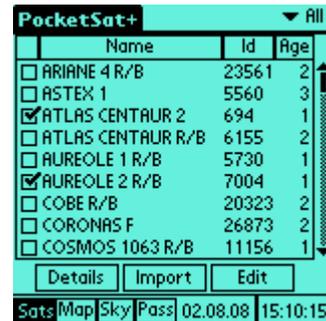


PocketSat+

Version 1.9 (10 December, 2004)



Introduction

Overview

PocketSat+ is a full-featured satellite tracking application for PalmOS devices. It is designed to be usable by both experienced satellite trackers as well as novices who are interested in knowing when they can simply look up and see satellites.

Like PocketSat, its predecessor, PocketSat+ includes tools to predict when satellites in low-Earth orbits will pass overhead and potentially be visible. Unlike PocketSat, however, PocketSat+ can track any satellite, and can display real-time plots of multiple satellites on both Earth maps and Sky charts.

Features of PocketSat+ include:

- Configurable to compute satellite visibility from any location on Earth.
- Track and plot real-time positions of up to 20 satellites simultaneously.
- Map view shows satellite position and orbit track on an Earth map.
- Sky view shows satellite position and path in the Sky.
- Flexible application clock can be set to any date and time as well as clock rate, allowing “what happens when...” experiments. You can make time stand still or even go backwards if you wish. A single button press restores the clock to current system time.
- “Pass” mode allows pre-calculation of satellites that will pass over a particular location during a given time span, including filters for minimum altitude and whether or not a satellite is lit by the Sun.

- Uses full SGP4 and SDP4 orbit propagation algorithms, allowing accurate tracking of any satellite.
- Supports PalmOS5 Hi-res devices.

Installation

Installation of PocketSat+ involves installing 3 different files:

- **PocketSatPlus.prc.** This is the application itself, and must be loaded onto your Palm device.
- **PSPlusMaps_XXX.prc.** Where XXX can be “ColorHR”, “GrayHR”, “Color”, “Gray” or “BW” for hi-res color, hi-res grayscale, color, grayscale and black-and-white devices, respectively. This database contains the artwork and color settings for PocketSat+, and the one that you load will determine the graphics mode that the application chooses. There are, of course, some limitations:
 1. A Hi-res color Palm must use the “ColorHR” map as the other maps aren’t large enough to fill the map window.
 2. A 160x160 color Palm can use any of the files (except the HR file), and will operate in any of the modes.
 3. A grayscale Palm running PalmOS 3.5 or newer can use either the grayscale or the black-and-white maps.
 4. A Palm running a version of PalmOS older than 3.5 can only use the black-and-white database.

If you load an unusable database nothing bad will happen – PocketSat will just let you know about it and then exit.

*** **Be sure to load only one map database.** *** If more than one is loaded, PocketSat+ will use the first on that it finds, which is probably not the one you want for it to use.

- **Mathlib.prc.** This is Rich Heubner's invaluable double precision math library. If you already use PocketSat or almost any other numerically intensive application you will almost surely already have it loaded, in which case you don’t need to install it again.

In addition to these files, you will probably also want to install some satellite data. You may want to get current data from the PocketSat+ web site (www.bigfattail.com/software/pocketsatplus) or, if you just want to see how it works, I have included a sample import database: **sampsats.pdb**. **Note that this database will almost certainly be out-of-date by the time you use it, and will probably give inaccurate results**, but you can still use it to get a feel for PocketSat+ and how it works.

Expansion Cards

PocketSat+ can be installed on an external memory card on newer PalmOS devices which support them. To do this, install both PocketSatPlus.prc and PSPlusMaps_XXX.prc on the card. **MathLib.prc must be in main memory.** In addition, since import databases are only temporary, they are also expected to be in main memory as well. PocketSat+ will save all of its internal databases on the card so will use almost no main memory when not running.

Hi Res Support

As of PalmOS v5, there is system support for hi-res Palm devices. On such a device PocketSat+ will operate in hi-res mode. Note that this does not include vendor proprietary hi-res systems, like the Handspring 330 or pre-PalmOS5 Sony Clies. When PocketSat+ is installed on these devices the hi-res maps database must be installed as well.

Obtaining Satellite Data

The orbital data for a satellite changes with time. While a given set of data is accurate for at least a few weeks to a couple of months for low-accuracy naked-eye observation, you will eventually have to update it. Fortunately, there are quite a few sources for the web for up-to-data orbital elements. Check out the PocketSat+ web site for pointers to some of them.

