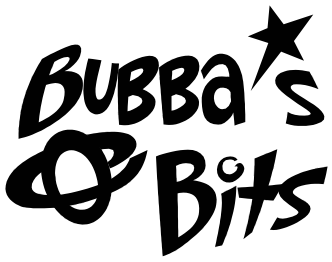

BUBBA'S BITS INCORPORATED

Cell Phone Astronomy Software

picoSky™ Users Manual

CELL PHONE ASTRONOMY SOFTWARE

picoSky™ Users Manual

Version 1.4

© 2003 - 2004 Bubba's Bits, Inc.
PMB 678 • 15600 NE 8th Street, Suite B1
Bellevue, WA 98008
support@bubbasbits.com

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A Guided Tour Through picoSky

An examination of picoSky's primary features.

This guided tour will walk you through some of the key elements of picoSky. The tour will take you through the initial run of picoSky, show you how to view the sky from any direction and present some of picoSky's powerful features. We highly recommend that you at least take a quick glance through this section of the manual so you will be able to enjoy picoSky from the first time you use it.

ICON KEY

Note

Warning

Advanced

Throughout this manual you may notice some of the icons to the right. We have attempted to call out some important features and to describe methods to help make your use of picoSky a pleasant experience.

Before running picoSky it is important that you make certain that your cell phones' time accurately represents your local time. Most cell phones update their time from the cellular service provider's network. If your cell phone does not show the correct local time, picoSky's information and rendering of the sky will not be accurate.

First Time

The first screen you will see when starting picoSky is the programs' title screen, which also presents you with information about data that the program is loading. Most cell phones take only a few seconds to load all of the data needed to run the program.

Figure 1: Title Screen

Figure 2: EULA

When you start picoSky for the first time the program asks two important questions. First, in order to continue running the program, you must accept the picoSky End Users Licensing Agreement (EULA). This common agreement is found with most software packages and can either be read through your phone or read online at **http://www.BubbasBits.com**. If you choose to read the agreement through your phone, picoSky will need to access the agreement over the wireless network, so your phone may ask your permission for picoSky to use the wireless network. This is the only time when picoSky will request use of the wireless network. If you've already read the agreement and wish to continue using picoSky, simply choose **Accept**.

picoSky continues once you have accepted the EULA. The application will then require you to enter a three digit United States telephone area code, which picoSky uses to find your approximate latitude, longitude and time zone. First, picoSky presents you with information about why it will be asking for your telephone area code. Next picoSky allows you to modify the default area code, which is "425". Figure 3 shows an example of these two screens. This information is critical for picoSky to give an accurate representation of your night sky. If you are located outside the United States, please see the section that describes the **Site Information** menu on page 14. You can use the **Site Information** menu to enter the exact latitude and longitude for any location on Earth.

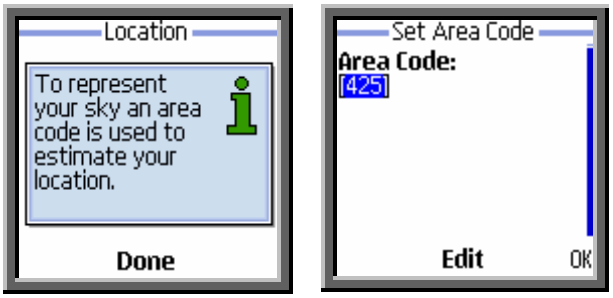

Figure 3: First two screens after EULA

Main Menu

After you have entered your telephone area code the picoSky main menu is presented. From here you can configure picoSky and access its wealth of information.

Registration

picoSky is considered a "Shareware" application, meaning that you may try this software on your cell phone for free five times and if you like it you can then purchase a license to use it. You will receive a registration key via e-mail once a license to use picoSky is purchased. You may enter this key by selecting **Register** from the Main Menu. You will then be free to use picoSky as many times as you wish.

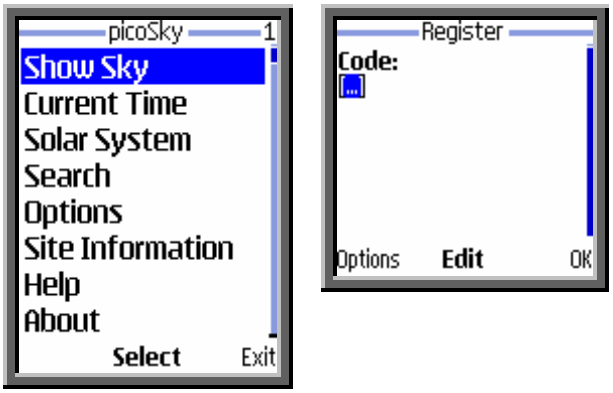

Figure 4: Main Menu & Registration

Show Sky

Once you are at picoSky's main menu, the first thing you may wish to do is to view the sky. When you select **Show Sky** for the first time, picoSky will calculate the position of all of the objects in its database for your time and location and then picoSky will create a graphical representation, or rendering of the sky to your south. This calculation of the astronomical object positions takes the most time as there are many objects and each requires a good deal of computation. Fortunately this calculation phase will only happen the first time you view the sky, and every fifteen minutes thereafter. The second

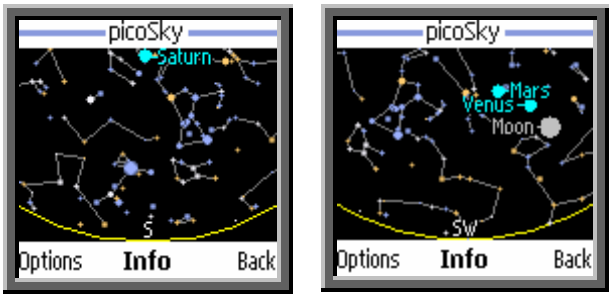

Figure 5: Before and after pressing "9"

phase of the process, the rendering, is much faster and will allow you to view the sky from any angle without the need to recalculate.

