

## **The Digital Universe Help File**

<b>COLLABORATORS</b>
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	<i>TITLE :</i> The Digital Universe Help File		
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## Chapter 1

# The Digital Universe Help File

### 1.1 Main help index

This help file provides the on-line documentation necessary to use "The Digital Universe" successfully, and to fully understand the information it provides. The following categories of help are available:

```
Starting The Digital Universe
Menus
Windows
Keyboard and Mouse Operations
Configuration of the software
Frequently Asked Questions

Utilities

Product Information
Ordering The Digital Universe
```

### 1.2 Menus

Help is available on the following menu items:

```
PROJECT:
About
-----
Environment Prefs
Screenmode Prefs
Display/Object Prefs
Fields of View
Open Control Panel
Time Control
Misc. Objects
-----
Full sky view
Medium sky view
Undo view
Redraw
```

Recalculate

-----  
Quit

PRINT:  
Full Screen  
Full Page

MODE:  
Planetarium  
Local Sky

FIND:  
Sun/Planet/Moon  
Constellation  
Star  
Deep Sky Object  
Misc. Object

EXPORT:  
Screen Snapshot  
Animation  
Reports

QUICKLOOK:  
North  
Northeast  
East  
Southeast  
South  
Southwest  
West  
Northwest

HELP:  
Dictionary  
Objects  
People  
Spacecraft

-----  
Intro. to Astronomy

-----  
Search Hypertext

## 1.3 Menu Shortcuts

Menu shortcuts are keys which may be pressed to access items from the menu without having to use the mouse. All shortcuts consist of pressing and holding the right "Amiga" key (immediately to the right of the spacebar) while pressing the shortcut key. For example, to choose "Environment Prefs" from the menu without using the mouse, press and hold the right "Amiga" key while typing "E".

Menu shortcuts are indicated by a letter or character following a slanted, stylized "A" in the menu entry.

---

## 1.4 MENU:Project:About

Menu Shortcut ?

Choosing this option brings up the About The Digital Universe window thanking the people who had various major roles in the development of the software. In addition, the window contains information on who the software is licensed to, as well as their registration number.

## 1.5 MENU:Project:Environment Prefs

Menu Shortcut E

Choosing this option brings up the Setting Environment Parameters window, allowing you to change various factors about your physical environment; namely where you are on the Earth, the time zone you are in, and related information.

## 1.6 MENU:Project:Screenmode Prefs

Menu Shortcut S

Choosing this option brings up the Setting Screen Mode window which allows you to change the screen resolution, monitor type, number of colors, etc. used by "The Digital Universe".

## 1.7 MENU:Project:Display/Object Prefs

Menu Shortcut D

Choosing this option brings up the Display/Object Preferences window. This window allows you to customize a great variety of options used by "The Digital Universe" in generating a view on the screen (or printer – see Full page or Full screen printing.)

## 1.8 MENU:Project:Fields of View

Menu Shortcut V

Choosing this menu item brings up the Field of View Preferences window. This window allows you to set up to ten preset fields of view (in degrees), as well as a custom display orientation for each field. A simple keystroke will then zoom the display to one of the ten fields.

---

## 1.9 MENU:Project:Open Control Panel

Menu Shortcut C

Choosing this menu item brings up the Control Panel window. This window allows you to pan around the simulated sky of "The Digital Universe", as well as quickly change various display options.

## 1.10 MENU:Project:Time Control

Menu Shortcut T

This option brings up the Time Control window. This window allows you to set the current date and time used in the simulation of the sky, as well as specify the conditions of automatic or manual advancement through time.

## 1.11 MENU:Project:Misc. Objects

Menu Shortcut O

This menu item brings up the Miscellaneous Objects window. This window allows you to specify which comets, asteroids, or Earth-orbiting satellites that "The Digital Universe" should consider.

## 1.12 MENU:Project:Full Sky view

Menu Shortcut F

Picking this option from the menu zooms the display so that an entire hemisphere of the sky can be seen (180 degree field of view). Due to difficulties of displaying a round celestial sphere on a flat monitor, distortion will occur near the edges of the view.

See also: MENU:Project:Medium Sky view

## 1.13 MENU:Project:Medium Sky view

Menu Shortcut M

Picking this menu option zooms the display so that a moderate field of view (70 degrees) is used. This can be useful to re-orient a user without causing severe distortions near the edges of the field.

See also: MENU:Project:Full Sky view.

---

## 1.14 MENU:Project:Undo view

Menu Shortcut U

Choosing this option from the menu will "Undo" the last zoom and/or direction of view. "The Digital Universe" keeps track of your last ten views, and can therefore "undo" the display up to ten times.

## 1.15 MENU:Project:Redraw

Menu Shortcut B

Choosing "Redraw" from the Project menu will redraw the screen. This is useful if you have aborted a draw in progress and then later change your mind.

Note that the Redraw option does only what it says - redraw the screen. If you aborted the generation of a display before the positions of various objects could be calculated, a redraw will not show them (since the computer has not calculated where they would appear). To recalculate their positions and redraw them on the screen, select Recalculate from the Project menu instead.

## 1.16 MENU:Project:Recalculate

Menu Shortcut .

Choosing "Recalculate" from the Project menu will recalculate the positions of objects and then redraw the screen. This is useful if you aborted a calculation in progress and then later change your mind.

Note that the computer first determines where various objects will occur on the screen, and then draws them there. If you interrupted the computer while it was drawing objects on the screen, chances are that their positions had already been calculated. In such a situation, choosing Redraw from the Project menu would be much faster.

## 1.17 MENU:Project:Quit

Menu Shortcut Q

Choosing this option from the Project menu will exit from "The Digital Universe".

## 1.18 MENU:Print:Full Screen

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### Menu Shortcut N

If you pick this option from the "Print" menu, the software will attempt to print the contents of the current screen to your printer. "The Digital Universe" uses the configuration you have set up with your Workbench printer preferences. If you have not configured a printer for use with your Amiga, you must do so. Consult your Workbench documentation for more information.

Print routines used with "The Digital Universe" make maximum use of the resolution of your printer. If you have a good quality printer and choose a density of 7 for your Workbench printer graphics preferences, the output will likely be superior to that on the screen.

"Full Screen" printing means that the contents of the entire screen will be sent to the printer. Since a standard monitor is wider than it is high, but a piece of paper is higher than it is wide, the plot is scaled down so that it can fit horizontally across the paper. As a result, the lower portion of the paper will not be used. Landscape printing is not currently supported with "The Digital Universe".

If you wish to fill an entire sheet of paper, use the Full Page mode.

View the difference between Full Page and Full Screen printing

## 1.19 MENU:Print:Full Page

### Menu Shortcut G

If you pick this option from the "Print" menu, the software will attempt to print the contents of the current screen to your printer. "The Digital Universe" uses the configuration you have set up with your Workbench printer preferences. If you have not configured a printer for use with your Amiga, you must do so. Consult your Workbench documentation for more information.

Print routines used with "The Digital Universe" make maximum use of the resolution of your printer. If you have a good quality printer and choose a density of 7 for your Workbench printer graphics preferences, the output will likely be superior to that on the screen.

"Full Page" printing means that the plot will be scaled to fill the paper. Since a standard monitor is wider than it is high, but a piece of paper is higher than it is wide, the right and left edges of the image on the screen will not be appear on the paper. Landscape printing is not currently supported with "The Digital Universe".

If you would rather print the entire contents of the screen, use the Full Screen mode.

View the difference between Full Page and Full Screen printing

## 1.20 MENU:Mode:Planetarium

---

Menu Shortcut P

If you put the software into "Planetarium" mode, it draws the screen so that celestial north is up. As a result, the horizon may not appear level.

See also Local Sky mode.

## 1.21 MENU:Mode:Local Sky

Menu Shortcut L

If you put the software into "Local Sky" mode, it orients the screen so that it matches the view it would have from your position on the Earth. In this mode, the horizon appears to be level.

See also Planetarium mode.

## 1.22 MENU:Find:Sun/Planet/Moon

Menu Shortcut X

Selecting this option from the "Find" menu brings up the Sun, Planets, and Moons window, allowing you to find the Sun, a planet, or a moon of interest. It is only enabled if you have set the option in the Display/Object Preferences window to draw planets and their moons.

## 1.23 MENU:Find:Constellation

Menu Shortcut Y

Selecting this option brings up the Constellation Selection window, allowing you to find a particular constellation.

## 1.24 MENU:Find:Star

Menu Shortcut Z

Selecting this option brings up the Star Selection window, allowing you to find a particular star of interest. It is only enabled if you have set the option in the Display/Object Preferences window to draw stars.

## 1.25 MENU:Find:Deep Sky Object

---

#### Menu Shortcut K

Selecting this option brings up the Deep Sky Object Selection window, allowing you to find a deep sky object of interest. It is only enabled if you have set the option in the Display/Object Preferences window to draw deep sky objects.

### 1.26 MENU:Find:Misc. Object

#### Menu Shortcut J

This menu option brings up the Miscellaneous Object Selection window, allowing you to find an asteroid, comet, or Earth-orbiting satellite of interest. It is only enabled if you have set the option in the Display/Object Preferences window to draw miscellaneous objects. In addition, the only items which can be found are those which have been selected in the Miscellaneous Objects window.

### 1.27 MENU:Export:Screen Snapshot

#### Menu Shortcut H

The "Screen Snapshot" option allows you to take a "photograph" of the current screen. It brings up a file requester allowing you to specify a directory and filename into which it will save an IFF ILBM picture. By convention, IFF picture files should end in a .iff extension.

IFF ILBM is the standard picture format for the Amiga, which can be viewed by a wide variety of software packages. The utility showanim provided with "The Digital Universe" may also be used to view these pictures.

An icon will be saved with the picture for Workbench users. It will use "showanim" to display the image.

### 1.28 MENU:Export:Animation

#### Menu Shortcut A

Choosing this option from the "Export" menu will bring up the Animation Control window. From this window, you can create an unlimited variety of animation files, saved as an IFF ANIM.

IFF ANIM is the standard animation format for the Amiga. A large selection of third party software packages can play animations in this format. The utility showanim provided with "The Digital Universe" may also be used to view these animations.

### 1.29 MENU:Export:Reports

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Menu Shortcut R

This menu option brings up the Report Generation window, which allows you to output numerical reports to the printer or a file.

### **1.30 MENU:Quicklook:North**

Menu Shortcut 8

Choosing this option will cause the software to generate a view of the sky as it appears to the north of your location. The menu shortcut for this option makes sense if you consider the numerical keypad to represent directions on a compass.

### **1.31 MENU:Quicklook:Northeast**

Menu Shortcut 9

Choosing this option will cause the software to generate a view of the sky as it appears to the northeast of your location. The menu shortcut for this option makes sense if you consider the numerical keypad to represent directions on a compass.

### **1.32 MENU:Quicklook:East**

Menu Shortcut 6

Choosing this option will cause the software to generate a view of the sky as it appears to the east of your location. The menu shortcut for this option makes sense if you consider the numerical keypad to represent directions on a compass.

### **1.33 MENU:Quicklook:Southeast**

Menu Shortcut 3

Choosing this option will cause the software to generate a view of the sky as it appears to the southeast of your location. The menu shortcut for this option makes sense if you consider the numerical keypad to represent directions on a compass.

### **1.34 MENU:Quicklook:South**

#### Menu Shortcut 2

Choosing this option will cause the software to generate a view of the sky as it appears to the south of your location. The menu shortcut for this option makes sense if you consider the numerical keypad to represent directions on a compass.

### 1.35 MENU:Quicklook:Southwest

#### Menu Shortcut 1

Choosing this option will cause the software to generate a view of the sky as it appears to the southwest of your location. The menu shortcut for this option makes sense if you consider the numerical keypad to represent directions on a compass.

### 1.36 MENU:Quicklook:West

#### Menu Shortcut 4

Choosing this option will cause the software to generate a view of the sky as it appears to the west of your location. The menu shortcut for this option makes sense if you consider the numerical keypad to represent directions on a compass.

### 1.37 MENU:Quicklook:Northwest

#### Menu Shortcut 7

Choosing this option will cause the software to generate a view of the sky as it appears to the northwest of your location. The menu shortcut for this option makes sense if you consider the numerical keypad to represent directions on a compass.

### 1.38 MENU:Help:Dictionary

#### Menu Shortcut None

Selecting this menu item will bring up a hypertext dictionary of astronomy and computer-related terms.

[Link to dictionary](#)

---

### 1.39 MENU:Help:Objects

Menu Shortcut None

Selecting this menu item will bring up a hypertext guide to a vast amount of information about various objects in the solar system and elsewhere, organized as a multimedia-based encyclopedia.

Link to object descriptions

### 1.40 MENU:Help:People

Menu Shortcut None

Selecting this menu item will bring up a hypertext guide to a number of prominent individuals in astronomy.

Link directly to information about individuals

### 1.41 MENU:Help:Spacecraft

Menu Shortcut None

This menu item will bring up a hypertext multimedia encyclopedia of all interplanetary spacecraft as well as several Earth-orbiting satellites.

Link to Spacecraft Encyclopedia

### 1.42 MENU:Help:Intro. to Astronomy

Menu Shortcut I

Choosing this item will bring up a hypertext multimedia encyclopedia providing an introduction to astronomy.

Link to Introduction to Astronomy

### 1.43 MENU:Help:Search Hypertext

Menu Shortcut W

Selecting this item from the menu will bring up the Search Hypertext Files window. This window will allow you to search through all the help files looking for a word or phrase.

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## 1.44 Windows

Context-sensitive help is available by simply pressing the HELP key when the mouse pointer is over the window or gadget you wish to have explained. As a result, help for a particular window is not usually obtained by going through this menu, but it is provided for users that make their way here one way or another.

- About The Digital Universe
- Setting Environment Parameters
- Setting Screen Mode
- Display/Object Preferences
- Field of View Preferences
- Control Panel
- Time control
- Miscellaneous Objects
- Sun, Planets, and Moons
- Constellation Selection
- Star Selection
- Deep Sky Object Selection
- Miscellaneous Object Selection
- Animation Control
- Report Generation
- Search Hypertext Files
- Printing Status
- Object Information
- Multiple Objects
- Calculating...
- Miscellaneous Object Orbit Entry

## 1.45 Multiple Objects Window

Normally, when you click the mouse pointer on an object on the screen, a window appears giving detailed information about the object. However, if more than one object is under the pointer, "The Digital Universe" needs to know which object you want more information about.

To find out, it brings up the Multiple Object Selection Window, containing a list of objects sorted by increasing magnitude (brighter objects at the top of the list). For objects with multiple names or designations, such as the brighter stars, only the most commonly used name is displayed. The designation for the object is shown on the left, and its magnitude is on the right.

To choose which object you are interested in, simply click on it. Detailed information will then appear. If you change your mind and would rather not obtain further information about anything, just close the window.