PocketSat+ reads data stored in the popular TLE (Two Line Element) text format. In order to get the data into you PalmOS device it can either be copied into a memo, or turned into a "PocketSat import database" by using one of several tools available at the PocketSat+ web site. See the section on importing data later in this manual for more details.

Note that currently both PocketSat and PocketSat+ share a common import database format, and databases created for use by either of them can be imported into both.

Registering

PocketSat+ is a shareware application and simply runs slower if unregistered. This seemed like a sensible way to allow people to get a feel for how it works and get through any installation and configuration kinks before actually paying for it. **I very strongly recommend installing it and getting it working before you register** – it is a complicated application and I would hate for anyone to spend money on it only to discover that it wasn't really what that they wanted.

To give an idea of the speed of app when registered versus when unregistered, I tested a couple of functions on my Palm IIIc. On newer devices with faster CPUs the registered speed can be expected to be faster.

Action	Unregistered	Registered
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“Select Above Horizon” (212 satellites)	159 sec	107 sec
Compute visible passes (108 satellites) over a 6 hr period	552 sec	400 sec
Map and Sky tracking	3 sec per update	1 sec per update

A registration code for PocketSat+ costs US\$25 and can be obtained at the PocketSat+ website (www.bigfattail.com/software/pocketsatplus).

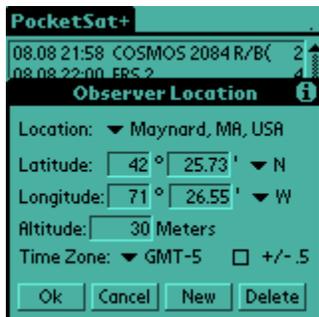
Using PocketSat+

Selecting Modes

PocketSat+ is made up of four basic operational modes, which are accessible by using the buttons along the bottom of the screen. These include:

- **Satellite Selection.** Use this screen to specify which satellites are to be included in calculations performed by the other modes. It is also where you import, modify, update and view satellite data.
- **Map.** This mode displays a zoomable Mercator projection map of the Earth. Overlaid on the map are the positions of satellites, their orbit tracks and visibility zones (areas on the Earth for which they are above the horizon.)
- **Sky.** This mode displays a plot of the overhead sky at the currently specified observer location. If any selected satellites are above the horizon their positions are plotted as well as their path across the sky.
- **Pass.** This mode enables you to calculate in advance times when satellites will pass overhead at the specified observer location. Passes are listed, ranked by “goodness” and can have PalmOS alarms attached to them to notify you when they occur. This mode is basically the entire original PocketSat application.

Setting the Observer Location



In order for PocketSat to determine when and where you should look in order to view satellites, it is necessary for you to tell it where you are on the Earth. Select your current location from the dropdown list.

To enter a new location, first select "New" and enter the location name. A new location will be created containing data copied from the previously displayed location. Now you must enter the following information:

- **Latitude.** Can range from 90 degrees South to 90 degrees North.
- **Longitude.** Can range from 180 degrees West to 180 degrees East. Note that locations in North and South America have West longitudes.
- **Altitude.** Above sea level, in meters. If you don't know, a reasonable guess is probably good enough.
- **Time zone.** The local offset from Greenwich Mean Time. Eastern Standard Time (EST) is GMT-5, Pacific Standard Time (PST) is GMT-8. How this setting is used is determined the settings in the "Clock Preferences" panel.

For those locations where there are half-hour time zones, you can select the '+/- .5' box to add a half hour to the time zone (or subtract a half hour from a negative one.) Quick-witted readers will notice that you can't enter a time zone of GMT-1/2 hour. No one has needed it yet...

If you are unsure what to enter for you location, it is usually good enough to look up the location of a nearby city (within 50 or so miles) and to use that.

Select the "Delete" button to remove the currently displayed location from your list of available locations.

If you only have one location in the list, you cannot delete it.

The PocketSat+ Clock



The PocketSat+ clock is the heart of the application, and drives everything else. Visible at the lower right corner of the screen in all program modes, it can be set by tapping either the date or time display.

Using the "Set Program Time" dialog, you can set the clock to any time and date, and can set its speed. You can even set the speed to zero or to go backwards!

