GPS Map Lite

Demo Version 1.0

Users Manual



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The *GPS Map Lite* demo version may be freely distributed as long as it contains this manual.

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Informations presented in this manual may be changed for progression without pre-announcement.

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You will find the latest demo version and up-to-date information at the *GPS Map* home page at:

<http://www.segelflug.de/gps/GPS_Map.html>.

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Introduction

GPS Map Lite changes your *Apple Newton* or compatible PDA in combination with almost every GPS receiver to a simple to operate navigation system with digital map display. The power of this system was formerly only available with special developed hardware or with powerful PCs, where both are much more expensive. Compared to the specialised hardware that may be used for navigation purposes only and to PCs that are unmanageable and heavy, your PDA is handy, has almost the same features and still can be used for your daily work.

GPS Map Lite is able to work with both bitmap type maps and vector based maps and supports all popular cartographic map projection methods. You could even draw your own map with either *MacDraw* like applications or *MacPaint* like applications. The new vector feature of version 1.5 is important for better support of nautical maps (with wide areas of pure water) or desert maps (with some oasis only). Because the vector format is PICT format based you can even combine both types of maps and use small bitmap regions (such as islands) within a vector based map.

Having only black and white displays on actual PDAs needs not to be a disadvantage, because colour displays always needs background illumination, much more energy, and have a very bad readability at day light. A colour PDA would be much more unmanageable and much more heavy. Because of the storage size of colour maps it would need a micro hard disk it would need even more energy. It would be nearly a portable PC.

The *GPS Map Lite* demo version has all functionality of the full version but there is no GPS interface included. Instead a circle flight above Friedrichshafen at Germany will be simulated. The demo Map Container contains aviation maps in various scales for that region.

PDA Requirements

GPS Map Lite runs on all *Apple Newton* compatible PDAs. Your PDA must have an operating system version of 1.3 or greater. *GPS Map Lite* is NOS 2.0 compatible and supports both landscape and portrait mode.

I don’t recommend using an upgraded PDA of the first generation such as the classic Newton or the *Sharp ExpertPad* because of the bad screen and low battery capacity.

Because of the internal memory may contain small map regions only you will need an additional PCMCIA 2.0 compatible storage card Memory cards are currently available in a range of one megabyte up to 40 megabytes.

Unfortunately memory cards are still expensive. The needed size depends on the size of the map region and number of scales you permanently need. You can calculate as follows: one average paper map sheet (85 x 55 centimetres) in two scales needs about 1,8 megabytes of memory.

GPS Requirements

NOTE: For running the demo version you don't need a GPS receiver!

There are no special requirements to the GPS receiver used because of it will be used only as a position sensor.

The receiver must have a serial interface with the following specification:

- TTL, RS232 or RS422 level, 4800 baud, 8 bits, 1 stop bit
- NMEA 183 software protocol

The NMEA protocol has many different implementations, but *GPS Map Lite* will adapt to them automatically.

GPS Map Lite supports the following NMEA message combinations:

1. $GPGGA and $GPVTG
2. $GPGGA and $GPRMC
3. $GPGLL and $GPVTG
4. $GPRMC only

If the receiver sends additional messages they will be suppressed automatically.

Because of almost each manufacturer for GPS receivers seems to invent his own private connector it is not possible to offer a ready made cable. Therefore you will need a matching data cable available from your GPS receiver's manufacturer and a free Mini-DIN 8 connector or a cutted cable part such as the cable coming with the *Newton Backup Utility* for soldering together.

