Auriga Reference Manual 2.11

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Introduction

Auriga is a cave survey software that runs on Palm OS devices. Auriga stores survey shots as a collection of records in Palm OS databases and performs appropriate computations to convert survey shot data into Cartesian coordinates. Results can be displayed in graphical (map) or list form. Each cave is stored in a separate database and is automatically backed up on the PC/Mac by the HotSync Manager. A conduit allows the synchronization of Auriga databases with various cave survey software running under Windows or Mac OS.

Auriga was designed with flexibility and ease of use in mind. Several survey teams, each with various sets of instruments using various measurement units, can survey a given cave and merge their data into a single cave, both on Palm devices and PC/Mac.

Why read this manual?

Despite all my efforts to make Auriga as user-friendly and intuitive as possible, it is sometimes hard to make all the information immediately visible on such a small screen.

Furthermore, if Auriga is not complicated, it remains nonetheless complex, due to the wealth of available options.

A single read of this manual should allow you to:

- get an understanding of underlying concepts in Auriga
- understand the operation of Auriga
- discover unsuspected features
- go underground with Auriga with peace of mind (without having to take this manual with you)

Installing Auriga

The basic Auriga delivery consists of 7 Palm OS files:

- **AurigaEN.prc** - the Auriga English executable
- **Grids.pdb** - a collection of geodesic datum, required to compute geographic positions; see Supported Geodesic Datum
- **Mathlib.prc** - a mathematical and trigonometric shared library already used by many calculators and other computational programs (it could already be present on your Palm OS device)
- 3 demo caves (optional):
  - ○ Fairy_Cave_Cave.pdb: Fairy Cave is a Toporobot export
  - ○ Kiamika_Cave.pdb; Kiamika was mapped with Auriga in September 2003
  - ○ Voronja_Cave.PDB : Voronja is a Compass export, but parts of it were surveyed with Auriga in 2005

If you want to be able to toggle operating language on the fly, also load desired resources files:

- AurigaFR_rsrc.prc (French)
- AurigaES_rsrc.prc (Spanish)

Install these files on the Palm OS device via the Palm Desktop and the HotSync Manager. Only Auriga appears on the Palm desktop, although the other files can be seen in the Palm OS **Info** view on the desktop (PRCs only) or with other file managers like FileZ.

If the available memory of your device permits, also install the 3 files from the FontBucket.zip archive to enjoy a larger selection of small fonts for the cave map. You may later reclaim the memory used by unwanted fonts by deleting them with the

FontBucket program.

Note: FontBucket does not work on high resolution Sony Clié devices.

If using a Palm Tungsten 3 device, also install the compatibility PRCs provided by Palm to support the Dynamic Input (Graffiti) Area (Tungsten3.zip archive.)

If you want to be able to print on IR-enabled Postscript or LaserJet printers, also load the 2 files contained in the XPprint.zip archive.

To export Auriga survey data into Compass or Visual Topo files, also install the Auriga conduit on your PC.

Notes on user interface

Online help is available in every Auriga form: in modal dialogs (signaled by a bold border), tap on the **i** icon in the title bar; in other forms, use the *Help* item from the *Options* menu.

The menu can be opened with the ![icon] icon in the Graffiti area or in the Status bar (depending on device model) or, under Palm OS 3.5 or better, by tapping on the title bar. In the case of multi-tabbed forms, tapping on the active tab opens the menu (tapping on an inactive tab changes the active tab.)

Exiting Auriga is done by tapping the ![icon] icon in the Graffiti area or in the Status bar (depending on device model.)

Configuration forms (Preferences, Details and Sessions) feature a **Defaults** menu allowing to save the current configuration as default values, and to recall them later.

Data input in forms is usually only validated upon saving the form contents. When invalid data is found, a beep is played and the insertion point is moved to the faulty field; if need be, the current tab is changed to the one containing the faulty field.

A few graphic buttons are used in various forms:

- ✓ Save
- ☐ New
- 🗑 Delete
- ✎ Sketch
- 🗺 Map
- ▦ List
- 🗋 Note (appears in black if a note already exists)
- ⧉ Form (exit)
- 🗐 Attributes

Quick start

Starting Auriga for the first time brings up the Main form. After that, starting Auriga restores its previous state.

Preferences should be configured before going further (Options menu, *Preferences* item.) Minimally, set the screen width in the **General** tab and the paper grid size in the **Map** tab.

Surveying a cave

- Create and open a new cave (Main form, **New** button)
  - Enter the cave name
  - Select length and angle units
  - Select the target software
  - Go to the **Stations** tab and select the station naming scheme
  - Go to the **Computations** tab and set the map scale and the global magnetic declination (optional)
  - Go to the **Map** tab and set the grid size
  - If you want to save these settings so that future caves inherit them by

default, drop down the **Defaults** menu and select the **Save Settings as Defaults** item
- ○ Save the cave details with the **OK** button

- The Session form pops up automatically (sessions are also known as "surveys" in some other cave surveying software)
  - ○ Enter the session name (optional)
  - ○ Select length and angle units for instruments set 1
  - ○ Tap the **Set 2** pushbutton and select length and angle units for instruments set 2
  - ○ Go to the **Shots** tab and set default dimension, azimuth and slope direction
  - ○ Set the session-specific magnetic declination (optional)
  - ○ Select the backsight azimuth and slope behavior
  - ○ If you want to save these settings so that future sessions use them as default, drop down the **Defaults** menu and select the **Save Settings as Defaults** item
  - ○ Save the session with the **Save** button and exit the form with the **Done** button

- Input survey shots with the Survey Shot form
  - ○ Enter start and end stations
  - ○ Enter length, azimuth and slope data
  - ○ If you enabled passage dimensions in the Session form, enter passage dimensions
  - ○ Enter a note (optional, but convenient to find your way in your survey data)
  - ○ Tap on the **Save** icon (checkmark)
  - ○ Tap on the **New** icon (square with a star) to create a new survey shot
  - ○ Repeat entering survey shot data
  - ○ Tap on the **Map** icon (network-like) to view the cave Map
  - ○ Tap on the **Form** icon (rightmost at the bottom of the screen) to return to the Survey Shot form
  - ○ Tap on the **Home** icon to return to the Main form

Countless other features are available and are fully described in this manual. This manual is easy to read and the text is accompanied by helpful screen shots. It contains:

- valuable information on key surveying concepts used in Auriga
- details on how to use the *Assistant* to enable you to enter data more quickly and more accurately
- description of all map features tools (zoom, pan, survey shot information, queries, ...)

- use of lists to review or navigate within the data
- and much much more!

To be informed about the frequent updates to Auriga, you should definitely subscribe to the Auriga e-mail list by sending an e-mail to: auriga-topo-subscribe@yahoogroups.com, or at least check back with the Auriga Web site regularly: www.speleo.qc.ca/Auriga.

Auriga key concepts

Stations are survey locations (virtual or physical, that is, placed anywhere in a cave passage, or located on a cave wall or some other physical feature. Survey shots are taken from one station toward another station.

Auriga supports station names of up to 12 characters, with an optional separator. In the latter case, the station name is input as 2 parts of at most 6 characters each, with the separator in the middle. Example: 12.41

As with any cave survey software, one of the difficulties is to be able to manipulate as a whole a series of survey stations that correspond to a single **cave leg** or **passages** This requires to be able to group survey stations into **Series**. One way to let the cave survey software know which survey stations belong to the same series is to use survey station names that share a common identifiable root.

In addition to 12-character station names, Auriga also offers a station name format called "6.6" where both the series name and the station number in that series can each use between 1 and 6 characters.

Auriga can discriminate series in station names in the 6.6 format if either:

1. An explicit separator (dot or slash) separates between the leg "prefix" (called the "series") and the station number within that series (ex. station LAKE.6B represents station number 6B in series LAKE)
2. Exclusive character sets are used for the series name and the station number (ex. A-Z for series name, 0-9 for station numbers, so station LAKE66 represents station 66 in series LAKE)
3. A character type change occurs between series name and station number. (ex. LAKE66B represents station 66B in series LAKE.) Note that in this case, the series prefix is detected when, starting from the leftmost character in the station name, a character type change occurs (ex. in LAKE66B, characters A-Z can occur in both the series name and station number, but when letters in LAKE change to a digit

(6), the series name is detected.)

Note: With or without separator, with the "6.6" station name format, a 6-character limit applies to the length of both series name and station number. Station names like LAKEHERE, LAKE2.66B or LA.665544 are thus invalid.

Survey shots are links between a pair of stations. Auriga differentiates 3 types of survey shots:

- regular survey shots
- virtual survey shots
- series beginnings

Regular survey shots are physical measures between a start station and an end station. They consist of:

- a length (distance between two stations) or a pair of Topofil readings
- a compass azimuth (horizontal angle between two stations relative to North, true or magnetic, or absolute if a theodolite is used)
- a slope (vertical inclination between two stations), an altimeter, or a depthmeter reading
- optionally, the passage dimensions (height below and above the reference station and width left and right of that station perpendicular to the survey shot; the station where these dimensions are taken, either start or end, is user-selectable)

    Note: The **Topofil** is a length-measuring device originally used in agriculture and forestry and involving a disposable cotton thread rolling onto a wheel connected to a numeric odometer; the thread is cut after each measurement and can be picked up or left to rot on the ground. The Vulcain Caving Group in Lyon, France, makes a popular model especially designed for caving. Their compact sturdy box also provides azimuth data by aligning the thread with the embedded compass, and slope data, measured with a protractor glued on the side of the box and placed against the thread while the box is maintained horizontal with the help of an embedded bubble level.

Virtual survey shots are zero-length survey shots that link two stations together. Virtual survey shots can act as milestones (the start and end stations can be the same.) Virtual shots can be used to mark an entrance or hold a geographic position; they are also convenient for joining cave legs together when junctions are made. Virtual shots can also

be used to record passage dimensions at the beginning (or end) of a passage when dimensions are recorded on end (or start) stations.

Series beginnings are virtual survey shots representing the beginning of a series. **Series** are logical groupings of contiguous stations. Their use in Auriga is optional. Stations composing a single passage, or "cave leg", would likely be part of the same series, while another cave branch would be part of another series.

Each series has a unique name; stations pertaining to the same series share this common series prefix. Ex. stations 3.1 and 3.2 are both part of series 3.

Survey shots do not have to be continuously numbered (without gaps) to be part of the same series; their start station only needs to share a common series name. Ex. survey shots 3.1-3.2, 3.2-3.6 and 3.6-4.2 constitute a possible series 3.

Although series can start at any shot number, a **Series Beginning** shot is necessary to hold settings that apply to a whole series (add to cave development, draw or color in map, etc.) Series beginnings are thus special virtual (zero-length) survey shots linking a cave passage to the rest of the cave.

Using series beginnings imposes 3 minor constraints:

- there can only be one series beginning per series
- the series beginning station must have the smallest station number within the series (ex. 2.2 cannot be a series beginning station if there also exists a survey station numbered 2.1)
- series beginnings survey shots must be entered as: *series beginning station - connecting station* (ex. 2.0 - 1.4 is the beginning shot for series 2) and not the opposite

Series beginnings are often given a station number of '0', '1', 'A' or 'a'. Although not required by Auriga, this may be convenient as it can allow automatic recognition of series beginning shots by the software. These options can be selected in the Stations tab of the Cave Details form.

Even if series beginnings are not used by the target cave survey desktop software, they improve Auriga navigation by making it easier to distinguish cave legs and browse survey shots faster. Series become transparent to cave survey desktop software that do not recognize them: the Auriga conduit simply converts them into virtual survey shots when syncing with these desktop software.

Geographic positions given to virtual survey shots or series beginnings are used to compute the geographical position of the current survey shot's stations as well as that of other stations that depend on them. An entrance is usually such a milestone, as well as any other station where a precise position can be determined (likely with a GPS or through radio-location techniques.)

If the Cartesian coordinates of the stations of a virtual survey shot or a series beginning cannot be computed (because no computed station links to this survey shot), the UTM position of this survey shot, if available, is used to compute the XY coordinates of its stations relative to the cave georeference (if a georeference is available.)

Warning: In order to minimize data storage, survey shots can only be **either**:

- a regular survey shot
- a virtual survey shot (2 stations virtually made equal)
- a series beginning

and **not** a simultaneous combination of these. Thus, for example, in order to give a geographic position to the entrance station 1.0 and survey from station 1.0 to station 1.1, the user should input:

- a virtual survey shot or a series beginning for stations 1.0-1.0, holding a geographic position
- a regular survey shot 1.0-1.1

Survey shots can be saved as **Incomplete**. This allows "reserving" their name, while measuring some or all of the actual survey shot data at a more convenient time. These incomplete survey shots are considered neutral during computations. Survey shots computed from such incomplete survey shots are then part of an incomplete leg. These survey shots are reported in the report produced with the *Shots Errors* item in the [Cave](#) menu.

Survey shots are said to be **Orphan** when there is no "path" between their stations and other computed stations. In order to be able to compute these survey shots and display the related cave legs in the cave map (albeit at an arbitrary location), the computation algorithm arbitrarily sets their start station on the origin station (set by default at position 0,0,0). Survey shots computed from such orphan survey shots are then part of an orphan leg. Such orphan survey shots are reported in the report produced with the *Shots Errors* item in the [Cave](#) menu.

Splay measures are measures taken from either station of a survey shot towards the ceiling/floor, a wall or some physical detail (formation, rock, etc.) They help sketching by appearing in the map. The also serve to improve the section view of a passage and to show the volume of a passage (completing or replacing Left, Right, Up and Down passage dimensions) in all map views except projected profiles.

Survey sessions are actual time periods during which survey shots are taken. The time period is up to the user (a day, a caving trip, an expedition or a whole cave survey.) Each survey session has a given instruments calibration and units choice. Each shot belongs to a session. A survey session can cover several series. Not every shot in a given series needs to be associated with the same survey session. Even with same instruments, sessions can be used to differentiate survey teams or periods of different magnetic declination over time.

An Auriga caves must have at least one session. A session numbered 1 is automatically created with default settings and calibration when the first survey shot is input. Using different Auriga sessions for actual different survey sessions is convenient should instrument calibration or team precision differences later be discovered: modifying the instruments calibration for that given session could fix the interpretation of all survey shot data input during that session.

Warning: Changing session settings, such as survey units, after survey shots have been input does not convert the input data, it only changes its interpretation.

For instance: If 5.3 meters were input, the survey shot holds 5.3 and the session indicate these are meters.
If the session length unit is changed to feet, the data is now interpreted as 5.3 feet, not 17.39 feet.

To perform an actual data conversion, and thus get 17.39 in the survey shot, use the Operations form operations on survey shots.

Sessions are transparent to the cave survey desktop software used: if the target desktop software does not recognize sessions, or a subset of session settings, the Auriga conduit simply applies the instruments calibration or subset of it to every shot and passes corrected data to the desktop software.

The **active session** is the session to which new survey shots are to be added. It is set with the Session menu in the Session form.

The **current session** is the session to which belongs the current survey shot.

Auriga keeps cave survey data in Palm OS **Databases** ("PDB" in the Palm OS vocabulary.) Each cave has its own database, named with the name of the cave (up to 26 character) completed with the "_Cave" suffix. Each cave is complete in itself, containing its settings, survey shots and sessions. Survey shots are automatically kept sorted in caves in increasing alphanumeric order of start and end stations; this is the order one can observe using the navigation arrows in the Survey Shot and the Map forms.

Customizing Auriga

Auriga offers a wealth of options, all of them useful at one time or another to adapt Auriga to your taste or work methods. Finding your way among them is easy when you understand how they are organized.

5 configuration levels affect Auriga:

1. Device preference that affect all programs, including Auriga, like number format, decimal separator and date format. They can be set in Palm OS' **Prefs.** program, thus outside of Auriga.

2. Auriga preferences, that determine the general Auriga behavior, regardless of the current cave or network. For example, the Keypad layout, the *Assistant* behavior, the grid of the sketching paper, the operation mode of connected devices (GPS, SAP, DistoX, etc.) or base colors. They can be set in the tabs of the Preferences form or the Display form.

3. General options pertaining to the current cave or network. For example, the base length and angle unit, the target software, the geodesic datum, the station name format, origin XYZ coordinates or the sketching scale. The can be set in the tabs of the Cave Details or Network Details.

4. Options specific to a survey session. For example the choice of instruments used, their calibration and measurement units, the choice to use backsights or not (may vary with teams or instruments) or the input order. They can be set in the tabs of the Sessions form.

5. Options specific to a survey shot. For example its color or the attributes of its stations (ex. an entrance.) They can be set in the Survey Shot form.

Series vs Sessions

Auriga offers sessions the same passage-related setting as with series. Sessions can thus be used to view a given set of survey shots as representing a cave passage and to act selectively upon these passages (map draw color, sum to/exclude from cave development or show/hide in the map.) So, why bother with series if sessions can do the same? Because, in my opinion, series were made just for that, while sessions rather correspond to a given time period when a given team of surveyors used a given set of instruments with a given calibration to survey a cave, or part of it, but not necessarily only a single passage. In other words, sessions relate to the survey process (team and instruments), while series relate to the physical arrangement of cave locations (survey stations.) Thus, hijacking the concept of sessions to make it correspond to cave passages requires to create or duplicate a session every time surveyors hit a new passage they could later wish to manipulate selectively. It is cumbersome, and also risky: if you later discover you had an instrument problem that day, you would have to find all relevant sessions to fix the instrument calibration for each of them. To sum up, sessions relate to the survey process (team and instruments) while series relate to the physical arrangement of the cave, the object of cave surveying. Hence my recommendation to use both series and sessions, each for its distinct purpose.

But the choice remains yours, Auriga clearly lets you do it your way.

Coordinates

Survey stations are computed into Cartesian coordinates, where:

- X is the horizontal axis (West-East); positive X values are located East of the origin; negative values West of the origin
- Y is the vertical axis (South-North); positive Y values are located North of the origin; negative values South of the origin
- Z is the depth axis; positive Z values are located above the origin; negative values below the origin
- C is the cumulative distance (normally drawn along the X-axis) and is used in combination with the Z-axis to draw Extended Extended Profiles.

Coordinates are relative to Magnetic North, or to Geographic (True) North if a magnetic declination is supplied, either in sessions (see the Shots tab of the Session form) or at cave level (see the Computations tab of the Cave Details form.) If the survey extends itself beyond a one-year period, it is advisable to create at least one session per year in order to associate the survey shots with their contemporary magnetic declination. Otherwise, a cave-global magnetic declination may be sufficient. If the cave has no global magnetic

declination, mixing sessions with a magnetic declination and sessions without leads to an incoherent map of Magnetic North-relative and Geographic-relative survey shots. The type of North used in the Map is indicated in the Statistics form.

Data input

In every form where data can be input, it is possible to pop up the Auriga Keypad with the **1-2-3** or **a-b-c** buttons in the Graffiti area (depending on field type.)

If a field contains invalid data, upon tapping on the **OK** or **Save** button, the insertion point is moved to the invalid field, its contents, if any, is selected, and a beep sound is played.

The Input Assistant

The input *Assistant* is an operation mode designed to ease data input by automating repetitive tasks involved with inputting survey shots. The *Assistant* can automatically:

- create a new blank survey shot every time a new survey shot is saved, applying proper auto-incrementation to current station names
- pop up the Auriga Keypad
- display the cave map
- turn off the device after a new survey shot is saved
- handle the device backlight

While the *Assistant* options can be set in the Assistant tab of the Preferences form, the *Assistant* mode is started/stopped in the Survey Shot form.

Under *Assistant* control, the behavior of the device hardware buttons is altered (see tables at the end of this manual), again to concentrate on the task of inputting survey shots. To prevent mishaps, leaving the *Assistant* mode must be explicitly confirmed.