Pressing the “Realtime” button in the dialog sets the clock rate to normal and the time and date to the system time and date.

The time is always displayed in 24 hour format as hh:mm:ss and the date is always displayed as yy.mm.dd (I apologize if that’s not your favorite format, but dots take up less space than slashes, and I was out of screen room...) When the clock is not set to real time, the date and time display is inverse-video to remind you.

Loading Satellite Data



PocketSat keeps an internal database containing satellite orbital data. As the data ages, it is periodically necessary to replace it with new data. This is done by pressing the “Import” button on the main Satellites form. If an imported dataset includes a satellite that is already in the PocketSat+ database, the old data will simply be overwritten, so there is no need to delete old data before performing an import.

Importing and Categories

There are some points worth noting regarding how the data import process deals with categories:

- If a satellite is already in the database, importing new data for it will not change its category, regardless which category is currently selected.
- Any new satellites will be placed into whatever category is currently selected.
- If the current category is 'All', any new satellites will be placed into the 'Unfiled' category.

A category selector is available in the upper right corners of the main satellite list and both import forms. If desired, a satellite’s category can be changed from the satellite “details” dialog.

Importing from a database

When you want to import data for a large number of satellites, it is best to make use of a “PocketSat import database,” which can be HotSync’ed onto your Palm and imported into PocketSat+. There are tools at the PocketSat+ website to allow you to create input databases from TLE text files, and there are also several

“ready to use” databases that are updated daily which can be downloaded and updated with no work on your part. PocketSat+ can also read import databases created for the original PocketSat.

Note that when one of these databases is imported, the data is transferred into PocketSat+'s internal satellite database, and the import database can (and should) be deleted. It is not necessary to delete satellites before you import new data. When the import database contains new data for satellites already in the PocketSat+ satellites database, the data is updated in place

Importing from a memo

If you only have a small amount of data to import, one easy way to handle it is to copy the data into a memo in the 'Palm Desktop' application, **add a descriptive first line containing the word “PocketSat” (case is not important) as a title**, and perform a HotSync to get the memo onto your Palm Pilot. The 'Import From Memo' menu item in the Satellites form will bring up a list of all of your memos, allowing you to import the data that you transferred. Be careful though: It is very important that you put a title line at the top of the memo. The satellite data must begin on the second line. Also, be sure not to inadvertently put any carriage returns in the data.

The memo will be almost unreadable - don't worry about it. Importing from a memo can be a bit tricky, but once you get the hang of it, it can be the quickest way to update just a couple of satellites. Here is an example of a memo containing TLE data. You should be able to cut this text and paste in into a memo as a test:

PocketSat Data - Mir & ISS (memo title)

Mir

1 16609U 86017A 99076.54703436 .00037756 00000-0 27472-3 0 3152

2 16609 51.6611 93.6229 0011761 251.2320 108.7379 15.72860261746983

ISS

1 25544U 98067A 99076.53636457 .00024082 00000-0 31143-3 0 4042

2 25544 51.5919 299.3023 0004337 230.5013 129.5640 15.58783698 18298

Editing manually (not for the faint of heart)



The screenshot shows a dialog box titled "Edit Orbital Elements" with a dark blue header. It contains three text input fields for satellite data, each with a label "Line 0:", "Line 1:", and "Line 2:". The data in the fields is as follows:

Line	Value
Line 0:	RUROOLE 1 R/B
Line 1:	1'05730U'71119B" 02218.90066311".00002480' 00000-0"20076-3'0'00008
Line 2:	2'05730"73.9121' 66.2869'0860520'270.1192' 80.1451'13.63459085456312

At the bottom of the dialog box, there are four buttons: "Done", "Cancel", "New", and "Set Checksums".

Sometimes you may find yourself in a position in which you have TLE data for a satellite sitting in front of you, but no way to send it to your Palm (you may be at a friend's house, for instance.) PocketSat+ allows you to do direct TLE entry in this situation. It's rough, but if it's all you've got it's better than nothing.

To enter new data for a satellite already in the database, make the satellite current in the main list and press "Edit." The TLE edit dialog will display the data for the satellite in editable fields that you can modify.