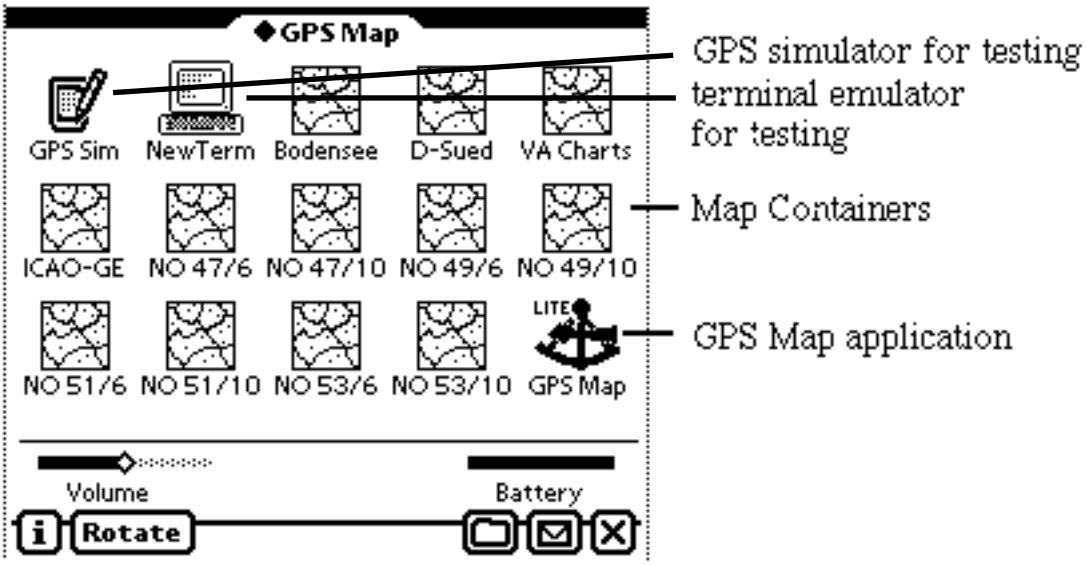
Installation

- Decide where to store the applications and check the storage settings within the built in application “Card”. *Map Containers* should be stored on the PCMCIA card.

- Now download *GpsMapLD.pkg* and the *DemoMaps.pkg* by using any installer application or the *Newton Backup Utility*.

Starting-up *GPS Map Lite*

Tap onto your PDA’s *Extras* symbol. Dependant of the map containers installed you should see your *Extras* folder similar as on the following picture.



Start *GPS Map Lite* by tapping onto its symbol. Please don’t get impatient because of it can need more than 10 seconds until the start-up process has finished.

GPS Map Lite is a very complex application which needs a maximum of free working memory (heap). If you get an error message during starting up *GPS Map Lite* please remove all unused applications from your PDA, freeze them, or archive them by using shareware tools such as *ScrollEx* (1.3 units) because they also need heap memory even if they do not run. Don’t run other applications in parallel to *GPS Map Lite* for the same reason. If there are still problems the system heap may be fragmented and the PDA must be reset.

After initialising you should see a screen like this:

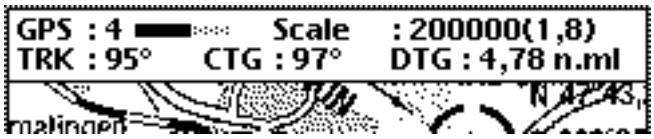


the actual position is at the center of the circle, the pointer shows to the movement direction, and the grey line is the route

As soon as simulated GPS data is available, *GPS Map Lite* will react a bit slacky to your inputs. That is normal and is a result of background processing and of the limited performance of the PDA processor.

Navigation Information

The upper screen part contains two information lines.



The **GPS** field shows how many satellites are currently available. The gauge display behind the value shows the quality of the actual GPS data (PDOP dependant). It depends on the number of satellites available and their relative positions at the firmament. GPS satellites are not at a fixed position but are orbiting, and therefore the

quality will change permanently. The GPS position should be usable as far as the black bar covers more than half of the maximum sized grey bar.

The **Scale** field gives you information about the currently loaded map. The value in brackets shows the map magnification in relation to the original paper based map.

The **TRK** field (TRUE TRACK) shows the track over ground relative to geographic north. Please don't mistake this value with your compass course, because of the compass course is magnetic north relative and does not regard the drift i. e. because of wind influence. "TRK" is calculated from the relative position change per measuring cycle and is only valid if you are moving faster than approximately 2 knots!