When the sky is shown you can use your phones numeric keypad to change the direction of the rendering. For example, when you first see the sky rendered it will be a representation of the southern sky. Depressing the **9** key will change the view to show the southwestern sky. Just above the horizon line are small text markers showing the currently viewed direction, in this case the first screen shows an "S" for south and the second an "SW" for southwest in Figure 5 on page 2.

Show Sky Orientation

Your cell phone's numeric keypad acts as a compass for picoSky. Pressing numbers **1** through **9** causes picoSky to render a representation of the sky in that direction. Figure 6 shows all of the functions of your phones numeric keypad when viewing the sky renderings. Keys **1** through **9** acts as the eight standard directions of a compass, and depressing one of those keys will show a view of the sky from that direction. The **5** key is a special case; it shows the zenith or what is directly above you for each direction of the compass. If you are viewing the southern sky and press **5** your new view will be of the zenith with south toward the bottom of the screen.

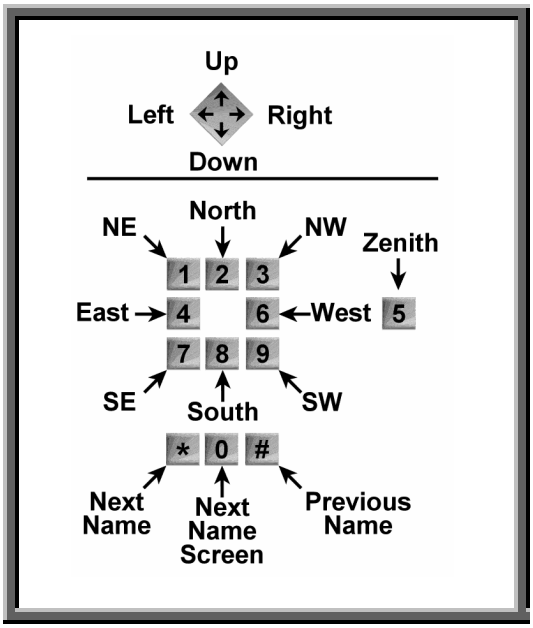

Figure 6: Numeric Keypad Functions

The direction keypad on your cell phone will pan or rotate the rendered view. **Left** and **Right** rotates the view as if you had turned to the left or the right respectively. **Up** and **Down** pans the view as if you had lifted or lowered your head up or down respectively. The zenith will always remain up while rotating or panning.

You may also **Zoom In** or **Zoom Out** of the rendered view to get a closer look or to see the whole sky in one screen. The Zoom features can be found by pressing the button labeled **Options**, which on some phones is labeled **Menu** or **More**. While zoomed in or out the panning and rotation keys will continue to work, but if you press any of the numeric keypad keys **1** through **9** then the rendered view will revert to the default magnification and show the sky from that particular compass direction.

Figure 7: Zoom In

Figure 8: Zoom Out

Show Sky Name Screens

The **0** (zero) key on the numeric keypad cycles through picoSky's name screens. The first name screen you see when you first view the rendering of the sky are the names of the planets, Sun, Moon, any found object from a Search and the direction along the horizon line.

Figure 9: Southwestern Show Sky; Solar System, Stars and Constellations Screens

The second Name screen displays star names. The third screen shows constellation names. The fourth screen displays the names and/or catalog identifications of each deep sky object if and only if they are rendered.

The fourth screen is only active when deep sky objects have been selected to be rendered. To learn how to render these deep sky objects, please see Advanced Features on page 6.

Pressing **0** (zero) while viewing the last name screen will cycle back to the first screen. In order of appearance, the name screens are as follows:

1. Planets, Sun, Moon, any found objects and direction
2. Star names
3. Constellation names
4. Deep sky catalog identifications and/or names

Show Sky Name Cycling

The ***** (asterisk) key lets you cycle forward through the names on each screen one name at a time. Since many screens are crowded with too many names to read, you may wish to use this function to display one name at a time when trying to identify a specific star or constellation.

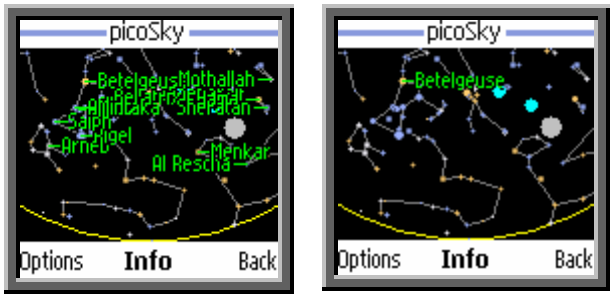

Figure 10: Southwestern Stars' Name Cycling

The **#** (pound) key lets you move backward through the names on each screen. If you are cycling through names at a rapid pace and you accidentally pass over the name you want, you can go back to that name using the **#** (pound) key.

A small green line next to the name (to the left, right, top or bottom) directs you to the exact object the name belongs to.

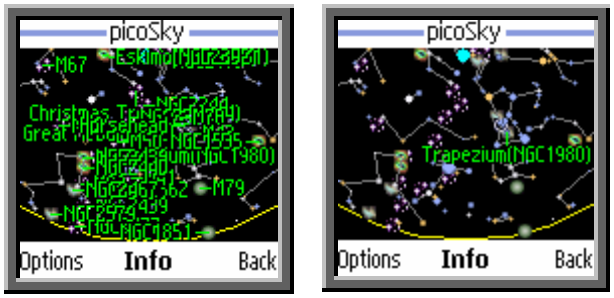

Figure 11: Crowded Deep Sky Screen and Single Name using # key

As you can see in Figure 11, often the screen can become too crowded to read when viewing the deep sky names. The simple solution to that problem is to cycle through the names using the * (asterisk) or # (pound) key one by one until you find the object you are interested in. Once you have selected an object you are interested in, you may then press the soft key associated with the **Info** label and obtain detailed textual information about that object, such as when it will rise or set and its exact altitude and azimuth.

Viewing the Moon

An important feature of picoSky is its ability to give you pertinent information about the celestial objects you wish to observe. For example, say you wanted to find information about the Moon. From the Show Sky screen you would press the soft key on your cell phone associated with the **Menu** label to return to the Main Menu. From there you would select the **Solar System** menu and finally select **Moon** from the Solar System menu.