Launching Auriga

When Auriga is launched, the 4 hardware buttons on the front of the device (or 2 on the Palm Zire) usually assigned to the built-in organizer applications are automatically reassigned to Auriga. This prevents accidentally exiting Auriga while letting Auriga use these buttons to ease survey shot navigation, map handling, data input, etc. After the device is turned off, either manually or automatically, hitting any hardware button wakes up Auriga, left in its previous state; the same result is obtained if the power button is

depressed. Thus, the proper way to let Auriga is to hit the **Home** button in the Graffiti silkscreen area. Upon exiting Auriga, hardware buttons are restored to their previous assignment (Agenda, Addresses, etc.)

If Auriga is not exited properly (i.e. after a crash or device reset), hardware buttons remain assigned to Auriga. Simply re-launching and exiting Auriga restores the buttons to their previous assignment.

Conversely, when tapping the **Calculator** button in the Graffiti silkscreen area (a **star** button on some Palm devices), this button gets temporarily reassigned to Auriga so as to allow a quick return from the calculator back into Auriga by simply tapping this button again. This button gets reassigned to its previous state when returning to Auriga.

When Auriga is launched, it re-opens the cave and the form it was left in when last exited. If the **Up** button is held down while the Auriga icon is tapped, an alert offers to start Auriga without opening the previously open cave, or to reset all Auriga preferences; note that this does not affect cave-specific settings.

Coordinates computation

Station coordinates are automatically computed when necessary. The following actions trigger this automatic computation process:

- Displaying the Map
- Displaying the *Stations* or *Graph* views in the List form
- Selecting the *Statistics*, *Shot Errors* or *Closure Errors* items of the Cave menu

The computation process can also be triggered manually by selecting the *Re-compute Coordinates* item of the Map or List menus.

If coordinates are already computed, saving a survey shot causes its coordinates to be incrementally computed; this is faster than re-computing the whole cave. Deleting and, in some case, modifying an existing survey shot requires a full re-computation, this is done automatically if the *Compute Shots on Save* is selected in the Map tab of the Preferences form. If the new survey shot completes a loop, an alert reports the closure error. If saving a survey shot connects an orphan leg to the rest of the cave, an alert is displayed.

Survey loops

Survey loops are searched and reported when saving a new survey shot that completes a survey loop. The loop error is reported in both absolute (meters or feet) and relative (% of error over total loop length, including error) forms. When a loop is hit as the survey goes, it becomes the current loop.

Loops can be viewed in the *Loops* view of the List form; selecting a loop in this list makes it the current loop.

The current loop can be zoomed on and/or highlighted with color in the Map. It is also possible to navigate the survey shots that constitute it while in the Survey Shot form thanks to the popup list of the *Loops* view of the List form obtained by holding the stylus on a loop item.

Global loop closure is triggered with the *Close Loops* menu item in the List or Map forms. Loops are closed consecutively, starting from the best (least relative error) loop down to the worst one. A bad loop can be excluded from global closure by deselecting its *Close* checkbox in the Loops List. After closure, some loops may present a non null error (visible in the Loops List) if too many of their survey shots had already been corrected while closing previous loops.

A single loop can be closed with the popup list of the *Loops* view of the List form. Closing a single loop may lead to different results from those obtained when closing all loops globally.

A loop cannot be closed if:

- all not null survey shots in the loop were previously corrected while closing another loop
- all not null survey shots in the loop have fixed XYZ coordinates

Note: Original coordinates, with loops not closed, can be restored with the *Re-compute Coordinates* item of the Map or List menus.

Passage dimensions

Auriga interprets passage dimensions (left, right, up and down) as being taken perpendicular to survey shots. Passage dimensions are associated to survey stations, and each station can only have a single set of passage dimensions. When station coordinates are computed, even if several survey shots provide passage dimensions for the same

station, only the first set of passage dimensions found while computing survey shots is kept for a given station in the cave graph for map display purposes (but the input data remains untouched.)

Cave diving data

Survey shots taken while cave diving differ from other survey shots in their use of a depthmeter as the instrument for slopes. When taking cave diving data, the associated session must thus use a depthmeter. If a dive survey shot connects to a non-dive survey shot, it is assumed that the start station is at depth = 0 (meters or feet.) For clarity to humans reading the data, it is suggested (but not required) that a zero-length shot be used to mark the beginning of a dive leg at depth 0. This zero-length shot can be a normal shot with length = 0 or, even better, a virtual ("=") shot or a series beginning (when series are used.) With virtual shots or series beginning, it is also possible to input an arbitrary depth (other than 0) with a position of type *Depth (diving)*.

Notes regarding cave diving survey data:

1. All underwater shots should have a negative value for depth. If a positive depth is provided, Auriga understands that the station is sitting above the water surface. Positive depths can therefore be used for short sections above water between two sumps (assuming of course that one has the ability to accurately measure the distance above water and that the surface of both sumps is at the same height.)
2. Depthmeter readings entered as foresight or backsight slopes are always assumed to correspond to the end station of a survey shot, regardless of the state of the *Direct* checkbox for the slope data in the [Survey Shot](#) form.
3. The backsight slope is not displayed (see the [Shots](#) tab of the [Session](#) form) if the slope instrument for one set is a depthmeter while the other set is not a depthmeter (but if two depthmeters are used, even with different units, the expected depth for the second instrument can be displayed, taking into account both instrument calibrations.) The expected backsight slope is not displayed if both depthmeters are the same (see the *Instrument Set #2=#1* checkbox in the [Instruments](#) tab (set #2) of the [Session](#) form) because this would only repeat the entered value.
4. The projected length of the survey shot cannot be displayed if the slope instrument for set 1 is a depthmeter because at the time of data input, Auriga does not know yet the depth of the start station, and thus, the depth difference for the current survey shot.

Constraints of the target software

Designed as a field tool, Auriga is often more flexible than cave survey PC and Mac software; it is thus possible that certain data, input and used within Auriga, such as GPS positions, is ignored by the target software (selected in the Cave tab of the Cave Details form.)

Some precautions may also be required from the user to make sure the input data is usable by the target software. Unless otherwise mentionned, Auriga does not enforce these constraints.

Compass

- The concept of series is unknown
- The conduit converts series beginnings and virtual survey shots into null-length regular survey shots
- Station names are limited to 12 characters, including separator
- Positions associated with series beginnings or virtual survey shots are ignored
- Topofil is not supported (the conduit converts these data in regular lengths)
- The concept of splay measures is unknown

Visual Topo

- The concept of series is unknown
- The conduit converts series beginnings and virtual survey shots into null-length regular survey shots
- Station names cannot contain a *
- Positions associated with series beginnings or virtual survey shots are ignored with the exception of the position associated with the origin station (if any)
- The cave must start with null-length survey shot that loops unto itself (i.e. both stations are the same) Otherwise, the cave cannot be saved or computed by Visual Topo
- Backsights are ignored
- The concept of splay measures is unknown

GH Topo and Toporobot

- Each survey shot must belong to a series for which a series beginning exists (where its station number must be 0)
- Series cannot cross each other
- Station names can only contain digits
- Station names must be strictly sequential (no gaps) and survey shots must respect

the "Toporobot method", otherwise the cave is not computable by Toporobot
- Passage dimensions are always associated with the start station of a survey shot
- Backsights are ignored
- The concept of splay measures is unknown

Auriga forms

The Main form

The Main form is Auriga's default entry point.

The view drop-down list in the title bar allows switching between a view of caves or networks present on the device.

The list displays the name of caves/networks present on the device. Read-only caves or networks (see the Cave Details form) appear with a **padlock** icon next to their name. Tapping a list entry selects it. Tapping again on the selection leads to the Cave Details or Network Details form.

Note: Auriga memorizes its previous state and automatically skips the *Main* form to go directly to the active form and current shot when Auriga was last exited. Holding the **Up** hardware key while starting Auriga opens the Main form (forgetting the previously open cave/network and active form.)

Icons at the bottom of the form allow to:

- Create a **New** cave/network (leads to the Cave Details or Network Details form)
- **Delete** the selected cave/network
- Display the Survey Shot form with a survey shot from the selected cave

- Display the selected cave/network [Map](#)
- Display the [List](#) form for the selected cave
- **View/Edit** the note associated with the selected cave/network

Note: Holding down the **Map** or **List** buttons pops up a list of available views prior to opening the corresponding form.

The **EN** selector allows to toggle the language under which Auriga operates (Auriga is available in French, English and Spanish.) This option requires to load on the device the proper supplementary **Auriga??_rsrc.prc** resource files (where ?? is the language abbreviation.) Toggling the language restarts Auriga. This setting is retained for subsequent Auriga start-ups. **Note:** The version of the resource file must match that of Auriga to be usable; otherwise Auriga falls back to the native language of its PRC file.

Up/Down scroll buttons scroll the cave list by one page.

Entering text in the **Lookup** field moves the list selection the first cave/network with its name starting with this text (characters other than alphanumeric are skipped.) The field can be scrolled horizontally using the hardware buttons located on either side of the Up/Down scroll buttons.

Menus: [Cave](#) or [Network](#), [Edit](#) and [Options](#).

The Export form

The Export form allows exporting survey shots or station coordinates into tab-delimited CSV (text) files (importable in spreadsheet programs like Excel) or various cave survey software program formats.

Indicate the **Name** of the export file (by default, the name of the cave.)

Select the **Card** checkbox if the file must be placed on the memory card in the device (the file is then placed in the /PALM/Applications/Auriga directory.)

Note: If the device has a memory card slot, this is the most convenient option as the file produced is a normal file directly usable in a computer, unlike the file hosted in the device internal memory, that is actually a Palm OS database from which a normal file must be extracted (see below.)

Select the **Beam to PC** checkbox if the file must be transmitted by *Infrared* or *Bluetooth* to a computer and indicate whether it must be **Deleted After**.

Notes: If this file is beamed with IR/Bluetooth to another Palm OS device, the receptor can crash or freeze because it does not know how to handle that kind of file.
If the *Card* checkbox is not checked and the file is beamed with IR/Bluetooth or HotSynced to a computer, it will be converted into a Palm OS database, and a ".pdb" extension will be added (ex. Fairy Cave.csv.pdb). To be usable on a computer, the original export file must be extracted from that ".pdb" file, for instance with the PAR tool (available in Auriga's download Web page) and the following DOS command:

```
par x "Fairy Cave.csv.pbd" "Fairy Cave.csv"
```

If a [Selection](#) is available, it can be used to limit the number of exported survey shots or stations.

Export rules:

- **CSV**

    - An output **Decimal separator** different from that used in Auriga can be selected.
    - **Survey shots** can be exported as **Raw** data, or converted to cave length and angle units, with session calibration settings and magnetic declination. Only the survey shot color column is skipped. **Position** data from virtual survey shots or series beginnings can be exported too. **Splay measures** can be interspersed among survey shots, starting with their anchor station. Measurement **Units** are optional.
    - **Station** coordinates can be exported along with their geographic **Position** if the cave is georeferenced and all survey shots have a magnetic declination (through session or cave settings). **Note:** Due to the way computed

coordinates are stored, they may be a rounding error of 0.01 length unit in widths (Left and Right).

- ❍ Columns are exported in the order they appear in the <u>List</u> form (except for Note and Position that always appear rightmost) and can be limited to **Visible** columns only.

- **Compass**

  - ❍ A ".dat" file is exported
  - ❍ Each non-empty session in Auriga is exported as a Compass *survey*, with its number as a name if the name were left empty, and the global cave magnetic declination as session declination if left empty in the session
  - ❍ When present, a "SURVEY TEAM" tag between [] at the beginning of session notes is exported with surveys
  - ❍ Sessions where slopes are measured with an altimeter or altimeter are marked as depth gauge inclination ('W') with slopes in degree angles
  - ❍ Dead or Incomplete survey shots are skipped
  - ❍ If necessary, survey shots are inverted in heading and/or slope to become direct (measured from start to end station)
  - ❍ If necessary, left/right passage widths are swapped to become direct (as seen from start to end station)

- **GH Topo and Toporobot**

  - ❍ A ".tab" file is exported; this export requires that station name format be numeric 6.6 with a non-null separator (see the <u>Cave Details</u> form)
  - ❍ The survey must strictly adhere to the "Toporobot method" in order to produce a valid file:
    - ■ Series beginnings must be present before each new series
    - ■ Stations must be strictly sequential within a series
    - ■ A single survey shot can leave from a given station
    - ■ Sessions must be numbered sequentially and start from 1
  - ❍ Only the whole cave can be exported (selection, if any, is ignored)
  - ❍ Each session in Auriga is exported as a Toporobot *expedition*, with the global cave magnetic declination as session declination if left empty in the session, and as a Toporobot line of parameters
  - ❍ When present, SM and SG tags between [] at the beginning of session notes are exported into the expedition "speleometer" and "speleograph" fields
  - ❍ When present, -2 tags between [] at the beginning of session notes are exported into the expedition comment
  - ❍ Dead or Incomplete survey shots are skipped
  - ❍ When present, -6 and -5 tags between [] at the beginning of survey shot

notes are exported into entrance and position lines
- ○ When present, -1N and -1C tags between [] at the beginning of survey shot notes are exported into the name and comment of series beginnings
- ○ If necessary, survey shots are inverted in heading and/or slope to become direct (measured from start to end station)
- ○ If necessary, left/right passage widths are swapped to become direct (as seen from start to end station)

- **Survex**

  - ○ A ".svx" file is exported
  - ○ The period (.) separator in station names, if any, is replaced by an underscore (_) to produce a valid file
  - ○ Each non-empty session in Auriga is exported as a block with its survey shots with the global cave magnetic declination as session declination if left empty in the session
  - ○ Dead or Incomplete survey shots are skipped
  - ○ If necessary, survey shots are inverted in heading and/or slope to become direct (measured from start to end station)
  - ○ If necessary, left/right passage widths are swapped to become direct (as seen from start to end station)
  - ○ Splay measures are exported
  - ○ GPS positions are exported in UTM using the cave datum

- **Therion**

  - ○ Native TH
    - A ".th" file is exported
    - Each non-empty session in Auriga is exported as a *centerline* block, with the global cave magnetic declination as session declination if left empty in the session
    - Dead or Incomplete survey shots are skipped
    - If necessary, survey shots are inverted in heading and/or slope to become direct (measured from start to end station)
    - If necessary, left/right passage widths are swapped to become direct (as seen from start to end station)
    - Splay measures are exported
    - GPS positions are exported in decimal degrees using the WGS84 datum

  - ○ TXT with sketch
    - A ".txt" file is exported

- Dead, Incomplete or uncomputed survey shots are skipped
- Survey shots and stations are exported as computed coordinates
- Splay measures and sketches are exported

- **Visual Topo**

  - A ".tro" file is exported
  - When present, the "Zone", "Club", "Triangle", "Surface" and "Couleur" tags between [] in the cave note are exported into the header
  - Each non-empty session in Auriga is exported as a line of parameters
  - Dead or Incomplete survey shots are skipped
  - If necessary, survey shots are inverted in heading and/or slope to match their parent session settings
  - If necessary, left/right passage widths are swapped to match their parent session settings
  - The first exported survey shot must be self-looping on the origin station (selected in the Computations tab of the Cave Details form or automatically assigned to the start station of the first survey shot); if such a shot does not exist, one is assumed and exported

- **Walls**

  - A ".srv" file is exported
  - Each non-empty session in Auriga is exported as a Walls *survey*
  - Dead or Incomplete survey shots are skipped
  - If necessary, survey shots are inverted in heading and/or slope to become direct (measured from start to end station)
  - If necessary, survey shot slopes are converted so that slope 0 is horizontal
  - If necessary, left/right passage widths are swapped to become direct (as seen from start to end station)
  - Splay measures are exported

Menu: Edit

The Import form

The Import form allows importing caves from files in various cave survey formats and present on the memory card.

Select the format of the import file.

Select the import file. The **...** button allows navigating among files and directories on the memory card. When a file is selected, the name of the cave it contains is displayed.

Select the appropriate station name format pushbutton: **6.6** or **12** characters. In 6.6 format, the separator (usually a dot) does not count as a character. In 12-character free format, all characters are counted.

Select the separator used between station name subparts (if 6.6 format is selected.)

Import notes:

- **Compass**

  ◦ The "SURVEY TEAM" line is kept as a tag between [] at the beginning of session notes

- **GH Topo and Toporobot**

  ◦ Entrances and positions are kept as -6 and -5 tags between [] at the beginning of survey shot notes
  ◦ Each unique pair of parameter and expedition lines becomes a session
  ◦ The expedition "speleometer" and "speleograph" fields are kept as SM and SG tags between [] at the beginning of session notes
  ◦ The expedition comment, if any, is kept as a -2 tag between [] at the beginning of session notes
  ◦ The series name and comment, if any, are kept as -1N and -1C tags between [] at the beginning of the series beginning survey shot notes
  ◦ Invisible survey shots (code -100) are hidden and excluded from statistics; ignored survey shots (code -101) are excluded from statistics;

- **Visual Topo**

    - The geographic "Zone" as well as "Club", "Triangle", "Surface" and "Couleur" header lines are kept as tags between [] in the cave note

- **Cave Sniper**

    - Data may be imported from the file produced by the device, or directly from the device

Menus: None.

The Preferences form

Preferences set in this form are global to Auriga and used throughout all caves.

This form has 4 tabs, selected with pushbuttons in the title bar.

The General tab

Select the **Sound** level for Auriga warnings and errors (used when no other visual clue is given to the user.) This sound level overrides the system sound level set in the built-in Prefs application.

Select the desired **type of data save** behavior:

- *Manual Shot/Session Save* requires a manual save of modified survey shot or session data before leaving the window or the current shot/session, otherwise it is lost; this is the least safe option.

- *Warn if Data Save Needed* warns the user when unsaved data is about to be overwritten or abandoned
- *Automatic Shot/Session Save* automatically saves modified survey shot or session data when needed; this is a convenient choice when inputting new cave data.
- *Automatic Save+Overwrite* automatically saves modified survey shot or session data when needed and automatically updates existing survey shots when modified; this is a convenient choice when reviewing existing cave data.

Select the calculator that gets launched when tapping the **Calculator** button (or **Star** on some Palm Zire devices) in the Graffiti area while Auriga is active. Tapping this button again while using the calculator returns to Auriga.

Select the **Enable Global Find** checkbox so that Auriga searches the cave notes, survey shot names and notes, session names and notes and network notes in all its caves and networks when the Palm OS Global Find is launched outside of Auriga. If the Palm OS Global Find is launched within Auriga while a cave is open, the search only takes place in the current cave or network.

Note: Global Find is always enabled when launched while Auriga is running.

If measuring lengths with a Topofil, select the **Continuous Topofil** checkbox to have Auriga automatically initialize the start Topofil reading of a survey shot with the end Topofil reading of the previous shot. This reading can be overridden for each individual survey shot

Select the desired display related to the input length in the [Survey Shot](#) form between *None*, *Net Topofil Length* or *Projected Length* checkbox to display the net shot length projected over horizontal ground (useful for sketching.)

Select the **Auto Decimal Lengths** checkbox to let Auriga complete length data (including passage dimensions) when the decimal sign is skipped during input (whether in Graffiti or through the [Auriga Keypad](#).) The data is then interpreted in hundredths of length unit:

7 becomes 0.07
70 becomes 0.70
700 becomes 7.00

Select the **Skipped LRUD = 0.00** checkbox to let Auriga complete missing passage dimensions (Left, Right, Up, Down) upon saving the survey shot when the opposite dimension has been input (e.g. insert 0.00 in Left dimension if a Right dimension is

provided, or vice versa, and conversely for Up/Down dimensions.) This can be convenient when survey stations tend to be located on cave walls.

