SKY TRAVEL™

An All Encompassing Astronomy Program

ADDENUM MANUAL

For The Commodore 64/128

Loading Instructions

1. Open the disk drive door.
2. Insert the **Sky Travel** disk into the disk drive with the label side up and facing you. Do not touch the exposed, shiny parts of the disk as this may damage it.
3. Close the disk drive door.
4. On the keyboard, type: LOAD "*",8,1 RETURN (Note: RETURN always means to press the return key.)

The disk drive will get busy for a few minutes and load the program. Upon completion of the loading process, the **Sky Travel** program will automatically start itself, calculate where all the stars and planets are, and draw a picture of the night sky.

If the program or any selection does not load within a few minutes, or if any time the program freezes and will not accept any keys you press, follow these steps:

1. Remove the disk from the drive.
2. Turn OFF your Commodore 64 computer, then turn it ON again.
3. Put the disk back in the drive.
4. Load the disk again.

On the sky you will see a symbol that looks like this: ⟵p. This is a symbol that always points to the celestial north pole.

A Shortcut for Starting Out

You have just bought an exciting program, and now you have another thick manual to read! Do not despair — although we have tried hard to make the manual interesting and really believe that you will get the most out of Sky Travel by going through all of the examples, you can do quite a few things just by knowing how to push a few buttons. So we begin by showing you how to get a display of the sky from where you are right now. We will also show you how to use the program to identify any object you can see in the sky outside, and we will give you a handy table summarizing how to use the various functions (See page 61).

1. Where are You? — Now, the program does not know where you live or even what day it is, so it starts up with some defaults: January 1, 1988 at Washington D.C. But, if it is not New Year's Day 1988 and you do not happen to live in Washington, you'll probably want to change the default setting; whenever any new location is selected from the map that location then becomes the new default location. How do you do this? First, tell the computer where you are. If you knew your latitude and longitude that would help, but most people do not. To find that, you have to use a map. Fortunately, your *Window to our Galaxy* has a built-in map to make it easy.

To get the map, press the f1 key on the upper right hand corner of your keyboard until the screen display in the lower right corner says "MAP" in reverse field letters. If you press f1 too many times and go past the map, keep pressing a few more times and it will reappear. Now press RETURN. Your disk drive will get busy and paint a Mercator style map of the world on your screen. When it is finished loading, you will find a gold colored cross symbol over Washington D.C. Press one of the cursor keys, or, if you have a joystick, use it. Note that the cross on the screen moves, and some numbers in the data window at the right-hand side of the screen change. These numbers are the LATITUDE and LONGITUDE of the cross shaped symbol. From now on, we will call that symbol "the cursor." You now have two choices. If you happen to know your latitude and longitude, you can move the cursor until the numbers in the data window match those for your location. If you do not know your latitude and longitude, just locate where you are on the map and move the cursor to that point. That is all there is to it!

2. Setting the Date and Time — If the date happens to be January 1, 1988 in the wee hours of the morning, you are done. However, since that is not too likely, you need to tell the computer what date and time it is. To do that, you need to get into the SET mode. Press f1 again until the screen display says "SET" in reverse field letters. Then press RETURN. The map will stay on the screen; however, the data window will change completely. It is now set up for accepting changes in the date and time. All changes can be made using the cursor keys or a joystick, if one is plugged in. Note that the month is highlighted by being displayed in reverse field. Pressing the up/down cursor key or pushing the joystick up or down will change the month. When the month is correct, use the right cursor key or the joystick, pushing it to the right, to highlight the first digit in the year. The number is then changed by pressing the up/down key or using the joystick. When you get the correct digit for today's date, push the cursor to the right one position and fix the other number. (You can freely go in either direction; the program is smart enough to prevent the cursor from ending up where it should not.) Similarly you can change the day of the month and the time, one digit at a time. Note that we use a 12 hour clock with a little "A" or "P" to the right of the time to indicate whether the time is before or after noon. You can change the A to a P and vice versa using the cursor keys. By the way, the + and - keys do the same thing as the up/down cursor key and the joystick. Use whichever is most comfortable for you.