Once you have selected **Moon** on the Solar System menu picoSky calculates the current phase, position, distance and rise, transit and set times and presents that information to you. Although there are only eight textual descriptions of the Moons phases, the image that represents the Moons current phase is highly accurate.

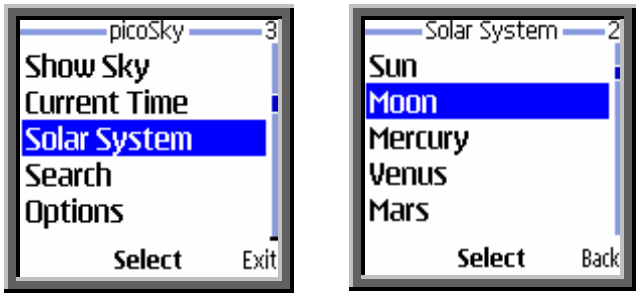

Figure 12: Obtaining Information about the Moon

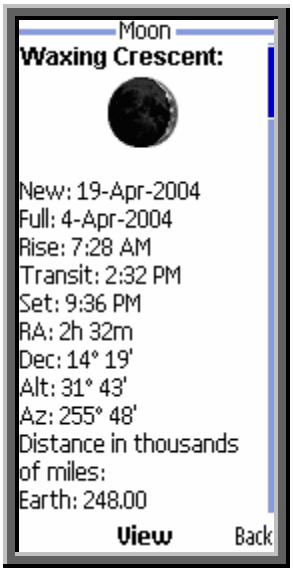

Figure 13: Information about the Moon

If the Moon is above your horizon a **View** soft key will appear. Pressing the soft key on your phone associated with the **View** label will cause picoSky to calculate and render a graphical representation of the current position of the Moon in your sky.

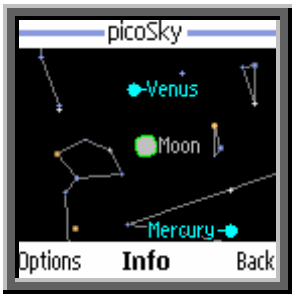

Figure 14: Results of pressing "View" for Moon

Advanced Features

If you are an amateur or professional astronomer you may wish to use picoSky's more advanced features to find celestial objects that you are interested in. picoSky contains a database of over 250 of the brightest and most popular deep sky objects as well as the ability to display information about them and to view them on a graphical representation of the sky if they are above your horizon.

You must first enable rendering of deep sky objects in order to see them in a **Show Sky** screen. To do this select **Options** from the Main Menu. Once in the Options menu, select **Rendering**. From this screen you can enable or disable the various graphical features you wish to be in effect when picoSky renders a **Show Sky** screen. In our example we need to enable or check the **Deep Sky** option. After **Deep Sky** is checked, select the soft key associated with the **OK** label, then select **Back** from the **Options** menu to return to the Main Menu.

Figure 15: Turning on Deep Sky object rendering

Alt/Az Grid

We have added an optional grid that represents 10 (ten) degree separations in altitude and azimuth to make it easier to judge scale when viewing the small representation of the sky that picoSky presents. This option can be found at the bottom of the **Rendering** dialog.

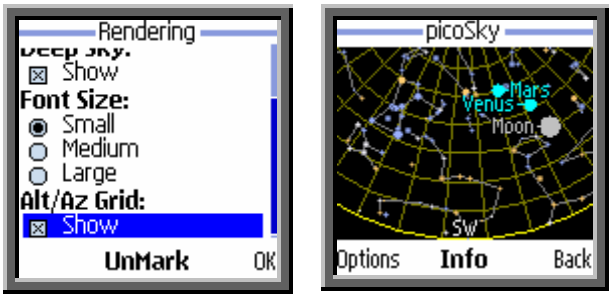

Figure 16: Alt/Az Grid and results

Searching

Once back at the Main Menu you can search for information regarding any object in picoSky's database, such as a star, constellation or deep sky object. Simply select **Search** from the Main Menu and enter in a name or catalog designation for the object you are interested in. The name does not have to be spelled out completely or have the proper case; picoSky will find the first object in its database that matches what you have entered. In our example we will search for the beautiful Pleiades open star cluster.

Figure 17: Searching for the Pleiades

The information calculated once the Pleiades is found include its type, position, name and/or catalog identification and the rise, transit and set times for your location. The right ascension and declination or altitude and azimuth position information can be useful for finding the object in your telescope. As can be seen in the last screen of Figure 17 above, the Pleiades cluster is above the horizon, otherwise had the Pleiades had been below the horizon the **Alt:** and **Az:** fields of that dialog would instead state **Below Horizon**. Simply press the **View** soft key to see the Pleiades in a graphical representation of the sky.

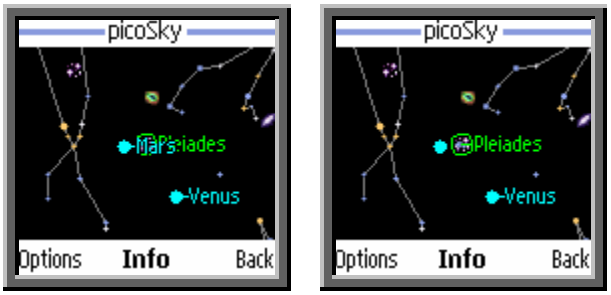

Figure 18: "View" of the Pleiades

When an object is viewed, picoSky paints a green circle around the object and displays its name. In the case of our example, the Pleiades appear right behind the label for Mars. You can see a clearer representation of the Pleiades by pressing the * (asterisks) key once. This will cycle through the labels and uncover the Pleiades location and label.

Each type of deep sky object represented in picoSky has an identifying icon to help make it easy to determine what is in a particular location in your sky. Figure 19 shows each icon and what type of deep sky object that icon represents.