Select the **Accept Dubious Data** checkbox to disable the alert that pops up when inputting survey data that seem to exceed the instruments resolution. Otherwise, for classic instruments, an alert pops up when:

- the length exceeds 100 meters or its feet equivalent
- the azimuth is not a multiple of 0.25 degree or grad
- the slope is not a multiple of 0.5 degree or grad

No alert is ever issued when electronic instruments are selected in the current session

The Assistant tab
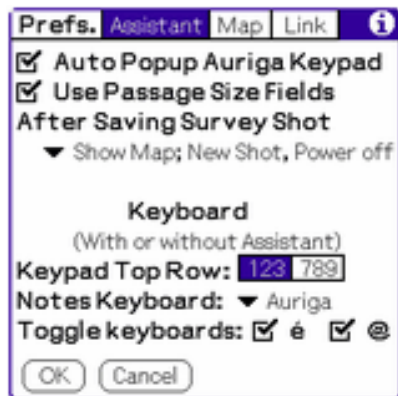
The *Assistant* provides an automated input mode while surveying a cave (see the [Assistant](#) section and the [Survey Shot](#) form.)

The Assistant tab is used to configure the behavior of the input *Assistant*. The *Assistant* itself is started by selecting the **Assistant** pushbutton in the [Survey Shot](#) form.

Select the **Auto Popup Auriga Keypad** checkbox to automatically display the Auriga Keypad when inputting a new survey shot.

Select the **Use Passage Size Fields** checkbox to make the Auriga Keypad navigate into the passage size fields of the [Survey Shot](#) form. when writing an up/down Graffiti symbol, scrolling with the **Up/Down** scroll buttons or using **Arrow** buttons. **Note:** If the current session makes passage sizes mandatory (see the [Shots](#) tab of the [Session](#) form), passage size fields are always navigated into.

Select the automatic *Assistant* behavior **After Saving a Survey Shot**:

- **No special action**
- **Create New Survey Shot** creates a new empty survey shot with auto-incrementation applied to the survey stations of the save survey shot
- **Create New Shot; Power Off** same as option above, with device powering itself off
- **Show Map** computes the new survey shot and displays the [Map]
- **Show Map; Create New Shot** computes the new survey shot and displays the [Map]; upon returning from [Map] (or [List] form), creates a new empty survey shot with auto-incrementation applied to the survey stations of the save survey shot
- **Show Map; New Shot; Power off** same as option above, with device powering itself off
- **Sketch to Scale** computes the new survey shot and displays the [Sketch to Scale] form
- **Sketch to Scale; Create New Shot** computes the new survey shot and displays the [Sketch to Scale] form; upon returning from [Sketch to Scale] form, creates a new empty survey shot with auto-incrementation applied to the survey stations of the save survey shot
- **Sketch to Scale; New Shot; Off** same as option above, with device powering itself off

Note: A new survey shot is automatically created only if the saved survey shot was itself new. Saving a modified existing survey shot does not automatically create a new survey shot.

Select the appearance of the numeric layout of the top row of the [Auriga Keypad] with the **123** or **789** pushbuttons.

Select the **Notes Keyboard** to use when editing notes. If the Palm OS keyboard is selected, it opens within the [Auriga Keypad]. If *None* is selected, when field navigation reaches a note field, the [Auriga Keypad] closes automatically.

Select the **Toggle keyboards**, i.e. the Auriga Keypad layouts that stay on for a single character (with a subsequent automatic return to the alphabetic layout.) See the [Auriga Keypad].

The Map tab
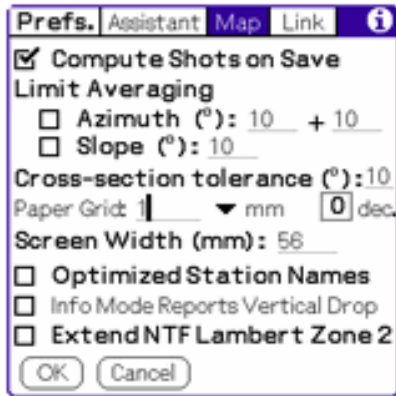
Survey shot coordinates are incrementally computed every time a survey shot is saved, if other survey shots are already computed. This is faster than re-computing the whole cave, but only works with new survey shots. Modifying or deleting an existing survey shot may require a total computation. Selecting the **Compute Shot on Save** checkbox allows Auriga to perform coordinates computations even if this requires a full re-computation of the cave.

Indicate the **Averaging Limit** of foresight-backsight **Azimuth** and **Slope**, if any, when performing computations; if the limit is not activated, averaging is performed regardless of the measurement span. The azimuth tolerance can be made to increase with the sine of the slope (maximum at extreme inclinations.) Survey shots that exceed one or both of these limits are marked as *Wrong Azimuth*, *Wrong Slope* or *Wrong Backsights*.

Input the angular **tolerance** around the perpendicular of the survey shot when selecting splay measures to display a cross-section view. Splay measures to the ceiling/floor or walls that fit within (±) this "slice" are automatically picked for the *Section* view.

Indicate the **Paper Grid Size** in the notebook where sketching is to take place (i.e. the actual physical size of printed squares; ex. 1 mm) as well as the number of **Decimals** used to display coordinates in the Sketch to Scale form.

Indicate the **Screen Width** in mm. This value corresponds to the net form width, including the its border, but excluding the inactive part of the screen; it varies between device models. By defautl, this value is initialized to 56 mm, except for some well-known models (listed in the Limits section.

Select the **Optimized station Names** to hide some or all station names when the zoom level would overlap them.

Select the **Info Mode Reports Vertical Drop** so that the *Info* stylus mode in Map shows

the vertical drop between the highest station of the cave or network and the current station in the Z coordinate or the altitude of geographic positions. Otherwise, the *Info* mode displays the true Z coordinate or the altitude if it is known.

When using Lambert coordinates in France, select the **Extend NTF Lambert Zone 2** checkbox to force its use, or let Auriga chose the local zone (I, II, III or IV) according to current latitude and longitude. This zone is used throughout forms that display positions in the NTF datum.

The Link tab

The *Link* tab allows configuring the link with an electronic measuring device.

Select the **Device** connected to Auriga. If no device is selected, the rest of the form is blank. Auriga currently support any NMEA-capable GPS (i.e. most GPSes) as well as a Disto laser distancemeter, the Revolution and the Shetland Attack Pony (SAP) electronic compass/clinometer devices and three 3-in-1 survey devices: the Toposcan prototype, the TruPulse 360 and the DistoX. Depending on the selected device, some form options may be locked or hidden if irrelevant.

If the **Link** type is *RS-232 (serial)*, select the **Baud** rate to match that of the connected device or let Auriga select the device-specific default speed.

In order to connect a serial device via the HotSync cable, a null-modem adapter is usually required between this cable and the one supplied with the device (2-3, 3-2, 5-5 on a 9-pin connector.)

Note: All Palm OS USB device connectors feature both USB and serial pins, except those with a mini-USB connector (Palm Zires and Tungsten E.) It is thus possible to buy or assemble a serial cable for most USB devices.

If a Bluetooth connection is used, selecting the **Persistent** checkbox leaves the data link open even after all expected data has arrived. This speeds up data reception at the price of a higher power consumption.

After a first connection is established with a Bluetooth device, a **Bluetooth** button allows to know the type of device and its Bluetooth address. The **Clear** button in the alert clears the memorized address, thus provoking a new device discovery at next connect (necessary when trying to connect another device of the same type.)

Note: Each individual Bluetooth device has its own unique Bluetooth address. (ex. two DistoX device have different addresses.) Auriga stores the last connected device address to speed up subsequent connections with this same device. Prior to attempting to connect to a different device of the same type, the stored address must be cleared in order to trigger a "Device Discovery".

Select the **Data Use Mode** in Survey Shot or Measures forms:

- **Display** displays the received data

  In the Survey Shot form, survey data or GPS locations are displayed in a popup form
  In the Map form, the current GPS location is marked with a crosshair (+)

  Select the **Cyclical** checkbox to repeatedly fetch data. The **Suspend Auto-Off** checkbox may be selected to suspend the Palm OS auto-off timer that would otherwise halt data reception

- **Input** fills the relevant Survey Shot or Measures form input fields with the received data

  Select the **Open Link on New Shot** checkbox to automatically connect the device when creating a new survey shot.

  Select the **Auto Create New Shot** checkbox to automatically create or adapt a new survey shot when data is received while an existing survey shot is displayed. Otherwise, if the survey shot currently displayed already exists when data is received, an alert asks whether to create a new survey shot or to replace the data of the existing survey shot. If the current survey shot is incompatible with the type of received data (ex. a virtual survey shot vs azimuth data), an alert asks whether to create a new survey shot or to adapt the existing survey shot to the type of data

received.

> **Note:** The received survey data can only be copied into relevant input fields of the Survey Shot form if *Device* is selected as the measurement instrument for these fields in the Session form.

Connecting a device

- In the Survey Shot form, the **Dimensions** icon ⊕ is replaced by a **Connect** pushbutton ⚡ used to connect/disconnect the device
- In the Measures form, the **Connect** pushbutton ⚡ is used to connect/disconnect the device (in Input mode only, for devices other than a GPS)
- In the Map form, connection is achieved with the *Connect* item of the *Map* menu

Tapping the **Select** button of the Palm 5-way Navigator also connects/disconnects the device.

The device is also disconnected when:

- The GPS position to input is received (in non cyclical mode)
- The stylus is tapped in the Map form (GPS only)
- The current survey shot is saved in the Survey Shot form
- Another survey shot is loaded in the Survey Shot form
- Auriga is exited

Note: The device beeps every time new data is received.

Note: A low tone beep is heard when disconnection is accidental.

En Input mode, with a device other than a GPS and a PDA with Palm OS 3.5 or better, select the **Popup Measures in** pushbuttons so as to automatically open the Measures form in the Survey Shot and/or Map forms after connecting the device.

Connecting a GPS

Select the **Format** used to display or store the received location.

Note: When acquiring GPS data into a survey shot for which the type or datum has

already been selected, these selections override the default format (selected above) and the cave datum (see the Cave tab of the Cave Details form.)

Note: When tracking GPS position in the Map, if the display cave position type set in the Cave tab of the Cave Details form or the Network tab of the Network Details form is a geographic format, it is used over the format selected here.

Make sure the data communication protocol is set to NMEA on the GPS side (many GPS units default to proprietary protocols.) The NMEA protocol standardizes the baud rate at 4800.

Note: The NMEA protocol requires that positions be sent using the WGS84 datum. However, certain GPS units use instead the user-selected display datum of the GPS, often without sending a datum indication over the data link. Auriga assumes the data is received in WGS84, and converts it to the current survey shot or cave datum (selected in the Cave tab of the Cave Details form or the Network tab of the Network Details form.) It is thus a good idea to test your GPS by putting Auriga in display mode: if the displayed position in Auriga does not correspond to the displayed position on the GPS, it means the GPS is sending positions using the GPS datum and Auriga is performing a redundant conversion. In this case, set the GPS to the current cave or network datum and deselect the **Strict NMEA (WGS84) GPS** checkbox to let Auriga accept the GPS data as is, without converting it.

Although a GPS sends data every second, the **Cyclical** mode limits the reception interval between 5 and 900 seconds (15 minutes.)

If Auriga is running on a Garmin iQue Palm OS PDA (featuring an internal GPS), select the *Internal* **Link** type.

The current time on a device running Palm OS 4.0 or better can be synchronized with the GPS time by selecting the **Sync Device with GPS Time**. This operation is performed only once after the connection is established. This option is not offered with the Garmin iQue, where the device already performs this operation automatically.

When using GPS data to fill survey shots, select the **Use GPS Altitude** checkbox to fill the altitude field with the altitude data reported by the GPS (if available.) The altitude unit is set by the current session; the GPS always transmits in meters, possibly causing an automatic conversion in Auriga.

In *Input* mode, the Survey Shot form displays the current position and, if available from

the GPS, the current altitude, the number of satellites tracked, the HDOP (Horizontal Dilution Of Precision), the horizontal precision in meters and the local magnetic declination. The HDOP is a unitless number indicating the quality of the GPS fix; the smaller (1 or sometimes less) the better. In the Map, the current position is tracked with a crosshair (+) and can also be displayed at the bottom of the screen.

In *Input* mode, selecting the **Wait for 4 Satellites** waits until four satellites are used by the GPS to compute the current position before copying it into the position fields of the Survey Shot. Until then, the position is simply displayed.

Note: The device beeps every time new data is received, even it he GPS has not yet determined its position and only transmits its status.

Using the Measures form

When receiving survey data (other than GPS), the Measures form can be used to view and edit that data. Selecting the **Shot** and/or **Map** pushbuttons determines when this form gets automatically popped upon receiving data from a connected device.

Connecting a TNT Revolution module

The TNT Revolution module needs to be prompted for data. A **2-step** process can be selected; this allows to pause between the link connection and the actual data measurement. The pause is interrupted when tapping again on the **Connect** pushbutton. It is also possible to select a **Delay** between the connection and the actual data measurement. In this case, the device beeps one second before the measurement takes place.

The azimuth and slope units in the current session may be selected among degrees, grads or %; the module must be set to report degrees (default selection), possibly causing an automatic conversion in Auriga.

Measuring lengths

When measuring the survey shot and passage dimensions with a length-measuring device, it is advisable to select the **Automatic Sequence** checkbox to let Auriga automatically move from field to field every time new data is received in the Survey Shot form. Otherwise, it is necessary to manually move the insertion point from field to field (with the PageDown button or the stylus.) If a measurement is repeated for a non-empty field, if the **Accept Retries** checkbox is selected, the previous data is silently overwritten, otherwise an alert pops up. Note that even in automatic sequence mode, it remains

possible to move the insertion point backwards to repeat a measurement, or forward to skip a measurement (e.g. when the survey station is against a wall, this zero-length measurement can be skipped) - it is then advisable to have the **Skipped LRUD = 0.00** (General tab) checkbox selected so as to let Auriga automatically fill the skipped field with 0.00.

Tip: To retain full control over acquired data, use the Measures form.

Connecting a Disto laser rangefinder

When the **2nd** button is hit on the Disto A6, 8 buttons can transmit an arrow character to navigate from one field to another:

- the 4 **corner** arrows write an 'X' (unknown) in the current passage dimension field of the Survey Shot form
- the **Up** or **Left** arrow moves the insertion point to the previous length or passage dimension field of the Survey Shot form
- the **Down** or **Right** arrow moves the insertion point to the next passage dimension field of the Survey Shot form

Connecting a 3-in-1 device (Toposcan/Easytopo, TruPulse or DistoX)

Select the **Automatic Sequence** and **Auto Detect LRUD** checkboxes to automatically distinguish between survey shot and passage dimension fields based on angular (azimuth and slope) changes. This option can only be available with 3-in-1 devices, that simultaneously report both distance and angles.

For this to work:

- Auriga assumes the first measurement is the survey shot and then follows the input order set in the Input Order form of the Session form for the current session
- Left and Right dimensions must be taken at an inclination no greater than 45° (up or down) and be more than 45° to the left or right of the shot
- Up and Down dimensions must be taken at an inclination greater than 45° (up or down)
- Unless the survey shot has a slope less than 45° (up and down), at least one Left or Right dimension must be taken before measuring the Up and Down dimensions

Tips

- Any measurement can be repeated at will, preferably before measuring the next dimension
- Manually selecting the current field in the Survey Shot form indicates to Auriga the upcoming data type
- If the first survey shot measurement (length, azimuth and slope) is too far off reality, Auriga may not be able to detect subsequent retries; just change the current field by hand to Length, Azimuth or Slope to force an overwrite of those fields
- If both Left and Right dimensions are skipped before Up or Down dimensions are taken, and the survey shot is steep, manually change the current field to Right, Up or Down to enable proper detection

Note: If the current field is manually selected and Auriga estimates the received measurement does not correspond to the current field, an alert is displayed to confirm the insertion of the measurement into the user-selected field.

If Auriga determines that a measurement is being repeated, and the **Accept Retries** checkbox is not selected, an alert asks whether to replace the data in the *Survey Shot* form by the new measurement. In the Measures form, the newly-received data is appended at the end of the list.

Note: On the TruPulse, length values input by Auriga correspond to the SD (Slope Distance) display. The mode must be set to display either SD, HD or VD; otherwise, the laser does not fire, and the length is not measured.

Connecting a DistoX

When first connecting the DistoX, the Bluetooth Security Manager may prompt for a passkey; enter 0000 (4 zeroes) and select the **Trusted Device** checkbox.

The DistoX stores every measurement in its non-volatile memory and sends it over Bluetooth as soon as it gets connected. Thus, if random measures (e.g. measuring a dome height) are taken between survey stations (i.e. while the DistoX is disconnected), these will get stored and later sent as soon as Auriga connects with the DistoX, possibly requiring to clear these measures from the Survey Shot form before actually measuring the current survey shot. It is faster to remove these unwanted measures from the DistoX by holding down the stylus on the **Connect** pushbutton in the Survey Shot form (or the **Select** button of the Palm 5-way Navigator) when connecting the DistoX. This operation can be automatically applied every time the DistoX is connected by selecting the **Pre-empty** checkbox; the device then beeps for each removed measurement.

Tips:
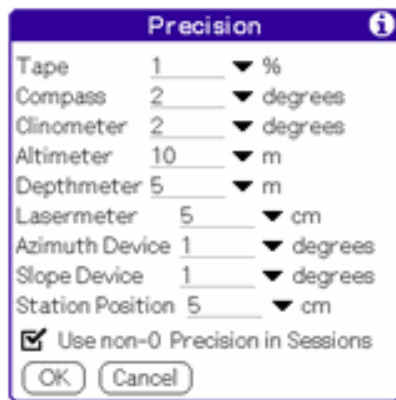
- The DistoX goes into sleep mode between measures. Attempting to connect the DistoX while in sleep mode often results in a time out. An automatic reconnect is then attempted, often to no avail. It is best to turn on the DistoX laser beam before attempting a connection
- Disconnecting the DistoX takes long and freezes the Auriga interface until the *Connection* pushbutton appears deselected. This delay can be avoided by leaving the Bluetooth link active between measures (see the *Persistent* checkbox)

Note: Some Palm TX devices have a faulty Bluetooth controller that only seems to work fine when data arrives in bursts (like when emptying a DistoX.) These devices do not work well when measures are sent one at a time. In this case, it is better to measure everything with the DistoX before actually connecting it to the device. Of course, this operating mode is incompatible with the *Pre-empty* option.

Menus: Preferences (if launched from Main form) and Edit.

The Precision form

This form allows selecting the precision of various survey instruments. This information is used to determined the expected error in loops (displayed in the List form.)

Select the precision for each instrument type. Precision of "Device" types is used for electronic devices such as the DistoX, TruPulse or SAP.

The station position precision corresponds to the distance between the real station position and the point at which measurement are actually taken. With optical instruments, this distance can reach the size of the head with its helmet.

Select the *Use non-0 Precision in Sessions* checkbox to override general instruments precision with those selected in sessions when not 0.

Menu: [Edit](#)

The Display form

This form is only available on devices with Palm OS 3.5 or better.

Select the **Default Trace**, **Current Shot**, **Walls** (passage dimensions, splay measures to walls or ceiling/floor and the wall line between them), **Splay Measures** (those that do not a wall or ceiling/floor) and **Grid** colors.

Select the **Black Background** checkbox to display the map against a black background.

