, and gives it the name of that object. This line has the format:

```
BEGIN OBJECTNAME
```

The second line of the display file may be the start of either a line segment or a wall. For simplicity's sake, we will deal with line segments first, and then walls. To draw a line segment, you must first give a 'Move' command, followed by a set of x,y,z coordinates. This identifies the starting

## VU/NET 3-D Perspective Simulation

### Display Files, Cont.

point of a line segment. This line has the format:  
MOVE X1,Y1,Z1

Note that x and y are the horizontal plane, while z is the elevation. The program does not care how many spaces are between the word MOVE and the coordinates. Nor does it care if you enter decimal points after the numbers or not.

The 'Draw' command gives the endpoint of the line segment that was begun with the 'Move' command. This line has the format:  
DRAW X2,Y2,Z2

Note that only 1 coordinate needs to be different from that specified in the 'Move' command to draw a line segment. Any two of the three coordinates, x2, y2 and z2 may be the same as x1, y1 and z1. If all three are the same, however, the starting and ending points of the line segment will be the same, and there will be no visible line segment.

To draw a second line segment whose starting point is the endpoint of the last line segment, you do not need to give another 'Move' command. You simply repeat the 'Draw' command, giving the new set of endpoint coordinates. This line has the format:

```
DRAW X3,Y3,Z3
```

You can continue to specify endpoints of line segments as long as the starting point of each is the previous endpoint. When you wish to specify a new starting point, however, you must use the 'Move' command again.

To specify a wall, you also use two commands. The 'Place' command gives the starting point of the wall, which is its lower left corner. This line has the format:

```
PLACE X1,Y1,Z1
```

To finish the wall, you must give its endpoint, which is the upper right corner of the wall. You must also indicate if you want any rotation, either horizontal or vertical, applied to the wall. This line has the format:

```
WALL X2,Y2,Z2,AZ,EL
```

## VU/NET 3-D Perspective Simulation

### Display Files, Cont.

Note that if you do not wish any horizontal or vertical rotation applied to the wall, you may omit the Azimuth and Elevation coordinates completely. You do not need to enter zeros.

**IMPORTANT:** If you wish to tone the perspective, or to view only the facing walls, code the walls in a counter-clockwise direction! Code any courtyards or similar internal spaces in a clockwise direction. See 'Coding Conventions' below.

To specify a second wall which abuts the first, you only need to enter the 'wall' command. The program will assume that the starting point of the second wall is the ending point of the previous wall. This line has the format:

```
WALL X3,Y3,Z3,AZ,EL
```

Of course, if the second wall does not connect to the first, you must specify its starting point, using the 'Place' command. You must also do this if the base of the second wall is lower than the base of the previous wall.

Remember that a four-sided building has four walls, so you will need four 'Wall' commands. The 'Place' command does not actually result in a wall being drawn, so FIVE commands are necessary to draw such a building.

Each display file may include any number of other display files. To nest a display file within another, you simply give the name of the desired display file as if it were a command, and enter the coordinates where its origin should be placed. This line has the format:

```
OBJECTNAME X1,Y1,Z1,AZ,EL
```

If you have included display files within a display file, and any of them have a rotation factor in the azimuth or elevation columns, then you must include azimuth and elevation for all future files nested in this file. Any display files to be nested which should have an azimuth or elevation of 0 should be coded with an azimuth or elevation of 360.

VU/NET 3-D Perspective Simulation

Display Files, Cont.

When you have finished coding all of the line segments, walls, and other objects that are needed to display the object, you must close the file, using the 'End' command. This line has the format:

END

If you do not close the file in this way, the VU program will display an error message in the Dialogue Window when you try to read the display file into memory.

## VU/NET 3-D Perspective Simulation

### Coding Conventions

There are certain conventions and assumptions that must be kept in mind when coding VU display files. First, only walls can be toned and shadowed, so you may want to use the 'wall' command in certain situations where otherwise you would have used the 'draw' command. It is important to keep in mind that even though you may not wish to tone or shadow a display file at the present time, that may be an important capability later on, and one that should not be foreclosed.

Secondly, in order to be toned and shadowed properly, and in order for the VU program to be able to discern which are the 'facing' walls, you must code the walls in the display file moving in a counter-clockwise direction. The reverse is true of courtyards or other similar spaces which are essentially hollows within the outer area of the display file. These must be coded moving in a clockwise direction. This does not mean that you must always do a string of walls one after the other. It does mean, however, that if you have a wall lying along the x axis, for example, you will code it from the lower LEFT corner to the upper RIGHT corner.

Thirdly, in order to cast the shadows correctly, the VU program assumes that North lies along the positive y axis, and East along the positive x axis. This is usually the orientation of a plan on a sheet of paper, but it is a good idea to verify that that is so before spending a lot of time coding the display file.