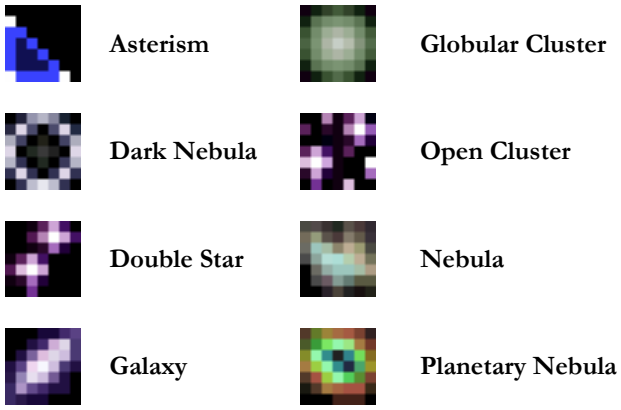

Figure 19: Deep Sky object icons

Main Menu Options

This chapter covers every feature of picoSky item by item.

Figure 20: Main Menu

From the picoSky Main Menu you can view a graphical representation of the current sky, obtain an accurate calculation of the astronomical times, access information about celestial objects and configure picoSky. The following subsections detail each Main Menu selection in detail.

Show Sky

Select Show Sky to render a view of the southern sky for your location and time. If this is the first time you've selected Show Sky for a particular session, picoSky calculates all the relevant positions for each celestial object above your horizon. This calculation may take up to a minute on some cell phones, but future renderings will only take a few seconds. picoSky has a default recalculation time of 15 minutes, meaning it will recalculate the position of everything above the horizon if it hasn't done so in the last 15 minutes. You can change the default recalculation setting (see **Recalc Rate** on page 14).

Current Time

Figure 21: Current Time Dialog

The current time dialog shows several related times useful to astronomers, amateur and professional alike. picoSky uses the standards defined internationally to calculate the mean sidereal times, so if your phone is synchronized with an atomic time standard then all displayed times are accurate to within one second.

Date: (unlabeled) is the current day of the month, month and Christian year.

Observing DST will appear if either **North American** or **European Union** has been selected under the **Daylight Saving** choice group within the **Time Zone** dialog, and the date and time is within the standard time frame for the respective daylight saving time standard.

Local: is the civil time for your given location. It should match the time the cell phone provides as the current time.

UT: (Universal Time) is the time in Greenwich, England without any day light saving time corrections.

GMST: (Greenwich Mean Sidereal Time) can be used with paper star charts to determine which stars are currently near the meridian.

LMST: (Local Mean Sidereal Time) is used for all astronomical calculations in picoSky. This time represents the Mean Sidereal Time adjusted for your longitude.

JULIAN DAY: represents the full Julian Day, or the number of days that has passed since January 1st 4713 B.C. at noon in Greenwich, and is used for all planetary position calculations in picoSky.

Solar System

Select **Solar System** from the Main Menu to get numerical information about the Sun, Moon and each planet in our solar system, as well as having the ability to view each one in a graphical representation of the sky if that solar system object is above the horizon.

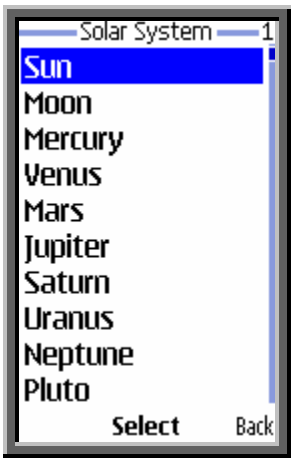

Figure 22: Solar System Menu

For each solar system object (the Sun, Moon and eight of the planets) the following information is given:

For the Moon, a special textual description of which phase it is in is given, followed by a graphic representation of the current phase.

- **Galilean Moons / Moon Phase** are special cases for Jupiter and the Moon respectively. Each will show a small graphical representation of the position of the largest four moons of Jupiter, or of the phase of the Earth's Moon.
- **New / Full** dates for the next "new" or "full" phase of the Moon.
- **Rise** represents the time this object will rise above the horizon, within a few minutes. Precision for rising and setting times should never be more than a minute since the Earth is not a smooth sphere and atmospheric refraction is dependant upon such factors as altitude and humidity.

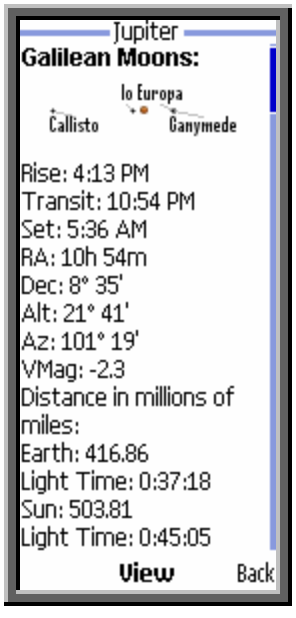

Figure 23: Jupiter Details

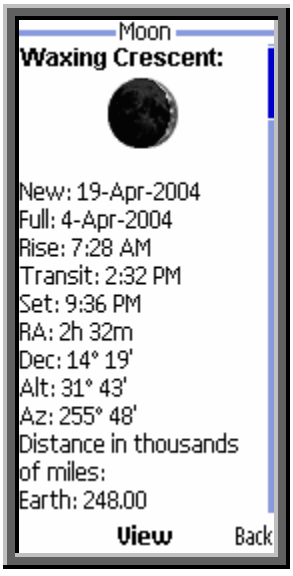

Figure 24: Moon Details

- **Transit** represents the time this object will reach its peak altitude for your location.
- **Set** represents the time this object will recede below the horizon.
- **RA** is the objects actual Right Ascension. Light time is not taken into account.
- **Dec** is the objects actual Declination.
- **Alt** is the objects apparent Altitude with atmospheric refraction taken into account.
- **Az** is the objects apparent Azimuth, or direction along the horizon. The standard used in picoSky is; 0 (zero) is North, 90 is East, 180 is South and 270 is West.
- **VMag** represents the apparent visual magnitude for a particular planet. The apparent visual magnitude scale is logarithmic in nature and more negative for brighter objects (around -12.6 for the full Moon, 0 (zero) for Vega and +4 for the dimmest stars within picoSky).
- **Distance** is either in millions of miles or kilometers for the Sun and planets, or thousands of miles or kilometers for the Moon. Each planet will show the distance in millions of miles or kilometers as well as "Light Time" from both the Earth and the Sun, while the Moon and the Sun only show distance from the Earth. Light Time is the time light takes to travel from that planet to the Earth (or from the Sun) in hours, minutes and seconds.