## 1.46 About The Digital Universe Window

This window lists several of the people who have had important roles in the development of "The Digital Universe".

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In addition, this window contains information about who the software is registered to, as well as their registration number. Please use this registration number in any correspondence you may have with us. Our postal address is:

Syzygy Research & Technology Ltd.  
Box 75  
Legal, AB  
T0G 1L0  
CANADA

In addition, you can contact us by sending Internet email to [sales@syz.com](mailto:sales@syz.com) or [support@syz.com](mailto:support@syz.com). You can also visit our World Wide Web (WWW) site with the following URL:

<http://www.syz.com>

## 1.47 Setting Environment Parameters

This window allows you to change various factors about your physical environment, such as your location on the Earth, the time zone you are in, etc.

For more information on a particular gadget, place your mouse pointer over the gadget of interest and press the HELP key.

Note that to make changes in this window take effect, you must press the Save or Use button at the bottom of the window. If you simply close the window, the software will use your old environment configuration.

Further help is available for the following gadgets in this window:

Latitude  
Longitude  
Altitude  
Temperature  
Pressure  
City List  
Current City  
Time Zones  
Current Time Zone  
Time Zone Offset  
Load  
Save  
Use  
Horizon File

## 1.48 Latitude

There are two methods of telling "The Digital Universe" where you are. One is to simply click on a nearby city in the list. The other is to directly enter your position. This box allows you to specify your latitude, if you would rather enter your location manually than click on a city in the list below this

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gadget.

The latitude must be of the format "DD:MM:SSX" where:

DD = degrees  
MM = minutes  
SS = seconds  
X = 'S' or 'N' (South or North)

For an example of acceptable format, click on a city in the list below.

If you prefer, your latitude may also be entered in decimal degrees, followed by 'N' or 'S', as before.

## 1.49 Longitude

There are two methods of telling "The Digital Universe" where you are. One is to simply click on a nearby city in the list below. The other is to directly enter your position. This box allows you to specify your longitude, if you would rather enter your location manually than click on a city in the list below this gadget.

The longitude must be of the format "DDD:MM:SSX" where:

DDD = degrees  
MM = minutes  
SS = seconds  
X = 'E' or 'W' (East or West)

If you prefer, your longitude may also be entered in decimal degrees, followed by 'E' or 'W', as before.

## 1.50 Altitude

Since "The Digital Universe" is capable of generating the appearance of the night sky to a great deal of precision, serious observers will want to take advantage of the fact that the software can make adjustments depending on your altitude above sea level. If you know your altitude, you may enter it in this box.

Your altitude should be entered in a form similar to '1000m' or '1000f' for 1000 metres or 1000 feet above sea level, respectively. If you leave the box empty, the software will assume a default altitude equal to sea level.

## 1.51 Temperature

If "The Digital Universe" is configured to take refraction into account when determining the position of stars and other objects, it needs to know the approximate temperature. This is because colder air bends light more strongly than warm air.

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By entering the current temperature into this box, the software will make the appropriate adjustments. This ability is only of limited use, however, since the true apparent position of an object depends on the temperature and pressure at different atmospheric levels – not just the conditions on the ground.

A valid entry for temperature should be similar to:

20C or 70F or 300K

to represent degrees Celsius, Fahrenheit, or Kelvin, respectively.

In addition, the given temperature should be between -100 to 100 degrees Celsius, -148 to 212 degrees Fahrenheit, or 173 to 373 Kelvin.

## 1.52 Pressure

If "The Digital Universe" is configured to take refraction into account when determining the position of stars and other objects, it needs to know the approximate pressure. This is because high pressure air bends light more strongly than that of low pressure.

By entering the current pressure into this box, the software will make the appropriate adjustments. This ability is only of limited use, however, since the true apparent position of an object depends on the temperature and pressure at different atmospheric levels – not just the conditions on the ground.

A valid entry for pressure should be similar to:

101K or 29.9I

to represent 101 kilopascals (kPa) or 29.9 inches of mercury, respectively.

The given pressure should be between 0 to 200 kPa or 0 to 59 inches of mercury.

## 1.53 Cities and towns

"The Digital Universe" contains a database of the locations of 1230 different cities and towns worldwide. If one of the entries is near where you live, all you have to do is click on it. Then, the latitude, longitude, and altitude (if known) of this location will be entered automatically in the appropriate boxes above.

It should be remembered that cities and towns take up a certain amount of size on the Earth's surface. The coordinates provided by the internal database usually refer to the geographical center of the settlement. If a high degree of accuracy is required, you may need to adjust the location manually to your observing location. "The Digital Universe" is accurate enough that an error of only a few hundred metres (a few arcseconds) in latitude and longitude can make a detectable difference.

There are two 'special' locations in this list. <Other> should be used when

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specifying a location not otherwise in the list. 'Geocentric location' places you at the centre of the Earth. Many tables and almanacs tabulate events as they occur from a geocentric position, so the ability to define your location as such is useful in comparing the calculations of "The Digital Universe" to published values.

## 1.54 Time Zones

The world is divided up into several different time zones. "The Digital Universe" needs to know which time zone you are in so that it can use your own local time in simulating the appearance of the sky. Time zones can be specified by two different methods: by name, and by the number of hours it is kept away from Greenwich Mean Time (also known as Universal Time - UT).

If you see your time zone in the list, a simple click on it will enable the software to calculate the offset from UT. If your time zone is not listed, select <Other> at the top of the list, and then enter the appropriate value into the Offset requester.

Some places in the world make use of something known as "Daylight Savings Time". Regions with this policy usually set clocks an hour ahead in the spring, and an hour behind in the fall. Since the dates at which Daylight Savings Time occurs vary from region to region (based on local custom and politics), "The Digital Universe" is unable to determine on its own when to consider Daylight Savings Time.

This means that twice per year you may have to change your time zone entry. Most zones appear twice in the list - once as a "Standard" time, and once as a "Daylight" time. For example, you may have to change your time zone from "Mountain Standard Time" in the winter to "Mountain Daylight Time" in the summer.

## 1.55 Current Time Zone

This little box indicates which time zone is currently being used by the software.

## 1.56 Current City

This box indicates which city has been selected in the list above.

## 1.57 Time Zone Offset

This indicates the current time zone offset from Universal Time (UT). It is expressed in hours and minutes (in the form +HH:MM or -HH:MM), and is calculated by subtracting the current Universal Time from the current Local Time. As a result, time zones in the western hemisphere are usually expressed

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as negative offsets, while time zones in the eastern hemisphere are positive.

You can only enter a value into this box if you have selected <Other> from the time zone list above.

## 1.58 Load

This button allows you to load a preset environment configuration. If selected, a file requester is brought up allowing you to specify the file from which to load the configuration. As a standard, environment filenames should end with an ".environ" extension. When the program first starts, it attempts to read the default environment from a file named "du.environ".

By allowing multiple configurations in this manner, "The Digital Universe" allows you to preset the environment settings for every observing site you have.

## 1.59 Save

This button allows you to save an environment configuration. If selected, a file requester is brought up allowing you to specify the file in which to save the configuration. Environment filenames should end with an ".environ" extension. If you save the configuration as a file named "du.environ", the settings will be loaded every time the program is started.

By allowing multiple configurations in this manner, "The Digital Universe" allows you to preset the environment settings for every observing site you have.

If you have entered invalid data somewhere on the window, the program will not let you save your configuration. Instead, it will describe what the problem is and give you the chance to fix it.

## 1.60 Use

This button allows you to use the environment settings specified in the window. These settings will only be used for the current session with the software - if you wish to make them permanent, press the Save button instead.

If you have entered invalid data somewhere on the window, the program will not let you use your configuration. Instead, it will describe what the problem is and give you the chance to fix it.

## 1.61 Horizon File

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"The Digital Universe" is capable of drawing more than just a simple line to represent your horizon. Since few of us have truly flat horizons, the software will allow you to specify a special file describing its appearance. By convention, horizon filenames should end in the ".hor" extension.

You may enter the filename (complete with path) into the box provided. If preferred, you can click on the image to the right of the input box to bring up a file requester to choose the file.

Note that a horizon is only drawn if the appropriate option is selected in the Display/Object Preferences window.

A sample horizon file, named "sample.hor", is provided with "The Digital Universe".

For more information, see The Horizon File Format.

## 1.62 The Horizon File Format

If you have instructed the software to draw a horizon, through enabling the appropriate option in the Display/Object Preferences window, it will, by default, draw a straight horizontal line. However, few of us have truly flat horizons. Therefore, "The Digital Universe" will draw a customized horizon if you ask it to. This is done by specifying the "horizon file" from the Setting Environment Parameters window.

A horizon file can be created by any word processor or text editor capable of generating plain ASCII output. It should consist of 360 lines, with a single decimal number on each line. Line number 'n' will contain the altitude of the horizon, in degrees, for the azimuth of (n-1) degrees. In other words, the first line should contain the altitude of your horizon straight north (at an azimuth of 0 degrees). The next line should contain the altitude of your horizon 1 degree to the east of that, and so on for 360 degrees.

Of course, it could get rather tedious obtaining and entering 360 different altitude measurements. The software requires the altitude of the horizon directly north (as the first line), but will interpolate for any other intermediate values if you give them an altitude of 100. Thus, you can create a less detailed horizon file by only specifying the coordinates you want (including the point on the horizon to the north), and entering 100 for every other line.

When creating a horizon file, it may be easiest to modify a copy of "sample.hor", provided as an example with "The Digital Universe".

### Determining Altitude/Azimuth Measurements for your Horizon

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Since not many people have access to a theodolite or professional surveying instrument, a method is described here to obtain rough measurements of the altitude of your horizon at varying degrees of azimuth.

You must first find the point on your horizon due north of your observing location. Northern hemisphere observers can approximate this on a clear night

by finding Polaris, the North Star. If you hang a weight from a string and line it up so it appears to pass over Polaris, it will intersect the horizon at a position within a degree or so of true north.

Since southern hemisphere observers cannot view Polaris, and do not have an equivalent bright "South Star", they must find true north by getting "The Digital Universe" to find the time when any bright star lies directly to the north of their location. This is done by finding a bright star lying north of the celestial equator (having a positive declination), and clicking on it to find its local time of meridian transit. This star can then be used in place of Polaris, but only at the specified time.

Remember where this north point is located, and come back out to your observing site in the day, bringing a protractor, level, and a ruler with you. If you line the protractor so that 0 degrees points directly north and the numbers increase in a clockwise direction, they will indicate azimuth angles. To take an altitude measurement at a particular azimuth, point the level in the proper azimuth direction, and keep it level. Put your eye at one end of the level, and adjust the ruler at the other end until the tip of it appears to line up with the horizon. Read off the distance between the tip of the ruler and the top of the level, then divide this number by the length of the level. If you then use a scientific calculator to determine the arctangent of the result, you are left with the altitude of your horizon.

View diagram of how to measure altitude

## 1.63 Setting Screen Mode Window

This window allows you to change the screen resolution, monitor type, number of colors, etc. used by "The Digital Universe".

For more information on a particular gadget, place your mouse pointer over the gadget of interest and press the HELP key.

Note that to make changes in this window take effect, you must press the Save or Use button at the bottom of the window. If you simply close the window, the software will use your old screenmode configuration.

Help is available for the following gadgets:

- Screen list
- Current screen
- Use topaz font
- Screen size
- # of colors
- Save
- Use

## 1.64 List of Screens

This list shows the different screenmodes which your Amiga is capable of using. You can choose any mode by simply clicking the mouse pointer on it. The Save

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or Use button must then be selected for the changes to take effect.

The first entry in the list is labeled <Default monitor>. If this is selected, "The Digital Universe" will open up an NTSC Hires Interlaced screen if you are using an NTSC monitor, or a PAL Hires Interlaced screen if you are using a PAL monitor.

## 1.65 Current Screen

This box shows the screenmode which you have selected in the list of screens above. Remember that "The Digital Universe" will not use the selected screenmode unless you click on the Save or Use buttons below.

## 1.66 Use Topaz font

If you have selected a non-interlaced screen in the screenmode list and are using a font other than Topaz/8 as your default system font, some of the windows used with "The Digital Universe" may become too large to display. If this happens, the window will simply not appear on the screen when it should.

If you tell the software to use the topaz font, it will override your system default preferences so that all the windows can be displayed.

If you are running a screen with more than 200 lines of vertical resolution, you will probably not need to select this gadget.

## 1.67 Screen Width and Height

You can enter your desired screen width and height into these boxes (in pixels). If you select a screenmode from the list to the left, the default sizes will appear. However, if you wish to use a "virtual" screen larger in size, simply increase the number in this box.

If you choose a screen size larger than that which can be shown on your monitor, you can scroll about simply by moving your mouse to the edges of the display. In this way, the size of the screen you wish "The Digital Universe" to use is limited only by the amount of chip (graphics) memory you have, and not by the capabilities of your monitor.

If you increase the screen dimensions to a size which cannot be supported by the amount of chip memory that you have, the software will reduce the screen until it fits. Note that the size chosen by "The Digital Universe" may not necessarily be the largest screen which can fit with the memory that you have, but will be a bit smaller.

If "The Digital Universe" opens up a screen smaller than that which you know you have been able to use in the past, chances are that your chip memory has become fragmented. Usually, rebooting the computer will solve the problem.

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## 1.68 Number of colors

This slider allows you to change the number of colors used by "The Digital Universe". The software currently only uses screens of 8 or 16 colors.

If 8 colors are chosen, everything appears on the screen as varying shades of gray. If 16 colors are chosen, color is used for the purposes of labeling, drawing grid lines, etc. However, 33% more chip memory is required.

## 1.69 Save

If you press this button, the preferences you have set for your screenmode are saved to the configuration file used by the software when it is started. In this way, your changes are made permanent, and it will use these preferences every time you use "The Digital Universe" in the future.

If you wish to use your preferences for the current session only, click on the Use button instead.

## 1.70 Use

The "Use" button tells "The Digital Universe" to use the preferences for screenmode and number of colors that you have set up. These preferences are only active for your current session - the next time you use the software, it will use its old settings.

If you wish to save the settings for future use, press the Save button instead. Then, your settings will be in effect every time the software is loaded.

## 1.71 Display/Object Preferences Window

This window allows you to customize a great variety of options used by "The Digital Universe" in generating a view on the screen (or printer - see Full page or Full screen printing.)

For more information on a particular gadget, place your mouse pointer over the gadget of interest and press the HELP key.

Note that to make changes in this window take effect, you must press the Save or Use button at the bottom of the window. If you simply close the window, the software will use your old display configuration.