The **CTG** and **DTG** fields will only be displayed if you have defined a route. **CTG** is the course for reaching your goal and **DTG** is the distance between your position and the goal.

GPS Map Lite Operation Modes

The application distinguishes among two user selectable operation modes:

NAV Mode

This mode is the standard mode for navigation. The map is under control of the GPS receiver and will move in relation to your position change. The present position will be always in the centre of the screen and be marked with the PPOS (Present Position). The pointer out of the symbol represents your current track.

The map may be moved limited by the user for a better orientation, and jumps back to the real position after some seconds. For moving the map with the pen, tap onto the map and then drag it in the desired direction. Don't release the pen until the originally tapped position is below the pen again.

If the PPOS symbol reaches the border of a map region *GPS Map Lite* will load a new map region with same scale and magnification automatically (if one exists).

You may enforce a premature map change by dragging the map in the movement direction.

PLAN Mode

This mode supports both navigation and planning. Map positioning is controlled totally by the user. In contrast to NAV mode the map will stay fixed and the PPOS symbol will move. Use PLAN mode for defining routes or displaying maps of other regions without loosing the present position.

The map may be moved either with the pen as in NAV mode or by using the scroll compass in the lower left edge. If you scroll over the map boarder the next map region will be loaded as in NAV mode.

Defining a Reference Position

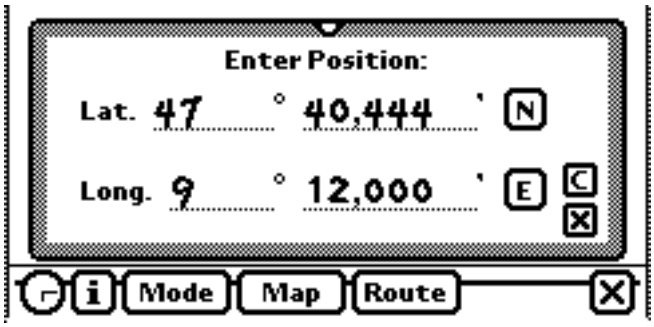
Many *GPS Map Lite* functions such as defining a goal or saving a position to the database depend on a reference position. A reference position may be defined by three different methods and will then be shown within the map as a small circle:

Defining by Tapping onto the Map

The map may be dragged with the pen in each operation mode (limited in NAV mode). To define a reference position drag the map until the desired position is visible and then tap onto the position. *GPS Map Lite* will mark the position with a small circle and then calculate and store the geographic position for later use.

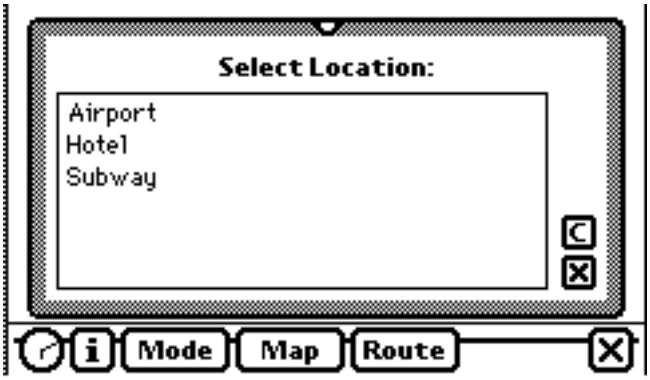
Defining by Numerical Entry

Use “Go to Position” within the “Map” menu for entering the desired position as longitude and latitude. Values must be entered as WGS84 reference system degrees and decimal minutes. If there is already a reference position active it will be pre-entered as default value. Tap onto the N and E buttons for changing the signs.