Use your cell phone's Navigation Pad to scroll down to view more factual information in any Solar System dialog.

Select **View** to see the celestial object in a graphical rendering of the sky.

Search

One of the most powerful features in picoSky is the database search feature. The picoSky database contains 500 named and/or numbered celestial objects which includes 108 star names, 258 of the brightest deep sky objects including the entire 110 objects in the Messier catalog, 46 deep sky object names and 88 constellation names.

Figure 25: Search Dialog

When searching for a celestial object by name, the search feature does not require you to enter the full name or even the correct case (uppercase or lowercase). picoSky compares the text you entered to every name for each celestial object in its database and displays rise, transit and set times as well as present position data for the nearest match. picoSky will display an alert if you enter text that can not be found, and then allow you to edit your text.

If the celestial object found is above the horizon a View soft key label will appear giving you the opportunity to see where this object is in a graphical representation of the sky.

You may also search for deep sky objects by their catalog identification. The picoSky database contains the entire 110 Messier catalog as well as the most visible NGC and IC catalog objects.

Messier numbers originate from the French astronomer Charles Messier, published between 1771 and 1784, and represent 110 bright non-stellar celestial objects. In picoSky's **Search** dialog these numbers are indicated with an **M** at the beginning of the text. For example the Andromeda galaxy could either be searched for by entering **M31** or **Andromeda**.

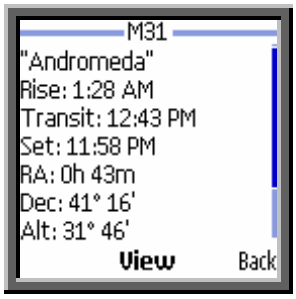

Figure 26: Search results for M31

NGC numbers originate from the New General Catalogue of Nebulae and Clusters of Stars by J.L.E. Dreyer, published in 1888. In picoSky's **Search** dialog these numbers are indicated with an **NGC** at the beginning. For example **NGC6992** will find the **Veil** nebula.

IC numbers originate from the Index Catalogue supplement to the New General Catalogue, which was published in 1895. In picoSky's **Search** dialog these numbers are indicated with an **IC** at the beginning. For example **IC1613** will bring up data on this dwarf irregular galaxy in our Local Group.

Options

This Main menu option lets you set rendering options, set date and time, time format, units of measure and the Sky screen recalculation rates.

Figure 27: Options Menu

Rendering

Turn the different graphical features shown in the Sky screens on or off. You may wish to turn **Constellations** or **Deep Sky** off in order to have quicker access to a graphic representation of the sky, or to make the sky image less cluttered. You may also change the **Font Size** depicted in the Sky screens. Lastly, the **Alt/Az Grid** choice will show a grid for every ten degrees for the altitude and azimuth. This grid can be used to get a better judgment for how far objects are from each other or from the horizon.

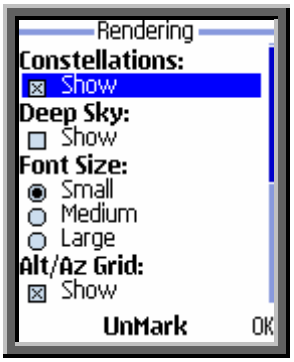

Figure 28: Rendering Dialog

Set Date & Time

Calculate and render the sky for the **Present** moment, or set a **Fixed** date and time in the past or future. Setting a date and time other than the present can be useful to see what was or will be visible in the sky at a different time. The default **Fixed** time is set for 11:00 pm of the current day. Figure 29 shows an example of the fixed date and time used for all of the figures used within this manual.

Figure 29: Set Date & Time Dialog

To keep the date and time set for the present moment, select **Present**. To set a fixed date and time select **Fixed**, then enter the date and time in the appropriate fields. Use the number keys on your cell phone to enter the numbers. When you exit picoSky, the next time you start picoSky the time and date will default to the **Present**.

Time Format

Choose either a twelve hour (civil) time format or a twenty-four hour (military) time format. Figure 30 shows the default setting.

Figure 30: Time Format Dialog

Units

Choose either miles or kilometers as the unit of measure for the celestial object distance information. Figure 31 shows the default setting.

Figure 31: Units Dialog

Recalc Rate

Set the recalculating frequency, the rate at which picoSky recalculates all the objects above the horizon. Setting this value to zero means picoSky recalculates every object in the sky each time a sky screen is rendered. A good recalculating rate is 15 minutes, since the sky only moves 3¾ degrees per hour, thus the sky appears to move the distance of approximately a Boy Scout Salute (the index, middle, ring fingers) held together at arms length. Figure 32 shows the default rate, which is 15 minutes.

Figure 32: Recalc Rate Dialog

Site Information

This set of dialogs let you configure picoSky for your particular location. The least accurate but simplest way is to use your current location's telephone area code. You can use the Latitude and Longitude dialogs to enter a very exact location.

Figure 33: Site Information Menu

By Area Code

Enter a rough approximation of your location by using the three digit telephone area code for the region your in. If you enter an area code that is not in the database you will be asked to enter a valid one. Figure 34 shows the default the telephone area code.

Latitude

Enter a location's latitude in degrees, minutes, and seconds, and if it is a northern or southern latitude. Figure 35 shows the default settings for the 425 telephone area code location.

Longitude

Enter a location's longitude in degrees, minutes, and seconds, and if it is an eastern or western longitude. Figure 36 shows the default settings for the 425 telephone area code location.