Help is available for the following gadgets:

Calculation & Display

=====

Display

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Ra/dec grid

---

Horizon  
Fast Labels  
Fast info  
Show Time  
Flip Horizontal  
Flip Vertical  
Star trails  
Show FOV  
Show Titlebar  
Earth's Shadow

Precision  
-----  
Precession  
Proper Motion  
Nutation  
Aberration  
Refraction

Objects  
-----  
Stars  
Sun/Planet/Moon  
Deep Sky  
Misc. Object

Palette  
-----  
Use night palette  
Simulate Twilight

#### Object Preferences

=====

Stars  
-----  
Bayer Designation  
Flamsteed number  
Star names

Deep Sky  
-----  
NGC/IC #  
Messier #  
Names

Sun, Planets & Moons  
-----  
Show Phase  
Features & Flattening  
Show Grid  
Object Names

Miscellaneous Objects  
-----  
Misc. Object Names

Constellations

---

```
-----  
Boundaries  
Figures  
Names  
  
Limiting Magnitudes  
=====
```

Stars/Planets
Deep Sky
Misc. Object

```
  
Save  
Use
```

## 1.72 RA/Dec grid

Selecting this option causes the software to draw the grid lines of right ascension and declination on the screen.

## 1.73 Horizon

If this option is selected, "The Digital Universe" will draw the horizon on the screen. If no horizon file has been chosen in the Setting Environment Parameters window, just a simple line will be drawn, representing an ideal, flat horizon. On the other hand, if a horizon file has been selected, a representation of the user's horizon will be generated as well.

Note that the horizon will only appear level if the software is in Local Mode.

## 1.74 Fast Labels

When "The Digital Universe" labels stars, planets, or other objects, it can do so by one of two methods:

1. The label is just placed to the right of the object.
2. The label's position is adjusted so as to minimize overlap with nearby labels and objects.

The "Fast Labels" gadget allows you to choose which method to use. If it is selected, labels are placed to the right of the object. This is much faster than the second method, though the results do not look as good.

## 1.75 Fast Info

If you click the mouse pointer on an object on the screen, a window is displayed containing information about it. For objects which move with respect to the background stars (such as planets), information such as rise and set times is difficult to determine and may take some time to calculate. If this gadget is selected, these calculations will not be performed, speeding up the process of obtaining information about an object. In such a case, the affected information will be marked "Unavailable".

## 1.76 Show Time

If this option is selected, the time used by the software in performing its calculations is displayed in the upper left hand corner of the screen (or paper, if a printed copy is made). Two times are displayed: LT (Local Time) and DT (Dynamical Time).

## 1.77 Flip Horizontal and/or Vertical

If you have a telescope, the apparent view through it may be flipped in the horizontal and/or vertical axes. These buttons allow you to specify whether you want "The Digital Universe" to produce such an inverted image to match that seen through your telescope.

## 1.78 Star trails

Normally, when the software steps through time (either automatically, manually, or when generating an animation), it erases the screen before redrawing the new image. If this option is selected, however, the screen will not be erased. This allows you to generate views showing how objects move across the sky, which appear similar to "star trail" photographs made by leaving a camera's shutter open for long periods of time.

## 1.79 Show FOV

The "field of view" indicates how much of the sky you can see at once. It can be thought of as a circular region with a particular angular diameter. With smaller fields of view, objects appear larger on the screen, but fewer objects can be seen at once.

Since a "field of view" is really a circular region, but computer monitors are rectangular in shape, "The Digital Universe" adjusts the display so that the field will just fit vertically on the monitor.

If you choose the "Show FOV" option, a circle will be drawn indicating the true field of view on the display.

## 1.80 Show Titlebar

Most Amiga programs have a title bar at the top of their screen. However, users of "The Digital Universe" may find its title bar distracting when viewing dim stars. Thus, the user is provided with the option of disabling the title bar, if desired.

Note that if the title bar is disabled, the user will be unable to use the regular screen rearrangement gadgets normally appearing within it.

## 1.81 Earth's Shadow

The Sun casts a shadow of the Earth into space. Objects near to the Earth (such as Earth-orbiting satellites and the Moon) may periodically move into this shadow and drastically darken in appearance.

When the Moon moves into the Earth's shadow, a lunar eclipse occurs. If this gadget is selected, "The Digital Universe" draws a representation of the Earth's shadow as it appears at the distance of the Moon. The outer circle drawn shows the region of the penumbral shadow, while the inner circle indicates the region of the umbra.

By telling the software to draw the Earth's shadow, the circumstances of lunar eclipses can be readily determined.

## 1.82 Stars

If this option is selected, stars will be drawn on the screen when the software is generating a view of the sky. For normal use this should be left on. However, if turned off, the display is updated much more quickly. The difference is especially noticeable when generating a view of the sky for the far past or future. For example, if you are generating an animation of the appearance of Saturn and its rings, you will likely be zoomed in so closely to the planet that you wouldn't see the stars anyway. Turning them off would allow the animation to proceed much more quickly.

## 1.83 Sun/Planet/Moon

This gadget allows you to specify whether or not you want "The Digital Universe" to calculate the positions of the Sun, planets, and their moons. Though it should be left on for an accurate representation of the night sky, there are many cases where an individual merely wishes to study the stars. On machines without a math coprocessor (FPU), updates to the display are much faster if the software doesn't have to calculate the position of these objects.

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## 1.84 Deep Sky Objects

If this option is selected, the software will determine and plot the position of deep sky objects from the Messier, NGC, and IC databases. Since doing so can slow the display, the user is provided with the ability to turn the feature on or off.

## 1.85 Miscellaneous Objects

If this option is selected, "The Digital Universe" will calculate and plot the positions of any miscellaneous objects (comets, asteroids, Earth-orbiting satellites, etc.) which you have selected in the Miscellaneous Objects window.

## 1.86 Precession

Choosing this option allows the software to calculate the effects of precession when determining the appearance of the sky. It slows down calculations significantly, so should only be chosen when you want high accuracy, or are simulating the sky for dates in the far future or past.

If selected, celestial objects are precessed to the epoch defined in the Time Control window.

## 1.87 Proper Motion

If this option is selected, the software will consider proper motion of the stars in determining their positions. Since proper motion calculations slow the software down somewhat, and it is only a significant effect over time periods of thousands of years, it can often be disabled.

If this option is selected, the effect of proper motion is applied to adjust the star's position to where it would be at the epoch defined in the Time Control window.

## 1.88 Nutation

If this option is selected, the software will consider the effects of nutation. Nutation is typically a small effect, noticeable only when zoomed in to a small region of the sky. Therefore, unless high accuracy is desired, it can often be left disabled to speed calculations.

## 1.89 Aberration

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If this gadget is selected, the effects of aberration will be considered in generating a simulated view of the sky. Aberration is only noticeable when zoomed in to a particularly small region of sky, and can therefore often be left disabled, speeding calculations.

## 1.90 Refraction

Refraction will be considered when generating views of the sky if this option is selected. If you are interested only in the relative positions of nearby objects, you can speed up calculations by leaving this gadget unselected. This is because refraction affects objects in the same part of the sky by the same amounts.

However, if you are interested in the apparent position of objects near the horizon, refraction can affect their position by a half a degree or so, so it may be significant.

If refraction is turned on, and you zoom in to the Sun or Moon as they rise or set, you will be able to see how refraction makes their appearance seem "squashed" when near the horizon.

Refraction calculations use the current temperature and air pressure as set in the Setting Environment Parameters window to provide a reasonably accurate estimate of the effect.

## 1.91 Use Night Palette

When you look at the night sky, it takes a half hour or more for your eyes to get as sensitive to light as they are capable of becoming. This "dark adaptation" is necessary for seeing the fainter objects in the sky.

However, a light source is sometimes needed to be able to look at star charts, equipment, etc. in the dark. A bright white light from a flashlight ruins your dark adaptation, and some time is required before your eyes get used to the dark once again.

Scientists have discovered that red light does not affect our eye's sensitivity nearly as much as white light. Therefore, astronomers often use flashlights with a red filter over the front of them to preserve their dark adaptation.

Computer monitors are notoriously bad for affecting night vision. With this in mind, "The Digital Universe" provides a special night palette for those observers who may be using their computer near the telescope. When selected, this gadget uses a special black and red palette instead of the standard one.

## 1.92 Simulate Twilight

Normally, the software shows the stars even if the Sun is in the sky. This allows users to study celestial objects and events without having to worry

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about the constraint of the Sun being below the horizon. This is quite useful, if a bit unrealistic.

If this gadget is selected and the Sun is currently in the sky, the background changes from black to blue, with only the brightest objects remaining visible. After sunset, the background slowly changes from blue to black, simulating the effect of twilight. Throughout the night, the sky remains black, slowly fading to blue again before dawn.

This gadget can only be selected if the software is set up to calculate the position of planets and their moons by enabling the Sun/Planet/Moon option. If it is not, the position of the Sun is unknown and twilight cannot be simulated.

## 1.93 Constellation Boundaries

Constellations have been defined in the heavens for thousands of years. But these constellations have only consisted of a few stars linked together into shapes.

In 1930, E. Delaporte realized that it would be useful to define particular constellations on the basis of the regions in the sky which they occupy, instead of just a few stars making up the figure. He published a list of proposed constellation boundaries in a work entitled "Délimitation Scientifique des Constellations", which soon became accepted by the astronomical community.

Selecting this gadget displays the constellation boundaries as outlined by Delaporte. His boundaries fall directly on lines of constant right ascension and declination when 1875 coordinates are used (the standard at the time of his publication). Since then, however, precession has caused the boundaries to shift slightly, so they do not always seem to line up perfectly.

## 1.94 Constellation Figures

Selecting this option causes the software to connect the stars into various constellation figures.

As of version 1.01 of "The Digital Universe", constellation figures will follow the stars in proper motion calculations. As a result, it may take a short time to draw constellation figures if proper motion is selected in the Display/Object Prefs window.

## 1.95 Constellation Names

If this option is selected, constellation names will appear on the screen.

An interesting detail can be seen with the constellation of "Serpens" (the serpent). Since it is considered to be held by "Ophiuchus" (the serpent holder), the two constellations actually overlap one another. This caused some problems when trying to divide the sky into regions, delineated by constellation boundaries.

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As a result, some astronomers subdivide Serpens into two smaller constellations – "Serpens Caput" (the serpent's head) and "Serpens Cauda" (the serpent's tail). The region of Serpens directly overlapping Ophiuchus is considered to be part of the latter constellation.

## **1.96 NGC/IC #**

If this option is selected, "The Digital Universe" will label any deep sky object with its NGC or IC numbers. It can only be selected if the software is configured to display deep sky objects.

## **1.97 Messier #**

If this gadget is selected, the software will label any Messier objects which may appear on the screen. It can only be selected if the software is configured to display deep sky objects.

## **1.98 Names**

If this option is selected, the software will label deep sky objects with their proper names, if any. It can only be selected if the software is configured to display deep sky objects.

## **1.99 Bayer designation**

If this gadget is selected, stars will be labelled with their Bayer designation, if they have one. It can only be selected if the software is configured to display stars.

## **1.100 Flamsteed number**

If this option is selected, stars will be labelled with their Flamsteed number, if they have one. It may only be selected if the software is configured to display stars.

## **1.101 Star Names**

If this gadget is selected, stars will be labelled with their proper names, if they have any. It can only be selected if the software is configured to display stars.

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## 1.102 Show Phase

The Moon is famous for going through its cycle of phases. However, all planets in our solar system also exhibit phases when viewed through a telescope. Mercury and Venus, lying closer to the Sun than the Earth, can be seen to go through a complete cycle of phases, just like the Moon. The other planets, lying further than the Earth, do not appear to go through the complete cycle, but the percentage of their illuminated surface visible from the Earth does change over time.

If this gadget is selected, "The Digital Universe" will display solar system objects with their proper phase, if the user has zoomed in sufficiently to be able to see details on the surface of the object. However, since drawing an object with the proper phase requires more time than drawing a simple disk, the software allows the user to shut off these phase calculations if desired.

The option can only be selected if the software is configured to display solar system objects.

## 1.103 Features & Flattening

This gadget enables or disables two related options of a solar system object's appearance. As with most options, enabling the gadget creates a more realistic view of the object, at the expense of taking longer to generate.

The option can only be selected if the software is configured to display solar system objects.

### Features

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"The Digital Universe" contains maps of the surfaces of Venus, the Moon, Mars, Jupiter, and Saturn. If the gadget is selected and the user is zoomed in sufficiently close to one of these bodies, the software will use these maps to generate the current appearance of the celestial body.

Only the maps of the Moon and Mars are of any real practical use. Venus' surface is permanently covered in clouds, hiding its details from astronomers. The map used by "The Digital Universe" is based on radar data from the Magellan space probe, and shows how Venus would appear if it were stripped of its cloud cover.

Jupiter and Saturn are gas giant planets, with no solid surface. Different parts of the planet rotate at different rates (known as differential rotation). As a result, predicting the current appearance of either of these objects is akin to predicting the weather on Earth over a long period of time. The maps used by the software for these objects simply indicate how the planets would appear if they had not changed in appearance since the Voyager 2 encounter.

### Flattening

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Most planets and moons in the solar system are wider at the equator than at the poles, due to their rotation about their axis. This effect, known as polar flattening, is especially evident with the "gas giant" planets (particularly Saturn). If the option is enabled, "The Digital Universe" will also take polar

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flattening into account in generating the appearance of an object.

### **1.104 Show Grid**

If this option is selected, "The Digital Universe" will draw the longitude/latitude grid on a solar system object. The software uses sophisticated algorithms and formulae to determine the orientation of the object, so the grid can be used to accurately determine the location of the poles and equator.

The option can only be selected if the software is configured to display planets and their moons.

### **1.105 Sun/Planet/Moon Names**

If this option is selected, the software will display names next to planets and their moons. It can only be selected if the software is configured to determine and display the position of these objects.

### **1.106 Misc. Object Names**

If this gadget is selected, the software will display names next to any miscellaneous objects (comets, asteroids, or Earth-orbiting satellites) that it is plotting on the screen. It can only be selected if the software is configured to determine and display the positions of these objects.

### **1.107 Limiting Magnitude of Stars/Planets @ 20 degree field**

Since "The Digital Universe" contains information on approximately 300,000 objects, it would be both time consuming and confusing if it placed all of the objects on the screen at once. To solve this problem, it uses the concept of limiting magnitude.

If the field of view is 20 degrees and you drag this slider gadget to a particular number, the software will only display objects brighter than that magnitude. If you zoom in to a smaller region of sky, the software automatically compensates to show fainter objects. Likewise, if you view a larger region of sky, only brighter objects will be shown.

By adjusting this bar, you can experiment with different apparent densities of stars on the screen.

This bar only adjusts the limiting magnitude for stars, planets, and their moons.

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## 1.108 Limiting Magnitude of Deep Sky Objects @ 20 degree field

Since "The Digital Universe" contains information on approximately 300,000 objects, it would be both time consuming and confusing if it placed all of the objects on the screen at once. To solve the problem, it uses the concept of limiting magnitude.

If the field of view is 20 degrees and you drag this slider gadget to a particular number, the software will only display deep sky objects brighter than that magnitude. If you zoom in to a smaller region of sky, the software automatically compensates to show fainter objects. Likewise, if you view a larger region of sky, only brighter objects will be shown.