3. Getting Back the Sky — To return to the SKY mode, go back to our friend the f1 key and press it until the display shows "SKY" in reverse field. Then press RETURN. The computer really gets busy now and calculates where all the planets are on that date and finally, which stars are visible. When all this computation is finished, the sky display will reappear, and it will be correct for where and when you selected.

4. Looking Around — You are now looking south and your window is 72 degrees wide (by default). An easy way to look around is to use the N, E, W, and S keys. These simply direct your point of view to the north, east, west, or south, and they do not affect how high you are looking. Try pressing N. If you told the computer you were anywhere in the northern hemisphere, you are now looking at the familiar circumpolar constellations including the Big Dipper, the Little Dipper (with the North Star at the end of the handle), and the sprawling W shape of Cassiopeia. Their positions in the sky depend on the season and what time of day it is. Looking up or down is easy. Use the up/down cursor key or your joystick to move the golden cross shaped cursor, which was in the center of the field. Note that you can move it all over the field of view and that the numbers in the data display window at the right of the screen will change. These numbers are the coordinates of your cursor in the sky; you will learn more about them later. Run the cursor all the way to the top of the screen and continue to press the up key. Note that the message "SLEWING" appears in the text window at the bottom of the display. After a few seconds delay, a new view of the sky appears, shifted in the direction which you were moving the cursor and allowing you to see higher up in the sky. You can continue to do this until the center of the screen is the point straight overhead (called the Zenith). At this point, the program refuses to let you look further in that direction and gives you the message "LOOKING STRAIGHT UP". It then begins to rotate the display, exactly as you would if you looked up as high as you could and then turned your body around to see further without falling down! As an exercise, try to look straight down. You are not limited to looking exactly north, south, east, or west. You can use the left/right cursor key or the joystick to slew the field of view also. Just run the cursor into the left or right-hand margin of the screen until the message "SLEWING" appears in the text window, and the field of view will shift in the direction you were trying to move the cursor.

5. Identification — Let us say it is evening, the sun has just set, and you noticed from your back yard that there is a brilliant "star" in the west, just above the horizon and easily seen in the twilight. What is it? Sky Travel will tell you. Do steps 1-4 above (if you are just starting up), and press W and the down cursor key until you see the horizon. Compare the display with the sky, and run the cursor over to the object located where your UAO (unidentified astronomical object) is. Then press f7 key or the Fire Button on your joystick. The program will now identify the object, and the disk drive will send the computer a text message which will tell you what the object is, how far away it is, and other bits of information. The message will scroll in from the right. Use the cursor keys to read the remainder of long messages. When you have read the message, press RETURN to regain control of the SKY mode.

A GUIDED TOUR OF THE PLANETARIUM

A great deal of flexibility has been built into the Sky Travel program to make it both versatile and easy to use. In this section we illustrate how to operate the program and how to choose among the many options, so you can get the optimum output for your particular purpose.

If you are a novice, please do not get discouraged by some of the sketches and explanations. All that is required to operate the program is to follow directions and push buttons. You may therefore safely bypass the descriptions of the various coordinate systems at your first reading. This is not a suggestion to avoid studying the sketches and explanations altogether. If you can balance your checkbook and make a graph of the daily temperature, you have sufficient background to follow everything in this manual — and your efforts will be well rewarded by the additional uses you will find for Sky Travel. If you are an expert, you will appreciate the convenience of having your Commodore 64 do your preliminary work before beginning more complicated calculations on larger computers.

The MODE Key f1

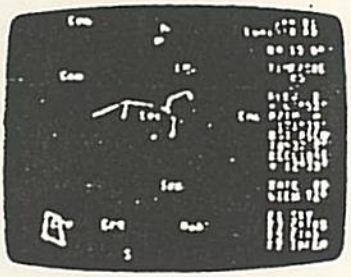
Sky Travel has four basic modes: MAP, SET, SKY, and CHART. The mode you are presently in is displayed in the data window to the right of your screen, in illuminated letters. You can change from mode to mode by tapping the f1 key. If you choose a new mode, it is shown in the data window in dark letters on an illuminated background (reverse field). You activate the new mode by pressing RETURN.