Figure 34: By Area Code Dialog

Figure 35: Latitude Dialog

Figure 36: Longitude Dialog

Time Zone

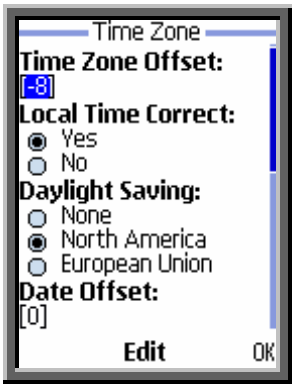

Figure 37: Time Zone Dialog

Adjust your current location's time zone as well as adjustments for daylight saving time and errant J2ME™ implementations. The **Local Time Correct** adjustment fixes a problem some cell phones have; when picoSky requests the current local time, some phones return with Universal Time. The **Daylight Saving** options allow picoSky to automatically adjust the local time for the given standard. For **North America** daylight saving time starts at 2 a.m. local time on the first Sunday of April and ends at 2 a.m. local time on the last Sunday of October. For the **European Union** daylight saving time starts at 1 a.m. UTC on the last Sunday in March and ends at 1 a.m. UTC on the last Sunday in October. The **Date Offset** value adjusts the date given in **Current Time**. Typically you will not have to adjust these settings, only do so if your current time is incorrect.

Help

Figure 38 shows the Help dialog. The primary information contained within this dialog shows how to change the Show Sky screens' orientation. Much more detailed information can be found at **http://www.BubbasBits.com/** or by using this manual.

Figure 38: Help Dialog

About

This dialog contains information on picoSky's publisher, rights, product serial number if registered and the current version number for the application. The information contained after **Platform:** should be included in any correspondence to Bubba's Bits.

Figure 39: About Dialog

Troubleshooting

This chapter focuses on issues that may arise while using picoSky and their solutions.

Please feel free to e-mail us at **support@bubbasbits.com** if you require any assistance with picoSky. When creating your e-mail, please include the information from the picoSky **About** dialog, as many cell phones are different and this will provide us with a reference point.

Configuring picoSky for Another Location

All planetarium programs are dependent upon two things; your location on Earth and the current local time. The first time you start picoSky it will ask you for your current telephone area code and will use that three digit number to search a database of all of the area codes in the United States in order to obtain an approximate latitude, longitude and time zone. picoSky contains a database comprising the latitude and longitude of each area code currently in use in the U.S.A.. This gives the program a close approximation of where you are on the planet. A more accurate location can be entered through the **Latitude** and **Longitude** menu items. See **Latitude** and **Longitude** on page 15 for more information.

To configure picoSky for any location and time:

1. From the **Main Menu**, select **Site Information**.
2. From the **Site Information** menu, select **By Area Code**.
3. Enter the desired telephone three-digit area code and select **OK**.
4. Select **Back** to return to the Main Menu.

Check to make sure picoSky is using the correct time setting by selecting **Current Time** from the Main Menu. If the **Local Time** is close to what you know is the current time, nothing more needs to be done. Otherwise, if it is off by a great deal (several hours), an adjustment is needed.

Local Time Correction

Some cell phone J2ME™ implementations may incorrectly give picoSky a Universal Time when picoSky asks for the current local time. Unfortunately picoSky can not detect when this happens (or we would've made an adjustment). If you notice that the **Local Time** in your **Current Time** differs greatly from what your cell phone states is the correct time, you will need to make a simple adjustment to let picoSky know of the problem.

To correct your local time:

1. From the **Main Menu** select **Site Information**.
2. Select **Time Zone**.
3. Choose **No** as the option under the **Local Time Correct** menu item.
4. Select **OK** to return to the **Main Menu**.
5. Check to see if the **Current Time** is correct.

Credits

picoSky was developed by a dedicated team of astronomy enthusiasts.

Executive Producer: Laura McGrath

Chief Software Architect: Kevin McGrath

Art Director: Connie Braat

Chief Editor: Laura McGrath

Database Creation: Laura McGrath, Kevin McGrath

Testing: Kevin McGrath

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Appendix A: Deep Sky Object Database

This table represents all deep sky celestial objects used in picoSky with their name, catalog number and type.

Name	Index	Type	Name	Index	Type
Crab	M1	Nebula		NGC1316	Galaxy
	M2	Globular Cluster		NGC1360	Planetary Nebula
	M3	Globular Cluster		NGC1365	Galaxy
	M4	Globular Cluster		NGC1502	Open Cluster
	M5	Globular Cluster		NGC1514	Planetary Nebula
Butterfly	M6	Open Cluster		NGC1528	Open Cluster
	M7	Open Cluster		NGC1535	Planetary Nebula
Lagoon	M8	Nebula		NGC1624	Nebula
	M9	Globular Cluster		NGC1746	Open Cluster
	M10	Globular Cluster		NGC1851	Globular Cluster
Wild Duck	M11	Open Cluster	Trapezium	NGC1980	Open Cluster
	M12	Globular Cluster	Tarantula	NGC2070	Nebula
Great Cluster	M13	Globular Cluster		NGC2129	Open Cluster
	M14	Globular Cluster		NGC2175	Nebula
	M15	Globular Cluster		NGC2244	Open Cluster
Eagle	M16	Nebula	Christmas Tree	NGC2264	Open Cluster
Omega	M17	Nebula		NGC2281	Open Cluster
	M18	Open Cluster		NGC2301	Open Cluster
	M19	Globular Cluster		NGC2362	Open Cluster
Trifid	M20	Nebula		NGC2362	Open Cluster
	M21	Open Cluster	Eskimo	NGC2392	Planetary Nebula
	M22	Globular Cluster		NGC2403	Galaxy
	M23	Open Cluster	Intergalactic Wanderer	NGC2419	Globular Cluster
	M24	Open Cluster		NGC2438	Planetary Nebula
	M25	Open Cluster		NGC2439	Open Cluster
	M26	Open Cluster		NGC2440	Planetary Nebula
Dumbbell	M27	Planetary Nebula		NGC2467	Nebula
	M28	Globular Cluster		NGC2477	Open Cluster
	M29	Open Cluster		NGC2579	Nebula
	M30	Globular Cluster		NGC2808	Globular Cluster
Andromeda	M31	Galaxy		NGC2841	Galaxy
	M32	Galaxy		NGC2903	Galaxy
Triangulum	M33	Galaxy		NGC3115	Galaxy
	M34	Open Cluster	Eight-Burst	NGC3132	Planetary Nebula
	M35	Open Cluster		NGC3201	Globular Cluster
	M36	Open Cluster	Ghost of Jupiter	NGC3242	Planetary Nebula
	M37	Open Cluster		NGC3247	Open Cluster
	M38	Open Cluster		NGC3293	Open Cluster