Note: Map elements (survey shots, dimensions, walls, sketches, etc.) that bear the same color as the map background are drawn in the opposite color, either black or white. This prevents a cave displayed on one device to suddenly disappear when displayed on another device using a different map background color.

Select the **Four Grayscales** checkbox to limit 16-grayscales capable devices to 4 grayscales This prevents a contrast change when leaving Auriga on Palm IIIxe and similar devices. This changes only takes effect after Auriga is restarted.

Select the **Full Screen Cave Map** checkbox to use the full screen height to draw the cave map. Controls at the bottom of the [Map](#) form can then be show/hidden by tapping in the Graffiti area as they overlap the cave map.
Note: This option is ignored in *Sketching* mode.

Select the **High Resolution Map** checkbox to draw Map in high-resolution on capable devices. Disabling high-resolution can help screen readability in bright light. This changes only takes effect after Auriga is restarted.

Select the **Self-adjust Sketch** checkbox so that curves drawn in this mode self-adjust with length, azimuth and/or slope changes of their associated survey shot (as long as they are not zero-length.)

Select the **Auto Select** checkbox to automatically select a new curve after it is drawn.

Select the level of **Conformance** between the stylus trace and the resulting curve when sketching. At maximum level, the trace is taken as is, with all its imperfections, and requires more memory.

Select the **High Resolution Sketch** checkbox to sketch in high-resolution on capable devices. On Sony devices, sketching and Map display share the same high resolution setting. This changes only takes effect after Auriga is restarted.

Menu: None.

The Power Management form

This form displays information on remaining battery power and offers various power management options.

Tapping the **Off** button turns the device off.

The **Auto-off** setting allows selecting a smaller delay than the built-in auto-off timer (30 seconds-3 minutes in the Palm OS Prefs), possibly extending battery life. Selecting *Never*, while convenient at times, may drain the battery in a few hours.

The **Backlight** pushbutton is only available on devices with a toggable backlight. Tapping the pushbutton toggles the backlight. The corresponding **On Startup** and **On Assistant** checkboxes can be used to select at what times the backlight should be automatically turned on.

The **Auto Dim Backlight** section allows selecting times the screen brightness/backlight should be dimmed or turned off, such as:

- **Beam Receive**
- **Beam Send**
- **Long Processes** like list sorting as well as cave/network DB computing, sorting, reorganization and migration
- **Map Drawing**
- after a configurable inactivity delay varying between 5 and 180 seconds; tapping the screen or hitting a hardware button restores the original brightness; requires Palm OS 4.2 and above

On devices with an adjustable brightness control, this feature requires the BrightnessFix add-on (see the Download page in the Auriga website.) The **Level** button allows selecting the auto-dimming level.

Menu: None.

The Cave Details form

This form displays information on a cave, either existing or being created.

This form has 4 tabs, selected with the pushbuttons in the title bar.

The Cave tab
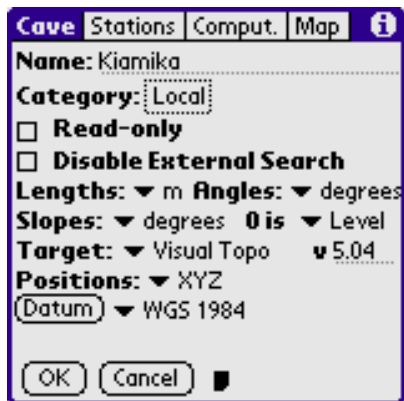
The **Name** of the cave can be any string of 26 characters or less and may include spaces but not ":" or "/". This corresponds to the name of the Auriga cave PDB on the Palm OS device (with a 5-character suffix to distinguish it between PDB types.) Editing the name of an existing cave actually renames it (an alert is issued before proceeding.)

The **Category** selector allows selecting the cave category. Categories are edited in the usual Palm OS way by selecting the *Edit categories...* list item.

If you do not intend to modify the cave data and wish to prevent accidental modifications, select the **Read-only** checkbox (implicitly prevents adding survey shots.) A new cave cannot be set as read-only.

Note: In read-only mode, survey data (survey shots or sessions) or details that could affect computations cannot be modified. Nonetheless, details that determine the cave map presentation can still be modified.

Select the **Disable External Search** checkbox to exclude this cave from Searches launched from outside of this cave.

Select measurement units to be used for computing coordinates:

- **Lengths** unit (*meters* or *feet*)
- **Angles** unit (*degrees* or *grads*) for azimuths and projection angle
- **Slopes** unit (*degrees*, *grads* or *%*)
- **Slope 0** setting (*Up (zenithal)*, *Level* or *Down (nadiral)*)

Note: Measures units selected in this form are used throughout Auriga to report coordinates, lengths and angles between stations and statistics.

Select the **Target** desktop software this cave is going to be synchronized with and

indicate the **version** number. This information is used to suggest usage in survey management or to enforce rules dictated by the target desktop software constraints. If no desktop software syncing is to take place (other than a backup with the HotSync Manager), select **Other** to ensure proper internal handling of deleted records.

Select the format to be used to display **Positions** in the cave map (*XYZ* (relative to the origin station), *d°m's"*, *d°m.m'*, *degrees* or *UTM*.)

If latitude/longitude or UTM geographical positions are to be input, select the proper topographical **Datum** to use for conversions; see [Supported Geodesic Datum](#). Tap the **Datum** button to open the [Datum](#) form to view the geodesic parameters that define the selected datum or to input parameters that define a *User* datum.

Tap the **Note** button to edit the cave note. 255 characters are permitted.

The Stations tab

Select the appropriate name format pushbutton: **6.6** or **12** characters. In 6.6 format, the separator (usually a dot) does not count as a character. In 12-character free format, all characters are counted.

Select the character set allowed for the left and right subparts of station names and the separator used between station name subparts (if 6.6 format is selected.)

Use the @ checkbox to select whether punctuation characters are allowed for the right subpart of station names. Supported characters are:

.,;:-+/=!@$%?&*()<>[]{}|~'

Use the **é** checkboxes to select whether accented letters are allowed for the left and right

subparts of station names.

Note: Series support is possible in the 12-character by actually choosing the 6.6 format with a null separator. If overlapping character sets are selected for the root (series) and survey shot number subparts, Auriga discriminates series prefixes upon the first leftmost change of character type (digit->letter or vice-versa.) Ex. in "HM12B", "HM" is interpreted as the series, and "12B" as the survey shot number in series "HM". Each resulting subpart remains limited to 6 characters in length.

Select the **Enforced Series Beginnings** checkbox to indicate that series beginnings can only use the allowed start station number among "0", "1", "A" or "a". Otherwise, series beginnings can be any first survey shot of the series. This checkbox only appears if 6.6 format is selected.

Select **Use Alpha Keypad** checkbox so that the Auriga Keypad opens its alphabetic layout when field navigation reaches a station name.

Note: Alphabetic characters can also be input with Graffiti strokes.

Select the **Shot Navigation Mode** with navigation arrows in the Survey Shot and Map forms. Choices are:

- **Go to the next or previous series beginning** (default if the 6.6 format is selected)
- **Go to Next Series** (determined by a station naming change in the left subpart of the station name if the 6.6 format is selected)
- **Go to Next Session**
- **Move by n shots**, where n is user-chosen value between 1 and 255

Note: If series are not allowed, that is, the naming scheme is not 6.6, the only available behaviors are to **Go to Next Session** or to **Move by n shots**

Select the **Auto-incrementation** mode for station names when creating new survey shots. Options are:

- **None** (station fields are left blank)
- **Repeat Shot** stations (and let user edit them manually)
- **Add one** to previous start station (start station is set as the end station of the previous shot and the end station is incremented by 1; this works with both numbers and letters)
- **Leap Frog**; if the previous shot is "forward" (start station < end station), then the

new start station is set to the previous end station + 1 and the new end station is set to the previous end station. If the previous shot is "backward", then the new start station is the same as the previous shot's start station, and the end station is the start station + 1.

- **Subtract one** to previous end station (end station is set as the start station of the previous shot and the start station is decremented by 1; this works with both numbers and letters)

Example: 1.2->1.1, 1.2->1.3, 1.4->1.3, 1.4->1.5, 1.6->1.5, 1.6->1.7

Note : Auto-incrementation can be performed equally on digits or letters, but if the rightmost character is a digit, only digits get incremented, or vice-versa with letters (where case is sensitive.) Eventually, characters may be added by the auto-incrementation process. If series are enabled, only the station number within the series is incremented.

Examples:

ANA99y increments to ABA99z, which increments to ANA99aa
ANA999 increments to ANA1000, but ANABDD999999 fails (12-character limit)
ANA.999 increments to ANA.1000, but ANA.999999 fails (series limit reached)

The Computations tab

Select the **Sessions override Series** checkbox so that the *Hide in Map*, *Flip in Extended Profile* and *Exclude from Statistics* session attributes override those of series.

Input the cave map **Scale** used to compute coordinates reported in the Sketch to Scale form; for example:

1 cm = 1 m corresponds to a scale of 1:100
1 inch = 20 feet corresponds to a scale of 1:240 (there are 12 inches in a foot)

Note: This scale does not affect coordinates reported in the Map form.

Select the **Save XYZC Computations** checkbox to retain computed coordinates when closing the cave, thus making map display faster when re-opening the cave (at the price of accrued storage requirements.)

Input the **Magnetic Deviation** that is going to be applied to survey shots that belong to session that does not hold a magnetic declination. A westward magnetic declination must be set as negative; an eastward declination as positive.

Select the **Georeference** station of the cave, that is the station whose geographic location is to be used to compute other locations. If this field is left blank, or if the selected station does not have a geographic location, the coordinates computation algorithm uses the start station of the first series beginning with a geographic location as the geographic reference station.

Select the **Altitude Reference** station of the cave, that is the station whose geographic altitude is to be used to compute other altitudes. It may differ from the georefernce station. If this field is left blank, or if the selected station does not have a geographic altitude, the coordinates computation algorithm uses the start station of the first series beginning with a geographic altitude as the altitude reference station.

Select the **Origin** station of the cave as well as its XYZ coordinates (0,0,0 by default), expressed in map units. If this field is left blank, the coordinates computation algorithm uses the first station of the cave as the origin station, and assumes a 0,0,0 initial position.

The Map tab

Select the cave-specific map **Grid** value. See the Map tab of the Preferences form for

general grid preferences (that apply to all caves.)

Select the **Automatic Grid Resize** checkbox so that the map grid gets resized when it cannot be displayed within the user-defined minimum and maximum number of lines. The grid value is then multiplied or divided by 2 and rounded to the lowest integer. Otherwise, the grid is hidden.

Select the **Automatic Subgrid** checkbox or indicate the value and length unit of the map **subgrid** for this cave. The *Divisions* unit allows a relative subgrid, dividing the grid by a fixed number of divisions. In automatic mode, the value and unit are locked and indicate the automatic configuration.

Note: an automatic subgrid shows points spaced by the field length represented by the squares on the sketching paper (indicated in the Map tab of the Preferences) form, to scale with the map scale (indicated in the Map tab of the Cave Details form.

Thus, with a 1:200 scale and 1 mm paper squares, the interval between subgrid points represents a distance of 20 cm in the field.

Select the **Wall Color same as Shot** checkbox so walls and dimensions are drawn in the map using the color of their corresponding survey shot. Otherwise, they are drawn using the default color selected in the Map tab of the Preferences form.

Select the default direction to **Develop** survey shots in the extended profile view with the **Left** or **Right** pushbuttons.

Select the **Vertical** factor used in profile maps and coordinate computations to exaggerate the verticality of the cave for display purposes. A factor less than 1 (ex. 0.5) actually flattens out a vertical cave. This factor is applied to coordinates reported in the List form for drawing, but coordinates reported in the Map form are not affected.

Menus: Edit and Defaults.

The Survey Shot form

This form is used to input and display survey shot data. It can be used in a manual mode or automated input with the help of an *Assistant*. The *Assistant* makes input easier and faster by automatically and optionally:

- popping up a smart keypad allowing to input digits without the help of the stylus

- creating a new empty shot when the current one is saved
- performing a smart incrementation of station numbers
- preventing accidental escapes from the input mode

The *Assistant* can be toggled on/off with the **Assistant** pushbutton in the form title bar (upper right corner.)

3 types of survey shots can be input with this form, which self-adapts by hiding or showing different user interface controls (checkboxes, pushbuttons or drop-down lists) depending on that type:

- Regular survey shots, with actual survey data (length, azimuth and slope) between two stations
- Series beginnings, linked onto themselves (cave entrance) or to other series, and usually determining the start of a cave leg. Series beginnings have no proper survey data (length, azimuth and slope) but can hold a geographic (UTM or latitude/longitude) or absolute position (XYZ)
- Virtual shots, where two survey stations are virtually made the same (convenient to complete loops)

Form features common to all survey shot types

The **Station IDs** are displayed as "series.number". The topmost station ID is the start station while the bottommost station ID is the end station. The direction that determines the start and end of survey shots is the direction of the surveying process, regardless of whether survey shots use direct or reverse azimuths.

Depending on settings configured in the Station tab of the Cave Details form, any first survey shot of a series or only those survey shots with a start station numbered "0", "1", "a" or "A" (ex. 6.0) may be automatically set as series beginnings.
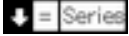
Passage sizes (above, below, left and right of the survey station) can be associated with either the **Start** or the **End** station of the survey shot using the corresponding arrow pushbutton in front of them. Holding down the stylus on either of these arrows toggles the direction of passage widths (a right-pointing arrow indicates passage widths as seen from start to end stations, and vice-versa).

Note : Auriga supports the input of letter 'X' to signal an unknown or undetermined passage dimension, for example when crossing another passage. This is similar to inputting a 'P' (Passage) in Compass.

Select the **Gray halftone** or **Color** this survey shot or survey shots in this series (depending on case) will take in the map (offered only if the device permits.)

Tapping the **Attributes** icon displays the Attributes form that allows to configure the attributes of the survey shot or the series. The icon is highlighted when at least one attribute is set.

Tapping the **Alarm clock** icon displays the date the survey shot was first saved or later modified. This date should only be modified with caution.

The type of survey shot is determined by the following pushbuttons; ⬇ = Series these determine which form controls must be hidden or shown:

- the **Link** pushbutton ⬇ creates a regular survey shot
- the ▢ pushbutton creates a virtual shot (station equal to another one)
- the **Series** pushbutton creates a series beginning

Note: If series are disabled (i.e. the station names format selected in the Stations tab of the Cave Details form is 12-character), the **Series** pushbutton does not appear in the form.

Arrow pushbuttons ⏮◀◀▶▶⏭ allow to navigate between survey shots within the cave. From left to right, they load:

- the first survey shot in the cave
- the previous series beginning/beginning of current series **or**
  - first shot in previous series or cave leg **or**
  - move backward by a user-chosen number of shots
  depending on settings configured in the Stations tab of the Cave Details form

- the previous shot
- the next shot
- the next series beginning **or**
    - first shot in next series or cave leg **or**
    - move forward by a user-chosen number of shots
  depending on settings configured in the Stations tab of the Cave Details form
- the last survey shot in the cave

Note: When navigating the survey shots of a loop (see the **Loops** view of the List form), the first and last survey shot pushbuttons are hidden, and a Loop pushbutton ⬚ is displayed. Tapping this pushbutton turns off the loop navigation mode, thus reverting to regular (sequential) survey shot navigation.

The **Session Number** selector leads to the Session form, which allows selecting and configuring the current session.

The **4 hardware application buttons** mimic navigation arrows (previous series/cave leg, previous shot, next shot and next series/cave leg.) On the Palm Zire, which has only 2 such hardware application buttons, these only mimic the previous shot and next shot arrows.

While in *Assistant* mode:

- the second leftmost hardware application button (Address Book, or Date Book on a Palm Zire) pops up the built-in keyboard or the Auriga Keypad, depending on the field into which the insertion point is blinking
- the second rightmost hardware application button (To Do, or Address Book on a Palm Zire) saves the current shot and creates a new shot

The **Up/Down** scroll buttons scroll the insertion point between fields in the form and scroll the note field when the insertion point is in the note field. The field navigation order is set in the Input Order form for the current session.

Icons ✓ ⬚ 🗑 ✎ ⬇ ⬚ ▦ ⌂ ▤ at the bottom of the form allow (from left to right) to:

- save the current shot (this button is only available when the survey shot data has been modified)

If the input data is erroneous, the field in error is highlighted and the save operation is hampered. It is however possible to save an incomplete survey shot by inputting at least the start and end station and leaving one or more field empty. The survey shot is then marked as incomplete and ignored during coordinates computation. This survey shot can be modified later with the complete survey data. This can prove useful when a survey shot is planned but currently impossible to take (required climb, water too high, etc.)

- create a new shot

By default, stations of the new survey shot are generated by applying to the last displayed survey shot the auto-incrementation mode selected in the Stations tab of the Cave Details form. However, holding the stylus on the *New* button displays a list of auto-incrementation options:

- **Default Auto-incrementation**
- **Radiant shot (from center)** creates a survey shot that keeps the previous start station, but increments the end station (aka splay shot); this incrementation mode is useful when surveying a room by taking several survey shots from the center to the walls
- **Convergent shot (to center)** creates a survey shot that keeps the previous end station, but increments the start station; this incrementation mode is useful when surveying a room by taking several survey shots from the walls to the center

The selected auto-incrementation option remains in effect until it is changed or the form is closed (then returns to default user-selected mode.)

Note: Stations obtained through auto-incrementation can be changed until the current survey shot is saved.

- delete the current shot
- load the Sketch to Scale form
- load the Measures form; this pushbutton appears selected when the survey shot has splay measures
- display the cave Map
- display the List form
- close the cave and return to the Main form
- display the note associated with the survey shot (in a full-screen edit form)

Note: Holding down the **Map** or **List** buttons pops up a list of available views prior to opening the corresponding form.

Note: If the *Assistant* is active, any operation that would close the current cave or load another survey shot is disabled.

Note: When handling a network, the *Assistant* pushbutton is replaced by an arrow that pops up a list of caves in the network for quick navigation.

Regular survey shots

Enter the survey shot **Length**, **Azimuth** and **Slope**. Select the **Direct** checkboxes if direct azimuth and/or slope are taken (from start station toward end station, as opposed to reverse.)

Note: While inputting a survey shot, Auriga may allow to temporarily accept invalid data, but when saving the survey shot, all data must be valid.

Note: When taking Topofil data, holding down the stylus on the **Length** icon displays the net survey shot length, taking into account Topofil calibration.

If the option is selected in the General tab of the Preferences form, the projected length is displayed in bold on the right of the length field. This field is updated when the length or slope changes.

Note: An alert is popped up if the azimuth or slope angles are not multiples of 0.25° (except for a theodolite or electronic devices.)

Depending on session settings, **Backsight Azimuth and Slope** are ignored, displayed in bold for purpose of self-validation and/or stored. If option **Show and Input** was selected

in the Shots tab of the Session form, the backsight azimuth and slope displayed for self-validation purposes can be overwritten with actual survey data. The backsight measurement is stored for averaging if it was edited, otherwise it is ignored.

Note: If the option of a backsight field is **Show and Input**, holding the stylus in this field confirms the proposed backsight azimuth or slope, and the font is changed accordingly; otherwise, if no data is input, the field is left empty in the saved survey shot.

When, due to physical constraints, the slope cannot be measured as an angle but as a height above the horizontal baseline that joins start and end stations, you may enter this height (in dimension units, i.e. the measurement unit set for passage dimensions in the Instruments tab (set #2) of the Session form) into the slope field and then hit the **Calculator** silkscreen button to call the Slope Calculator to compute the resulting angular slope. Hitting the **OK** button or the **Calculator** silkscreen button again pastes the computed slope into the slope input field.