The MAP mode allows you to select your location on the Earth, and the SET mode allows you to choose the month, day, year, and time. The SKY mode is the normal display mode, and here you have a number of options in order to make the sky appear so it best suits your individual purpose. Finally, the CHART mode gives you the opportunity to view the part of the celestial sphere you are pointing at, without obstruction by the horizon and with north always directed upwards for easy orientation. The CHART mode is basically intended for making permanent sky maps of stars and galaxies; for plotting the locations of the sun, moon, or planets during a given period; and for plotting the predicted path for Halley's comet.

When Sky Travel first starts up, it goes directly to the SKY mode. We suggest that you accept our preset default selections for location and time the first time around — you will have plenty of opportunity to select your own choices later.

The SKY Mode

After you have started up, Sky Travel presents the following screen display:



You are looking out the window early in the morning on January 1, 1988 after celebrating New Year's Eve in Washington D.C. You are looking straight south, and with the help of line diagrams and names magically painted in the sky, you immediately recognize the constellation Leo (the Lion). But your window is controlled by magic also! Use the cursor key on the keyboard to move the cross hair cursor from the center of the screen until it pushes on the right side of your window; your window now moves to the right! Keep pushing until the text line underneath the window shows a W (west), then stop. You are now readily recognize the constellation Gemini (the Twins).

Continue pushing on the right side of the screen until the text line shows an N (north), then stop. You now see these constellations: the Big Dipper, the Little Dipper, and next to the North Pole (which is marked with a small cross) you see Polaris, the Pole Star. Then use the down cursor to move the window downwards until you see the horizon come up; stop when the horizon is about one third up the screen. You now recognize the open W of Cassiopeia about to set below the horizon in the early morning hours.

Note that Sky Travel has a translucent Earth; you can see through it! Therefore, stars and planets, which have already set — or which may be about to rise — can actually be seen through the Earth itself. This, incidentally, is true also of the sun and the moon. Now, use the down cursor to push the window further down; when the cursor no longer moves, you are looking straight down at your own feet!

Now let us push the window upwards as far as it will go using the up cursor key. When you get to the point where you are looking straight up, you cannot go further without losing your balance. So instead, you turn your head. As you turn looking straight up, many of the constellations you saw before now reappear in this overhead view.

This example is merely an illustration of how to operate the basic SKY mode. However, you can change the viewing angle, use an automatic time clock, include deep-sky objects, identify and get information on all visible objects, and even replace the cross hair cursor with a space ship. This will be covered in more detail under the description of the various command keys.

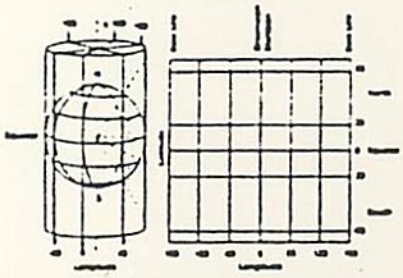
In order to prepare for the next SKY display, tap the [I] key until the message in the data window shows LINES. Then hold down the [SHIFT] key and tap [I] again; the message now shows NO LINES in reverse field. Continue tapping [I] until it shows NO SOUND, then hold down [SHIFT] and tap [I] changing the message to SOUND. Press [RETURN]. We shall now show you how to change your location on Earth; this is done by means of:

The MAP Mode

Tap the [I] key until "MAP" shows in reverse field in the data window, then press [RETURN]. The program now loads a map of the world onto your screen.

The map is a Mercator style projection of the Earth's surface, meaning that the Earth's sphere is projected onto a cylinder which then is unrolled onto a flat map. Each location on Earth is defined by two coordinates: latitude and longitude.

Mercator Projection



Latitude is measured in degrees from the equator and goes from 0 degrees at the equator to +90° (degrees) at the North Pole, and to – 90° at the South Pole. Note that on a Mercator map you cannot reach the poles. Also, the map reproduces actual distances and areas faithfully only near the equator and stretches everything more and more as you go near the poles. On the other hand, a Mercator projection is ideal for mapping time zones because lines of constant longitude are parallel lines on the map.