Some important points:

- Spaces have been replaced with apostrophes (') in order to make them more apparent.
- The 3 fields for each line contain a fixed number of characters, and do not flow into one another.
- The last character of each TLE line is a "checksum" and is used to validate the data. If you have modified some of the data (assuming you know what you are doing) you can press "Set Checksums" and appropriate ones will be calculated and inserted into the data. Normally you will enter the checksums along with the rest of the TLE data and a "checksum error" will indicate a transcription problem.
- There is quite a bit of data validation performed, but the messages assume you understand the contents of the data.

If you want to enter data for a satellite not already in the database, choose any satellite and press "Edit" and then press the "New" button. The data in the fields will be replaced with a template containing n's where there should be digits and a's where there should be letters. Any other characters in the template (apostrophes, periods, dashes) must remain as-is.

Selecting Satellites

PocketSat+ ▼ All			
	Name	Id	Age
<input type="checkbox"/>	ARIANE 4 R/B	23561	2
<input type="checkbox"/>	ASTEX 1	5560	3
<input checked="" type="checkbox"/>	ATLAS CENTAUR 2	694	1
<input type="checkbox"/>	ATLAS CENTAUR R/B	6155	2
<input type="checkbox"/>	AUREOLE 1 R/B	5730	1
<input checked="" type="checkbox"/>	AUREOLE 2 R/B	7004	1
<input type="checkbox"/>	COBE R/B	20323	2
<input type="checkbox"/>	CORONAS F	26873	2
<input type="checkbox"/>	COSMOS 1063 R/B	11156	1

Details Import Edit

Sat Map Sky Pass 02.08.08 15:10:40

All calculations performed throughout the PocketSat+ application are performed only on satellites that have been “selected” using the main Satellites form. A satellite is considered to be selected if it:

- a) Is shown in the list
- b) Has a check mark to the left of its name.

In order to be shown in the list a satellite must belong to the currently selected category (all satellites belong in the “All” category.) The category selection gadget is in the upper right corner of the satellites form. See the “Importing Data” section of the manual for a discussion describing how to set and modify the category to which a satellite belongs.

Satellites can be “checked” and “unchecked” either by tapping the box to the left of their names, or by using the “Select All” and “Select None” menu options. Note that “Select All” and “Select None” only affect the check boxes of satellites in the current category.

There is also a menu item to “Select Above Horizon” which does exactly that: it goes through every satellite in the displayed list and selects its check box only if it is currently above the horizon for the current observer position at the current PocketSat+ clock time. Any satellite higher than 5 degrees below the horizon and on its way up will also be selected. Since this process can take a couple of minutes if the list is long it is often useful to set the clock a couple of minutes ahead and set its rate to 0 before performing the selection.

Using combinations of these tools it is possible to make relatively sophisticated selections. For a couple of examples let’s assume I have set up the following categories:

- AMSAT – containing satellites of interest to radio operators
- Visual.txt – containing naked-eye satellites from the Celestrak.com “visual.txt” list
- Bright50 – containing satellites from Rainer Kracht’s list of 50’ish bright satellites
- GeoStat – containing high-orbit geostationary satellites.

To select all of the potentially visible satellites: maybe before performing a “visible only” pass calculation.

- a) Select the “All” category.
- b) Choose “Select None” from the menu
- c) Select the “Visual.txt” category.
- d) Choose “Select All” from the menu.
- e) Select the “Bright50” category.
- f) Choose “Select All” from the menu.
- g) Select the “All” category

Now all satellites are shown in the list, but only those from the “Bright50” and “Visual.txt” categories are selected.

To select all non-geostationary satellites currently above the horizon: I can't remember why, but I've wanted to do this before...

Either:

- a) Select the “All” category.
- b) Choose “Select above horizon” from the menu.
- c) Select the “Geostat” category.
- d) Choose “Select None.” from the menu.

or (requires more steps but less calculation):

- a) Select the “All” category.
- b) Choose “Select None”
- c) Go through each of the categories that you want, selecting them and then choosing “Select Above Horizon.”
- d) Select the “All” category.

One further thing worth mentioning is the concept of the “current” satellite, which is the one that will be displayed preferentially in the map and sky views. A satellite is made current by being in the list, being checked **and** being highlighted in the list (by tapping it.) If the currently highlighted satellite is not checked, the closest checked one to it on the list is made current when leaving Satellite list mode.

Using the Map



After selecting a satellite (or some satellites) press the “Map” button at the bottom of the screen to go into Map mode.