Virtual survey shots

If a geographic position is available for this virtual shot, it can be given to that station. First select a position type with the position popup list. UTM positions require an easting, a northing, a gore (1-60) and a zone (A-Z), while MTM do not have a zone, and Lambert positions do not have a gore. DMS (degrees, minutes, seconds: ddd°mm'ss.ss") or DM (degrees minutes: ddd°mm.mmm') positions require a latitude and a longitude. These must be entered with a blank or appropriate symbol as separator between degrees, minutes and seconds values. Every position type other than XYZ may be accompanied by an **Altitude** reading (⛰). Select the shot-specific **Datum** or use the cave-wide datum; see Supported Geodesic Datum

Series beginnings (cave legs or passages)

Series beginnings act as milestones and are thus not related to a real survey shot. Rather, these are kept in the Auriga cave to store settings that apply to all shots belonging to that series.

If a geographic position is already input, it is displayed; in this case, the series beginning attributes can be seen by tapping the **Attributes** icon.

Select whether shots pertaining to this series will be displayed, or not, in the cave map with the **[H]ide Series in Map** checkbox.

Indicate with the **[F]lip Extended Profile** checkbox whether survey shots in this series must be extended in a direction opposite to the cave default in the extended profile view.

Select the **e[X]xclude Series from Statistics** checkbox to exclude the length of survey shots in this series from the total cave development (convenient to exclude surface survey data from cave development.)

Abbreviations in [] are those used in the list of attributes in the *Survey Shots* view of the List form.

If a geographic position is available for the series beginning, it can be given to that station; see Virtual survey shots.

Menus: Cave, Edit and Options.

The Attributes form

This form allows selecting the attributes of an individual survey shot (regular or virtual), or to all survey shots belonging to a series (series beginnings) or to a session. Checkboxes are:

- **[H]ide in Map**[1]: hides this individual survey shot from the map
- **[S]urface**[1]:
- **[F]lip**[1]: flips the development direction of this survey shot, series or session in the Extended Profile view
- **E[X]clude from statistics**[1]: excludes the length of this survey shot from the total development of the cave
- **[E]ntrance [Es/Ee]**[2]: the start/end station is a cave entrance; the Map form can display a 'E' next to these stations
- **[P]ermanent[Ps/Pe]**[2]: the start/end station is marked permanently (cairn o other); the Map form can display a 'P' next to these stations
- **Lead [?s/?e]**[2]: the start/end station has a possible lead; the Map form can display a '?' next to these stations
- **Ignore GPS Position [IG]**: the geographic position, if any, of this virtual survey shot or series beginning is ignored by computations
- **Ignore Azimuth [Ia]**: the foresight azimuth of this survey shot is ignored by computations - selecting this attribute displays the azimuth field with a small font
- **Ignore Backsight Azimuth [Ia-]**[3]: the backsight azimuth of this survey shot is ignored by computations - selecting this attribute displays the backsight azimuth field with a small font
- **Ignore Slope [Is]**: the foresight slope of this survey shot is ignored by computations - selecting this attribute displays the slope field with a small font
- **Ignore Backsight Slope [Is-]**[3]: the backsight slope of this survey shot is ignored by computations - selecting this attribute displays the backsight slope field with a small font

1. Displayed for regular survey shots and for sessions or series beginning depending

on what controls passage attributes (see the *Sessions Over Series* checkbox in the [Computations](#) tab of the [Cave Details](#) form)

2. Displayed for survey shots only
3. Displayed for regular survey shots only

If a station has a sketched cross-section, a +s/+e is displayed above its name.

If the **Dead Survey Shot [D]** pushbutton is selected, this survey shot is ignored by computations and map display (similar to 'X' shots in Compass.)

Abbreviations in [] are those used in the list of attributes in the *Survey Shots* view of the [List](#) form.

Parallel or duplicate survey shots that would otherwise exaggerate total cave length can be ignored when computing this length. This can be done at the survey shot level by selecting the *Exclude from Statistics* attribute.

Note: If the **Exclude from Statistics** checkbox is selected in the series or session parameters, the *Exclude from Statistics* attribute is ignored for all shots within this series/ session.

Menu: None.

The Search form

This form is used to find survey shots by **Stations**, by **Note** or by **Attribute**, **Sessions** by

Name or **Note** or **Loops** by **Stations**; it can be reached by tapping the ⊘ icon in the Graffiti area or the Status bar (depending on device model) from the [Survey Shot](#), [Map](#), [List](#) or [Session](#) forms.

Search by station

Edit the station name and tap the **OK** button to find related survey shots or loops. Tapping on the ♺ button pastes the other station (start or end) of the current survey shot into the search field. Found stations are those whose name correspond exactly to the name to search for, unless wildcards are used.

Selecting the **Current Shot** checkbox (available when launched from the [Survey Shot](#) form) searches the current shot in all other caves that allow an external search (see the [Cave](#) tab of the [Cave Details](#) form.) Found caves get selected in the *Caves* view of the [Selection](#) form. This is convenient when working with subcaves to fix loops.

Search by name

Enter the text to be searched in sessions names. Found sessions are those whose name contains the text to search for.

Search by note

Enter the text to be searched in survey shot or sessions notes. Found survey shots or sessions are those whose note contains the text to search for.

Search by number

Enter the session number to be searched.

The **Wildcards** checkbox allows performing a search using wildcards:

- ***** substitutes any character string of 0, 1 or more characters
- **?** substitutes exactly one character

Even when wildcards are used, it is possible to search for these characters:

- ******* finds any string of characters followed by a '*' and another string of characters (or none)
- ***?*** finds any string of characters followed by a '?' and another string of characters (or none)
- ***??** finds any string of characters followed by a '?' and exactly one other character
- **AB??** finds a string of characters that starts with 'AB' followed by another character and exactly one other '?'

The **Ignore Case** checkbox allows performing a search while ignoring lowercase/uppercase or accented letters.

Search by attribute

Select the attribute to search for in survey shots among *Entrances*, *Permanent*, *Leads*, *With Position*, *With Note*, *With Splay Measures*, *With Sketch*, *With Section*, *Virtuals* or *Series Beginnings*.

Tapping on one of the found shots or sessions in the results list of related survey shots or sessions loads that survey shot or session.

Note: When the Search form is launched from the Session form, the **Shots** option is not offered.

Note: When the Search form is launched from the Survey Shot, Map and List (with a list other than that of sessions) forms, the search ignores sessions without survey shots.

Menu: Edit

The Slope Calculator
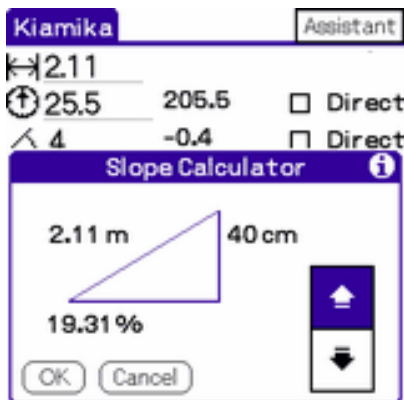
When, due to physical constraints, the slope cannot be measured as an angle but as the height of the triangle which hypotenuse joins start and end stations, you may enter this height (in dimension units, i.e. the measurement unit set for passage dimensions in the Instruments tab (set #2) of the Session form) into the slope field of the Survey shot form or the Auriga Keypad and then hit the **Calculator** silkscreen button to call this Slope Calculator to compute the resulting angular slope. The **Up** and **Down** pushbuttons can be used to indicate whether the slope heads upwards or downwards. Hitting the **OK** button or

the **Calculator** silkscreen button again pastes the computed slope into the slope input field of the calling form. The same works for the secondary slope.

The Sketch to Scale form
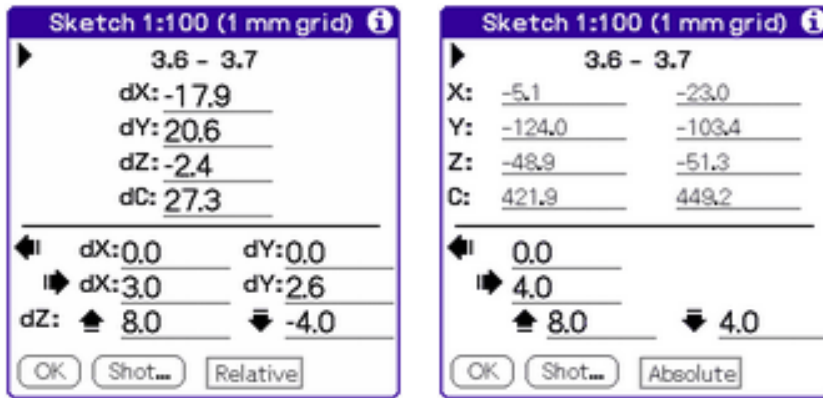
The Sketch to Scale form displays the coordinates necessary to report, on paper, the current survey shot and its passage dimensions. The selector at the bottom of the form allow to toggle between **Relative** and **Absolute** coordinates.

In relative mode, the form displays:

- X, Y, Z and C (extended profile) offset of the survey shot
- X, Y segments of left and right passage dimensions relative to the reference station of these dimensions
- Z segments of up and down passage dimensions relative to the reference station of these dimensions

Note: An arrow appears next to the reference station for passage dimensions.

In absolute mode, the form displays:

- absolute X, Y, Z and C coordinates of the stations of the survey shot (if the cave coordinates are computed, otherwise, '?' are shown)
- the length of left, right, up and down passage dimensions segments

Note: Left/right passage sizes may be swapped in order to always correspond to a direct survey shot.

Note: In absolute mode, if the *Ignore Origin* option is selected with the selector, the

origin X, Y, Z and C coordinates are substracted from the station coordinates, thus displaying origin-relative absolute coordinates.

Note: All numeric data shown takes into account the map scale indicated in the Computations tab of the Cave Details form, as well as the size of the notebook grid indicated in the Map tab of the Preferences form. An overly large map scale or paper grid may lead to very large offsets, overflowing the available display width.

The **Shot** button allows to quickly show raw data of the current survey shot without having to return to the Survey Shot form.

Usage

Sketching to scale in the notebook first requires to position the start and end stations on paper before sketching walls and other features. Prior to Auriga, this was done with a ruler and a protractor:

- position the start station; location can be arbitrary
- apply the center of the protractor against the start station and mark the edge of the protractor at the angle corresponding to the azimuth of the survey shot (when sketching in top view)
- place the start of the ruler on the start station and align it on the azimuth mark
- with the ruler, measure the projected length over ground of the survey shot from the start station and position the end station, correctly reducing this length as the slope increases (using a cosine table or a special protractor)
- repeat the process with the slope angle to sketch a profile

With the *Sketch to Scale* form in Auriga, the X and Y offsets represent the number of paper grid squares to count horizontally and vertically, respectively, from the start station to position the end station. Positive offsets grow up and right, negative offsets grow down and left. For sketching a profile, use the Z offset for the vertical axis. For sketching a West-East profile, use the X offset for the horizontal axis. For sketching a South-North profile, use the Y offset for the horizontal axis. For sketching an extended profile, use the C offset for the horizontal axis.

Relative coordinates correspond to the type of work performed with a ruler and protractor. Absolute positionning is best suited when using very large gridded paper or to avoid cumulative sketching mistakes when one station gets misplaced. Note that the *Sketch to Scale* form opens in the last used mode (Relative or Absolute.)

The Measures form

This form is used to view and select data (usually) acquired through a connected device. **Its use requires Palm OS 3.5 or better.**

The form opens in regular (survey shot) or splay measurement mode, and displays the current data available for this mode. If permitted, the **Splay** pushbutton toggles between regular and splay measurement modes.

Note: When called form the Survey Shot form, this form can only be opened if the survey shot already has its start and end station fields filled.
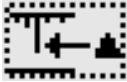
Data is presented in a tabular fashion, with 4 columns:

- Type:

  In regular mode:

  - Ignored: used to reject the whole line of data; the corresponding line will not be saved

  - Undetermined: used by the LRUD detection algorithm to indicate it could not determine the type of data it received; the corresponding line will not be saved

  - Foresight: survey shot taken from the start station

  - Backsight: survey shot taken from the end station

  - Left, Right, Up and Down passage dimensions

In splay measurement mode:

- ○ Fore splay measurement: splay measurement to a wall taken from the start station
- ○ Fore splay measurement: splay measurement to the ceiling/floor taken from the start station
- ○ Fore splay measurement: splay measurement taken from the start station
- ○ Back splay measurement: splay measurement to a wall taken from the end station
- ○ Back splay measurement: splay measurement to the ceiling/floor taken from the end station
- ○ Back splay measurement: splay measurement taken from the end station

- Length
- Azimuth
- Slope

Note: Due to space constraints, lenghts and angles must be input in decimal form only: feet-inches, d°m's" or d°m.m' are not supported.

Individual data can be deselected by holding the stylus on them; entire lines can be deselected selecting the *Ignored* or *Undetermined* type. Deselected data appears in a small font. When the survey shot data is saved, data of the same type is averaged, ignoring deselected data, and stored in relevant fields of the Survey Shot form. This applies to length, azimuth and slope fields, as well as to passage dimension fields; splay measures are never averaged.

The **Connect** pushbutton allows to connect the connected device, if any, and to receive data.

Menus: Measures and Edit.

The Session form

This form is used to manage survey sessions and to select the current session. When called from the Map, it operates in read-only mode.

This form has 3 tabs, selected with pushbuttons in the title bar.

Existing survey session numbers can be cycled through with the **Up/Down arrow** pushbuttons.

A session numbered 1, initialized with default instrument calibration and units, is automatically added when creating a new cave. If the displayed session is the active session, an **Asterisk** is displayed on the left of the session number.

A 31-character name can be given to each session.

The **Date** shown is that of the creation of the session. It is optionally updated when the first survey shot is taken during this session. Tapping on the date selector allows to change it.

The **Done** button exits the *Session* form. If the *Session* form was launched with the *Session number* selector in the Survey Shot form, changing the session associated to the current survey shot must be confirmed. Calling the Session form with the *Sessions* item in the Cave menu does not affect the session number to which the current survey shot (if any) is associated.

The **Save** button saves the current session.

The **New** button creates a new session, initialized with default data and numbered with the

next available session number. It is possible to create a session from an existing session by merely editing the session number and saving this new session (provided the new session does not already exist.)

The **Note** button allows linking a note to the session (name of surveyors, details of instruments used, etc..) 255 characters are permitted.

Note: These buttons simultaneously affect all three tabs of the form.

Several session calibrations may be edited sequentially by saving modifications before selecting another session number.

The Instruments tabs
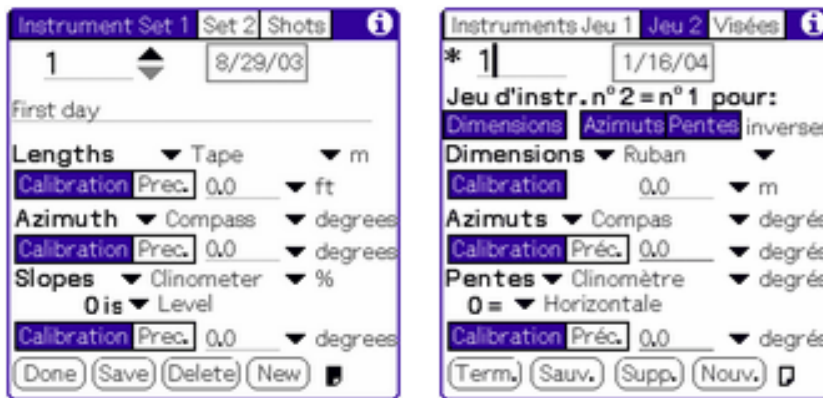
These tabs allow to select instruments and set their calibration values.

Select instruments used for surveying. The handling of theodolite angles is not implemented yet.

When selecting a Topofil, also select the **number of digits** on its counter. Repeatedly tapping on the selector next to the *Topofil* instrument cycles though possible choices (3 to 6, default is 5.)

Note: When using a connectable electronic measuring device, even in non connected mode (e.g. a DistoX on a PDA without Bluetooth), this device should still be selected in the Link tab of the Preferences form and selected in the session as *Device* in order to avoid dubious data alarms due to the extra precision these devices provide (ex. a 134.23 degree-azimuth.)

Select **Lengths**, **Azimuths** and **Slopes** units.

Note: Auriga supports the following angular units and universal notations:

- **d°m's"**: degrees in base 360 written in sexagesimal format with seconds (ex. 20° 30'17" means 20 degrees, 30 minutes and 17 seconds)
- **d°m.m'**: degrees in base 360 written in sexagesimal format without seconds (ex. 20°30.4' means 20 degrees, 30 minutes and 4 tenths of minute)
- **degrees**: degrees in base 360 written in decimal format (ex. 20.8 means 20 degrees and 8 tenths of degree)
- **grads**: grads in base 400 written in decimal format (ex. 370.4 means 370 grads and 4 tenths of grad, in base 400)

Note: The **d°m's"** is only offered for the theodolite, where the measures are stored with a precision sufficient to hold a second of angle.

For convenience, with unit **d°m's"** and **d°m.m'**, Auriga allows to input a space instead of the °, ' or " symbols. Furthermore, it is possible to input a decimal value even if the selected unit format is sexagesimal (ex. 20.5, equivalent to 20°30'). However, when showing the input value, Auriga uses the selected unit format, and the appropriate symbols, if any.

Select the proper orientation for **Slope 0**: *Up (zenithal)*, *Down (nadiral)* or *Level*. Slopes measured in % impose a Level 0.

Select the **Calibration** or **Precision** pushbuttons to toggle between calibration and precision input. **Length**, **Azimuth** and **Slope** calibrations will be added to surveyed values to obtain the correct value.

Note: A % length calibration is added to the measurement to obtain exact data (including the Topofil.) A % slope calibration is accepted only if the slope is measured in %.

Note: For a Topofil, the calibration is taken as a multiplying factor applied to the measurement to obtain exact data. When using a centimetric Topofil, inputting a 0.01 calibration allows to select Meters as length unit, thus simplifying displays such as the List form.

Length, **Azimuth** and **Slope precisions** are used by the loop analysis process.

Azimuths taken with a **Compass** are relative to the North (magnetic or geographic,

depending on whether a magnetic declination was input.)

[not implemented] Azimuths taken with a **Theodolite** are absolute angles relative to the previous survey shot.

Auriga simultaneously supports 2 instrument set calibrations, numbered 1 and 2. Instrument set 1 is used for primary shots (regardless of their direction), while set 2 is used for backsights. Respective calibrations can be reached by selecting either the **Set 1** or the **Set 2** tab pushbutton.

If only one instrument set is actually used for both direct and backsight azimuths or slopes, as is often the case, select the appropriate **Instrument Set #1 = #2** checkbox in the secondary instrument set calibration. By default, only one instrument set is assumed.

Length measures are associated with instruments set 1, while passage dimensions are associated with instruments set 2.

Note: A Topofil cannot be selected in instruments set 2 used for measuring passage dimensions.

The Shots tab

The **Number of Shots** associated with this session is displayed between parentheses at the top of the form.

Select the **Gray halftone** or **Color** this session will take in the map (offered only if the device permits.)

Tapping the **Attributes** icon displays the [Attributes](#) form that allows to configure the attributes of the session. The icon is highlighted when at least one attribute is set.

Tapping the **Input Order** button displays the <u>Input Order</u> form that allows selecting the order in which survey shot fields are navigated; this order is specific to each session.

Select the **Passage sizes** checkbox to indicate passage sizes are mandatory. Select either the **Start** or the **End** pushbutton to indicate which side of the survey shot is to be associated, by default, with size measures. This association can be overridden in each individual survey shot. Select the **Direct** checkbox if passage sizes are "seen" from the start station.