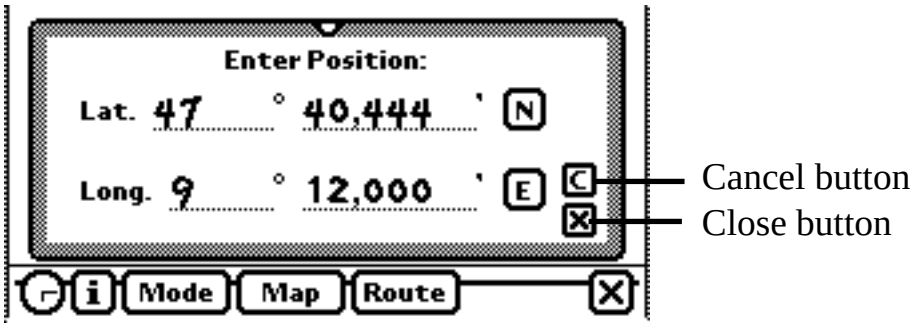
Defining by using a stored Location

Use “Go to Location” within the menu “Map” to select an entry from within a database containing stored positions.



More Details about Windows

All windows within *GPS Map Lite* may be moved freely. Tap at the boarder of a window and drag it away without releasing the pen. If your PDA is running NOS 2.0 all windows have an additional small triangle for dragging, centred within the upper frame.



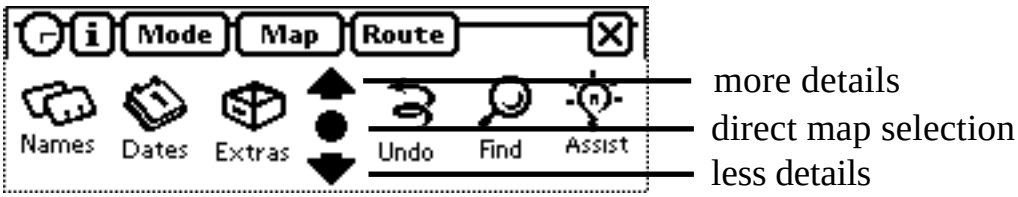
Each window has a Close button ⊠. After tapping the window will be closed and inputs made by the user will be executed.
Some windows have an additional Cancel button Ⓒ. Tapping this button will also close the window, but all inputs will be rejected.

Loading a Map and Changing the Scale

Press the overview button for directly selecting a map within a map list window.

The standard arrow buttons below the screen may be used for a quick scale change. If an adequate map region is available the upper button will load a map with more details and the lower button will load a map with fewer details.

Changing scale is dependent on the current operation mode. In NAV mode the new map will be loaded in such a way that the Present Position is in the centre of the screen.



In PLAN mode the map will be loaded in such a way that a defined reference position shows up at the centre of the screen. If there is no reference position the map will load in such a way that the old screen centre position will be conserved.

Note: If you try to load a map in NAV mode only maps covering the Present Position will be displayed.

Menus

"Info" Menu

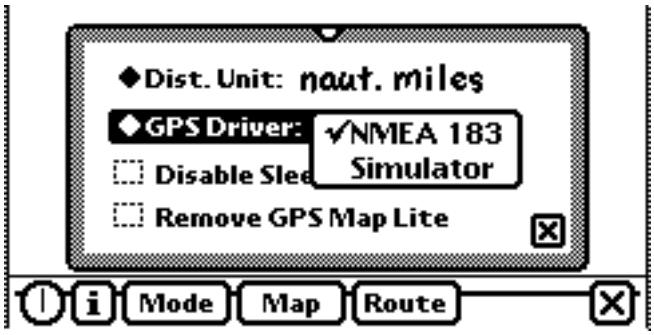
About *GPS Map Lite*

Tap onto this item to see the program version and copyright information. The window may be closed by tapping onto it.



Preferences

Tap onto “Preferences...” to get a window for changing default settings for your special needs.



Distance Unit

You may select your preferred distance unit out of kilometres, nautical miles or statute miles.