The current satellite will be displayed on a Mercator projection of the Earth along with the observer position (the “eye” icon.) Also on the map is a warped-looking circle enclosing the area of the Earth that can currently see the satellite. If the satellite is currently lit by the Sun it will appear light colored – if unlit it will be dark. On grayscale or black and white displays a lit satellite will have a light-colored center, while an unlit one will have a black center.

As time passes, the orbital path of the satellite will “creep” out from the satellite icon until it extends forwards and backwards to show a full orbit. The “forwards” direction is lighter colored than the “backwards” direction. The reason for the “creeping” is that it would take the Palm’s CPU a couple of seconds to calculate the entire thing at once, and not only would you have to wait (and maybe find out that you didn’t care about that satellite after all) but it also uses a tremendous amount of battery power. On black and white displays the path is displayed as the inverse color of whatever is under it, and there is no indication as to orbit direction.

The map will scroll to try to keep the satellite centered unless you press on the screen for a while (a second or so) and then drag, at which point the map will follow your drag and will no longer track the satellite.

Press the “+” button to magnify the view and the “-“ button to zoom back out.

The buttons above and below the satellite icon on the right make current the previous and next selected satellites in the main list, respectively. The “Up” and “Down” hard buttons on the Palm do this as well.

The current satellite’s name, ID and some information about its position are displayed at the bottom of the screen. By default, latitude, longitude and altitude above sea level are displayed. Pressing the “page” button to the right of this information will switch the bottom line to display current Azimuth, Range and closing speed (dR.) Pressing “page” again will cycle back to the original display.

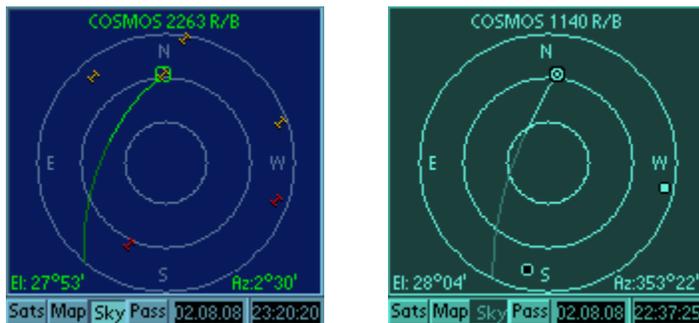
If more than one satellite is being tracked (see “Preferences”) the neighboring satellites to the current one on the list will also be shown - how many being a function of the preferences choice. If the option is selected to do so, their orbit

tracks will also be shown. The current satellite can be distinguished from the others by the extra ring around it.

The current satellite is always updated at the rate selected in the main preferences screen, and any other satellites are updated in round-robin fashion, one at a time between each current satellite update. For this reason if you are tracking a large number of satellites it can be quite a while between updates for the non-selected ones.

In addition to using the up and down buttons to make a satellite current, you can also tap on its icon to accomplish the same thing.

Using the Sky View



Once you've decided that a satellite is above the horizon, either because you used the "Select Above Horizon" tool or because the observer location icon appeared within the visibility circle on the map, or for whatever reason, select Sky mode by pressing the "Sky" button at the bottom of the screen.

You will see a representation of the whole overhead sky, with the cardinal points labeled, and rings to show 0, 30 and 60 degrees of elevation. Superimposed on this plot will be the current satellite (bright if lit, dark if unlit) as well as its future path across the sky extending from it. The path is also bright in color where the satellite will be lit and dark where it will be in shadow.

To use the sky plot, so outside and face in the direction of the label closest to the bottom of the screen. Now hold your Palm up and try to visualize the circle extending up overhead (the center of the circle is the zenith, or the point directly overhead) and over behind you. The outer circle represents the horizon and the inner ones represent 1/3 and 2/3 of the way to the zenith, respectively.

To look in different directions you can either rotate the Palm itself, or you can rotate the view by pressing the "Phonebook" and "To Do list" buttons on the Palm. Each press will rotate 90 degrees in the specified direction. It is generally much easier to view a satellite when it lies in the "bottom" half of the plot.

Pressing the "up" or "down" button on the Palm makes current the previous or next selected satellite in the main list, just as it does in Map mode.

Also, as in map mode, if you are tracking more than one satellite, tapping on a satellite's icon will make it current.