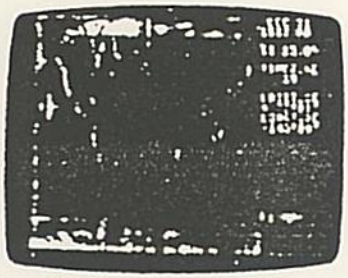
Longitude is measured in degrees (or hours) from the so-called Greenwich meridian near London, England and is usually (as in Sky Travel) counted positive eastward and negative westward. Each 15° corresponds to an hour of time difference (360 degrees/24 hours = 15 degrees/hour). In Mercator's projection, each hour zone is therefore a 15° wide band parallel to the Greenwich meridian, which goes through the middle of the Greenwich or Zero Time Zone. At 180° east and 180° west, the eastern and western longitudes superpose as the Date Line.

Note that the astronomical time zones may differ from the official time zones because actual zone boundaries are based on political decisions. The official time may also vary during the year due to daylight saving time.

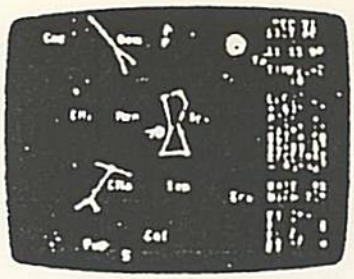
At start-up the cursor was placed over Washington D.C. You can change your location by using the up/down and left/right cursor keys. If you have a joystick, just plug it in at either of the two joystick ports on your Commodore 64 computer. The program will allow you to use either method for moving your cursor; incidentally, this is the case also in the SKY mode. The data window on the right of your screen displays the latitude and longitude as well as the time zone of your cursor location. In cases where great accuracy is needed in pinpointing a location, you should use this numerical display to fine tune the cursor position. The latitudes and longitudes of many strategically located cities and islands are listed in a table at the back of the manual.

One of the **f1** operations (SOUND), demonstrated before leaving the SKY mode, changed the MAP mode cursor into an airplane and the SKY mode cursor into a space ship. In addition, the cursor movement is now accompanied by sound effects! This option is intended to help you learn concepts such as time zones, the date line, star recognition, etc. while flying around the world. Let us illustrate this by continuing our introductory example:

While you were looking out the window early New Year's morning in Washington D.C., your friend was flying back from a vacation in Hawaii. Since you are now in the MAP mode, use the right/left and up/down cursor keys, or the joystick, to move the airplane to longitude 22° north, latitude 145° west. Being over the Eastern Pacific (Time Zone 10), your friend is five hours behind Washington D.C. (Time Zone 5), and he is just getting ready to welcome the New Year; the data window shows that his local time is 11:15 P.M. on Dec. 31, 1987.



Now, if you wish to see his view of the southern sky, tap the **f1** *key until "SKY" shows in reverse field in the data window. Then press* **RETURN**. *You are now back in the SKY mode. In order to reduce the VIEWing Angle to 36 degrees, hold down the* **SHIFT** *key while pressing the — key, then press* **RETURN**. *Press S for a southern view. You may now recognize the familiar constellation Orion just to the lower left of the full moon, next to the space ship (the cursor) and the brightest of all stars, Sirius, just to the lower left of Orion in the constellation Canis Major. This is your friend's view as he celebrates New Year.*



We now leave your friend to describe how to change to another year, date, and local time. This is done in:

The SET Mode

"When longitude is east
Greenwich time is least
When longitude is west
Greenwich time is best"

In order to get into SET mode, tap **f1** until "SET" is shown in reverse field, then press **RETURN**. This mode allows you to select the time and date. As the SET mode is displayed, a reverse field cursor is shown over the month. Using the + and – keys, you can change it to any month desired. After changing the month, use the left/right cursor key to move the cursor over any digit of the day display and change it to the desired value using the +/– keys. Again, using the right/left cursor key and the +/– keys, change the year. Note that the +/– keys change any digit by one unit at a time, and that years before 1 A.D. are automatically changed to B.C.