GPS Driver

GPS Map Lite is able to support nearly all thinkable navigation receivers with different interface protocols. Each specific protocol needs a special driver software for handling it.
If you have purchased *GPS Map Lite* with an extra interface option you may select that option instead of NMEA 183 by tapping onto the “GPS Driver” line. You may get a *GPS Driver Developers Kit* from the author to support your special receiver.

Sleep Mode

If you have defined a sleep time in your PDA’s setup you may override this setting for preventing the PDA from going into sleep mode while *GPS Map Lite* is running.

Prepare the Removing of *GPS Map Lite*

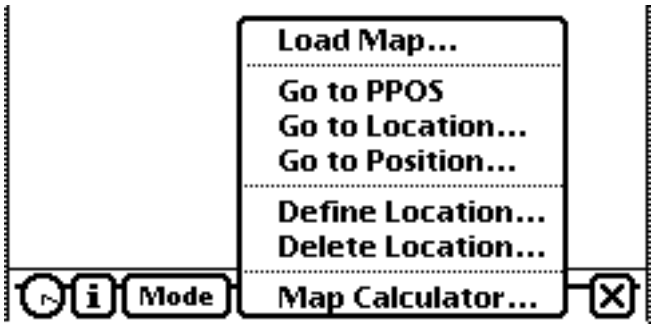
If you ever intend to delete the *GPS Map Lite* application you should first check the “Remove GPS Map Lite” box. During quitting *GPS Map Lite* will remove all preferences and defined locations from the PDA memory. Then you may delete the application as described in the PDA’s user manual.

"Mode" Menu

Tap onto Mode to check or select the current operation mode.

"Map" Menu

Tap onto Map to get a menu with map functions.



Load Map

Use this item will open a list window for directly loading a specific map. While in NAV mode only maps covering the present position will be displayed. The function is identical to tapping the "overview" button below the screen.

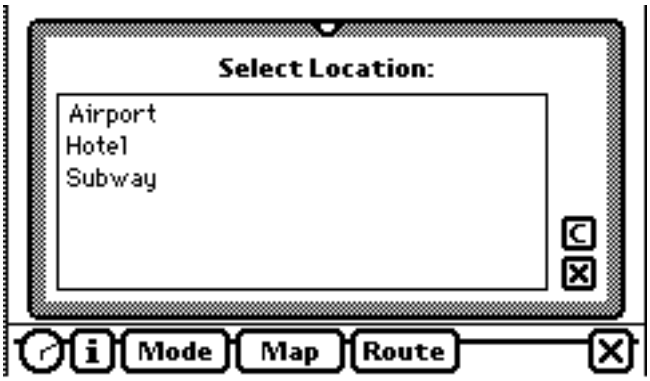
Go to PPOS

Tapping this item while in PLAN mode will scroll the map to the present position. The PPOS symbol will be in the centre of the screen afterwards.

If the present position is not within the current map a new map covering the position will be loaded. The present position will be stored as current reference position

Go to Location…

Use this item to position the map to a pre-defined position and for defining that position as reference position. If the desired position is not covered by the current map a new map containing that position will be loaded (if available).

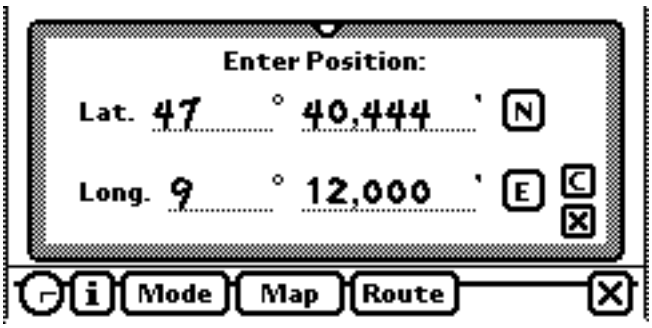


If this item will be selected while in NAV mode the map will not move but the selected position will be stored as reference position.

Go to Position…

Use this item to move the map to a position entered by longitude and latitude and for defining that position as reference position. You may use the keyboard for entry by double tapping into an input field.
If the desired position is not covered by the current map a new map containing that position will be loaded (if available).
If this item will be selected while in NAV mode the map will not move but the selected position will be stored as reference position.