Satellite Passes



The screenshot shows the PocketSat+ application interface. At the top, there is a title bar with the text "PocketSat+". Below this is a list of satellite passes with columns for date and time, satellite name, and a numerical value. The list is as follows:

Date	Time	Satellite Name	Value
08.08	21:58	COSMOS 2084 R/B	2
08.08	22:00	ERS 2	4
08.08	22:08	INTERCOSMOS 24	6
08.08	22:11	IDEFIX/ARIANE 42P	4
08.08	22:32	COSMOS 1140 R/B	1
08.08	22:46	COSMOS 2278 R/B	3
08.08	22:46	COSMOS 482 DEB	7
08.08	22:53	THOR AGENA D R/B	3

Below the list, there are two input fields: "From: 08.08 16h" and "Thru: 08.09 1h". Underneath these fields are three buttons: "Calc", "Details", and "Plot". At the bottom of the screen, there is a status bar with the text "Sats|Map|Sky|Pass|02.08.08|16:20:37".

Calculating Passes

Calculating satellite passes is one of the most complex functions of PocketSat+. In fact, the original PocketSat application does only this. Select Pass mode by pressing the “Pass” button at the bottom of the screen.

The concept here is that as satellites orbit around the Earth, and the Earth turns under them, they occasionally “pass” overhead at any given location. If it happens to be after dark at that location, and the satellite is high enough to be lit by the Sun (out of the Earth’s shadow, really) then there’s a good chance that the satellite can be seen, in many cases with the naked eye.

Pass Calculation determines those times when satellites will be overhead, and, if asked to do so, will also filter out passes that occur during the daylight or when the satellite is not lit.

To specify the beginning and ending times for the calculation, tap the “From:” and “Thru:” fields. A dialog will appear allowing you to set the time and date for each. You will not be allowed to specify a “Thru” time which comes before the “From” time.

Assuming your Observer Location is set, and there are satellites selected (see “Selecting Satellites”) you should now press the “Calc” button and calculation will begin. As it proceeds, the name of the satellite that is being checked will appear at the top of the screen along with a line showing total progress. In addition, to assure you that something is indeed happening a “spinner” will move in the upper right of the screen.

To interrupt calculation, press the “Calc” button again - it will be labeled “Stop” during calculation. Actually, pressing almost any other button will interrupt calculation.

Examining Passes

When calculation is complete, any passes found will be listed in the table. For each pass there are 5 columns:

- Date
- Time

- Satellite name
- Alarm flag (only visible if an alarm is set)
- Pass “quality”

The “quality” of a pass is an estimate of how ‘good’ the pass is, taking into account overall altitude and how long it is lit. For visible passes, it ranges from 0 (worst) to 9 (best) or D (daylight) or N (night, but satellite unlit and invisible.) If "All Passes" is selected in Preferences, this number is just a measure of the maximum pass altitude, and visibility is disregarded.

In order to set an alarm that will alert you when a pass happens, touch in the space just to the left of the "quality" value for the pass. A dialog will appear to allow you to choose when the alarm should occur, up to 15 minutes before or after the rise time for the pass. A small clock icon will appear in the space to indicate the alarm has been set. To clear the alarm, just touch the clock icon. Alternatively, you can choose the "Clear Alarms" menu item to clear all alarms.

If a pass is selected in the table, pressing the “Details” button will bring up a dialog which displays information it. The dialog consists of a list of observations, one per row. Each row consists of the following columns:

- Date
- Time
- Elevation (degrees)
- Azimuth - or bearing (degrees from North)
- Status - either Daylight, Visible or Night (unlit)

Pressing the 'Copy to Clipboard' button will cause the contents of this dialog to be copied into the PalmOS clipboard. You can then switch to any text handling application, like Memo Pad, and paste the data into a document.

Plotting Passes

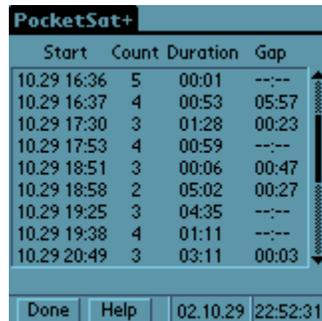


Pressing the “Plot” button brings up a plot of the sky which shows the satellite's path across the sky during the pass. This plot is in most ways identical to the Sky mode, the only real difference being that rise, set and culminations times for the pass are displayed on the plot.