By adjusting this bar, you can experiment with different apparent densities of deep sky objects on the screen.

The ability to adjust the limiting magnitude for stars and deep sky objects separately is necessary, since most deep sky objects are quite faint. However, since they are often more interesting than individual stars, the user may want to make them more prominent on the screen by making them appear brighter with this slider.

## 1.109 Limiting Magnitude of Miscellaneous Objects @ 20 degree field

Since "The Digital Universe" contains information on approximately 300,000 objects, it would be both time consuming and confusing if it placed all of the objects on the screen at once. To solve the problem, it uses the concept of limiting magnitude.

If the field of view is 20 degrees and you drag this slider gadget to a particular number, the software will only display miscellaneous objects (comets, asteroids, and Earth-orbiting satellites) brighter than that magnitude. If you zoom in to a smaller region of sky, the software automatically compensates to show fainter objects. Likewise, if you view a larger region of sky, only brighter objects will be shown.

The ability to adjust the limiting magnitude for stars and miscellaneous objects separately is necessary, since most comets and asteroids are quite faint. However, since they are often more interesting than individual stars, the user may want to make them more prominent on the screen by making them appear brighter with this slider.

## 1.110 Save Display Preferences

If this button is pressed, the options set in the Display/Object Preferences window are used, and saved to disk. The next time you start a session with "The Digital Universe", your preferences will be loaded.

If you merely wish to use your settings for the current session, click on the Use button instead.

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## 1.111 Use Display Preferences

If this button is pressed, the options set in the Display/Object Preferences window are used. However, if you quit the program and start it up again, it will use the settings last saved to disk (and not necessarily the settings you chose the last time you used the software).

If you wish to make your settings permanent, you should save them to disk by clicking on the Save button instead.

## 1.112 Field of View Preferences Window

This window allows you to preset up to 20 different fields of view. The software can then be made to instantly adjust its display to a given field of view (and orientation) with a single keypress.

Simply type the desired field of view in the appropriate box. This is the angular distance (in degrees) across the field. You can also specify if the field should be flipped in the horizontal or vertical dimensions. In this way, you can customize the field of view presets to allow you to see how a particular region of the sky would appear through binoculars or your telescope with different eyepieces.

Note that to make changes in this window take effect, you must press the Save or Use button at the bottom of the window. If you simply close the window, the software will use your old display configuration.

When your fields of view are set up, you can tell the software to instantly adjust the magnification to any of the twenty fields. Simply ensure that the background window (the window upon which the simulation of the night sky is generated) is selected. Then, for a field between 0 and 9, press the number key corresponding to the desired field, using the keys on the main portion of the keyboard (NOT the numeric keypad). For a field between 10 and 19, hold down the SHIFT key while pressing a number from 0 to 9.

If you wish to see the field of view circle drawn in the display, select the option labelled "Show FOV" in the Display/Object Preferences window.

### Determining the Field of View in Telescopes or Binoculars

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There are two methods of determining the field of view of an optical system - either by the manufacturer's specifications, or by experiment.

### Specifications

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Sometimes binocular manufacturers specify their equipment's field of view directly, measured in degrees. If this is the case, you merely need to enter this value into the software. Other manufacturers specify the field of view in terms of 'x' feet (or yards, metres, etc.) at a certain distance 'y'. To determine the field of view in degrees, make sure that 'x' and 'y' are specified in the same units (if not, convert so that they are). If you then divide 'x' by 'y' and take the arctangent of the result (using a scientific calculator), you will be left with the field of view in degrees.

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Telescope manufacturers are unable to provide field of view specifications with their equipment, since it depends on the particular eyepiece being used. If the field of view for an eyepiece is available, it can be used in determining the effective field of view for the telescope.

First, the magnification needs to be calculated. For this, you need the focal length 'a' of the objective lens or mirror (the larger lens or mirror in your telescope) as well as the focal length 'b' of your eyepiece. These parameters are usually readily available. The magnification of the system is then given by  $a/b$ , provided that 'a' and 'b' are both specified in the same units. Call this result 'c'.

Now, divide the field of view of the eyepiece by 'c'. The result is the effective field of view of the telescope, with that particular eyepiece. The number can be entered directly into the boxes in this window. If your telescope inverts its image in either the horizontal or vertical dimensions, consider setting the appropriate "Flip Horiz." or "Flip Vert." boxes to the right.

You should repeat the calculation for each eyepiece you use with your telescope. Then, the software will be able to generate the true appearance of the sky through each of your eyepieces.

#### Experiment

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If you are unable to obtain one or more of the parameters necessary to calculate the field of view directly, it can be determined by experiment. Use "The Digital Universe" to find a bright star near the celestial equator. The stars in Orion's belt work good for this, if they are visible. Then, take your equipment outside, find the star, and center it in your view. If your telescope has a motor allowing it to track the stars across the sky, turn the motor off. Time how long it takes for the star to drift out of the field, expressed in seconds. Divide this number by 120, and you are left with the diameter of the field of view in degrees, which may be directly entered into the software.

As before, if your telescope inverts its image in either the horizontal or vertical dimensions, consider setting the appropriate "Flip Horiz." or "Flip Vert." boxes to the right.

## 1.113 Save

If you press this button, your field of view preferences will become active, and will be saved to disk. The next time you start the software, they will automatically be loaded for you.

If you merely wish to use the settings for the current session, click on the Use button instead.

## 1.114 Use

The "Use" button allows you to use the field of view preferences for the current session only. If you quit the program and then restart it, the

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settings will be lost.

If you wish to keep your settings for future sessions, click on the Save button instead.

## 1.115 Control Panel Window

This window provides buttons and gadgets to quickly perform common functions. The buttons on the left control the orientation and field of view of the display, while the ones on the right provide shortcuts to settings in the Display/Object Preferences window.

Unlike other windows, there is no "Use" button to make your changes take effect - instead, they are acted upon immediately. If you are interested in changing only one parameter, this is faster. However, if you have several parameters to change it may be quicker to use the Display/Object Preferences window to adjust them all at once before getting the computer to recalculate the display. In addition, you must use the Display/Object Preferences window if you would like your changes saved to disk.

Additional help is available for the following gadgets and buttons:

- Arrows
- Zoom in
- Zoom out
- Field
- Right Ascension
- Declination
- 
- Display Stars
- Bayer Designation
- Flamsteed Designation
- Star Names
- Constellation Figures
- Constellation Boundaries
- Constellation Names
- RA/Dec Grid
- Horizon
- Deep Sky Objects
- NGC Number
- Messier Number
- Deep Sky Name
- Miscellaneous Objects
- Misc. Object Name
- Earth's Shadow
- Flip Horizontal
- Flip Vertical
- Sun/Planet/Moon
- Phase
- Features
- Planetary Grid
- Sun/Planet/Moon Names
- Star Trails
- Field of View

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Display Time

## 1.116 Arrows

The arrow buttons in the Control Panel allow the user to pan the display around the sky. In general, clicking on one of these buttons moves the center of your field of view in the direction of the arrow.

Specifically, the function of these arrows depends on whether you are in Planetarium or Local Sky mode. If you are in Planetarium mode, the arrows move your view in the directions of the compass (north, south, east, west, etc.). In Local Sky Mode, they move your field of view left, right, up or down.

## 1.117 Zoom Out

Selecting this button enlarges the field of view by a factor of 1.5.

## 1.118 Zoom In

This button reduces the field of view by a factor of 1.5.

## 1.119 Field

This requester allows you to enter the diameter of the field of view directly. It may be specified in one of two ways - by decimal degrees (such as 42.5) or in degrees, minutes, and seconds separated by colons (such as 45:32:25).

After typing the desired field of view, press the ENTER key. The display will be adjusted to the exact field that you specified.

## 1.120 Right Ascension

The Right Ascension of the center of your field of view may be entered into this requester. It may be specified in one of two ways - by decimal hours (such as 12.4) or in hours, minutes, and seconds separated by colons (such as 10:24:35).

After typing the new right ascension, press the ENTER key. The display will immediately be adjusted so that the center of the field is defined by the contents of the right ascension and declination requesters in the Control Panel window.

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## 1.121 Declination

The Declination of the center of your field of view may be entered into this requester. It may be specified in one of two ways – by decimal degrees (such as -45.3) or in degrees, minutes, and seconds separated by colons (such as 56:23:54).

After typing the new declination, press the ENTER key. The display will be immediately adjusted so that the center of the field is defined by the contents of the right ascension and declination requesters in the Control Panel window.

## 1.122 Stars

This button is provided as a shortcut to the Stars gadget in the Display/Object Preferences window.

## 1.123 Bayer designation

This button is provided as a shortcut to the Bayer designation gadget in the Display/Object Preferences window.

## 1.124 Flamsteed designation

This button is provided as a shortcut to the Flamsteed designation gadget in the Display/Object Preferences window.

## 1.125 Star Names

This button is provided as a shortcut to the Star Names gadget in the Display/Object Preferences window.

## 1.126 Constellation Figures

This button is provided as a shortcut to the Constellation Figures gadget in the Display/Object Preferences window.

## 1.127 Constellation Boundaries

This button is provided as a shortcut to the Constellation Boundaries gadget in the Display/Object Preferences window.

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### **1.128 Constellation Names**

This button is provided as a shortcut to the Constellation Names gadget in the Display/Object Preferences window.

### **1.129 RA/Dec Grid**

This button is provided as a shortcut to the RA/Dec Grid gadget in the Display/Object Preferences window.

### **1.130 Horizon**

This button is provided as a shortcut to the Horizon gadget in the Display/Object Preferences window.

### **1.131 Deep Sky Objects**

This button is provided as a shortcut to the Deep Sky Objects gadget in the Display/Object Preferences window.

### **1.132 NGC/IC #**

This button is provided as a shortcut to the NGC/IC # gadget in the Display/Object Preferences window.

### **1.133 Messier #**

This button is provided as a shortcut to the Messier # gadget in the Display/Object Preferences window.

### **1.134 Deep Sky Names**

This button is provided as a shortcut to the Deep Sky Names gadget in the Display/Object Preferences window.

### **1.135 Miscellaneous Objects**

This button is provided as a shortcut to the Miscellaneous Objects gadget in the Display/Object Preferences window.

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### **1.136 Misc. Object Names**

This button is provided as a shortcut to the Misc. Object Names gadget in the Display/Object Preferences window.

### **1.137 Earth's Shadow**

This button is provided as a shortcut to the Earth's Shadow gadget in the Display/Object Preferences window.

### **1.138 Flip Horizontal**

This button is provided as a shortcut to the Flip Horizontal gadget in the Display/Object Preferences window.

### **1.139 Flip Vertical**

This button is provided as a shortcut to the Flip Vertical gadget in the Display/Object Preferences window.

### **1.140 Sun/Planet/Moon**

This button is provided as a shortcut to the Sun/Planet/Moon gadget in the Display/Object Preferences window.

### **1.141 Show Phase**

This button is provided as a shortcut to the Show Phase gadget in the Display/Object Preferences window.

### **1.142 Features & Flattening**

This button is provided as a shortcut to the Features & Flattening gadget in the Display/Object Preferences window.

### **1.143 Show Grid**

This button is provided as a shortcut to the Show Grid gadget in the Display/Object Preferences window.

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### 1.144 Sun/Planet/Moon Names

This button is provided as a shortcut to the Sun/Planet/Moon Names gadget in the Display/Object Preferences window.

### 1.145 Star Trails

This button is provided as a shortcut to the Star Trails gadget in the Display/Object Preferences window.

### 1.146 Show FOV

This button is provided as a shortcut to the Show FOV gadget in the Display/Object Preferences window.

### 1.147 Show Time

This button is provided as a shortcut to the Show Time gadget in the Display/Object Preferences window.

### 1.148 Time Control Window

This window contains the controls necessary to set the current time and time advancement criteria used by the software.

Help is available for the following gadgets:

Set Time

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Local Mean Time  
Universal Mean Time  
Dynamical Time  
Local Sidereal Time  
Universal Sidereal Time  
Delta T  
Estimate  
Current/Other Time  
Epoch

Time Advancement

=====

Advance  
Advance Units  
Every  
Every Units  
Automatic/Manual Advance  
Lock onto

---

Object list

Use

## 1.149 Local Mean Time

In these two boxes you can enter your local time - the civil time kept by clocks in your time zone. You can enter the time in "conventional" format (yyyy/mm/dd hh:mm:ss.s) in the left hand box or as a Julian Date in the right hand box.

After entering the time, press ENTER. The time you entered will then be converted to all of the other standards displayed in the window and they will be updated. You must press the Use button at the bottom of the window for your changes to take effect.

See also: Description of Local and Universal Time  
Entering Dates B.C., Leap Years

## 1.150 Universal Mean Time

In these two boxes you can enter the Universal Mean Time - the civil time kept by clocks in Greenwich, England. You can enter the time in "conventional" format (yyyy/mm/dd hh:mm:ss.s) in the left hand box or as a Julian Date in the right hand box.

After entering the time, press ENTER. The time you entered will then be converted to all of the other standards displayed in the window and they will be updated. You must press the Use button at the bottom of the window for your changes to take effect.

See also: Description of Local and Universal Time  
Entering Dates B.C., Leap Years

## 1.151 Dynamical Time

In these two boxes you can enter the current Dynamical Time. Dynamical Time is that used by professional astronomers, closely related to time as kept by atomic clocks. Due to irregularities in the Earth's rotation, the difference between Dynamical Time and Greenwich Mean Time varies irregularly. The difference (in seconds) is specified in the Delta T requester.

You can enter the time in "conventional" format (yyyy/mm/dd hh:mm:ss.s) in the left hand box, or as a Julian Date in the right hand box.

After entering the time, press ENTER. The time you entered will then be converted to all of the other standards displayed in the window and they will be updated. You must press the Use button at the bottom of the window for your changes to take effect.

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See also: Description of Dynamical Time  
Entering Dates B.C., Leap Years

## 1.152 Local Sidereal Time

Your Local Sidereal Time can be entered in these two boxes. It can be input in "conventional" format (yyyy/mm/dd hh:mm:ss.s) in the left hand box, or as a Julian Date in the right hand box.

After entering the time, press ENTER. The time you entered will then be converted to all of the other standards displayed in the window and they will be updated. You must press the Use button at the bottom of the window for your changes to take effect.

See also: Description of Sidereal Time  
Entering Dates B.C.

## 1.153 Universal Sidereal Time

The current Universal Sidereal Time can be entered in these two boxes. It can be input in "conventional" format (yyyy/mm/dd hh:mm:ss.s) in the left hand box, or as a Julian Date in the right hand box.

After entering the time, press ENTER. The time you entered will then be converted to all of the other standards displayed in the window and they will be updated. You must press the Use button at the bottom of the window for your changes to take effect.

See also: Description of Sidereal Time  
Entering Dates B.C.