You can now use the left/right cursor key to move the reverse field cursor to the Hour: Minute display. Again, use the +/– keys to choose the local time. Note that to the right of the time display, A.M. is indicated as an A and P.M. as a P. For convenience, the +/– keys also allow you to change between A.M. and P.M. If you wish to know the corresponding Greenwich Mean Time (GMT), add (with the sign !) the number of hours shown under "Time Zone," to your local zone time. (See the Glossary for a detailed explanation of Greenwich Mean Time.) You can use the little rhyme quoted above to remember this: western time zones are positive numbers so when you add the time zone number to your local time, you get a later hour in GMT. In contrast, eastern time zone numbers are negative so you have to subtract and always get an earlier time for Greenwich than for local eastern times.

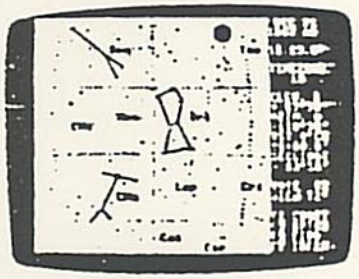
The CHART Mode

The CHART mode allows you to view and print the section of the celestial sphere corresponding to the view of the sky you selected in the SKY mode. In the CHART mode, the horizon is removed and celestial coordinate lines for Right Ascension and Declination are shown. These lines correspond to longitude and latitude on Earth and help you use the chart for plotting. North is always up on the chart. The CHART mode displays the sky objects in reverse field (that is as dark spots on a light background). The printout is black signatures for the sky objects on a white background, to save your printer ribbon! If you have a printer connected to your Commodore 64, the print command is simply **SHIFT** P. (See page 10 for further instructions.)

The CHART mode can be used for making star maps for any date and location on Earth. The map can be used to locate the planets and any deep-sky object of particular interest. In addition, the movement of the planets, the sun, or the moon for any desired time period can be plotted by hand on the chart. You do this by placing the cursor over the object. Then read the location of these moving sky objects from the Right Ascension/Declination values in the data window for a sequence of times or dates. This is most easily done by using the TRACKing option (more detailed description under Option key [3]). In general, all of the options available in SKY mode are still available in CHART mode except that you can no longer use the cursor to move your window. To do that, you have to return first to the SKY mode, make the change, and then come back to the CHART mode.

If you wish to know the Declination/Right Ascension values for any object, line, or line intersection on your chart, remember that the coordinates of the cursor position are shown in the data window. All you have to do is move your cursor to the point in question and read the values off the display. And if you are in doubt as to the identity of any object, just place the cursor over it and use INFORM [7] as we shall discuss below.

For illustration, tap the [1] key until "CHART" is shown in reverse field, then press [RETURN]. If you have a printer, connect it and press P while holding down the [SHIFT] key. If you have left the settings (both location and time) unchanged from our earlier example, you will get the CHART mode display of your friend's New Years Eve view, on his flight from Hawaii.



Now, before we discuss the other function keys ([3] — [7]), let us become familiar with the commands assigned to some of the regular keys on the keyboard.

Other COMMAND Keys

The Accelerated Clock (RATE)

In the SKY mode, you can start a clock that updates the display so you can watch, for example, you can see a sunset or an eclipse as it progresses. In the data window to the right, you see a line saying RATE 0X — that means that the clock is stopped. To start the clock, you press the + or - keys. 1X is actual time, 2X is twice regular time, and so forth. You can go up to 64X, which means that an hour of real time only takes about a minute on your computer. Pressing the — key reduces the speed of the clock until you reach 0X — the stopped clock. You can even go backwards in time by continuing to tap the — key up to a maximum rate of — 64X.

It is good practice to stop the clock before you change to another location or date. When your computer is computing, it tells you so in the textline below the screen display. During these times, no new commands are accepted by the computer — it is "busy." The more you speed up the time factor, the busier the computer gets, and the more difficult it becomes to find a small time window to enter your change command. Therefore, before changing displays, etc., stop the clock!

Sometimes when the clock is set at a RATE of 64X, especially with a wide VIEWing Angle (see below), the computer is so busy that you may have difficulties stopping the clock by tapping the - or + key. In that case, hold the key down steadily. You will eventually catch the brief non-busy moments and manage to stop the clock.