Input the **Magnetic Deviation** to be added to compass (magnetic) azimuths to obtain geographic (true) azimuths. This setting can be different for each individual survey session as it can vary over time and space. A westward magnetic declination must be set as negative; an eastward declination as positive.

Select the behavior for **Reverse Azimuths** and **Reverse Slopes**:

- **Ignore**: backsight azimuths/slopes are ignored (neither shown nor input)
- **Show**: backsight azimuths/slopes are automatically computed while the direct measurement is input and displayed for self-validation purposes
- **Input**: backsight azimuths/slopes are to be input by the user and stored in the shot data
- **Show and Input**: backsight azimuths/slopes are automatically computed and displayed while the direct measurement is input but may be overwritten by the user with the actual measured backsight data and then gets stored in the shot data

Note: With options *Show* and *Show and Input*, Auriga shows what the expected backsight (azimuth or slope) should be, taking into account the calibration of both instruments sets. For instance, if the foresight azimuth is 35°, assuming neutral calibration, the expected backsight azimuth should be 215° (35° + 180°).

Note: Some compasses offer two reading scales, one direct and one corrected (i.e. reverse.) The Auriga user may find more natural to compare the foresight azimuth with a corrected backsight (ex. 35° vs 36° rather than 35° vs 216°); in this case, option *Show* becomes irrelevant. Auriga accepts either a true backsight azimuth or a corrected backsight azimuth. When computing the survey shot (and averaging azimuths, if both exist), if its foresight and backsight azimuths do not fall within 90°, Auriga assumes the backsight azimuth is not corrected. The backsight is always considered normal (not corrected) if the foresight azimuth is missing or if the survey shot has the *Ignore Azimuth* attribute.

Select the **Direct** checkboxes in the **Azimuths** and **Slopes** groups to indicate direct azimuths and slope measures by default. These options can be overridden for each individual survey shot in the Survey Shot form.

Select **Altitude** units.

Warning: Modifying existing sessions modifies the interpretation of input data for the shots associated with the modified sessions.

Menus: Session, Edit and Defaults The latter can be used to store or retrieve default values.

The Input Order form

This form is used to determine the order of input fields in the Survey Shot form, i.e. the order in which these fields are navigated with the **Up/Down** scroll buttons or in the Auriga Keypad with the **Up/Down arrow** buttons. All fields can be reordered, except the station names, which must be input at the beginning.

To change the order of a field, select it in the list and use the **Up** or **Down** arrow buttons to move it. Note that all survey shot fields appear in the list, but only those checked currently appear in the Survey Shot form, depending on current session (e.g. Topofil fields do not appear if a Tape is used.)

Note: The selected field order applies to the current session. To make the selected order the default order for all future sessions, use the Defaults menu in the The Session form.

Menu: None.

The Auriga Keypad

The Auriga Keypad overrides the built-in Palm OS alphabetic and numeric keypads in every Auriga form where text data can be input. It pops up when the **1-2-3** or **a-b-c** keyboard button is tapped in the silkscreen area. This custom keypad self-adjusts to the type of field being edited; thus some buttons (like "**-**", "**.**", "**North**", "**Direct**" or "**Series**") may not always be present. Buttons are big enough to make a stylus unnecessary when surveying. The name of the currently edited field along with its measurement unit, if any, is displayed in the Keypad form title.

Depending on the type of data input, alphabetic, symbolic or international keyboard layouts may be offered.

When editing a note or a file name, holding down a letter button inserts the opposite case, or pops up a list of accented versions of that letter.

When editing sexagesimal coordinates (d°m's"), tap the **West**, **East**, **North** or **South** selector to invert the coordinate. The symbol key at the bottom self-adjusts into °, **'** and **"** to allow separation of degrees, minutes and seconds.

Use the **OK** button to leave the keypad; saving the input field is automatic. Tap the **left arrow** (backspace) button to erase one character, or hold it to erase the input field.

Press the **Up/Down arrow** buttons to save the input field and move to the previous/next field.

When editing a survey shot, holding the stylus on the **i** button (upper right corner) displays the name of the stations of the survey shot. Holding the stylus on the **Up** or **Down** buttons displays a list of the Survey Shot form input fields to speed up navigation.

If the edited field is the azimuth or slope field, a **Direct** pushbutton is displayed left of the input field. Conversely, if the edited field is the start station and the automatic detection of series beginnings is not selected (see the Stations tab of the Cave Details form), a **Regular/ Virtual/Series** pushbutton is displayed to allow selecting the type of survey shot.

If the edited field is the backsight azimuth or slope field, and the corresponding setting in the Shots tab of the Session form is **Show and Input**, a **Confirm** button is displayed left of the input field to explicitly accept the proposed backsight azimuth or slope.

When editing a series beginning or a virtual survey shot, the type of position, if any, can be selected with the Position menu while editing the start station.

Menus: Edit and Position when relevant.

The List form

The List form displays surveyed and computed cave data in list views.

The number of list elements may be displayed tapping on the # button in the title bar.

Displayed data is in read-only mode except for survey shot text fields, the attributes list, checkboxes and color selectors that can be modified by maintaining the stylus on them for a short delay; modifications take effect immediately. If the cave is open in read-only mode or if not a single list column is editable (i.e Stations or Graph views), a **padlock** icon is displayed in the title bar.

The selected row is shown in reverse (light text on dark background.) It is possible to bookmark a row by tapping the desired row with the stylus. The bookmarked row is surrounded by solid lines. In views that allow it (see below), tapping the marked row

selects it, thus changing the current survey shot.

List columns can be resized by tapping the stylus on the right end of the column head to resize and dragging it to the desired width. Tapping on the + button at the bottom, right of the list widens the rightmost visible column. Columns are limited to a minimal and maximal width.

List columns can be selectively shown or hidden with the *Columns* item of the *List* menu, leading to the Columns form.

List columns in Survey Shots, Virtuals, Sessions and Loops views can be sorted by tapping the stylus in the head of the column to sort. Sorting the same column a second time inverts its sort order. The head of the sorted column is shown in reverse.

Note: Modifying a checkbox or color selector may break the sort if the modified column is the sort column. In this case, tapping the head of the column re-sorts the view without inverting the sort order.

The 2 center **hardware application buttons** scroll the view horizontally.

Note: On devices with Palm OS version prior to 3.5, horizontal scroll bars being unusable, Auriga does not show them. Use the hardware application buttons instead.

Lists can be printed with the *Print* item from the *List* menu. In the Graph view, consecutive survey shots (with connecting end-start stations) are printed as blocks separated by a dotted line.

Seven views are selectable with the rightmost drop-down list in the title bar:

- **Survey Shots** displays a list of raw survey shots (as they were input.) The selected row is the current survey shot; it can be changed by selecting another row. Available columns are:

    ◦ stations name
    ◦ status (incomplete, invalid, duplicate, orphan or part of an incomplete or orphan leg, bad dive data or wrong backsight azimuth and/or slope)
    ◦ input date
    ◦ color (editable)[7]
    ◦ session number[6]
    ◦ attributes (editable list)[1]

- length (editable)[2]
- Topofil start (editable)[2, 8]
- Topofil end (editable)[2, 9]
- direct azimuth (editable checkbox)[2]
- azimuth (editable)[2] - shown between () if the survey shot has the *Ignore Azimuth* attribute
- azimuth backsight (editable)[2] - shown between () if the survey shot has the *Ignore Backsight Azimuth* attribute
- direct slope (editable checkbox)[2] - shown between () if the survey shot has the *Ignore Slope* attribute
- slope (editable)[2] - shown between () if the survey shot has the *Ignore Backsight Slope* attribute
- slope backsight (editable)[2]
- left, right, up and down passage sizes (editables)
- note

This view can be filtered with the center drop-down list in the title bar to only show:

- survey shots pertaining to the current series
- survey shots pertaining to the current session
- survey shot errors (incomplete or orphan survey shots or survey shots with invalid data or bad dive data)
- survey shot warnings (duplicate survey shots or survey shots part of an incomplete or orphan leg or survey shots that have a foresight-backsight azimuth or slope measurement span that exceeds the tolerance set in the Map tab of the Preferences form)
- survey shot errors and warnings

- **Virtuals** displays a list of virtual survey shots (pure virtuals and series beginnings.) The selected row corresponds to the current survey shot or the series beginning it belongs to; it can be changed by selecting another row. Available columns are:

- stations name
- input date
- color (editable)[7]
- session number[6]
- number of survey shots in the series[3, 5]
- total surveyed length of survey shots in the series[3, 5]

- draw virtual survey shot or survey shots in the series in the map (editable checkbox)
- flip survey shots in the series in the extended profile map view (editable checkbox)[3, 5]
- sum length of survey shots in the series to total cave development[3, 4, 5]
- position

- **Sessions** displays a list of survey sessions. The selected row corresponds to the session to which the current shot belongs; selecting another row also selects the first survey shot of that session as the new current survey shot. Available columns are:

  - session number (the active session is marked by an asterisk)
  - session name
  - input date of the first survey shot associated with the session (or session creation date if no survey shot is yet associated with the session)
  - color (editable)[7]
  - number of survey shots in the session
  - total surveyed length of survey shots in the session[4]
  - draw survey shots in the session in Map (editable checkbox)
  - sum length of survey shots in the session to total cave development
  - flip development direction of survey shots in the session in the extended profile map view (editable checkbox)
  - magnetic declination
  - note

- **Stations** displays a list of stations with computed XYZC coordinates and an uneditable **Attributes** column that can contain a combination of 'E' (Entrance), 'P' (Permanent), '?' (Lead) and '+' (Sketched cross-section) characters. All coordinates use the map scale and, for the Z coordinate, the vertical factor defined in the Computations tab of the Cave Details form. The selected rows correspond to the stations of the current survey shot. Selecting another row also selects the first survey shot associated to that station as the new current survey shot and consequently selects the other station of this survey shot.

- **Graph** displays a list of stations with computed XYZC coordinates and links to other stations along with an uneditable **Attributes** column that can contain a combination of 'E' (Entrance), 'P' (Permanent) and '?' (Lead) characters. this is the most useful view to draw the cave map on paper. In this view, scrolling, marking and selection is done by pair of rows. A dotted line separates pairs of stations linked by a survey shot. All these coordinates use the map scale and, for the Z coordinate, the vertical factor defined in the Computations tab of the Cave Details

form. All passage sizes use the map scale; up/down sizes also use the vertical factor.

Note: Left/right passage sizes may be swapped in order to always correspond to a direct survey shot.

- **Loops** (available when handling a cave) displays a list of survey loops. The selected row is the current loop; it can be changed by selecting another row. Available columns are:

    - loop name
    - close loop when applying loop closure (editable checkbox)
    - closed
    - number of survey shots in loop
    - loop length (including error)
    - absolute error
    - relative error (error over total length including error)
    - quality index: ratio of the relative error over the expected error (standard deviation of errors for all survey shots in the loop) given instruments precision selected in [Precision](#) and [Session](#) forms (corresponds to *sigma* value in Compass software); a velue of 1 indicates the loop error corresponds to the expected error, while a greater value indicates the loop error exceeds the expected error; a quality index above 2.5 requires attention (see csg.bcra.org.uk/surveynotes.html)
    - horizontal and vertical errors

The **Check "Close" for All** menu item of the *List* menu sets the *Close* checkbox of each loop in the list.

Holding down the stylus on a given row makes it the current loop. If the stylus is held on an uneditable column, a list of loop options is popped up:

    - **Loop Path**; leads to an ordered list of survey shots making up the loop
    - **Zoom loop in Map**; zooms and highlights the loop in [Map](#)
    - **Navigate Loop Shots**; survey shots that are part of the loop can be navigated in a circular fashion in the [Survey Shot](#) form
    - **Close Loop**; individually closes the current loop; **Warning:** this can lead to a cave map that differs slightly from the one obtained with global loop closure, where loops are closed in order of increasing relative error
    - **Add Survey Shots to Selection**; select survey shots in loop path in the [Selection](#)

- **Analyse Loop**; analyses the loop, searching for:
  - possible errors in selecting stations in survey shots (ex. shot 1-2 should actually be 1-3)
  - single input errors (one measurement error in one survey shot for the whole loop) in either length, azimuth or slope that have a positive effect on loop error

    based on the analysis target selected in this small form:
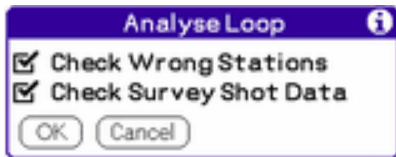
If the analysis process does not find any particular error to explain the current loop error, an alert pops up (often the case when the loop error is within the expected error.) Otherwise, analysis results are presented as a list of error hypotheses:
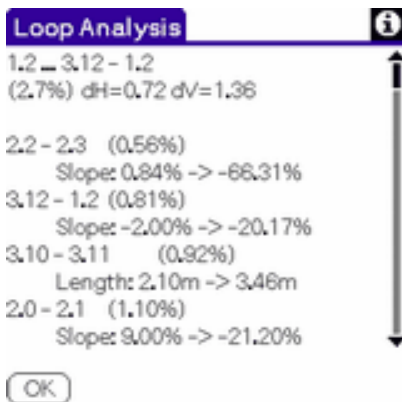
with loop name, current relative error in % and horizontal and vertical absolute error values (m or ft), followed by a list of survey shots (ex. 2.2-2.3) where a single change (ex. inverting the survey shot, changing its start or end station, or, like here, changing the slope from 0.84% to -66.31%) would improve the loop error (here to 0.56%).

It is then up to the user to determine which hypothesis, or none, is the cause of the loop error. The analysis process tends to find blunders (ex. omitted or inverted digits) rather than measurement errors. Tapping on a survey shot name opens it in the Survey Shot form. The analysis can be quickly recalled from other forms using the *Current Loop Analysis* item of the Cave menu.

- **Caves** (available when handling a network) displays the list of the caves in the

network. Available columns are:

- ❍ index of cave in network
- ❍ cave alias
- ❍ color (editable)[7]
- ❍ draw cave in Map (editable checkbox)
- ❍ number of survey shots in cave
- ❍ number of sessions in cave
- ❍ number of series in cave
- ❍ cave development
- ❍ total surveyed length in cave
- ❍ cave vertical drop

1. The column displays abbreviated survey shot attributes; if no attribute is set, the column displays the *Attribute* icon; tapping on this column pops up a list of selectable attributes
2. Only applies to regular survey shots
3. Only applies to series beginnings
4. Only if cave coordinates are computed
5. Only if series are enabled
6. Only if cave has more than one session
7. Only if the device has color or grayscale
8. Editing the Topofil start re-computes the corresponding Topofil end value
9. The edited Topofil end value must be greater than the Topofil start value or correspond to a valid counter rollover; the resulting length is re-computed

Note: The *Stations* and *Graph* views require the cave coordinates to be computed. If computations cannot be performed (likely due to a lack of memory), the display of these views is denied. Other views can benefit from computed coordinates by displaying faster or showing computed lengths (*Virtuals* and *Sessions* views.)

Note: The *Stations* and *Graph* views can display 3 different types of coordinates, selectable in the title bar:

- **Real** coordinates are expressed in cave length units (meters or feet), as selected in the Cave tab of the Cave Details form
- **To Scale** coordinates where the map scale (selected in the Computations tab of the Cave Details form) is applied. These coordinates are displayed in centimeters or inches, depending on the cave map length unit (selected in the Cave tab of the Cave Details form)

- **Grid** coordinates, where both the map scale (selected in the [Computations](#) tab of the [Cave Details](#) form) and the paper grid (selected in the [Map](#) tab of the [Preferences](#) form) are applied. These coordinates are expressed in paper grid units and are identical to those displayed in the [Sketch to Scale](#) form when ran in absolute mode

If the *Ignore Origin* option is selected with the selector, the origin X, Y, Z and C coordinates are substracted from the station coordinates, thus displaying origin-relative absolute coordinates.

Note: Modifying the status of series-related checkboxes in the Virtuals view has no effect if the **Sessions override Series** checkbox is selected in the [Computations](#) tab of the [Cave Details](#) form. Conversely, modifying the status of checkboxes in the *Sessions* view has no effect if the **Sessions override Series** checkbox is unselected.

- Columns that are irrelevant for a given row display as '-'
- Columns with missing data for a given row do not display
- Columns with yet uncomputed data for a given row display a '?'

Note: Numeric columns are normally right-justified to maintain number alignment. However, for columns other than station names and session number, if a number does not fit in the column width, it gets automatically left-justified so as to show its most significant digits (and truncate its decimals.)

Select the **Forms** icon (bottom right corner) to return to the previous form or select the *Close* item in the [Cave](#) menu to return to [Main](#) form. This is disabled by the *Assistant* (if active.) Maintaining this icon depressed displays a list of exit choices (*Survey Shot*, *Map* or *Close Cave*.)

Note: When handling a network, the data displayed in the **Shots**, **Virtuals** and **Sessions** views can be grouped by cave by selecting this option in the views list. The *Stations* and *Graph* views are always grouped by cave, while this setting is irrelevant for the *Caves* view.

Menus: [Cave](#), [List](#) and [Options](#).

The Columns form
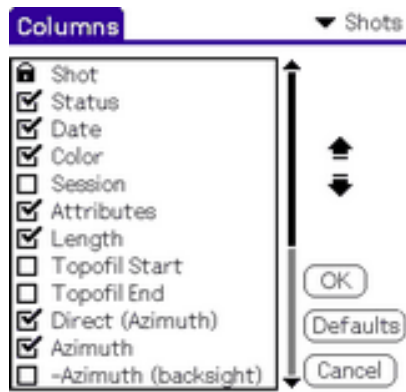
Select in the list columns to be shown holding down the stylus on their checkbox. Columns whose name is preceeded by a padlock icon are not toggable.

To change the order of a column, select it in the list and use the **Up** or **Down** arrow buttons to move it.

The Map form
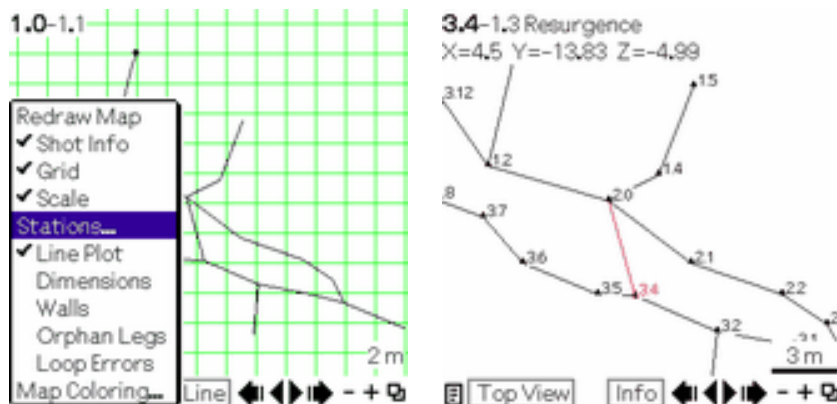
The Map form displays the cave in top view or various profile views.

Tapping in the screen while the map is being drawn aborts the operation, as indicated by a message at the bottom of the map. In this case, the **Info** mode (see below) no longer works. The Map can be redrawn using the *Display Options* list (see below.)

Note: The top of the map corresponds to the North, either geographic (true) or magnetic, depending on whether a magnetic declination was input or not in individual sessions and/or the Cave Details form.

The map is restored with the previously used zoom ratio and pan factor for this cave.