## 1.154 Entering Dates B.C.

Since the definition of our current calendar was introduced in stages, there are several inconsistencies. For example, in 1582 it was found that the calendar in use was no longer synchronized with the seasons, so ten days were dropped in an effort to restore things to normal (see the definition of a leap year for more information).

Another inconsistency arises from the fact that there was no year 0. 1 B.C. was immediately followed by 1 A.D. In order to account for this fact, "The Digital Universe" specifies years (and expects you to specify them) in the following manner:

Year	Specification
----	-----
2 A.D.	2
1 A.D.	1
1 B.C.	0

2 B.C.            -1  
3 B.C.            -2  
etc.

Thus, a moment like 2:00 pm on August 2, 5 B.C. would be specified like:

-4/8/2 14:00:00

## 1.155 Delta T

Since the Earth is gradually (and erratically) slowing down in its rotation, Universal Time (based on the rotation of the Earth) and Dynamical Time (related to atomic time, and representing a uniform timescale) differ in an unpredictable manner. You can specify a value (in seconds) for the difference between dynamical and universal time in this box.

Since all calculations are done using dynamical time, and civil timekeeping is based on universal time, results are only as accurate as the specification for Delta T.

See also: Estimate Delta T

## 1.156 Estimate Delta T

"The Digital Universe" contains a historical record of the value of Delta T from 1620 to the present. If you are simulating the appearance of the night sky during this period and press the "Estimate" button, an appropriate value for Delta T will be inserted into the box to the left.

## 1.157 Current/Other Time

This radio button specifies whether the software is using the current time (as kept by the Amiga's internal clock) or some other time. If "Current Time" is selected, the time requesters above will represent the time that the Time Control Window was opened, or the time that "Current Time" was selected. In addition, the time will be reset at the instant that Use is depressed. In this way, it is easy to synchronize "The Digital Universe" to keep pace with the current time.

On the other hand, if "Other Time" is selected, "The Digital Universe" will not read the internal clock to determine the time. "Other Time" will automatically be selected if the time is changed in one of the boxes above.

## 1.158 Epoch

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You are able to specify the epoch used for calculations in this box. Four different entry formats are possible:

Jnnnn.n (J2000.0) - specifies the instant at the start of a  
Julian Year  
Bnnnn.n (B1950.0) - specifies the instant at the start of a  
Besselian Year  
JDnnnnnnn.nn - specifies the epoch as a particular Julian Date  
DATE - specifies the epoch of date. The epoch used is  
that represented by the date and time in the boxes  
above.

## 1.159 Advance

You are able to enter a number in this box which (in combination with the Advance Units gadget directly to the right) specifies how much time the software is to advance by, either manually or automatically.

## 1.160 Advance Units

Use this box to select which unit of time (used in conjunction with the Advance gadget directly to the left) should be used in manual and automatic time advancement. You can choose from:

seconds  
minutes  
hours  
days  
Gregorian Years  
Julian Years  
Tropical Years  
Sidereal Years  
Anomalistic Years  
Eclipse Years  
Gaussian Years

## 1.161 Every

If automatic advancement is selected with the Automatic/Manual Advance radio button, the software needs to know how frequently to update the screen. You can use this requester in conjunction with the Every Units gadget to the right in order to specify this interval.

## 1.162 Every Units

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If automatic advancement is selected with the Automatic/Manual Advance radio button, the software needs to know how frequently to update the screen. You can use this gadget in conjunction with the Every requester to the left in order to specify this interval. You can choose from:

- seconds
- minutes
- hours
- days
- Gregorian Years
- Julian Years
- Tropical Years
- Sidereal Years
- Anomalistic Years
- Eclipse Years
- Gaussian Years

### 1.163 Automatic/Manual Advance

These radio buttons allow you to specify whether time should be advanced automatically or manually. It is advanced by the amount specified by the Advance and Advance Unit gadgets.

If manual advancement is selected, the user can step forward or backward through time with the right and left arrow keys respectively. If automatic advancement is selected, time progresses forward at an interval specified by the Every and Every Unit gadgets.

If the computer is in automatic advancement mode, it stops immediately after manual advancement is depressed – you don't have to press Use first.

### 1.164 Lock Onto

As time progresses, either manually or automatically, "The Digital Universe" needs to know what it should be "locked onto". This information is specified with this radio button and possibly the Object list to the right.

If "RA/Dec" is selected, the computer will keep the center of its field of view locked onto the same right ascension and declination as time progresses. This is useful if you wish to keep looking at the same stars.

If "Alt/Az" is selected, the computer will keep the center of its field of view locked onto the same altitude and azimuth as time progresses. As a result, the horizon stays fixed in place and you can see the motion of the stars across the sky.

If "Object" is selected, you will be able to select an object to lock onto in the list to the right. In this way, you can follow a planet, moon, asteroid, comet, or Earth-orbiting satellite as it travels across the sky.

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## 1.165 Object List

If "Object" is selected in the Lock Onto radio button to the left, you are able to select an object from this list to lock onto as time advances. In this way, you can follow a planet, moon, asteroid, comet, or Earth-orbiting satellite as it travels across the sky.

## 1.166 Use

Once you have made changes to the Time Control window, you need to press this button for the changes to take effect.

## 1.167 Miscellaneous Objects

This window provides an interface whereby you can specify which miscellaneous objects (comets, asteroids, or Earth-orbiting satellites) that "The Digital Universe" should consider in generating a view of the sky.

Help is available for the following gadgets:

- Orbit File
- Objects in the File
- Selected Objects
- Sort By
- Edit
- Add
- Remove
- Save

## 1.168 Orbit File

You can use this requester to specify the file that you wish to obtain miscellaneous object orbits from. By convention, these orbit files should be placed in the DU:data/orbits directory.

You may enter the filename (complete with path) into the box provided. If preferred, you can click on the image to the right of the input box to bring up a file requester to choose the file.

"The Digital Universe" uses files in the "Universal Orbit Format", developed specifically for use with this package. This format allows for orbital elements of asteroids, comets, or Earth-orbiting satellites to be stored and retrieved. Several utility programs exist to convert orbital element files in a variety of formats into the "Universal Orbit Format" – see Utility Programs for more information.

The current version of this software is restricted to there being no more than 1000 objects in an individual file. As a result, the databases for comets, asteroids, and Earth-orbiting satellites are split up into several different

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files:

```
asteroids_numbered_1.uof - Numbered asteroids from 1 to 1000
asteroids_numbered_2.uof - Numbered asteroids from 1001 to 2000
asteroids_numbered_3.uof - Numbered asteroids from 2001 to 3000
asteroids_numbered_4.uof - Numbered asteroids from 3001 to 4000
asteroids_numbered_5.uof - Numbered asteroids from 4001 to 5000
asteroids_numbered_6.uof - Numbered asteroids from 5001 to 6000
asteroids_numbered_7.uof - Numbered asteroids from 6001 to 7000
asteroids_precise_1.uof  - Designated asteroids from 29TD1 to 81WS1
asteroids_precise_2.uof  - Designated asteroids from 81WE9 to 89SR
asteroids_precise_3.uof  - Designated asteroids from 89SA3 to 92CU
asteroids_precise_4.uof  - Designated asteroids from 92DA  to 94RZ
asteroids_precise_5.uof  - Designated asteroids from 94RCB to 95DW
comets_1.uof             - Comets with perihelion dates prior to Sep, 1973
comets_2.uof             - Comets with perihelion dates from Oct, 1973 to
                          Sep, 2042
comets_3.uof             - Comets with perihelion dates after Oct, 2042
misc.uof                 - File to which the user can add orbit information
                          for newly discovered objects
satellite_molczan.uof    - Earth-orbiting satellites from Ted Molczan
satellite_tle.uof        - Earth-orbiting satellites from T. S. Kelso
```

When the program is first started, it defaults to loading comets\_2.uof.

NOTE: Since this is a demonstration version of "The Digital Universe", only the files "satellite\_molczan.uof" and "comets\_2.uof" are included.

There are a few points which should be remembered about the files. The brightest asteroids are those in the asteroids\_numbered files. See The Brightest Asteroids for a list of the hundred brightest asteroids, most of which can be found in asteroids\_numbered\_1.uof.

Since periodic comets are typically in highly eccentric orbits and are strongly perturbed by the larger planets, their orbits are often substantially different from one appearance to the next. As a result, a separate orbit is provided for each appearance of these comets. When predicting the path of a comet, it is best to use the orbit with the perihelion date closest to the time of interest.

As comets and asteroids are continually being discovered, "The Digital Universe" allows the user to enter orbital elements manually. All additions should be made to the misc.uof file.

Updates to the asteroids and comets databases are available from Jost Jahn. If you require more up-to-date information than that supplied with the software, you can obtain the new data sets directly from him. His address is:

```
Jost Jahn
Neustädter Straße 11
29389 Bodenteich
Germany
Tel.: 05824-3197
FAX: 0581-14824
Internet: j.jahn@abbs.heide.de
```

At the time this documentation was written, he was charging DM 30 (30 Deutschmarks) for a new data set. You will need some of the utility programs

supplied with the software to convert between his file formats and the "Universal Orbit Format" used by "The Digital Universe".

Earth-orbiting satellites are strongly affected by atmospheric drag and other phenomena. While "The Digital Universe" uses NORAD's highly accurate SGP4 model to consider these effects, the most accurate results are always obtained with recent satellite data sets. This software package contains the program tle2uof to convert between NORAD's standard three-line element format and the "Universal Orbit Format". Two good sources of updated satellite orbit information are available to users with a modem:

Dr. T. S. Kelso's (email: tkelso@afit.af.mil) orbital elements:

- Celestial BBS at (334) 409-9280
- Internet anonymous FTP at archive.afit.af.mil  
(file: /pub/space/tle.new)

Ted J. Molczan's orbital elements:

- Canadian Space Society BBS at (905) 458-5907
- Internet anonymous FTP at kilroy.jpl.nasa.gov  
(file: /pub/space/elements/molczan/new\_molc.Z)

In addition, satellite orbit files pre-converted to the "Universal Orbit Format" will periodically be available at our own Internet World Wide Web (WWW) site at the following URL:

<http://www.syz.com>

## 1.169 Objects in the File

This list shows the objects contained in the file selected with the Orbit File requester above. To add an object to your Selected Objects list (necessary for the computer to calculate the position of that object), double click the mouse pointer on the object.

If you wish to examine or change the orbital element data for any object, click once on the object and then select the Edit button at the bottom of the window. Ensure that you only change information in the "misc.uof" file!

## 1.170 Selected Objects

This list shows the miscellaneous objects which "The Digital Universe" will consider when displaying the appearance of the sky. Items are added to this list by double clicking the mouse pointer on objects presented in the Objects in the File list, and are removed by clicking once on the object to remove, then selecting the Remove button at the bottom of the window. There is a limit of 100 miscellaneous objects which can be selected at any one time.

If you close the window, the display will be recalculated to consider any new miscellaneous objects that you might have added. If you would like to save your current list of miscellaneous objects so that it is loaded the next time "The Digital Universe" is started, you must click on the Save button at the bottom of the window.

---

## 1.171 Sort By..

This gadget enables you to specify how you want the objects in the list above to be sorted. If the list contains comets or asteroids, you can choose between an alphabetical sorting by name or a chronological ordering by perihelion date. If the list contains Earth-orbiting satellites, you can choose between an alphabetical list by name or a chronological ordering by epoch. Some satellites in low Earth orbit are strongly affected by the atmosphere and other phenomena in unpredictable manners. As a result, it is important to ensure that you obtain more recent orbital information for a satellite if its Epoch Date is getting old. See Orbit File for information on obtaining more recent data sets.

## 1.172 Edit

If you select on an object in the list above and then press the "Edit" button, the Miscellaneous Object Orbit Entry window will appear enabling you to edit the orbital elements and related information for the object. Ensure that you only edit or add orbits to the misc.uof file!

## 1.173 Add

If there are less than 1000 objects in the current file, clicking on this entry brings up the Miscellaneous Object Orbit Entry window allowing you to add additional objects. Ensure that you only edit or add orbits to the misc.uof file!

## 1.174 Remove

If you click on an object in the Selected Objects list and then press the "Remove" button, the object will be removed from the list. The computer will no longer consider the position of that object when generating a view of the sky.

## 1.175 Save

Pressing the "Save" button allows you to save the contents of the Selected Objects list. The next time you start "The Digital Universe", these objects will automatically be loaded into your "Selected Objects" list.

If you merely want to use the list of selected objects without saving your preferences to disk, just close the Miscellaneous Objects window.

---

## 1.176 The Brightest Asteroids

The following table provides the names and mean opposition magnitudes of the 100 brightest asteroids. Keep in mind that since asteroid orbits are fairly eccentric, an asteroid may appear substantially brighter or fainter at any particular opposition. "The Digital Universe" can simulate the position of any of these asteroids, most of which can be found in the orbit file entitled "asteroids\_numbered\_1.uof".

	Asteroid	Opposition Magnitude
	-----	-----
4	Vesta	5.7
1	Ceres	6.8
2	Pallas	7.6
7	Iris	8.1
6	Hebe	8.4
15	Eunomia	8.5
3	Juno	8.6
8	Flora	8.6
29	Amphitrite	8.8
9	Metis	8.9
18	Melpomene	8.9
20	Massalia	9.2
532	Herculina	9.3
40	Harmonia	9.3
11	Parthenope	9.3
14	Irene	9.4
27	Euterpe	9.5
39	Laetitia	9.5
10	Hygiea	9.6
89	Julia	9.6
16	Psyche	9.6
349	Dembowska	9.7
12	Victoria	9.7
44	Nysa	9.7
192	Nausikaa	9.8
13	Egeria	9.8
19	Fortuna	9.9
5	Astraea	9.9
51	Nemausa	9.9
230	Athamantis	9.9
354	Eleonora	9.9
704	Interamnia	10.0
43	Ariadne	10.0
21	Lutetia	10.1
115	Thyra	10.1
324	Bambergia	10.1
23	Thalia	10.1
30	Urania	10.1
63	Ausonia	10.2
22	Kalliope	10.2
68	Leto	10.3
42	Isis	10.3
433	Eros	10.3
4544	Xanthus	10.3
80	Sappho	10.3

---

52	Europa	10.4
511	Davida	10.4
471	Papagena	10.4
25	Phocaea	10.5
37	Fides	10.5
88	Thisbe	10.5
41	Daphne	10.6
28	Bellona	10.6
17	Thetis	10.6
32	Pomona	10.6
196	Philomela	10.6
346	Hermentari	10.6
129	Antigone	10.6
451	Patientia	10.6
409	Aspasia	10.7
79	Eurynome	10.7
26	Proserpina	10.7
71	Niobe	10.7
216	Kleopatra	10.8
387	Aquitania	10.8
45	Eugenia	10.8
194	Prokne	10.8
287	Nephtys	10.8
85	Io	10.8
60	Echo	10.8
92	Undina	10.8
270	Anahita	10.9
97	Klotho	10.9
31	Euphrosyne	10.9
654	Zelinda	10.9
128	Nemesis	10.9
69	Hesperia	10.9
135	Hertha	10.9
64	Angelina	10.9
67	Asia	11.0
103	Hera	11.0
48	Doris	11.0
54	Alexandra	11.0
389	Industria	11.0
185	Eunike	11.0
2063	Bacchus	11.0
1566	Icarus	11.0
4769	Castalia	11.0
173	Ino	11.1
148	Gallia	11.1
385	Ilmatar	11.1
198	Ampella	11.1
111	Ate	11.1
144	Vibilia	11.1
93	Minerva	11.1
386	Siegena	11.1
105	Artemis	11.1
345	Tercidina	11.2
344	Desiderata	11.2
674	Rachele	11.2

---

## 1.177 The Sun, Planets, and Moons

By clicking on the Sun, a planet, or a moon, "The Digital Universe" will adjust the display so that the object of interest is centered in the field of view. If the object is too dim to show up with your current settings for limiting magnitude in the Display/Object Preferences window, the computer will zoom in until the object is visible.