The VIEWING ANGLE

When you are in the SKY mode, the data window just below the clock RATE line, displays the word VIEW. This is the angular section of the sky displayed on the screen, the maximum angle being 72°, the minimum angle being 9°. You change the VIEWing Angle by holding down the [SHIFT] key while tapping the +/- keys. Always start out with the widest angle, making sure that the objects you are interested in are well centered on your screen, before reducing the VIEWing Angle. If you do not do this, you may lose your object outside the screen and have difficulty orienting yourself. For the same reason, it is easiest to decrease the VIEWing Angle in steps!

The DIRECTION Keys

When you are in SKY mode and you want to look in a different direction, you have already seen that you can use the cursor to push the window to either side, as well as up or down. However, there is an easier way. You can use four keys: N (for north), S (for south), and you can guise what directions you get with E and W. North, south, east, and west are known as the cardinal directions.

There is still another direction key: O for Opposition. This key points you in a direction exactly 180° (opposite) from the direction you were looking in. You can use that to see whether any planets are in direct opposition to the sun. Use the FIND key (see page 11) to center the sun on your screen, then press the letter O (not zero) — and abracadabra, there you are!

If you have a joystick, you can use that instead of the direction keys. Just plug it in either of the joystick ports on the side of your Commodore 64. The computer will honor both the keys and the joystick — the latter being most convenient for most people.

By the way, the Fire Button on your joystick functions as your INFORM key in both SKY and CHART modes.

The PRINT Keys

If you have a Commodore printer, you can make a permanent record of any visual screen display you create. You can use either a VIC 1525 printer or a Commodore MPS 801. Just plug it into the serial bus in the back of your Commodore 1541 disk drive, plug in the printer, and turn it on. The printer is activated by holding down the SHIFT key while pressing P (for Print).

You will probably be using the printer mostly in connection with the SKY or CHART mode. Therefore carefully study the many choices you have for changing the screen display by means of the Option key [3].

If you try to print when your printer is not hooked up or turned on, the program will show an error message at the bottom of your screen. (IO error, try again!) Simply check your printer to make sure it is hooked up and turned on, and try again.

The OPTION Key [3]

This key can be used in both SKY and CHART modes and provides a number of choices. By default, Sky Travel chooses: LINES, NAMES, SYMBOLS, NO DEEP, NO TRACK, and NO SOUND. (These options are explained below.) The selections which currently are active are shown one at a time in the data window when you tap the [3] key. If you wish to change any of them, hold down the SHIFT key and tap [3] again; the opposite choice is then shown in reverse field, and you activate it by pressing RETURN. Incidentally, you can make all of your choices and then press RETURN to activate all of them at once.

LINES mean constellation lines. Simplified line diagrams are available to help locate principal constellations, especially those that are useful for orienting yourself in the sky. NO LINES eliminates these line drawings.

NAMES displays three letter abbreviations next to the constellations appearing on the screen. NO NAMES eliminates them. As with LINES, NAMES is helpful for general orientation, but may be in the way, for example, in trying to identify individual objects.

SYMBOLS refer to the symbols commonly used to identify the planets. For example:

Mercury ☿ Venus ♀ Mars ♂ Jupiter ♃

Saturn ♄ Uranus ♅ Neptune ♆ Pluto ♇

SYMBOLS are generally quite helpful since planets move around and sometimes are difficult to identify by inspection. When not needed or in the way, NO SYMBOLS replaces them with regular starlike patterns.

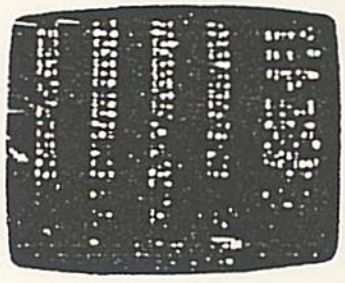
DEEP-SKY displays several hundred very interesting nebula and galaxies and is essential when you want to study the distant universe. However, they do clutter up the more familiar star patterns and make it difficult to orient yourself, at least in the beginning. NO DEEP turns them off.