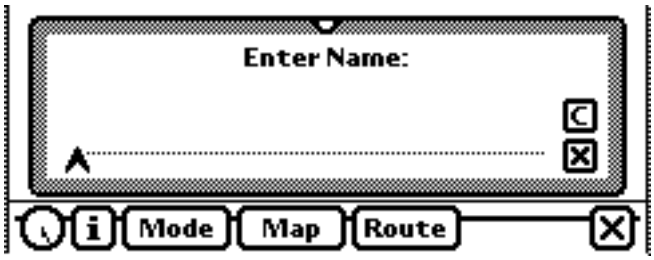
The default value displayed is the last reference position selected or defined.



Define Location…

Tap this item to store the current reference position by name for later use as a pre-defined location. You will get a window for entering a name. The name may be up to 25 characters in length. Double tap into the input field for using the keyboard instead of handwriting.

GPS Map Lite supports up to six pre-defined locations. If the message "You cannot store more than 6 Locations!" is displayed you must first delete an old entry for adding a new one.



Delete Location…

Use this item to delete a previously defined location that is wrong or no longer needed. The window looks the same as of the “Go to Location…” command.

Map Calculator

This item opens a geographic calculator window for getting the distance and course between two points. All navigational calculations are based on great circle formulae.



The calculator will need two reference positions which you can enter while this window is open. After entering the first position tap onto the upper Set button and the reference position will be displayed. Then define the second reference position and press the lower Set button. The calculator will show the second reference position and the distance and course (geographic north relative) between both positions.

You can also use the PPOS button either for only showing the actual position as numerics or for using the value as the first reference position.

Selecting the geographic calculator and then tapping onto PPOS is the best way, if you ever need your actual position in numerical form.

"Route" Menu

Tap onto Route to get a menu with route planning functions.

Define Goal / Remove Goal

This items are used for defining or removing a connecting line between your actual position and a reference position you have previously defined as your goal. The course and distance to the goal are displayed at top of the screen.

Miscellaneous

While a window is open the GPS position will not be updated on the screen for more performance with entering values by handwriting recognition. Therefore you should close all windows as soon as you have done your entries.

Because of *GPS Map Lite* accesses the PCMCIA card permanently you should first close *GPS Map Lite* if you intend to change the card. Otherwise it will be possible that you have to press the reset button!

Most important functions, but only the latest two may be cancelled by tapping onto the "Undo" button below the screen.

If you find problems such as error messages caused by the operating system or malfunctioning within *GPS Map Lite* first try pressing the PDA's reset button within the battery compartment for reinitialising the PDA. That will help in common.

But the old software rule applies also to PDA software: There is always one more bug!

If you should find a reproducible error which does appear again after pressing reset then you should note down the error message exactly together with the circumstances around and send it directly to the author.

Short Intro into Map Preparation

Hard- and Software Conditions

You will need the following equipment for creating *Map Container Packages* :

- a fast *Apple Macintosh* or *Windows* computer with at least 8 megabytes of RAM (sufficient only for small map regions) and a big hard disk with at least 80 megabytes of free space.
- image processing software like *Adobe Photoshop* (the "light" version will be sufficient) or vector based drawing software such as *Claris MacDraw*
- the development system *Newton Toolkit* from *Apple*
- the *Map Preparation Package*
- access to a big format scanner, if possible it should be big enough to scan your paper map in one piece (scanning is offered by DTP studios, too)

Overview of the Map Preparation Process

Creating *Map Container Packages* consists of the following steps:

"Real" maps:

- Search for a suitable map, both for navigation purposes and for displaying on a b/w PDA screen.
- Scan the map (or get it in electronic form)
- Do the optical preparation of the raw image with image processing software (*Photoshop*) and reduce the result to a b/w PICT resource file

Synthetic vector maps:

- Draw your map by using a vector oriented drawing application such as *Claris MacDraw (Pro)* or similar.
- If supported by your drawing application store your map directly as a PICT resource filer, or create it within *Apple's ResEdit* by copying the map as PICT resource into a new created file.