## 1.178 Constellation Selection

This window contains a list of all currently recognized constellations. If you click on an object in the list, "The Digital Universe" will adjust the display so that the constellation is centered on the screen and fills the field of view.

The constellation itself will only be visible if you have selected Constellation Figures or Boundaries in the Display/Object Preferences window.

## 1.179 Star Selection

This window allows you to find a star of interest. Stars can be located based upon a number of different designations - Proper Name, Bayer designation, Flamsteed number, Yale Bright Star (YBS) catalogue number, Smithsonian Astrophysical Observatory (SAO) catalogue number, or the Henry Draper (HD) catalogue number.

The general process in selecting a star is to first pick the type of designation that you will be searching for, and then fill in the appropriate blanks or choosing the appropriate items from lists.

When you are done, your search criteria will be entered automatically into the Criteria requester at the bottom of the screen. If you are satisfied with your request, press the Search button and the computer will find the star of interest (if it exists) and center it on the screen.

If you prefer, you can enter the search criteria directly in the blank before pressing "Search". This can be faster than getting the computer to fill in the blank for you once you know the format that the entries should take.

Help is also available for the following items:

- Star Name
- Bayer Designation
- Flamsteed Number
- YBS Number
- SAO Number
- HD Number

- Criteria
- Search

---

## 1.180 Star Name

If "Star Name" is selected, a list of currently recognized star names is displayed. To find a star from this list, just click on the star of interest and then press the Search button below.

## 1.181 Bayer Designation

If you are finding a star by Bayer designation, you must click on both the Greek letter and the constellation name to identify a unique object. Once you have entered your request, press the Search button to find the object. Some combinations of Greek letters and constellations are not associated with any particular star (there is no star designated Psi Arae, for example). In these cases, you will be presented with a little window describing that the object of interest could not be found.

## 1.182 Flamsteed Number

You can find a star by Flamsteed Number if you enter a number into the "Flamsteed #" box and press ENTER as well as pick a constellation from the list on the right. Once your request appears in the Criteria box, you can press the Search button to try and find the object. If it cannot be found, a window will appear to notify you. Otherwise, the star will appear in the center of the screen.

## 1.183 YBS Number

To find a star by its Yale Bright Star (YBS) Catalogue number, just enter the number into the box provided and hit ENTER. If you are satisfied with the result appearing in the Criteria box, press the Search button.

## 1.184 SAO Number

To find a star by its Smithsonian Astrophysical Observatory (SAO) Catalogue number, just enter the number into the box provided and hit ENTER. If you are satisfied with the result appearing in the Criteria box, press the Search button.

## 1.185 HD Number

To find a star by its Henry Draper (HD) Catalogue number, just enter the number into the box provided and hit ENTER. If you are satisfied with the result appearing in the Criteria box, press the Search button.

---

## 1.186 Criteria

This box performs two functions. If you enter a search request by using the gadgets above the box, the request will be composed and appear within. Alternately, you can enter a search criteria directly into this box if you use the proper entry format.

You must press Search to get the computer to find the object of interest.

## 1.187 Search

After a search criteria has been composed and appears in the Criteria box (either automatically or manually), you must press the "Search" button to allow the computer to try and find the object of interest.

## 1.188 Deep Sky Object Selection

This window allows you to find a deep sky object of interest. You may search according to a number of different designations - Proper Name, Messier number, NGC number, or IC number.

The general process in selecting a deep sky object is to first pick the type of designation that you will be searching for, and then fill in the appropriate blanks or choosing the appropriate items from lists.

When you are done, your search criteria will be entered automatically into the Criteria requester at the bottom of the screen. If you are satisfied with your request, press the Search button and the computer will find the object of interest (if it exists) and center it on the screen.

If you prefer, you can enter the search criteria directly in the blank before pressing "Search". This can be faster than getting the computer to fill in the blank for you once you know the format that the entries should take.

Help is also available for the following items:

- Object Name
- Messier number
- NGC number
- IC number

- Criteria
- Search

## 1.189 Deep Sky Object Name

If "Object Name" is selected, a list of currently recognized deep sky object names is displayed. To find an object from this list, just click on the name of interest and press the Search button below.

---

## 1.190 Messier Number

If "Messier Number" is selected, you can find a deep sky object by Messier number. Just type the Messier number in the box provided and hit ENTER. A search request will be composed in the Criteria box. If it is acceptable, press the Search button to begin the search.

## 1.191 NGC Number

If "NGC Number" is selected, you can find a deep sky object by NGC number. Just type the NGC number in the box provided and hit ENTER. A search request will be composed in the Criteria box. If it is acceptable, press the Search button to begin the search.

## 1.192 IC Number

If "IC Number" is selected, you can find a deep sky object by IC number. Just type the IC number in the box provided and hit ENTER. A search request will be composed in the Criteria box. If it is acceptable, press the Search button to begin the search.

## 1.193 Criteria

This box performs two functions. If you enter a search request by using the gadgets above this box, the request will be composed and appear within. Alternately, you can enter a search criteria directly into this box if you use the proper entry format.

You must press Search to get the computer to find the object of interest.

## 1.194 Search

After a search criteria has been composed and appears in the Criteria box (either automatically or manually), you must press the "Search" button to allow the computer to try and find the object of interest.

## 1.195 Miscellaneous Object Selection

This window allows you to find a miscellaneous object. Simply click on the object of interest and the software will center the object on the screen. If the object is too dim to show up with your current settings for limiting magnitude in the Display/Object Preferences window, the computer will zoom in until the object becomes visible.

You will be allowed to choose from any objects appearing in the Selected Objects list of the Miscellaneous Objects window.

---

## 1.196 Animation Control Window

This window allows you to make user-definable animations. They are created and stored as "IFF ANIM5" files – the animation standard for Amiga computers. Many third party software packages can play these animations. The showanim utility is provided for just that purpose.

The Lock Onto radio button in the Time Control window specifies what the animation should follow from frame to frame. You can tell "The Digital Universe" to keep its field of view fixed with respect to the horizon, follow the stars across the sky, or follow an object moving with respect to the stars. See the information provided on the "Time Control" window for further assistance.

Several parameters of the animation may be specified to further customize it. As a few examples, you can create an animation which slowly zooms in on an area of sky, or shows how the sky's appearance changes as you move in a southerly direction across the Earth's surface. The possibilities are limited only by your own imagination.

Help is available for the following gadgets:

- Number of Frames
- Advance
- Advance Units
- Right Ascension
- Declination
- Altitude
- Azimuth
- Latitude
- Longitude
- Field (ratio)
- Start

## 1.197 Number of Frames

In this box, you can specify the number of frames of your animation. You cannot create an animation with less than 2 frames.

## 1.198 Advance

This box, in conjunction with the Advance Units gadget to the right is used to tell the computer how much time should elapse between each frame.

## 1.199 Advance Units

This gadget is used in conjunction with the Advance box to the left to tell the computer how much time should elapse between each frame.

---

You can choose between the following units of time:

- seconds
- minutes
- hours
- days
- Gregorian Years
- Julian Years
- Tropical Years
- Sidereal Years
- Anomalistic Years
- Eclipse Years
- Gaussian Years

## 1.200 Right Ascension

This box allows you to specify the value that should be added to the current right ascension of the center of the field of view between frames. It should be specified in decimal hours.

If you do not wish to advance the center of the field in right ascension, just leave the box blank.

## 1.201 Declination

This box allows you to specify the value that should be added to the current declination of the center of the field of view between frames. It should be specified in decimal degrees.

If you do not wish to advance the center of the field in declination, just leave the box blank.

## 1.202 Altitude

This box allows you to specify the value that should be added to the current altitude of the center of the field of view between frames. It should be specified in decimal degrees.

If you do not wish to advance the center of the field in altitude, just leave the box blank.

## 1.203 Azimuth

This box allows you to specify the value that should be added to the current azimuth of the center of the field of view between frames. It should be specified in decimal degrees.

---

If you do not wish to advance the center of the field in azimuth, just leave the box blank.

## 1.204 Latitude

This box allows you to specify the value that should be added to your current latitude between frames. It should be specified in decimal degrees.

If you do not wish to change latitude throughout the animation, just leave the box empty.

## 1.205 Longitude

This box allows you to specify the value that should be added to your current longitude between frames. It should be specified in decimal degrees.

If you do not wish to change longitude throughout the animation, just leave the box empty.

## 1.206 Field (ratio)

This box allows you to specify the value that should be multiplied to the current field of view between frames. If it is greater than one, the computer zooms out - if it is less than one, the computer zooms in.

If you do not wish to zoom in or out throughout the animation, leave the value at 1.0.

## 1.207 Start Generating Animation

When you have the parameters of the animation all set up the way you like, press the "Start" button. The software will first bring up a requester asking where you would like to store the animation. By convention, animation files should end in a .anim extension. Then, the computer will begin to generate the animation.

While "The Digital Universe" is calculating and drawing each frame of an animation, you will be unable to abort the process. However, while it is compressing the image into the animation file, you are given the opportunity to do so if you wish.

When the animation has been completely generated, the software provides an icon with the file. Workbench users can simply double click on the icon to play back the animation (using showanim, a utility provided with this package).

---

## 1.208 Report Generation Window

This window allows you to generate numerical reports. They can be output to either a file or an attached printer.

Each line in the report corresponds to a particular instant in time. Up to four columns of information may be generated per line. The information to be generated is selected using the lists in the center region of the window.

The initial line of the report corresponds to the current time used by the software when report generation begins.

More help is available for the following gadgets:

- Advance
- Advance Units
- Times
- Type of Information
- Particulars
- Save Report to File
- Print Report
- View Report

## 1.209 Advance

This gadget, used in conjunction with the Advance Units gadget to the right, allows the user to specify how much time is to elapse between lines of the report.

## 1.210 Advance Units

This gadget, used in conjunction with the Advance gadget to the left, allows the user to specify how much time is to elapse between lines of the report.

You can choose between the following units of time:

- seconds
- minutes
- hours
- days
- Gregorian Years
- Julian Years
- Tropical Years
- Sidereal Years
- Anomalistic Years
- Eclipse Years
- Gaussian Years

## 1.211 Times

---

In this box, you can specify how often that time is to advance (ie: how many lines the report is to have).

## 1.212 Type of Information

With these lists (one per column), you can tell the software what type of information you would like to generate. The entry you select with the mouse affects the data appearing in the Particulars list below.

## 1.213 Particulars

These lists (one per column) are used to specify the particulars of the Type of Information selected in the list above. For example, if you pick "Apparent RA/Dec" in the "Type of Information" list, the "Particulars" list presents you with a list of objects for which the apparent right ascension and declination can be calculated.

## 1.214 Save

If the user clicks on the "Save" button, a requester is brought up asking where he or she wishes to save the report. By default, all such reports should end in a .txt extension.

When the user specifies the filename, report generation begins.

## 1.215 Print

If the user clicks on the "Print" button, the report is generated and output to an attached printer, a line at a time. If you'd rather save the information to a file, press the Save button instead.

## 1.216 View

If the user clicks on the "View" button, the report is generated and output sent to the screen, in an Amigaguide window.

## 1.217 Search Hypertext Files

---

This window allows the user to search through all the Amigaguide hypertext files used with "The Digital Universe". You can search for a word, phrase or pattern.

Additional help is available for the following gadgets:

- Search String
- Search

## 1.218 Search String

You type the word, phrase, or pattern you are looking for in this box. The special characters used for pattern matches are displayed at the top of the window.

As an example, suppose that you wanted to find all occurrences of "Halley", but were unsure of its spelling. If you know that it begins with an "Hal" and ends in a "y", you could instruct "The Digital Universe" to look for:

```
Hal?*y
```

It would then find all occurrences to "Halley" (as well as anything else that starts with an "Hal" and ends with a "y", including "halfway").

Searches are case-insensitive. It doesn't matter if you specify your search in upper or lower case letters.

If you press the ENTER key after typing your search string, the software will automatically begin to do its work, as if you'd hit the Search button.

## 1.219 Search

When you are done entering your search phrase in the Search String requester, you can either press ENTER or the "Search" button to begin the search.

There are approximately 1.5 megabytes of hypertext provided with "The Digital Universe", so searching through it all can take a few moments. As it is searching, you are presented with the opportunity to abort your request.

Once it has scanned through all the files, "The Digital Universe" displays a list with hypertext links to all the matches it found.

## 1.220 Printing Status

This window provides you with information on the status of your print job, including what the software is currently doing and how much percent of the request has been completed. It also provides the ability to stop the current print job in progress by pressing the "Abort" button.

---

## 1.221 Object Information

If you click with the mouse pointer on an object on the screen, this window will tell you information about it. The precise details of what is displayed are highly dependent on the object itself, but definitions for most of the terms used appear in the online dictionary of astronomy (accessible by selecting "Dictionary" from the "Help" menu).

Additional help is available for the following gadgets:

Print  
More Info

## 1.222 Print

This button allows the user to print a copy of the information in the window to an attached printer. The software assumes that the printer uses the ECMA-94 Latin 1 character set (conforms to ISO/DIS 6429.2 and ANSI X3.64-1979 standards) for foreign language and special characters. This is the same character set used by the Amiga for screen text. If it does not use this standard, you may see inappropriate representations of characters like the degree symbol.

## 1.223 More Info

If this button is not "ghosted" (if it is able to be depressed), more information is available for the object. By pressing the button, an Amigaguide hypertext window is displayed which may contain audiovisual information in addition to regular text.

## 1.224 Calculating...

This window appears when "The Digital Universe" has spent more than a few seconds calculating something. If you press the "Abort" button on the window, you can tell the software to stop the calculation in progress. Be aware that it may take a few seconds to regain control of the computer, however.

## 1.225 Miscellaneous Object Orbit Entry

This window allows you to enter or change orbital elements for comets or asteroids. In addition, it also allows you to specify locations for user-defined fixed objects. Ensure that you only edit or add items to the "misc.uof" file!