As with Sky mode, the idea is that you hold the Palm out in front of you, facing the direction indicated at the bottom of the plot. You can rotate the plot to the left and right, respectively with the 'Address Book' and 'To Do' buttons on the case until the desired direction is at the bottom.

You can also select the previous or next pass by pressing the 'up' or 'down' button on the Palm's case.

Satellite Availability



Start	Count	Duration	Gap
10.29 16:36	5	00:01	--:--
10.29 16:37	4	00:53	05:57
10.29 17:30	3	01:28	00:23
10.29 17:53	4	00:59	--:--
10.29 18:51	3	00:06	00:47
10.29 18:58	2	05:02	00:27
10.29 19:25	3	04:35	--:--
10.29 19:38	4	01:11	--:--
10.29 20:49	3	03:11	00:03

Done Help 02.10.29 22:52:31

Selecting the “Availability” menu option from the Pass List form brings up the Satellite Availability form. This form lists in tabular form the number of satellites that meet selection criteria defined in the Pass Preferences page.

Here's an example: Let's say your Pass List contains all passes above 10 degrees for a selection of Global Positioning satellites and that you want to know when there will be at least 4 GPS satellites higher than 30 degrees above the horizon.

First go to the Pass Preferences screen and reset the minimum altitude value to 30 degrees. Now from the Pass List form select “Availability...” from the menu. You will see a list like the one above, which shows the number of satellites from the current list that are above (in this case) 30 degrees.

Let's say we don't care about times before 17:30. We can see that starting at 17:53 there will be 4 satellites available and that there will be at least 4 available for 59 minutes. At 18:51 the number drops to 3, and we can see that it is 47 minutes until the number goes back up again (to 4) for 1:11.

Preferences

The behavior of PocketSat+ is in many ways controlled by settings that the user selects in the Preferences screens. These screens are accessed by choosing the “Preferences” menu item from any of the main modes.

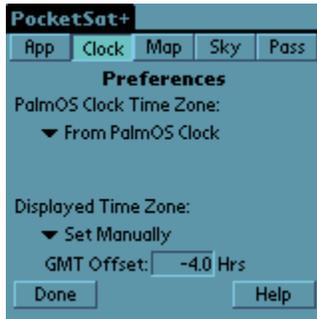
App Preferences



These options control program behavior in all of the modes:

- **Disable PalmOS Auto-off.** (Default: off) If selected, the normal PalmOS Auto-off feature will be disabled while PocketSat+ is running. Be careful when using it, since it can result in discharged batteries if you forget and walk away from your Palm while it is on.
- **North.** (Default: true) If "Magnetic" is selected, magnetic variation will be applied to all displayed azimuth values. Magnetic variation is calculated using the WDM2000 geomagnetic model.
- **Tracked Sats.** (Default: 1) PocketSat+ can track more than one satellite at a time and display them in Map and Sky modes. This value determines how many are tracked. If it is more than one, satellites other than the "current" one will be calculated round-robin style in between its calculations. The maximum value is 20.
- **Calc Interval.** (Default: 1 sec) This value determines how long an interval PocketSat+ will wait between calculations of the current satellite. Setting it to a larger number will increase battery life. Note that if more than one satellite is tracked, the current one is still tracked at this rate – other satellites are fit in between.
- **Colors.** The "Set" button allows you to customize the colors used in the user interface, map display and sky display.
- **Night Vision.** If checked on a color device, the entire palette will be re-mapped into shades of red to help preserve your low-light night vision. If "set" is pressed while night vision is active, you can customize the color choices used in night vision mode. These are saved separately from the colors you choose in normal mode. On a grayscale device the color palette is not changed, but the night vision color settings are still saved separately from the normal ones.

Clock Preferences



These options define the time zones used by PocketSat+.

PalmOS Clock Time

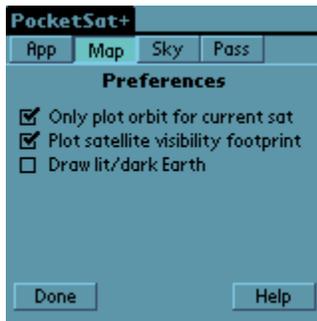
This setting is used by PocketSat+ to determine when “now” is for realtime position calculations. It is important that it always be set to match the time zone for which your PalmOS clock is set. Possible settings include:

- **From PalmOS Clock.** If you are running PalmOS v4 or higher, this is probably the choice that you want. It asks the operating system for the time zone and Daylight Savings Time offset. It is not available for older PalmOS versions, however.
- **From Obs Location.** This choice will use the time zone set in the Observer Location form for the currently selected location.
- **Zulu Time.** This choice assumes your Palm clock is set to Zulu Time (GMT).
- **Set Manually.** This choice allows you to manually set the GMT offset.