Common for both:

- If your map image exceeds a maximum of about 10 000 000 pixels you should consider dividing the map into two or more smaller parts, overlapping each other for about 100 pixels at the borders because of PDA performance limitations.
- Find map locations (calibration points) for generating the geographic reference. You will need 3 locations for maps with a rectangular type projection or 9 locations for maps with cone type projection
- Calculate the map description parameters by entering the selected locations into a *Macintosh* or *Windows* application (*RectMap, QuadrantMap* or *ConeMap*) comming with the *Map Preparation Package*
- Copy the map description parameters into a NTK project template, compile it and load it into your PDA
- Check the *Map Container Package* by entering the locations used for calibration into the "Go to Position" window of *GPS Map Lite*

Map Projection Methods

It is not necessary to be a cartographer for making *Map Container Packages,* but you will need a little base knowledge.

Putting a map onto a screen is not as simple as showing a photography. Along with the map image *GPS Map* will need supplementary information for finding just that image pixel corresponding to a given geographic position.

A globe surface may be projected to a flat surface only with some difficulties because of its curvature. For solving this problem cartography has developed several projection methods, each with both advantages and disadvantages.

Rectangular Type Projections

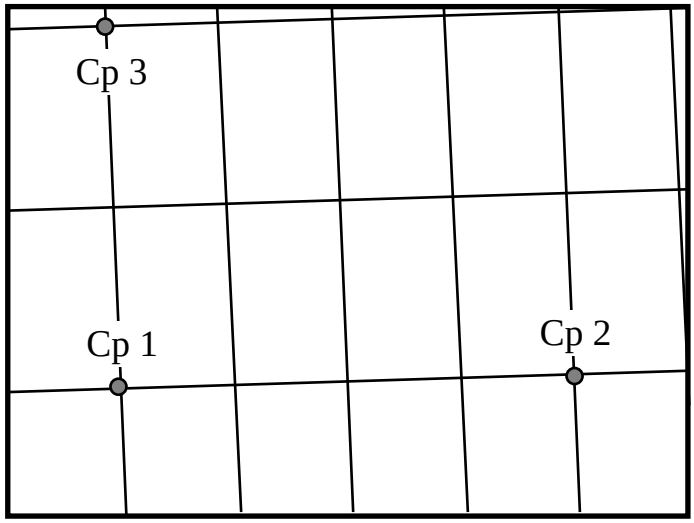
This projection method is especially used for topographic maps with scales between 1:1 and approx. 1:100000. Examples are town maps, walking maps or airfield maps for aviation.

If you have a map where both latitude and longitude lines are straight, all latitude lines as all longitude lines are running in parallel and all latitude lines are crossing the longitude lines with a 90° angle it is a rectangular type projection.

There is a projection error because of the decreasing distance between longitude lines in pole direction, but this error can be neglected with small map scales and therefore small regions.