Remembering these conventions can save a great deal of time and effort later on in the course of a project, when you may wish to re-use a display file for a different purpose.



## VU/NET 3-D Perspective Simulation

### Examples of VU/NET Display Files

The following are some examples of the preceeding commands. It is a good idea to enter them in the computer using the GRAPH/NET Text Editor, to gain facility with both the coding process, and with the Text Editor.

The first object is a square, with no height or elevation at all. Its sides are 10 feet long. It would be coded as follows:

```
BEGIN SQUARE
MOVE 0,0,0
DRAW 10,0,0
DRAW 10,10,0
DRAW 0,10,0
DRAW 0,0,0
END
```

The second object is a building, with two sides 25 feet long, and two sides 50 feet long. The building is 12 feet high. It would be coded as follows:

```
BEGIN BUILDING
PLACE 0,0,0
WALL 25,0,12
WALL 25,50,12
WALL 0,50,12
WALL 0,0,12
END
```

Note that the building has been coded moving in a counter-clockwise direction. This will allow me to view the facing walls only, and to tone them if I wish.

If the walls were not coded in this way, then I would only be able to view them correctly using the 'Draw Every Line' default viewing command.

## VU/NET 3-D Perspective Simulation

### Examples of VU/NET Display Files, Cont.

The third object is the same building, but with a central courtyard inside it.

```
BEGIN BUILDING
PLACE 0,0,0
WALL 25,0,12
WALL 25,50,12
WALL 0,50,12
WALL 0,0,12
PLACE 10,10,0
WALL 10,30,12
WALL 18,30,12
WALL 18,10,12
WALL 10,10,12
END
```

Note that the building has again been coded moving in a counter-clockwise direction, but that the courtyard, which begins at the second 'Place' command, has been coded moving in a clockwise direction. This means that I can view the facing walls of the building and the courtyard, or tone them, correctly.

It is possible to combine elements in a single object in any pattern, such as the following, which alternates them end to end with a five foot interval between them.

```
BEGIN COMBO
SQUARE 0,0,0
BUILDING 15,0,0
SQUARE 45,0,0
BUILDING 60,0,0
SQUARE 90,0,0
BUILDING 105,0,0
END
```

Note that I can combine the elements in any order, moving in any direction, because each element has itself been coded following the appropriate coding conventions.

## VU/NET 3-D Perspective Simulation

### Sequence Files

The second type of file used by the VU/NET program is the Sequence file. This file specifies first the center point for the views, and then key viewpoints, with the number of steps you wish drawn in between viewpoints. There is no specific number of spaces required between the x, y and z coordinates; however, it is recommended that the user leave 3 or 4 for visual clarity. Also please note wherever decimal points are indicated and where they are not.

The first line of this file specifies the centerpoint. It is entered in the following format:

```
CENTER      X1.      Y1.      Z1.
```

Note that it is not possible to take any steps prior to establishing the centerpoint.

The succeeding line of the sequence file is the first view point.

```
EYE         X1.      Y1.      Z1.
```

The next lines of the sequence file are the subsequent key viewpoints, as well as the number of steps to be taken between this and the preceding viewpoint. These lines are entered in the following format:

```
TRACK      nsteps    X2.      Y2.      Z2.  
TRACK      nsteps    X3.      Y3.      Z3.  
TRACK      nsteps    X4.      Y4.      Z4.
```

There is no limit to the number of viewpoints that can be specified. Typically, however, the number of steps for the second line of the file is 1, to establish that this is the first viewpoint. Thereafter, you may specify any number of steps between the first viewpoint and the second, and a different number of steps between the second viewpoint and the third.

## VU/NET 3-D Perspective Simulation

### Sequence Files, Cont.

It is possible to control the length of time that each perspective remains on the screen after it has been drawn using the TIME command. This command may occur anywhere in the sequence file, and it will affect all subsequent commands. The default setting is 3000 mseconds (3 seconds). This command is entered in the following manner:

```
TIME mseconds
```

A similar command is the PAUSE command, which changes the length of time that the current view only will be displayed. This command is entered in the following way:

```
PAUSE mseconds
```

It is also possible to move the viewer while holding the viewer's eye pointed in a constant direction - in other words both the center of vision and the viewpoint are changed in each step. This command is entered in the following format:

```
PAN nsteps X2. Y2. Z2.
```

There is no end command for sequence files. Simply close the file, and store it on disk.

Since the name of the display file is not included in the sequence file in its current form, it is a good idea to make the name of the sequence file identical to the name of the display file. Since the extension code of the display file is .VIL and the extension code of the sequence file is .SEQ, there will not be a problem telling them apart, or overwriting one with the other.