Displayed Time Zone

This setting is used for all time displays in the program. The options are the same as for PalmOS Clock Time. In general the best bet is to have this set to “From Obs Location” unless you always have your observer location set to where you really are. Many observers will want to chose “Zulu Time” to have all times displayed as GMT.

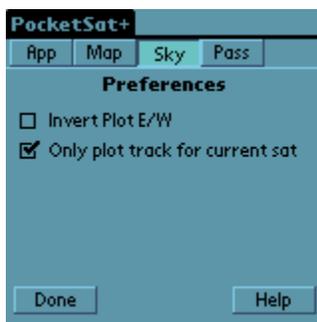
Map Preferences



This option affects the Map display:

- **Only plot orbit for current sat.** (Default: true) If more than one satellite is being tracked, this option prevents PocketSat+ from plotting the orbit tracks for satellites other than the current one. If it is unchecked, the display can get pretty crowded, but it can also be pretty interesting if used sparingly.
- **Plot satellite visibility footprint.** (Default: true) If true, the current satellite is displayed on the map along with the circle that defines the region of the Earth for which it is above the horizon.
- **Draw lit/dark Earth.** (Default: false) If true, the part of the Earth that is in shadow (where it is night) is darkened. This is a fairly expensive operation, and can slow down the update rate noticeably. It only works on color and grayscale displays.

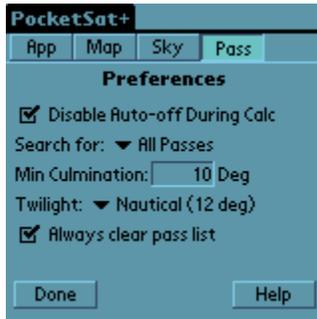
Sky Preferences



These options affect the Sky display:

- **Invert Plot E/W.** (Default: false) Some people would rather that the Sky display be presented looking from the top down – more like a map than a sky chart. Selecting this option reverses East and West in the display, effectively accomplishing this. This choice also affects the Pass plot display.
- **Only plot track for current sat.** (Default: true) If more than one satellite is being tracked, this option will prevent the display of the paths of any satellites other than the current one.

Pass Preferences



These options define the behavior of pass calculations. They are **very** important in determining the results of calculations, so you should take some time to understand their use. Seeming discrepancies between PocketSat+ and other satellite tracking tools often result from these settings.

- **Disable Auto-off During Calc.** (Default: true) If enabled, the PalmOS auto-off feature will be disabled while a pass calculation is in progress. The calculation can take a few minutes, so this can be very useful. Note that as soon as the calculation is complete auto-off will be re-enabled and the Palm will shut itself off if enough time has passed.
- **Search for.** (Default: All passes) If “Visible Passes” is selected, only passes that occur at night (defined by the “Twilight” option) **and** when the satellite is lit by the Sun are listed. These passes are potentially visible. If “All Passes” is selected then all passes will be listed, including those during the daylight and when the satellite is in shadow.
- **Min Culmination.** (Default: 10 degrees) This filter defines the minimum culmination (highest point) that a pass can have and still be listed. Since trees and building can limit a site’s horizon this filter can limit “false positives”: passes that don’t ever get high enough for you to really see. Using this option aggressively can speed up calculation considerably, but it can also result in disagreement between PocketSat+ and other programs (many of which have no such filter.)
- **Twilight.** (Default: Nautical – 12 degrees) There are different definitions of the term “Twilight,” differing in the angle of the Sun below the horizon. The three most common are: Civil (6 degrees), Nautical (12 degrees) and Astronomical (18 degrees) From a practical point of view this selection determines how dark the sky must be before it is considered “night.” Depending on your location, it may be too light to actually see a satellite at Civil twilight, in which case you should make a more conservative choice.
- **Always clear pass list.** (Default: true) If selected, any passes in the list will be deleted when a new calculation is performed. If false, you will be asked if previous passes should be cleared.

Contact Info

The PocketSat+ website can be found at:

<http://www.bigfattail.com/software/pocketsatplus>

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