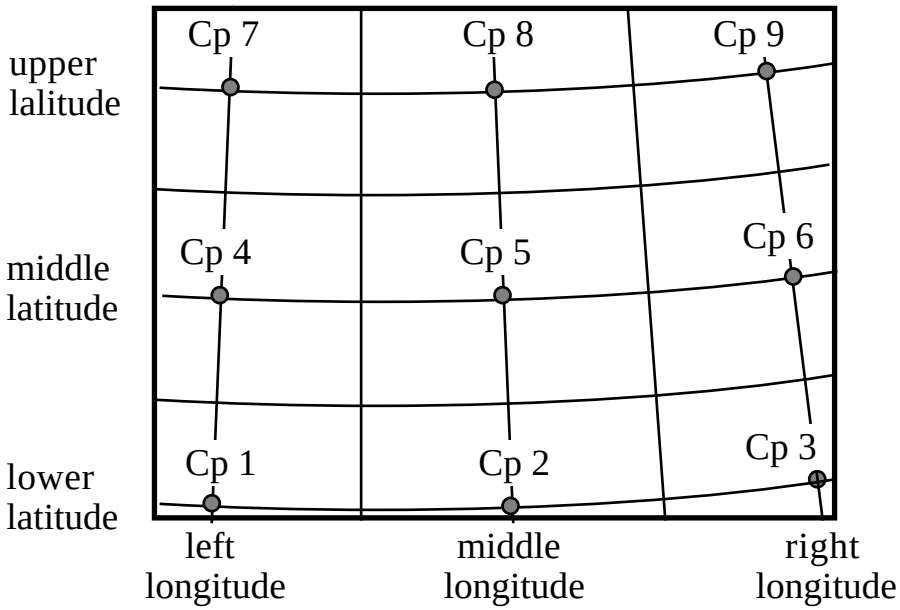
The advantage of this method is the simple handling. You may determine distances and angles simply by using a ruler and setsquare.

GPS Map Lite uses a transformation method that describes a rectangular type projection map by three special calibration points and which is able to eliminate little twist or warp of the scanned map image.



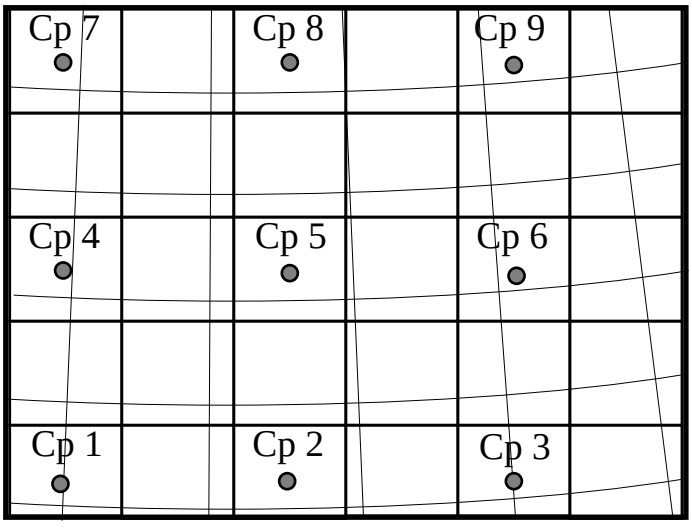
Cone Type Projections

This projection method has many variations. It is used for maps with high scale up to world wide maps.
If you have a map where latitude or both latitude and longitude lines are curved it is handled as a cone type projection.
It is much more difficult to extract positions out of these maps because you must remember the actual curving of the latitude and longitude lines at each map point.



A widely available road map in US comes from Thomas Bros. and an alteration is available through *Trimble,* called the *Trimble Atlas*. These maps are also cone type maps, but without geographical grid. You can use them only if you have a possibility to convert between their grid format and the geographical WGS84 latitude / longitude format. Some GPS receivers (e.g. the *Trimble ScoutMaster*) are able to convert the grid.

GPS Map Lite uses a transformation method which describes almost any cone type map by nine special calibration points with sufficient exactness.



Distribution

GPS Map Lite is offered as a bundle including the *Map Preparation Package*., but without maps. Documentation is available both in English and German language. The *Map Preparation Package*. is available either for *Macintosh* or*Windows-PCs*.

The price for delivery by e-mail is DM 149,- (around US$99), for delivery on disks it is DM 165,- (about US$110) plus self costs for mailing.

Included is six months free support by phone or e-mail, and free updates up to the next major revision.

All distributors are also offering a map preparation service. Customers can send in paper based or digitized maps. The price depends on the map source, size (square centimeters) and the expense for optical preparation and calibration. Please ask for a special offer and specify the desired map.

For an actual list of distributors please take a look to the *GPS Map* home page at <http://www.segelflug.de/gps/GPS_Map.html> or send e-mail to the address below.

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