Name	Index	Type
	M39	Open Cluster
	M40	Double Star
	M41	Open Cluster
Great Nebula	M42	Nebula
	M43	Nebula
Beehive	M44	Open Cluster
Pleiades	M45	Open Cluster
	M46	Open Cluster
	M47	Open Cluster
	M48	Open Cluster
	M49	Galaxy
	M50	Open Cluster
Whirlpool	M51	Galaxy
	M52	Open Cluster
	M53	Globular Cluster
	M54	Globular Cluster
	M55	Globular Cluster
	M56	Globular Cluster
Ring	M57	Planetary Nebula
	M58	Galaxy
	M59	Galaxy
	M60	Galaxy
	M61	Galaxy
	M62	Globular Cluster
Sunflower	M63	Galaxy
Blackeye	M64	Galaxy
	M65	Galaxy
	M66	Galaxy
	M67	Open Cluster
	M68	Globular Cluster
	M69	Globular Cluster
	M70	Globular Cluster
	M71	Globular Cluster
	M72	Globular Cluster
	M73	Asterism
	M74	Galaxy
	M75	Globular Cluster
Little Dumbbell	M76	Planetary Nebula
	M77	Galaxy
	M78	Nebula
	M79	Globular Cluster
	M80	Globular Cluster
Bode's Nebula	M81	Galaxy
	M82	Galaxy
	M83	Galaxy
	M84	Galaxy

Name	Index	Type
	NGC3293	Open Cluster
	NGC3324	Nebula
	NGC3521	Galaxy
	NGC3532	Open Cluster
	NGC3572	Open Cluster
	NGC3603	Open Cluster
	NGC3621	Galaxy
	NGC3628	Galaxy
Blue Planetary	NGC3918	Planetary Nebula
	NGC4236	Galaxy
	NGC4361	Planetary Nebula
	NGC4559	Galaxy
	NGC4565	Galaxy
	NGC4631	Galaxy
	NGC4725	Galaxy
Jewel Box	NGC4755	Open Cluster
	NGC4833	Globular Cluster
	NGC4945	Galaxy
	NGC5053	Globular Cluster
	NGC5102	Galaxy
	NGC5128	Galaxy
Omega Centauri	NGC5139	Globular Cluster
	NGC5286	Globular Cluster
	NGC5824	Globular Cluster
	NGC5897	Globular Cluster
	NGC5927	Globular Cluster
	NGC5986	Globular Cluster
	NGC6101	Globular Cluster
	NGC6124	Open Cluster
	NGC6144	Globular Cluster
	NGC6193	Open Cluster
	NGC6210	Planetary Nebula
	NGC6231	Nebula
	NGC6231	Open Cluster
	NGC6281	Nebula
	NGC6281	Open Cluster
	NGC6284	Globular Cluster
	NGC6293	Globular Cluster
	NGC6304	Globular Cluster
Box	NGC6309	Planetary Nebula
	NGC6316	Globular Cluster
	NGC6322	Open Cluster
	NGC6356	Globular Cluster
	NGC6362	Globular Cluster
	NGC6383	Open Cluster
	NGC6388	Globular Cluster

Name	Index	Type	Name	Index	Type
	M85	Galaxy		NGC6397	Globular Cluster
	M86	Galaxy		NGC6401	Globular Cluster
	M87	Galaxy		NGC6441	Globular Cluster
	M88	Galaxy		NGC6522	Globular Cluster
	M89	Galaxy		NGC6530	Open Cluster
	M90	Galaxy		NGC6541	Globular Cluster
	M91	Galaxy	Cat Eye	NGC6543	Planetary Nebula
	M92	Globular Cluster		NGC6544	Globular Cluster
	M93	Open Cluster		NGC6553	Globular Cluster
	M94	Galaxy		NGC6569	Globular Cluster
	M95	Galaxy		NGC6572	Planetary Nebula
	M96	Galaxy		NGC6604	Open Cluster
Owl	M97	Planetary Nebula		NGC6624	Globular Cluster
	M98	Galaxy		NGC6633	Open Cluster
	M99	Galaxy		NGC6642	Globular Cluster
	M100	Galaxy		NGC6712	Globular Cluster
Pinwheel	M101	Galaxy		NGC6723	Globular Cluster
	M102	Galaxy		NGC6744	Galaxy
	M103	Open Cluster		NGC6752	Globular Cluster
Sombrero Galaxy	M104	Galaxy		NGC6790	Planetary Nebula
	M105	Galaxy		NGC6803	Planetary Nebula
	M106	Galaxy		NGC6818	Planetary Nebula
	M107	Globular Cluster	Barnard's Galaxy	NGC6822	Galaxy
	M108	Galaxy	Blinking Planetary	NGC6826	Planetary Nebula
	M109	Galaxy		NGC6883	Nebula
	M110	Galaxy		NGC6934	Globular Cluster
	NGC40	Planetary Nebula		NGC6946	Galaxy
	NGC55	Galaxy	Veil	NGC6992	Nebula
47 Tucanae	NGC104	Globular Cluster	North America	NGC7000	Nebula
	NGC246	Planetary Nebula	Saturn Nebula	NGC7009	Planetary Nebula
	NGC247	Galaxy		NGC7023	Nebula
	NGC253	Galaxy		NGC7027	Planetary Nebula
	NGC281	Nebula		NGC7331	Galaxy
	NGC288	Globular Cluster	Blue Snowball	NGC7662	Planetary Nebula
	NGC300	Galaxy		NGC7793	Galaxy
	NGC346	Open Cluster		IC342	Galaxy
	NGC362	Globular Cluster		IC1396	Nebula
	NGC869	Open Cluster		IC1613	Galaxy
	NGC884	Open Cluster		IC2391	Open Cluster
	NGC1023	Galaxy		IC2602	Open Cluster
	NGC1097	Galaxy		IC5146	Nebula
	NGC1232	Galaxy	Coalsack		Dark Nebula
	NGC1261	Globular Cluster	Coathanger		Asterism
	NGC1291	Galaxy	Horsehead		Dark Nebula
	NGC1313	Galaxy	SagDEG		Galaxy

Appendix B: Constellation Names

This table represents all constellation names used within picoSky and their English translation.