Troubleshooting: An empty map display may be caused by:

- an extreme zoom ratio
- a pan factor that moves survey shots out of the view
- a choice of invisible colors for survey shots
- unselected display options (see the *Display Options* list)

If the **Full Screen Cave Map** option is selected in the Preferences form, controls at the bottom of the screen are only briefly displayed when the form is open to show the current view and stylus mode. These controls can then be shown or hidden by simply tapping a '.' in the numeric sector of the Graffiti area. This allows viewing the entire cave, that then uses the full screen height.

Note: On devices with a dynamic Graffiti area, in full screen map mode, when the Graffiti area is closed, tapping the **Menu** icon first displays the Map form controls

A scale is displayed at the bottom of the screen. If option **Show Scale** is not selected in the Map tab of the Preferences form, the scale is only displayed for a second. It briefly reappears every time the map is redrawn. In permanent scale display mode, it can be hidden by tapping on it with the stylus.

Tapping on the leftmost **Attributes** icon pops up a list of display options. Options in this list are specific to the current cave:

- **Redraw Map** redraws the map with a normal zoom ratio and a null pan factor; if the map drawing was interrupted, the map is redrawn with current zoom ratio and pan factor
- **GPS Position** toggles the display of the last geographic position received from the connected GPS, if any (see GPS Tracking below)
- **Shot Info** toggles the display of the current shot information at the top of the map
- **Grid** toggles the display of a grid; note that if less than one grid line fits in the screen or if grid lines are spaced by less than 10 pixels, no grid is effectively displayed
- **Subgrid** toggles the display of a subgrid; note that if the subgrid is superior to the current grid or if the subgrid points are spaced by less than 5 pixels, no subgrid is actually displayed
- **Scale** toggles the display of a scale
- **Selection** toggles the use of the Selection to limit the number of displayed survey shots; if no survey shots are selected, filtering takes place on:

- ❍ survey shots in selected loops (if any), or
- ❍ survey shots in selected sessions (if any), or
- ❍ survey shots linked to selected stations (if any)

    If no survey shots can be selected, the option is turned off
- **Mask** toggles the use of the clipping mask to limit the number of displayed survey shots
- **Stations** pops up a list of the station display options:
  - ❍ **Markers** toggles the display of triangular markers on stations
  - ❍ **Landmarks** toggles the display of asterisks on stations with a geographic position
  - ❍ **Entrances** toggles the display of a letter 'E' next to cave entrances
  - ❍ **Permanent** toggles the display of a letter 'P' next to permanent stations
  - ❍ **Leads** toggles the display of a '?' next to leads
  - ❍ **Names** toggles the display of station names
  - ❍ **Suffixes** toggles the display of station name suffixes (only available if series are enabled); series are truncated from the station names to lead shorter labels in map
- **Line Plot** toggles the display of the line plot between stations
- **Splay Measures** toggles the display of the splay measures; splay measures to walls are displayed in Top view while ceiling/floor splay measures are displayed in profile views; other splay measures are displayed in all views
- **Dimensions** toggles the display of dimension lines (left-right or up-down) across stations; see note below; if the map displays a cave network, this option and the following one only have an effect if the *Retain Passage Dimensions* is selected in the Network tab of the Network Details form
- **Walls** toggles the display of (theoretical) wall lines between dimension lines (visible or not); see note below
- **Sketch** toggles the display of sketches; this has no effect in *Sketch* mode where sketches are always displayed
- **Fill Passages** toggles the filling of passages with walls color
- **Orphan Legs** toggles the display of orphan shots and all survey shots that depend on orphan shots (dotted line)
- **Loop Errors** toggles the display of loop errors as dotted lines between actual and theoretical shot ends for survey shots that are part of a loop; if the map displays a cave network, this option and the following one only have an effect if the *Retain Closure Errors* is selected in the Network tab of the Network Details form
- **Map Coloring** pops up a list of map coloring modes:
  - ❍ **Default** colors used are those selected in the Map tab of the Preferences form
  - ❍ **By Series** color is selected in the Survey Shot form
  - ❍ **By Session** color is selected in the Shots tab of the Session form

- ○ **By Survey Shot** color is selected in the [Survey Shot](#) form
- ○ **By Depth** color is selected in the [Colors by Depth](#) form according to the depth of individual survey shot
- ○ **By Date** color is selected in the [Colors by Date](#) form according to the input date of individual survey shot
- ○ **By Selection** colors used are those selected in the [Map](#) tab of the [Preferences](#) form (if a selection is available in the [Selection](#) form)
- ○ **By Cave** (when displaying a network) the cave-specific color is selected in the [Caves](#) tab of the [Network Details](#) form

Note: Stations with a sketched cross-section display a '+' next to their name.

In **Section** view, display options are:

- **Other Station** toggles between the start and end stations of the current survey shot
- **Swap Sides** swaps left-right sides; **the right side is indicated by the map or grid scale position**
- **Grid** toggles the display of a grid; note that if less than one grid line fits in the screen or if grid lines are spaced by less than 10 pixels, no grid is effectively displayed
- **Subgrid** toggles the display of a subgrid; note that if the subgrid is superior to the current grid or if the subgrid points are spaced by less than 5 pixels, no subgrid is effectively displayed
- **Dimensions** toggles the display of dimension lines
- **Walls** toggles the display of (theoretical) passage walls between dimensions lines (visible or not)
- **Fill Section** toggles the filling of the section

Note: The map grid (and subgrid) is not centered in the screen but aligned on the origin station of the cave. In profile views, if a vertical factor other than 1.0 is set (see the [Computations](#) tab of the [Cave Details](#) form), the grid may appear rectangular to match the displayed numeric grid value both horizontally and vertically.

Note: Passage dimensions are computed with the Up, Down, Left and Right survey data. As each survey shot can hold a single set of passage dimensions, the user has to indicate to which of the two stations (of the survey shot) the set of dimensions belongs, i.e. start or end station. Thus, it is possible to end up with more than one set of dimensions for a given station if more than one shot leaves/arrives from/to a given station. For simplicity, Auriga only retains the first set of dimensions for a given station while computing cave coordinates. In some cases, depending on passage morphology, this may lead to an

incorrect graphical rendition of actual cave walls.

Note: Auriga takes passage dimension data as perpendicular to the axis of the survey shot./

Note: Splay measures that run between a station and a wall (in Top view) or ceiling/floor (in profile views) can also be displayed as wall lines and/or get color-filled.

The leftmost popup list allows selecting the type of cave view displayed:

- **Top View** is X vs Y
- **W-E Profile** view is X vs Z
- **S-N Profile** view is Y vs Z
- **Extended Profile** is a X vs C stretched profile view
- **Projected Profile** is a profile view relative to a user-selected projection angle (see the next popup list); Auriga offers 2 different projected profile views, each with its distinct projection angle. The projection is performed as if the karst were cut on a plane in line with the angle specified; this is 90° off from another common method of specifying a projection angle that considers the "looking towards" angle.
- **Section** is a section view of the passage at the current station, drawn using its left, right, up and down dimensions and designed to assist sketching. If suitable splay measures are available (touching a wall or the ceiling/floor) (see the Map tab of the Preferences form and the Measures form), these are used too. The section view uses the walls color if only left, right, up and down passage dimensions have been used, or the splay measures color if splay measures have been used too (see the Display form)

Note: Dragging the stylus from the Graffiti area up to the middle of the screen toggles between the Top and Extended profile views; on devices with a Dynamic Input Area, in closed mode, dragging the stlylus from an empty spot in the bottom Status bar up to the middle of the screen does the same.

Note: Each cave has its default direction for developing survey shots in the extended profile view (set in the [Map]{.underline} tab of the [Cave Details]{.underline} form.) This direction can be toggled by the passage flip attribute (either series or session, depending on the state of the *Sessions over Series* checkbox in the [Computations]{.underline} pane of the [Cave Details]{.underline} form.) For series, this flip attribute can be set in the [Survey Shot]{.underline} form, while for sessions, the flip attribute can be set via the *Sessions* view of the [List]{.underline} form. In addition, this direction can again be toggled by the individual survey shot flip attribute set in the *Survey Shots* view of the [List]{.underline} form. Thus, the survey shot can inverse the development direction set by the passage, that can itself inverse the general cave development direction. This allows the

user full control on the display of extended profiles of complex cave systems.

The center popup list allows selecting the stylus mode (**Zoom**, **Pan**, **Info**, **Span**, **Line**, **Spot**, **Projection**, **Mask**, **Select**, **Path** or **Sketch**.) This mode determines the results of stylus taps or drags in the cave map.

Note: In *Section* view, only the *Zoom* and *Info* are permitted.

In **Zoom** mode, tracing the diagonal of a rectangle in the cave map zooms the part of the cave map enclosed in that rectangle. The zoom rectangle may be adjusted when re-displaying the cave to maintain a uniform zoom ratio, both vertically and horizontally. If the stylus only taps the screen, a 50% zoom is performed, centered on the stylus position.

In **Pan** mode, dragging the stylus in the cave map shifts the map in the drag direction.

In **Info** mode, the name of the stations of the current shot and its note (if any) are displayed at the top of the screen. The current station is marked with a bullet in the map and displayed in bold at the top of the screen. On color or halftone-capable devices, both the current station bullet and the current shot segment use the color set in the Map tab of the Preferences form. The current station can be selected with **arrow** pushbuttons (see below) or by tapping directly into the cave map. Tapping on the survey shot name displays the current station position (in the format selected in the Cave Details form.) Tapping on this location reverts to the survey shot name or the current position of the connected GPS, if any. Tapping on the GPS location reverts to the survey shot name if enabled in display options.

The **Span** mode behaves like the *Info* mode, but displays the absolute (geometric), horizontal and vertical distance between the current station and the previous one.

In **Line** mode, dragging the pen in the cave map displays the length and angle or slope of the drawn line along with the vertical and horizontal distance (map-wise.) Length and angle units used are those set in the Cave Details form. Tapping the screen again dismisses the line display; in this mode, the device does not respond to any button, but will power itself off automatically after the auto off delay.

```
1.25~1.26 point in front of hole in c...
X=-37.08 Y=-6.71 Z=-35.14
```
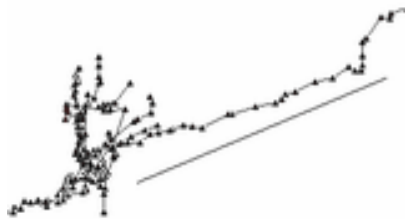
67° 120.9 m dX=112 m dY=47 m

When viewing a **Top** cave view, the angle of the drawn line is automatically copied into the clipboard to later ease selecting the projected profile angle. In profile cave views, a slope angle is displayed instead.

The **Spot** mode displays the position of the stylus in the cave map. In top cave view, the position format is that selected for the cave in the Cave Details form; geographic locations can only be provided if the cave is georeferenced. In profile views, the position is displayed in XZ format, with altitude if the cave has an altitude reference. Tapping the screen again dismisses the spot display; in this mode, the device does not respond to any button, but will power itself off automatically after the auto off delay.

The **Projection** mode is used to select the angles used by the two projected profile views. In the plan view, angles can also be selected graphically, as in the *Line* mode. The corresponding projected profile is displayed after an angle is selected. The angle unit is that selected in the Cave tab of the Cave Details form Network tab of the Network Details form.

In **Mask** mode, tracing the diagonal of a rectangle in the cave map determines the sides of the clipping mask (see the Clipping Mask form.) At all times, this mode displays the current clipping mask, if any.

In **Select** mode, tracing the diagonal of a rectangle in the cave map determines a selection area that can then be used in the Select form to select survey shots or stations.

The **Path** mode is used to select the *From*, *Middle* and *To* stations for which the shortest path is to be searched. At least two stations must be selected, either by direct input with Graffiti or the Auriga Keypad or by selection in the Map. The numeric pushbuttons determine which station is currently input. The **Back** button allows to return to the Map and zoom and/or pan it to locate another path station. The **OK** button launches the path search. If a path is found, its number of survey shots, its length and its vertical drop are

displayed. The vertical drop of the path is computed by adding the absolute value of the vertical drop of all its survey shots; a negative value indicates a descent towards the end station (possibly with some climbs), and vice-versa. The path can then be highlighted in the Map, or its survey shots can be enumerated in a report.

If the current station has survey shots toward other stations, the current shot is the first survey shot (in cave list order) leaving from the current station.

If the current station has no survey shots toward other stations, the current shot is the first survey shot (in cave list order) arriving from the current station.

The current station name is displayed in bold in the information line displayed at the top of the cave map.

The **Up/Down** scroll buttons allow to cycle through the various survey shots associated with the current station. Currently, only survey shots that start from the current station can thus be reached.

Arrow pushbuttons ◀ ◀▶ ▶ allow navigation between survey shots. From left to right, they:

- go to previous series beginning of current series **or**
    - go to first survey shot in previous series or previous cave leg **or**
    - move backward by a user-chosen number of survey shots
  depending on settings configured in the Stations tab of the Cave Details form
- move one survey shot backward
- move one survey shot forward
- go to next series beginning **or**
    - go to first survey shot in next series or cave leg **or**
    - move forward by a user-chosen number of survey shots
  depending on settings configured in the Cave Details form

The **+** and **-** buttons zoom in or out the cave map by 50% from the center. The first zoom out action restores the previous zoom ratio, regardless of whether it was manually determined (stylus dragged across the map) or automatic with the + button.

If the **-** or + buttons are held down, a list of zoom options is displayed:

- × or ÷ **1.5**, **2**, **3**, **5**, **10**, **25**, **50** and **100** provoke a zoom-in (×) or zoom-out (÷); the number of available options depends on the current zoom ratio, so as to avoid zooming beyond maximum zoom or below minimum zoom

- **Maximum Zoom** provokes a maximum zoom of the map
- **Full Map** displays the entire cave or network map within the size of the screen
- **Zoom to Scale** displays the cave or network to scale with the sketching scale indicated in the Map tab of the Cave Details form or the Map tab of the Network Details form, and taking into account the screen width indicated in the Map pan of the Preferences form. The map then corresponds exactly to what should appear on paper
- **GPS Position** zooms and pans the map to show the last geographic position received from the connected GPS, if any; the cave or network must be georeferenced for this to work (see GPS Tracking below)
- **Full Section** displays the entire passage section within the size of the screen (*Section* view only)
- **Current Shot** provokes a zoom on the current survey shot
- **Current Shot and Neighbors** provokes a zoom on the current survey shot and its immediate neighbors
- **Current Series or Session** provokes a zoom on the series or session of the current survey shot. The choice between series or session is determined by the status of the *Sessions Over Series* checkbox in the Computations pane of the Cave Details form
- **Current Loop** provokes a zoom on the current survey loop (if any)
- **Current Cave** provokes a zoom of the network map on the cave to which belongs the current survey shot

Select the **Forms** icon ⬓ to return to the previous form or select the *Close* item in the Cave menu to return to Main form. This is disabled by the *Assistant* (if active.) Maintaining this icon depressed displays a list of exit choices (*Survey Shot*, *List* or *Close Cave*.)

The 4 hardware application buttons have the following effect:

- In **Info** mode, from left to right, they mimic the arrow buttons (previous series beginning/cave leg, previous survey shot, next survey shot and next series beginning/cave leg.) On the Palm Zire, which has only 2 such buttons, they only mimic the previous shot and next shot arrows.
- In **Zoom**, **Pan** or **Line** mode, the leftmost button (Date book) mimics the **-** (zoom out) button while the rightmost button (Memo Pad) mimics the **+** (zoom in) button. The second (Address book) and third (To do) buttons and the **Up/Down** scroll buttons pan left, right, up and down.

Graffiti shortcuts:

- '-' zooms out
- '+' zooms in
- the 'tab' stroke returns to the [Survey Shot](#) form
- dragging the stylus from the Graffiti area to the middle of the screen toggles between top and extended profile views

Note: For these shortcuts, tapping the Graffiti 1 punctuation mark (a single tap in the Graffiti area) is not required. Thus, ' ' (space) acts as '-' (zoom out), 'k' as '+' (zoom in) and 'f' as a tab (exit.)

Menus: [Cave](#) or [Network](#), [Map](#) and [Options](#).

On-screen sketching of passage walls and details

Cave passages and details can be sketched on the PDA screen, superimposing the line plot in the Map form. When the Sketching stylus mode is selected, the following controls are displayed at the base of the Map form:
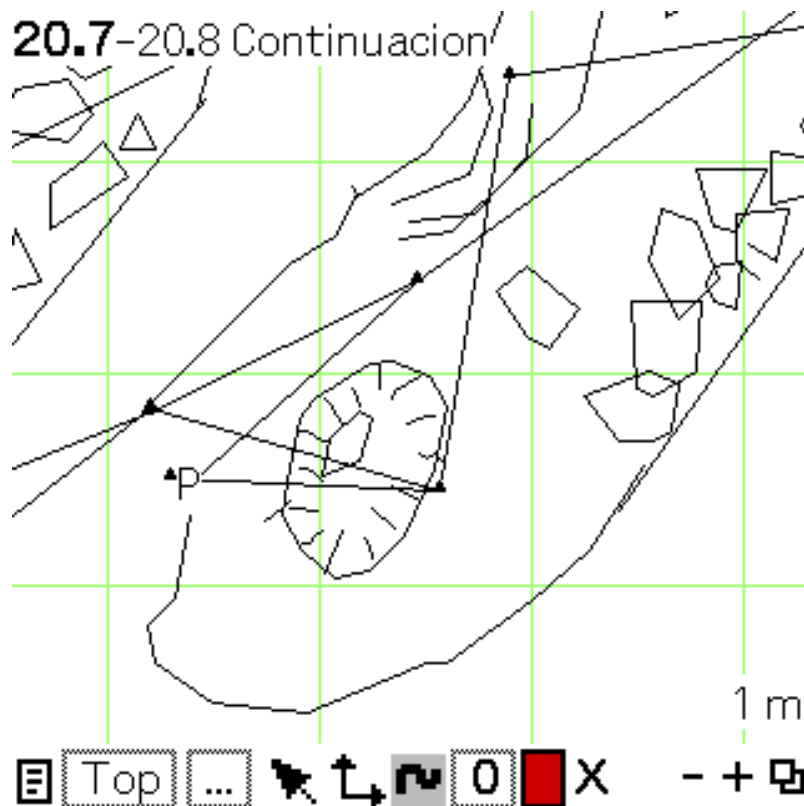
From left to right, controls are:

- the **Attributes** icon[*]: pops up a list of display options
- the **View** selector[*]: selects the Map view
- the **Mode** selector (shrunk to **...**): selects the Map mode (allows to leave Sketching mode)

- the **Selection** tool, with 2 possible modes:

  ❍ **Arrow**: tapping on a sketch element selects it (illustrated by a frame around both the element and the arrow), the color selector then displays the element color and the layer selector displays the layer it belongs to; dragging the stylus from the selected element moves it; holding down the stylus on a text element allows to edit it or change its style; holding down the stylus on the arrow displays information about the selected element:
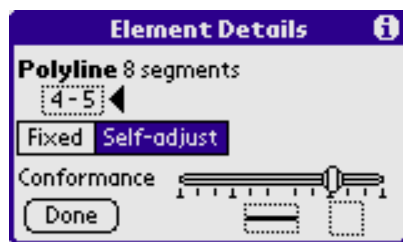
  The *Element Details* form displays the type of the selected element (and the number of segments for polylines or polygons). The parent survey shot is also displayed, while the parent station is pointed with an arrow.

  Note: A '+' appearing next to the number of segments indicate the polyline or the polygon has reached the limit while more segments would be required to represent it properly.