TRACK is used in special cases only in combination with the FIND key. If the sun, moon, any of the planets, or Halley's comet has been located under the cursor by means of the FIND function, it is kept there as long as TRACK is active. The principle use is to record Right Ascension and Declination values individually for, say, a planet or the moon over a period of time in order to determine their closest approach. This method is also useful in preparing star charts showing the location of planets over a time period, say, for later outside observation. NO TRACK turns this option off, and this should be the normal position.

SOUND is intended to enhance the learning experience. Aside from a sound effect when the cursor is being moved around, this option simultaneously turns the cross hair cursor into an airplane when in the MAP mode and into a space ship when in the SKY mode. NO SOUND turns these special effects off.

The Find Key [5]

This key can be used in SKY and CHART modes and enables you to locate the SUN, MOON, any PLANET, any CONSTELLATION or the COMET (in season) at the center of your screen. Instead of looking around the sky for a specific object, just tap the [5] key until the desired sky object is shown in the data window, then press RETURN. When you ask for a constellation, the screen changes to a display of three letter abbreviations for the 88 constellations. Move the cursor over the desired one and press RETURN. If you do not remember the abbreviation, the manual has a listing in the back. By the way, the constellation list also gives you the option to select either the North Pole or the South Pole (lower right on list display). It even gives you the option to get back if you change your mind and do not want to see a constellation after all. The last "constellation" on the display is Oops. When you put the cursor on that and press RETURN, you get back to where you were!



The INFORM Key [7]

INFORM can be used in SKY and CHART modes and is intended to reduce the need for looking in manuals while using Sky Travel. Detailed descriptions of the 88 constellations, more than 1200 stars, and 300 deep-sky objects are contained in a disk file which is accessed simply by placing the cursor over the particular sky object and then pressing [7] (in the case of constellations, the cursor should be placed over the first letter of the abbreviated name). The Fire Button on your joystick may be used instead of [7].

The information is displayed on the textline below the screen. You can scroll both forwards and backwards, so in case you mistakenly pass over some important information, you do not have to start all over again. When INFORM is used the left/right cursor key or your joystick controls the scrolling.

The textline always identifies the object and lists the proper catalog number. For the stars, the HD number (Henry Draper Catalog) is used. For the deep-sky objects, the so-called NGC number (New General Catalog) is shown together with the Messier number. The Messier number is used if the object was originally listed by Charles Messier, a French astronomer and comet hunter who prepared the first catalog (1781 A.D.) of non-stellar sky objects. (e.g. Andromeda galaxy = NGC 224 = M31). These catalog numbers are in universal use and enable you to locate more detailed information about any particular sky object in the literature if you should wish to do so. In addition, the text contains the most important astronomical data including mass and/or dimensions as well as distance in light years.

To get out of INFORM, press RETURN or the Fire Button, if you are using the joystick!

Program OPERATING HINTS

You will appreciate the many options this program provides as soon as you become familiar with Sky Travel and start to use it on your own. However, for general purposes, the following settings are just fine (remember that the Clock RATE, VIEW Angle, and [3] option changes are made in SKY mode):

Clock RATE:0X (stopped); VIEWing Angle: 36 degrees is a good choice; DIRECTION keys: a joystick enables you to manipulate the system most easily while you sit back and enjoy it; PRINTER: very helpful if you plan to study the real sky later (constellations, planets, comet); [3]/LINES: on; [3]/NAMES: on; [3]/SYMBOLS: on; [3]/DEEP-SKY: off; [3]/TRACKING: off; [3]/SOUND: off.

For the following purposes, these changes are appropriate:

Star/Constellation recognition: go to VIEW ANGLE 72 degrees.

Studies of galaxies: DEEP-SKY must be on. For faintest stars and galaxies, start with 36 degrees VIEW Angle and lower in steps.

Sunrise/sunset studies: the Clock RATE should be set at 16X to 32X.

Teaching youngsters: turn on SOUND.

For special purposes: consult the discussion in the preceeding section and the examples in this manual.