The window appears when you press Edit or Add on the Miscellaneous Objects window.

---

Additional help is available for the following gadgets:

- Primary Name
- Secondary Name
- Object Type
- Perihelion Date
- Perihelion Distance
- Eccentricity
- Argument of Perihelion
- Long. of Ascend. Node/RA
- Inclination/Dec
- Mag param. 1
- Mag param. 2
- Mag param. 3
- Mag param. 4
- Save

### 1.226 Primary Name

This requester allows you to specify the primary name of the object.

### 1.227 Secondary Name

This requester allows you to specify a secondary name for an object.

### 1.228 Object Type

These radio buttons specify the type of object being defined.

### 1.229 Perihelion Date

This requester allows you to define the perihelion date for the object. It is often designated by the symbol "T".

"The Digital Universe" expects the perihelion date to be given in the format yyyy/mm/dd.d.

If you are not given the perihelion date, you may be able to calculate it from other data. See Calculating Missing Orbital Elements for further details.

### 1.230 Perihelion Distance

You can use this requester to specify the distance in AU from the object to the Sun when it is at perihelion. It is usually designated by the symbol "q". If you are not given the perihelion distance, you may be able to calculate it from other data. See Calculating Missing Orbital Elements for further details.

A perihelion distance of 0 has a special meaning to "The Digital Universe". In this circumstance, the object is taken to be fixed in the sky. The right ascension of the object is to be specified in the Long. of Ascend. Node/RA requester and the declination in Inclination/Dec. In addition, the magnitude should be entered into Mag param. 1.

### 1.231 Eccentricity

The eccentricity of the object's orbit should be entered into this requester. It is usually represented by the symbol "e".

### 1.232 Argument of Perihelion

The argument of perihelion (usually denoted by the lower case Greek letter "omega") should be entered into this requester. If it is not supplied, you may be able to calculate it from information provided in the section entitled Calculating Missing Orbital Elements.

### 1.233 Long. of Ascend. Node/RA

One of two pieces of information can be found in this requester. If an asteroid or comet is being defined, it will contain the longitude of the ascending node. If a stationary object is being defined (by setting the Perihelion Distance to 0), it should contain the right ascension of the object.

The Longitude of the Ascending Node is usually represented by the upper case Greek letter "omega", and the right ascension by "alpha".

### 1.234 Inclination/Dec

One of two pieces of information can be found in this requester. If an asteroid or comet is being defined, it will contain the inclination of the orbit. If a stationary object is being defined (by setting the Perihelion Distance to 0), it should contain the declination of the object.

The inclination is usually represented by the letter "i", and the declination by the Greek letter "delta".

---

### 1.235 Mag param. 1

The value in this box may represent one of several different things depending on what type of object is being defined. If the object is stationary (defined by setting the Perihelion Distance to 0), it simply represents the magnitude of the object. If the object being defined is a comet, it represents a brightness parameter designated  $H(1,0)$  of the coma. If the object is an asteroid, it represents a parameter designated "H".

### 1.236 Mag param. 2

The value in this box may represent one of two different things depending on what type of object is being defined. If the object is a comet, it represents a brightness parameter designated as "n" for the coma. If the object is an asteroid, it represents a parameter designated "G".

### 1.237 Mag param. 3

This requester only has meaning for comets. It represents a brightness parameter designated  $H(1,0)$  of the nucleus.

### 1.238 Mag param. 4

This requester only has meaning for comets. It represents a brightness parameter designated "n" of the nucleus.

### 1.239 Save

If this button is depressed, the updated orbital elements are written to the orbit file. You will have to double click on the entry in the Objects in the File list in order to make it appear on the Selected Objects list if you want "The Digital Universe" to determine where the new object is.

### 1.240 Calculating Missing Orbital Elements

The orbit of an object can be specified in a wide variety of different ways. Sometimes you will be given orbital elements which may not correspond directly to the elements required by "The Digital Universe". If this is the case, you may be able to calculate the missing quantities by using the some of the relations given below:

a	= semimajor axis, in AU
e	= eccentricity
q	= perihelion distance, in AU

$n$  = mean motion, in degrees/day.  
 $T$  = Julian Date of perihelion  
 $t$  = Julian Date of epoch  
 $M$  = mean anomaly  
 $\omega$  = argument of perihelion  
 $\Omega$  = longitude of the ascending node  
 $\pi$  = longitude of perihelion  
 $L$  = mean longitude of the object

$$a = \frac{q}{1-e}$$

$$n = \frac{0.9856076686}{a \sqrt{a}}$$

$$\text{if } (M < 180) \quad T = \frac{-M}{n} + t$$

$$\text{else} \quad T = \frac{360-M}{n} + t$$

$$\omega = \pi - \Omega$$

$$M = L - \omega - \Omega$$

## 1.241 Frequently Asked Questions

Though "The Digital Universe" is intended to be quite user-friendly, there are periodically circumstances where people may become confused with its operation. This short section contains answers to a few frequently asked questions.

- Question 1: Periodically I see quantities expressed as numbers separated by colons (such as 21:45:42). What does this mean?
- Question 2: What settings should I give the software to get the most accurate results?
- Question 3: What settings should I give the software to get results the quickest?
- Question 4: I'm trying to make an animation while zoomed in close to a planet, but it keeps moving off the screen. What's wrong?
- Question 5: Why am I unable to select some menu items or gadgets?
- Question 6: What is the difference between Planetarium and Local Mode, and when should I use one or the other?
- Question 7: I would like to see where a particular comet (or asteroid, or Earth-orbiting satellite) is, but the procedure seems a bit complicated.
- Question 8: I'm using the menu to try and open a window but nothing is appearing. What's wrong?
- Question 9: On some (but not all) windows, the font is much too small to

be read. Why is this, and what should be done?

Question 10: When I generate an animation, the first frame looks like it doesn't belong. What's causing this?

Question 11: When I open up the Time Control window, I'm presented with ten different boxes where I can enter the time. Where should I enter it?

Question 12: When I click on an object, I see that the rise and set times are "Unavailable". How can I see what they are?

## 1.242 Question 1

Periodically I see quantities expressed as numbers separated by colons (such as 21:45:42.1). What does this mean?

Astronomers often deal with angular measurements. For example, they may need to know how many degrees above the horizon an object is, or how large an object appears to be. Though they can specify these measurements in decimal notation (21.7617 degrees), this is not commonly done. Normally, a measurement system called "degree-minute-second" is used to deal with fractional degrees. In this system, there are 60 minutes in a degree and 60 seconds in a minute. Thus, 21.7617 degrees can be expressed as 21 degrees, 45 minutes, and 42.1 seconds.

Though it may seem a bit needlessly confusing, it is not without precedent. After all, we have been dividing the hour up into minutes and seconds in the same manner for centuries.

The "official" notation for such a quantity would be written as 21\textdegree ↵ {}45'42".1

(where in actuality the " symbol would appear directly above the decimal point, not in front of it). However, this notation is somewhat cumbersome to enter on a standard keyboard. To simplify the process, the scheme of using colons (:) to separate the various quantities has been "unofficially" adopted by "The Digital Universe". Thus, the quantity may be expressed as 21:45:42.1. The user must decide whether a quantity expressed like this refers to an angular measurement or a measurement of time by context.

## 1.243 Question 2

What settings should I give the software to get the most accurate results?

If you are interested in obtaining the highly accurate results that "The Digital Universe" is capable of generating, there are several parameters that you should manipulate. Naturally, the more that the computer has to consider, the slower it will become. Therefore, unless you have an extremely fast Amiga it is not recommended that you leave these parameters set for everyday use.

In the Display/Object Preferences window, set all of the options under "Precision" - namely precession, proper motion, nutation, aberration, and refraction. If you are interested in obtaining rise and set time information for objects, ensure that you unselect Fast info. Click on Use or Save. Then, open up the Time Control window and enter "DATE" in the box marked Epoch before pressing Use.

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Once this has all been accomplished, "The Digital Universe" will provide the most accurate calculations it is capable of, at the expense of taking longer to do so.

### 1.244 Question 3

What settings should I give the software to get results the quickest?

"The Digital Universe" was originally designed to provide the most accurate astronomical calculations generally available to the owner of a personal computer. As such, it may be slower than some competing products.

To some extent, the user can tell the computer to ignore some effects it would otherwise consider, speeding up calculations and screen updates. Of course, the results will not be as accurate, but they may be acceptable for most everyday use.

In the Display/Object Preferences window, unselect all of the options under "Precision" - namely precession, proper motion, nutation, aberration, and refraction. If you are not interested in obtaining rise and set time information for objects, ensure that you select Fast info. Selecting Fast Labels as well will reduce the amount of time the software requires to label objects on the screen. Click on Use or Save. Then, open up the Time Control window and enter "J2000" in the box marked Epoch before pressing Use.

Once this has all been accomplished, "The Digital Universe" will require less time in performing its calculations, at the expense of a loss of accuracy.

### 1.245 Question 4

I'm trying to make an animation while zoomed in close to a planet, but it keeps moving off the screen. What's wrong?

When making an animation, the computer needs to be told what it should be following between frames. When you first start "The Digital Universe", it assumes that it should follow the stars across the sky. But since planets move with respect to the stars, it won't be too long before the planet has moved out of your field of view.

To get the software to lock onto a planet or other object during an animation, open up the Time Control window, and bring up the "Time Advancement" section. With the Lock Onto radio buttons, select "Object". Then, click on the object you wish to follow in the list to the right. After pressing Use at the bottom of the window, you should then be able to generate your animation and automatically follow the planet as it moves.

### 1.246 Question 5

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Why am I unable to select some menu items or gadgets?

If you are unable to select one of these objects, chances are that it is "ghosted" (shaded out). Sometimes some options do not make sense unless other options are set. For example, if you use the menu to open up the Time Control window, it cannot be opened up a second time. As a result, the menu item becomes ghosted while the window remains open.

As another example, it does not make sense to label deep sky objects or search for these objects if they are not being displayed on the screen.

To enable a "ghosted" option, you just have to change the status of whatever is causing it to be "ghosted". There are too many dependencies like this throughout the program to list in detail, but most of them should be fairly straightforward to discover.

## 1.247 Question 6

What is the difference between Planetarium and Local mode, and when should I use one or the other?

Planetarium and Local mode merely differ in the orientation they give to the appearance of the sky. Local mode draws the sky as it appears from your location on Earth. Up is up and left is left. For most people just beginning to develop an interest in astronomy, this way of viewing the sky is the most natural.

But the orientation and appearance of the night sky is highly dependent on the time and geographical position of the observer. As a result, astronomers have developed a "standard" way of representing the sky, similar to the way terrestrial maps have been defined. In this representation, up is the direction towards the north celestial pole. To the left is east (opposite to a terrestrial map since instead of looking down upon the Earth, we're looking up into the sky). If Planetarium Mode is selected, "The Digital Universe" will orient the display in this manner. This enables the user to generate star maps appearing like those published in printed star atlases.

If you are generating an animation of a planet's rotation about its axis, you should be in Planetarium mode. Otherwise, in addition to the planet's rotation, you will see it "wobble" back and forth. This apparent motion isn't something the planet actually does, but results from the planet's changing orientation with respect to the user's horizon throughout the day.

## 1.248 Question 7

I would like to see where a particular comet (or asteroid, or Earth-orbiting satellite) is, but the procedure seems a bit complicated.

The procedure is a bit complicated since "The Digital Universe" contains information on tens of thousands of these objects. If it were to figure out where each and every one was located, it would take a very long time to do so.

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Therefore, you must first select which of these "miscellaneous objects" you want "The Digital Universe" to consider. First, open up the Miscellaneous Objects window and choose the objects you are interested in, ensuring that they appear in your Selected Objects list. For more information on this process, see the help for the "Miscellaneous Objects" window.

Then, close the window (or optionally Save your preferences to disk so that they remain in effect the next time you start the software). Open up the Display/Object Preferences window and ensure that you have told the computer to plot miscellaneous objects (by selecting the Misc. Object gadget in the "Objects" section of "Calculation & Display"). It wouldn't hurt to pick Misc. Object Names under "Object Preferences" on this window either, to label the object. Then, the computer should be calculating and plotting the position of the object you're interested in. You can find the object of interest from the "FIND" menu if it doesn't appear on your screen.

## 1.249 Question 8

I'm using the menu to try and open a window but nothing is appearing. What's wrong?

First, make sure the menu option is not "ghosted" (shaded out). If it is, then the option is not currently available. See Question 5 for more information.

If the window should be appearing but isn't, there are two possible explanations. You may be out of chip (graphics) memory. Every window opening on the screen takes a certain amount of chip memory. If you have too many windows open, or your graphics memory has become too fragmented, it is possible that not enough memory remains to open the new window. Either try closing some windows or exit from "The Digital Universe" and reboot the computer to unfragment the memory and try again.

Another possibility, if you are using a non-interlaced screen, is that the windows are too big to fit on the screen. They should all be able to fit on a 640 X 200 screen if you have selected Topaz Font in the Setting Screen Mode window. Ensure that it has been selected.

## 1.250 Question 9

On some (but not all) windows, the font is much too small to be read. Why is this, and what should be done?

If you find this occurring, you are probably using a screen that is too small to fit the windows properly. If you are running a 640 X 200 screen, make sure that you have selected Topaz Font in the Setting Screen Mode window.

## 1.251 Question 10

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When I generate an animation, the first frame looks like it doesn't belong. What's causing this?

When an animation is made, the initial frame is always a copy of the screen at the instant you press Start - it doesn't recalculate and redraw the screen first. If you have specified that the computer should lock onto a particular object (in the Time Control window), the software will follow this object throughout the animation. But if the object is not centered on the screen before the animation starts, the first frame will not "belong" with the rest.

To avoid this problem, choose Recalculate from the "Project" menu immediately before generating the animation. This will ensure that the software centers the field of view on whatever is being locked onto before the animation begins. This step should only be necessary if you are locked onto an object and have manually changed your field of view since you left the "Time Control" window.

## 1.252 Question 11

When I open up the Time Control window, I'm presented with ten different boxes where I can enter the time. Where should I enter it?

For full details on what all these boxes mean, refer to the help given for the "Time Control" window itself. For those who just want to see what the sky will look like at 10:00 pm tonight without worrying about all the other details, just enter your local time into the top left box (Conventional Local Mean Time). Remember that you have to enter the time in 24 hour format (in this case, 10:00 pm is entered as 22:00), that you need the date as well as the time, and that you must press ENTER when you are done.

Provided that you have set up your Time Zone properly in the Setting Environment Parameters window, when you click on the Use button, the software should show you a view of the sky for the time you specified.

## 1.253 Question 12

When I click on an object, I see that the rise and set times are "Unavailable". How can I see what they are?