Name	Translation	Name	Translation
Andromeda	Daughter of Cepheus	Lacerta	Lizard
Antlia	Air Pump	Leo	Lion
Apus	Bird of Paradise	Leo Minor	Lesser Lion
Aquarius	Water Bearer	Lepus	Hare
Aquila	Eagle	Libra	Balance
Ara	Altar	Lupus	Wolf
Aries	Ram	Lynx	Lynx
Auriga	Charioteer	Lyra	Lyre
Boötes	Herdsman	Mensa	Table
Caelum	Chisel	Microscopium	Microscope
Camelopardalis	Giraffe	Monoceros	Unicorn
Cancer	Crab	Musca	Fly
Canes Venatici	Hunting Dogs	Norma	Square and Rule
Canis Major	Greater Dog	Octans	Octant
Canis Minor	Lesser Dog	Ophiuchus	Serpent Bearer
Capricornus	Goat	Orion	Hunter
Carina	Keel	Pavo	Peacock
Cassiopeia	Mother of Andromeda	Pegasus	Winged Horse
Centaurus	Centaur	Perseus	Hero, son of Zeus
Cepheus	King of Ethiopia	Phoenix	Phoenix
Cetus	Whale	Pictor	Painter's Easel
Chamaeleon	Chamaeleon	Pisces	Fishes
Circinus	Compasses	Piscis Austrinus	Southern Fish
Columba	Dove	Puppis	Stern
Coma Berenices	Berenice's Hair	Pyxis	Compass Box
Corona Australis	Southern Crown	Reticulum	Net
Corona Borealis	Northern Crown	Sagitta	Arrow
Corvus	Crow	Sagittarius	Archer
Crater	Cup	Scorpius	Scorpion
Crux	Southern Cross	Sculptor	Sculptor's Workshop
Cygnus	Swan	Scutum	Shield
Delphinus	Dolphin	Serpens	Serpent
Dorado	Swordfish	Sextans	Sextant
Draco	Dragon	Taurus	Bull
Equuleus	Little Horse	Telescopium	Telescope
Eridanus	River	Triangulum	Triangle
Fornax	Furnace	Triangulum Australe	Southern Triangle
Gemini	Twins	Tucana	Toucan
Grus	Crane	Ursa Major	Great Bear
Hercules	Hercules	Ursa Minor	Little Bear
Horologium	Clock	Vela	Sails
Hydra	Water Monster	Virgo	Virgin
Hydrus	Water Snake	Volans	Flying Fish
Indus	Indian	Vulpecula	Fox

Appendix C: Star Names

This table represents all star names used within picoSky and which constellation they reside within.

Primary Name	Constellation
Acamar	Eridanus
Achernar	Eridanus
Acrux	Crux
Acubens	Cancer
Adhara	Canis Major
Al Giedi	Capricornus
Al nair	Indus
Al Na'ir	Grus
Al Rescha	Pisces
Alchibah	Corvus
Alcor	Ursa Major
Aldebaran	Taurus
Alderamin	Cepheus
Algol	Perseus
Algorab	Corvus
Alioth	Ursa Major
Alkaid	Ursa Major
Alkes	Crater
Alnilam	Orion
Alnitak	Orion
Alphard	Hydra
Alphecca	Corona Borealis
Alpheratz	Andromeda
Altair	Aquila
Ankaa	Phoenix
Antares	Scorpius
Arcturus	Boötes
Arneb	Lepus
Asellus Australis	Cancer
Asellus Borealis	Cancer
Atria	Triangulum Ausrale
Avior	Carina
Bellatrix	Orion
Betelgeuse	Orion
Canopus	Carina
Capella	Auriga

Primary Name	Constellation
Caph	Cassiopeia
Castor	Gemini
Cor Caroli	Canes Venatici
Deneb	Cygnus
Denebola	Leo
Diphda	Cetus
Dschubba	Scorpius
Dubhe	Ursa Major
Elnath	Taurus
Eltanin	Draco
Enif	Pegasus
Fomalhaut	Piscis Austrinus
Gacrux	Crux
Glensh	Corvus
Hadar	Centaurus
Hamal	Aries
Izar	Boötes
Kaus Australis	Sagittarius
Kaus Borealis	Sagittarius
Kaus Media	Sagittarius
Kitalpha	Equuleus
Kochab	Ursa Minor
Kornephoros	Hercules
Markab	Pegasus
Megrez	Ursa Major
Menkar	Cetus
Menkent	Centaurus
Miaplacidus	Carina
Mintaka	Orion
Mirach	Andromeda
Mirak	Ursa Major
Mirfak	Perseus
Mizar	Ursa Major
Mothallah	Triangulum
Muphrid	Boötes
Nunki	Sagittarius

Primary Name	Constellation
Phact	Columba
Phecda	Ursa Major
Polaris	Ursa Minor
Pollux	Gemini
Procyon	Canis Minor
Ras Algethi	Hercules
Ras Alhague	Ophiuchus
Regulus	Leo
Rigel	Orion
Rigel Kentaurus	Centaurus
Rukbah	Cassiopeia
Rukbat	Sagittarius
Sabik	Ophiuchus
Sadal Melik	Aquarius
Saiph	Orion
Scheat	Pegasus
Schedar	Cassiopeia
Segin	Cassiopeia
Shaula	Scorpius
Sheliak	Lyra
Sheratan	Aries
Sirius	Canis Major
Spica	Virgo
Sualocin	Delphinus
Sulafat	Lyra
Tchou	Ara
The Garnet Star	Cepheus
The Peacock Star	Pavo
Thuban	Draco
Unukalhai	Serpens
Vega	Lyra
Vindemiatrix	Virgo
Yed Posterior	Ophiuchus
Yed Prior	Ophiuchus
Zubenelgenubi	Libra
Zubeneschamali	Libra