For objects which move with respect to the background stars (such as planets), a computation of the rise and set times is a rather complicated procedure. On some computers, this may slow down the speed at which the Object Information window appears to unacceptable levels, particularly when such information is not required. The user is therefore given the option of whether or not to display rise and set times with object information.

To allow the computer to calculate these times, unselect the Fast Info button in the Display/Object Preferences window and press Use or Save.

Note that the times for different phases of the Moon are also marked as being unavailable if this option is selected.

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## 1.254 Keyboard and Mouse Operations

You should already be familiar with using the mouse to select items from the menu bar and click on gadgets, as well as using the keyboard to enter information. However, there are a few ways that you can use the keyboard and mouse to control the operation of "The Digital Universe" that may not be as obvious.

Mouse Operations

Keyboard Operations

Combined Operations

## 1.255 Mouse Operations

There are two things that you can do with the mouse in addition to clicking on gadgets and menu items.

1. If you click on a star, planet, or other object on the screen, a window will appear with information about the object.
2. If you click and hold down the left mouse button and move the mouse you will drag out a "zoom box". When the mouse button is released, the screen will zoom in to show those objects which were enclosed by the box. Since it is impossible to accurately portray the celestial sphere on a flat computer monitor, distortion will occur near the edges of the screen. It is at its strongest when large fields of view are being displayed. The "zoom box" will distort itself to more accurately indicate which objects will be displayed on the screen when the mouse button is released. If you zoom in sufficiently close to a planet or moon, the appearance of the object's disk will be generated. Maps of Venus, the Moon, Mars, Jupiter, and Saturn are provided with the software to provide a realistic view of the object. These maps will be used if Features & Flattening has been enabled on the Display/Object Preferences window.

## 1.256 Keyboard Operations

There are several things which can be done directly from the keyboard to control the operation of "The Digital Universe".

1. Menu shortcuts - beside most menu options you will find a stylized "A" followed by a letter or symbol. This indicates a method of choosing the menu item without using the mouse. Just hold down the right Amiga key (to the right of the spacebar) and press the letter or symbol indicated.
  2. Gadget shortcuts - some gadgets have one of the characters in their labels underlined. If the window containing the gadget is currently active and you type the underlined letter, the gadget itself will become active. In this manner, you do not have to choose a gadget to type in with the mouse.
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3. Tab cycling - if you press the TAB key (to the left of the 'Q' key) when a window with multiple gadgets is active, you will cycle through making the various gadgets active. If you hold down the SHIFT key while typing the TAB key, the gadgets will cycle in the reverse order.
4. Escape key - if you press the escape key (marked ESC) while a window is active, the window will be closed.
5. Number keys - if the background window (the window upon which all the stars are drawn) is active, you can press one of the number keys (above the standard keyboard) to instantly zoom to one of the fields of view that you preset in the Field of View Preferences window.
6. Numeric keypad - on most models of Amiga, the numeric keypad is located to the right of the standard keyboard. If the background window is active and you press one of the keys numbered 1, 2, 3, 4, 6, 7, 8, or 9 the screen will pan in the appropriate direction. If 5 is pressed, the field of view will zoom out by a factor of 1.5, and if the decimal point (.) on the numeric keypad is pressed, the field will zoom in by a factor of 1.5.
6. Arrow keys - If the background window is selected and you press the right arrow key, the time will be advanced by the amount specified in the Time Control window for manual advancement. Likewise, if you press the left arrow key, the time used by the software will be decreased by the same amount.
7. HELP key - if you press the HELP key while the background window is active, you will receive online help for "The Digital Universe". If you depress this key while the mouse pointer is above some gadget or window, information about the use of the gadget or window will be displayed.

## 1.257 Combined Operations

There are two operations which can be done through a combined use of the mouse and keyboard.

1. If you hold down the SHIFT key while clicking at a spot on the screen, the software will center this location in your field of view.
2. If you hold down the Control key (marked CTRL) while dragging with the mouse (moving the mouse with the left mouse button depressed) you will drag out a line that can be used to measure the distance between two points. When the mouse button is released, the angular distance between these points will be displayed.

## 1.258 Configuration of the software

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Other than the configuration options available from the Setting Screen Mode, Setting Environment Parameters, and Display/Object Preferences windows, there are a few additional things that you can configure with the operation of "The Digital Universe".

When viewing hypertext, you will periodically come across links to pictures or audio samples. "The Digital Universe" calls the scripts named "playsound" and "showpic" in the DU: directory to deal with these files. The scripts are currently configured to use software programs called DUAudio and ShowAnim, supplied with the package, but if you have software that you would rather use, you only need to modify these scripts with a text editor.

## 1.259 Starting The Digital Universe

If you would like to start "The Digital Universe" from the Workbench, you only have to double click upon the "DigitalUniverse" icon once the software has been installed from disk.

The introduction sequence to "The Digital Universe" may crash on some Amigas with 3rd party graphics boards. If this is the case with your machine, or you would merely like to run the software without seeing the introduction, just double click on the "DigitalUniverseNoIntro" icon instead.

On the other hand, if you would rather start the software from the command line (CLI), first ensure that you are using a stack of at least 6000 bytes. Type 'stack' at the CLI prompt if you are not sure. If you need to raise the stack, just type 'stack 6000'. Refer to your AmigaDOS manual for more information on the 'stack' command.

Once this is done, change to the DU: directory and type:

```
DigitalUniverse
```

If you would like to avoid the introduction, type:

```
DigitalUniverse nointro
```

One other option is available to CLI users. If your configuration somehow becomes corrupted or you would like to return your settings to the factory defaults, type:

```
DigitalUniverse init
```

Remember that if you do so, all your previous settings will be lost.

When you run the software for the first time, or after you have returned the settings to factory defaults, you should tell it where on the Earth you are located, and what time zone you are in. This can be done by choosing Environment Prefs from the menu bar, to bring up the Setting Environment Parameters window. See the help associated with this window for more details.

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## **1.260 Utilities - other software provided with the package**

This information is not provided with the demonstration version of "The Digital Universe". Please consult Ordering The Digital Universe for more information on how to obtain a registered version.

## **1.261 ShowAnim**

This information is not provided with the demonstration version of "The Digital Universe". Please consult Ordering The Digital Universe for more information on how to obtain a registered version.

## **1.262 DUAudio**

This information is not provided with the demonstration version of "The Digital Universe". Please consult Ordering The Digital Universe for more information on how to obtain a registered version.

## **1.263 jahnprecise2uof**

This information is not provided with the demonstration version of "The Digital Universe". Please consult Ordering The Digital Universe for more information on how to obtain a registered version.

## **1.264 jahnsingle2uof**

This information is not provided with the demonstration version of "The Digital Universe". Please consult Ordering The Digital Universe for more information on how to obtain a registered version.

## **1.265 jahnnumber2uof**

This information is not provided with the demonstration version of "The Digital Universe". Please consult Ordering The Digital Universe for more information on how to obtain a registered version.

## **1.266 jahncomet2uof**

This information is not provided with the demonstration version of "The Digital Universe". Please consult Ordering The Digital Universe for more information on how to obtain a registered version.

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## 1.267 tle2uof

This information is not provided with the demonstration version of "The Digital Universe". Please consult Ordering The Digital Universe for more information on how to obtain a registered version.

## 1.268 Ordering The Digital Universe

This demonstration version of "The Digital Universe" has several disabled features (such as only displaying the stars in one small region of the sky, not allowing you to advance the time past December 31, 1995, and providing only a small portion of the hypertext encyclopedia of astronomy). By ordering the registered version of this software, these restrictions will be removed.

There are two packages which may be of interest to the amateur astronomer. First and foremost is "The Digital Universe" software itself, which comes provided with a 138 page user manual. Secondly, in the process of creating the package, more than 700 pages of a hypertext multimedia encyclopedia was created (the electronic version of which is shipped with the software). However, since many individuals prefer reading from paper than the computer screen, a printed version of this information is also available.

The prices of "The Digital Universe" software and printed encyclopedia (as of November 1, 1995) can be found in the following table. All prices include shipping and handling, and Canadian prices include 7% GST. Note that the prices for Canadian orders are quoted in Canadian dollars, UK orders are quoted in British pounds, and US and other international orders are quoted in US dollars.

If you are an educational user, or a member of an Amiga user group, you qualify for a 15% reduction in the prices appearing below. Contact us for further details. Prices and promotions are subject to change without notice.

	Canada (CAN \$)	US (US \$)*	UK (pounds)*	Inter.(US \$)*
Software	149.95	129.95	89.95	139.95
Encyclopedia	69.95	64.95	47.95	74.95

\*NOTE: Since we must process all credit card transactions in Canadian dollars, the US, UK, and international prices provided above should only be considered as an estimate if you are using a credit card for payment. Due to exchange rate fluctuations between the time of purchase and the time your credit card company processes the transaction, the actual amount may be a few dollars more or less than that quoted above. However, the prices will be accurate for cheque or money order transactions.

Payment can be made by check (drawn in Canadian dollars, US dollars, or British pounds), money order, Visa, or Mastercard.

We need to know your name and address for the registration, and the shipping address (if different). In addition, if you are paying by Visa or Mastercard, the cardholder's name, credit card number, and expiry

date are required. See the file entitled "ProductInfo", included with this archive, for more information (such as system requirements) and a sample order form.

Orders may be sent to:

Syzygy Research & Technology Ltd.  
Box 75  
Legal, AB  
T0G 1L0  
CANADA

Phone: (403) 961-2213

Internet email: sales@syz.com

or you can visit our WWW site with the following URL:

<http://www.syz.com>

## 1.269 The Digital Universe - product information

### PRODUCT DESCRIPTION

"The Digital Universe" is a complete astronomy program for the amateur or professional observer. It combines the advantages of traditional "planetarium" programs with a massive hypertext multimedia encyclopedia to create an effective tool which assists the user in observing and learning about the heavens. 50,000 lines of code, more than 700 pages of hypertext, and thousands of man-hours have gone into this product to make it the most complete program of its class. The software would not have been possible without the generous assistance of countless individuals from the Canadian Space Agency, the National Research Council of Canada, NASA, JPL, NORAD, the European Space Agency, the Bureau des Longitudes, the Smithsonian Astrophysical Observatory, the Russian Academy of Sciences, and several other organizations worldwide.

### PRODUCT FEATURES

The following features by no means summarize all the things which the software is capable of. Due to space considerations, only the major features can be summarized here.

- The following databases are integrated into the software:
    1. Yale Bright Star (YBS) Catalogue of 9110 stars.
    2. Smithsonian Astrophysical Observatory (SAO) Catalogue of over 250,000 stars.
    3. Messier's Catalogue of 110 deep sky objects (galaxies, nebulae, and clusters).
    4. Sky & Telescope's NGC 2000.0 Catalogue of 13,226 deep sky objects.
    5. Tom Lorenzin's "1000+" database of observing comments for over 2000 objects.
    6. Jost Jahn's comet database containing 2298 cometary orbits.
    7. Jost Jahn's minor planet database containing orbital
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information for thousands of asteroids.

8. Ted Molczan's and T. S. Kelso's orbital information for approximately 900 Earth-orbiting satellites.

- The software can generate accurate views of the night sky for any date from 100,000 BC to 100,000 AD.
  - The package includes over 700 pages of hypertext, including an introduction to astronomy, dictionary of terms, biographies of famous people, celestial object descriptions, and summaries of every interplanetary spacecraft launched to date.
  - More than 250 pictures are linked into the hypertext encyclopedia. They include images of all the planets, most of their satellites, all of the Messier objects, some NGC objects, and many miscellaneous images. A few audio clips are incorporated as well.
  - A context-sensitive help system, linked into the online encyclopedia, is integrated into the software.
  - The user can select whether or not they want to consider effects such as precession, proper motion, nutation, aberration, or refraction.
  - "The Digital Universe" uses the latest analytic theories of motion for the planets (VSOP87) and their satellites, resulting in typical accuracies of better than 1 arcsecond (1/3600th of a degree).
  - The current analytic theory of motion for the moon (ELP2000-85) has been extended to improve its accuracy even further for times within a few hundred years of the present. The extension was done specifically for "The Digital Universe".
  - NORAD's SGP4 model of orbital motion is used to accurately predict the apparent positions and movement of Earth-orbiting satellites. "The Digital Universe" can work with standard "2-line" orbit files. Hundreds of satellites are included with the software, and information is provided to explain how to obtain future data sets as new satellites are launched and older orbits decay.
  - Unlike many other astronomy programs which only consider the four brightest satellites of Jupiter, "The Digital Universe" accurately computes orbits for the moons of:
    - Earth: Our Moon
    - Mars: Phobos and Deimos
    - Jupiter: Io, Europa, Ganymede, Callisto, Amalthea, and Thebe
    - Saturn: Mimas, Enceladus, Tethys, Dione, Rhea, Titan, Hyperion, Iapetus, Phoebe, Telesto, Calypso, and Helene
    - Uranus: Miranda, Ariel, Umbriel, Titania, and Oberon
    - Neptune: Triton and Nereid
    - Pluto: CharonWhen the software is zoomed in sufficiently to the planet of interest, the moons are rendered in their proper positions.
  - When zoomed in to most planets and satellites, the object's orientation and phase is determined and a latitude/longitude grid superimposed if the user desires. Maps of Venus, the Moon, Mars, Jupiter, and Saturn are incorporated into the software to generate
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accurate renditions of the appearance of these objects. The ring systems of Saturn and Uranus are rendered.

- Supports the Amiga preferences printer. Plots of star charts, etc. are far more than a simple screen dump. The maximum resolution of the printer is used for outstanding clarity.
  - The user can enter his or her own horizon, if desired. Horizons for multiple observing sites can be configured.
- The user can select their location from a list of over 1000 cities, or enter their latitude, longitude, and altitude above sea level manually if higher accuracy is desired.
- Completely configurable IFF animations can be generated. To mention just two examples from the infinite number of possibilities, you can see how stars move and constellations distort over centuries, or view how Saturn's rings change their orientation and appearance over time. "The Digital Universe" can also save screen snapshots as ILBMs.
- A report generation feature lets you choose between a wide variety of data and customize tabular reports. They may either be printed or saved to disk.
- Provided that you have sufficient chip memory, the screen upon which "The Digital Universe" runs can be of any size. If the screen is larger than can fit on the monitor, you can scroll around simply by moving your mouse to the edge of the visible area. A screenmode requester is provided to allow users to specify their particular monitor.
- All development was done entirely on Amiga. It is not a port from the IBM or Macintosh world. As a result, the software closely adheres to the Amiga style guidelines and behaves in the manner you would expect from Amiga software.

#### SYSTEM REQUIREMENTS

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The software will run on any Amiga with Workbench 2.04 or greater, at least 3 megabytes of memory, and a minimum of 11 megabytes of hard drive space (17 megabytes of hard drive space is required for a full installation). Due to the calculation-intensive nature of this software, an accelerated Amiga and math chip (FPU) is strongly recommended, though not required.

See also: Ordering The Digital Universe.