  The form can be used to:

  ▪ convert a polyline into a polygon (if its ends are close enough) and vice-versa
  ▪ toggle between fixed and self-adjusted modes (provided the element is not associated to a zero-length survey shot)

    In case of a group, the selected pushbutton indicates the mode, fixed or self-adjusted, of all its elements; if both pushbuttons are selected, the group contains elements of both modes; deselecting the unwanted mode pushbutton converts all group elements to the mode that remains selected (if need be)

- change the conformance level of a new curve (so long as the raw stylus data is available)
- change the pattern of a line or curve (ex. dashes) or the fill type of a curve (ex. hatches)

Fills give more predictable results with closed polygons than with open curves

Attention: In Map Export these types are not yet exported in SVG or DXF

- **Station** to select the current station to which future sketch elements will be associated

Note: holding down the Station tool filters the Map to only display sketches related to the current survey shot (the tool then gets displayed in red as a warning).

- the **Map** tool, with 2 possible modes:

  - **Pan** to move the Map
  - **Zoom** to select a zoom rectangle in the Map

- the **Sketch** tool, with 6 possible modes:

  - **Curve** to draw curves or dots
  - **Line** to trace straight lines or dots
  - **Text** to add floating text

    The Auriga Keypad is popped open and a selector in the title bar allows choosing among *Plain*, *Overlined*, *Underlined*, *Framed*, *Circled* or *Two-line with a bar* text styles. Up to 31 characters in one or more lines may be input, with the exception of the *Two-line with a bar* style (usually used to represent water heights), where a single line of text may be input, in x/y format (with a slash).

  - **Scissors** to split the selected element into two parts
  - **Section** (only in Section view) to automatically generate a polygon that corresponds to the section outline (that can later be modified)
  - **Group** (only when the tool list is popped up by holding down the stylus on it) to turn on Group mode (see Grouping sketch elements)

- the **Layer** selector to select the current layer and set this layer to the selected sketch element (if any); the *Modify* option pops up the [Layers](#) form
- the **Color** selector to select the sketch color and set the color of the selected sketch element (if any); the 10 last used colors are offered (with their RGB code), along with the default color for the current layer and an *Other* option to select any color available in the current palette
- the **Delete** button to delete the selected sketch element (if any)
- the **Undo** button to undo the last sketch operation (or redo the last undo operation); this button is hidden when there is no sketch operation to undo/redo; group operations performed simultaneously with the [Element Details](#) form are undone in bulk and only line type or fill can then be redone
- the **+ (zoom out)** button[*] to zoom out the Map by a fixed ratio
- the **- (zoom in)** button[*] to zoom in the Map by a fixed ratio
- the **Forms** icon[*] to leave the Map form

* = unchanged from other stylus modes

The **Selection**, **Map** and **Sketch** tools are the main tools used while sketching. Since they determine the action of the stylus as it moves on the screen, only one of these tools can be active at any time, and highlighted with a light gray background. Tapping on one of these tools makes it the active tool. Tapping on the already active tool changes its mode. A list of possible modes of the *Sketch* tool can also be popped up by holding the stylus down in it.

Each sketch element (dot, line, curve or text) is linked to a survey station/shot, and stored as vector graphics into the relevant survey shot record. Should the station move, the sketch element moves too. If the corresponding survey shot changes length or direction (like after loop closure), the sketch element self-adjusts if the element was sketched while the corresponding option was selected in the [Display](#) form.

Each sketch element belongs to a single Map view. Only the Top, Extended profile and Section views can be sketched on. In Sketching mode, only these views are available.

Each sketch element belongs to a layer. Up to 10 user-configurable sketch layers are available. Layers can be configured in the [Layers](#) form.

Notes:

- Curves are stored as polylines; when zoomed, they may look less smooth than

Illustrator's splines for instance
- Polylines are limited to 60 segments
- On some devices, sketching curves too fast may produce very sharp angles
- After a curve is drawn, selecting the *Arrow* selection tool automatically selects that curve
- When sketching a curve with one or two of its tips that touch the selected line or curve, they get merged; to avoid this merging, first deselect the selected curve with the *Arrow* selection tool by tapping in an empty spot on the Map before sketching the new curve
- The curve produced automatically by the *Section* tool is a polygon, i.e. a closed geometric form. To modify it with a curve, it must have two points of contact with the polygon in order to maintain closure, otherwise the modification is refused
- When sketching a curve with its ends touching or almost, a polygon is created (the difference can be seen selecting it: a polyline displays a small red square at its start). It's better to trace a polygon in a clockwise direction so that later modifications, in clockwise direction, don't cause bad surprises
- It is possible to convert a polyline into a polygon by selecting it and tracing a curve or line between its ends, in the same direction
- It is possible to convert a polygon into a polyline by selecting it and splitting it with the *Scissors* tool or the Element Details form
- Sketch elements belonging to a survey shot that lies outside the screen are not displayed

Suggestion: Always draw in a **clockwise** direction to allow Auriga's heuristics to properly interpret the sketcher's intention when editing a curve or a polygon

Limitations:

- Each survey shot can hold a maximum of 255 sketch elements; thus, besides being impractical, the whole cave cannot be sketched attaching all elements to a single station
- The Map can display a maximum of 2000 sketch elements; at low zoom ratio, tiny sketch elements may not be drawn or not be selectable
- When exported in DXF format, text styles *Underlined*, *Overlined*, *Framed* or *Circled* are not rendered; *Two-line* text style is rendered as "xxx/yyy"
- When exported in SVG format, text styles *Framed* or *Circled* are not rendered; *Two-line* text style is rendered as "xxx/yyy"
- Curves can be self-adjusting only if their parent survey shot is a regular survey shot with non-zero length; it cannot work with virtual survey shots

Grouping sketch elements

When Group mode is turned on (see *Sketch* tool), if the *Group* tool is active, dragging the stylus on screen traces a selection rectangle that groups all sketch elements within that belong to the current survey shot. If the *Selection* tool is active, tapping on a sketch element adds it or removes it from the current group.

The group is saved when:

- the color is changed*
- the layer is changed*
- a selected sketch element is moved by dragging the stylus*
- the *Delete* button is tapped*
- The *Sketch* tool is changed from *Group* to another one
- the map is zoomed or panned

and grouped elements can no longer be individually selected; instead, any change on the selected group (color, layer, position or deletion) applies to all its elements.

* then executed on the newly saved group.

Notes:

- A sketch element can only belong to one group
- Groups cannot contain other groups
- Only sketch elements belonging to the same survey shot can be grouped together
- A group belongs to a single map view
- Grouped sketch elements can be "degrouped" using the *Degroup* button of the Element Details form
- When a group is selected, the color selector takes the color of the tapped element within the selected group; the layer selector displays the number of the group layer if it is unique, or remains empty if group elements span more than one layer

The Layers form

This form allows configuring sketch layers.
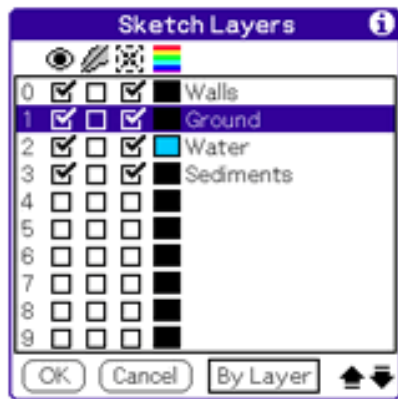
From left to right, columns are:

- layer **Number**: 0 to 9
- **Visible** attribute: checked if this layer is visible in Map
- **Movable** attribute: sketch elements on this layer can be moved by the morphing process of the Compass' SVG Exporter to follow survey shots (ex. walls or floor details)
- **Warpable** attribute: sketch elements on this layer can be morphed (scaled and/or warped) by the morphing process of the Compass' SVG Exporter (ex. walls); text elements do not get warped
- layer **Color**: default color of sketch elements on this layer; this color self-adapts to remain visible despite map background color changes
- layer **Name**

The checkboxes, the color picker and the name can be changed by holding the stylus on them. Checkboxes in a column can be changed all at once by holding the stylus on the column header icon (only named layers are changed.)

Note: A nameless layer cannot be set as visible. At least one layer must be visible.

If the **By Layer** pushbutton is selected, sketch layers are drawn one at a time, starting with layer 0. The draw order or a layer can be changed by selecting it and using the **Up** and **Down** arrows.

Menu: Defaults.

Acquiring splay measures while in Map

If an acquisition device is selected in the Link tab of the Preferences form, select the *Connect* item in the Map menu. Received data is then assumed to be splay measures to a

detail, from the current station of the current survey shot (use the *Info* mode to change it.) To select a different type of splay measurement, open the Measures form with the *Measures* item in the Map menu or have this form automatically open when connecting the device by selecting the *Popup Measures in Map* pushbutton in the Link tab of the Preferences form.

GPS Tracking

If the cave or network is georeferenced and if a GPS is selected for *Display* mode in the Link tab of the Preferences form, it is possible to track on the Map the geographic position reported by the GPS.

Select the *Connect GPS* item in the Map menu or tap the **Select** button of the Palm 5-way Navigator to connect the GPS. Every time a position is received, the map is panned to show the current position as a +. The position can also be reported in writing by selecting the *GPS Position* display option of the *Attributes* icon. Tapping the screen disconnects the GPS, allowing to poke the map without annoyance from GPS-triggered map movements.

If both the *GPS Position* and the *Shot Info* display options are selected, the latter takes precedence unless a GPS is connected and a position has been received. When the GPS is disconnected, the + remains visible until the map is panned or the *GPS Position* display option is deselected.

The Map Export form

The Map Export form allows exporting the map to various formats for further import in a GPS, Google Earth, or a drawing program.

Select the **Format**; *GPX*, *KML* (Google Earth), *DXF* (AutoCAD) and SVG (Illustrator,

Inkscape, etc.) are currently offered.

Indicate the **Name** of the export file (by default, the name of the cave or network.)

Select the **Card** checkbox if the file must be placed on the memory card in the device (the file is then placed in the /PALM/Applications/Auriga directory.)

Note: If the device has a memory card slot, this is the most convenient option as the file produced is a normal file directly usable in a computer, unlike the file hosted in the device internal memory, that is actually a Palm OS database from which a normal file must be extracted (see below.)

Select the **Beam to PC** checkbox if the file must be transmitted by *Infrared* or *Bluetooth* to a computer and indicate whether it must be **Deleted After**.

Notes: If this file is beamed with IR/Bluetooth to another Palm OS device, the receptor can crash or freeze because it does not know how to handle that kind of file.
If the *Card* checkbox is not checked and the file is beamed with IR/Bluetooth or HotSynced to a computer, it will be converted into a Palm OS database, and a ".pdb" extension will be added (ex. Fairy Cave.gpx.pdb). To be usable on a computer, the original (GPX, KML, DXF or SVG) file must be extracted from that ".pdb" file, for instance with the PAR tool (available in Auriga's download Web page) and the following DOS command:

```
par x "Fairy Cave.gpx.pbd" "Fairy Cave.gpx"
```

Select the **Shots** checkbox to export the line plot as a trace (series of segments.)

Select the **Stations** checkbox to export stations. In DXF and SVG formats, all stations are exported; in GPX or KML format, it is possible to export a combination of:

- *Dead Ends* (terminal stations)
- *Junctions* (stations that connect to more than one passage)
- *Passages* (stations that connect to a single passage)
- *Entrances*
- *Landmarks* (stations with a geographic position)
- the *Georeference* station

If a Selection is available, it can be used to limit the number of exported survey shots and stations.

Note: In DXF format, the screen may blink due a palette change to determine color indexes.

In GPX or KML format, station names are exported only if they are currently visible in [Map](Map).

In KML format, survey shots and stations **Color** can be selected; the **Opacity** of stations can also be selected.

In DXF format, select the **Black background** to force a conversion of black survey shots and sketches to white to make sure they remain visible. Conversely, white survey shots and sketches are converted to black it this checkbox is deselected. This allows using a different map background color in Auriga and in the PC drawing program.

In DXF format, select the **Keep Origin XYZ** checkbox to export absolute coordinates, that use the XYZ coordinates of the origin; otherwise, coordinates are origin-relative (i.e. as if the origin is 0,0,0). The map is exported with a 1:1 scale; this works fine in AutoCAD but may be a problem in Illustrator, where a SVG file is preferred.

Data is exported as follows:

- In GPX format, starions are exported as waypoints, and survey shots as a traca. Station names are exported if they are currently visible in the [Map](Map).

- In KML format, stations are exported as "placemarks" with a triangle shape, and survey shots as lines. Station names, wall lines and passage color fill are also exported if the corresponding display option is set in the [Map](Map).

- In DXF format, the export depends on the exported view. In Top view, the DXF file can be used in 2D or 3D, since the X, Y and Z axis correspond to the cartesian coordinates of the cave; it also has both passage widths and heights. In profile views, the DXF file is a 2D view that corresponds to what is displayed in Auriga, where the Y axis corresponds to the depth coordinate and the X axis changes according to the current view. In all views, stations are exported as triangles in the "STATIONS" layer. Other layers are:

  - "0": scale (always) and North arrow (Top view only)
  - "NAMES": station names
  - "ATTRIBUTES": attributes (Entrance, Permanent ot ? - Lead) of each station; in Cross-section view, only the view angle is inscribed
  - "ALTITUDES": origin-relative depth (Z) of each station, and real altitude,

when known (ex. 2.33/1025.3)[1]

- ❍ "SURVEY_SHOTS": survey shots between stations[2]
- ❍ "WIDTHS": passage widths (left and right) for each survey shot[1]
- ❍ "HEIGHTS": passage heights (up and down) for each survey shot[2]
- ❍ "WALLS": wall line between passage widths[1]
- ❍ "CEILING_FLOOR: ceiling or floor line between passage heights[2]
- ❍ "SPLAY_TO_WALLS": splay measures to a wall[1]
- ❍ "SPLAY_TO_CEILING_OR_FLOOR": splay measures to a ceiling or floor[2]
- ❍ "SPLAY_TO_DETAIL": splay measures to a passage detail[2]
- ❍ "SECTIONS": sections of stations with pasage dimensions or splay measures that allow assembling a cross-section view[3]
- ❍ Sketch layers are exported only if sketch is currently visible in Map

1. Only in Top view
2. With all Map views except the Cross-section view
3. Only in Cross-section view

- In SVG format, the export depends on the exported view. In **Walls/Compass Layers** mode, layers correspond to those prescribed by the Walls cave software plus those added by the Compass cave software; these layers should be compatible with the morphing process of the Compass' SVG Exporter. Otherwise, layers are similar to those present in the DXF export:

  - ❍ "Names": station names
  - ❍ "SurveyShots": survey shots between stations
  - ❍ "Widths": passage widths (left and right) for each survey shot[1]
  - ❍ "Heights": passage heights (up and down) for each survey shot[2]
  - ❍ "Walls": wall line between passage widths[1]
  - ❍ "CeilingFloor": ceiling or floor line between passage heights[2]
  - ❍ "SplayToWalls": splay measures to a wall[1, 3]
  - ❍ "SplayToCeilingOrFloor": splay measures to a ceiling or floor[2, 3]
  - ❍ "SplayToDetail": splay measures to a passage detail[3]
  - ❍ Sketch layers are exported only if sketch is currently visible in Map

  1. Only in Top view
  2. Only in profile views
  3. Only if splay measures are currently displayed in Map

Note: Compass' morphing process does not support the cross-section view; Walls'

morphing process only support the top view.

Note: Walls and floor/ceiling splay measures are exported in walls color while splay measures to details are exported in splay measurement color (see the [Display](#) form.)

Coordinates are scaled to 72 DPI (Dots Per Inch) using the scale computed in the **Paper** tab:

according to paper size, orientation and margins.

Note: Leaving the **Scale** field empty forces Auriga to compute the largest scale where the exported line plot can fit in the selected paper sheet size. The scale may then be rounded.

Note: When exporting sections, each one occupies 72 dots (one inch). Sections are laid out to occupy the whole paper width (within margins) and as many vertical sheets of paper as necessary. In virtual paper mode, sections are laid out using an estimated number of sections.

Note: In virtual paper mode, if no drawing appears after importing the SVG file, it may be that coordinates exceed the program limit (the limit depends on the program); reducing the scale usually solves the problem.

Note: Care must be taken when moving the SVG file: Illustrator cannot open a SVG file with an uppercase .SVG extension.

Note: Successive exports overwrite the output file.

Menu: <u>Edit</u>

The Clipping Mask form

The Clipping Mask form allows determining the six sides of the cuboid used as a mask to unclutter the Map by restricting the display to a given cave slice. The Top and Bottom sides are used in the Top view, while the North, South, West and East sides are used in the profile views. The cuboid can have open sides, thus not masking anything in those directions. The use of the mask is determined by the list of Map display options. Computations are not affected by the mask.

The Center location, as well as the North, South, West, East, Top and Bottom sides of this mask can be defined by:

- a geographic position for the Center location, its X and Y coordinates are then used
- an absolute coordinate: X (West and/or East), Y (North and/or South), Z (Top and/or Bottom) or all three (Center)
- a survey station; its X, Y or Z coordinate is then used
- an X, Y or Z offset from the opposite side (North vs South, West vs East or Top vs Bottom) or the Center location, expressed in map units (meters or feet)

The **Clear** button clears the current mask.

The mask sides can also be graphically selected by tracing a rectangle in the <u>Map</u> using the *Mask* mode; North, South, West and East sides can be selected in the *Top* view while Top and Bottom sides can be selected in any profile view. At all times in *Mask* mode, the <u>Map</u> displays the current clipping mask, if any.

Menu: <u>Edit</u>

The Colors by Depth form
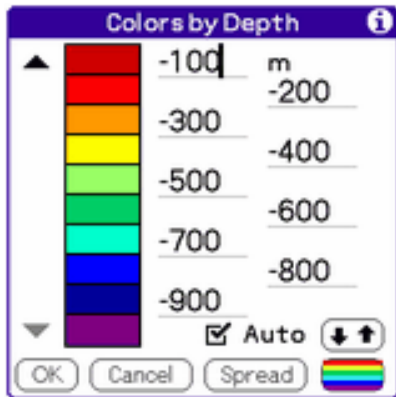
The Colors by Depth form allows selecting colors and depth ranges for the *Color by Depth* map setting, where each survey shot is colored according to the depth (Z axis) ot its deepest station.

Up to 10 depth ranges can be determined by their corresponding bottom limit. The number of depth ranges can be increased or decreased using the arrow buttons. The first and last depth ranges are open-ended: survey shots above or below the depth limit respectively use their color.

Note: Depth fields are horizontally shifted purely for readability.

Tapping on a color picker allows selecting its color; dragging the stylus from one color picker to another swaps these color selections.

The **Spread** button spreads the current vertical range of the cave or network over the current number of enabled depth ranges. If the vertical range in meters or feet is less than the number of enabled depth ranges, this number may be adjusted. Selecting the **Auto** checkbox automates this spread action every time the cave or network is recomputed.

The **Rotate** button rotates the color selection of enabled depth ranges.

The **Rainbow** button sets the color pickers (even the disabled ones) as a rainbow.

Depth ranges and colors can be saved as defaults or restored from defaults using the **Defaults** menu.

Menus: Edit and Defaults

The Colors by Date form
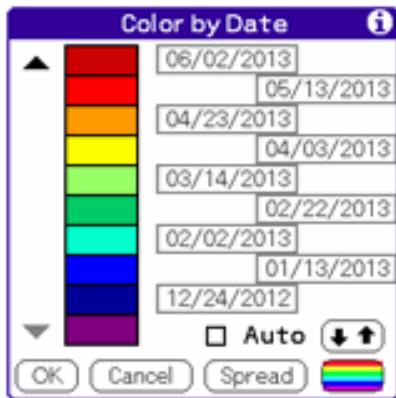
The Colors by Date form allows selecting colors and date ranges for the *Color by Date* map setting, where each survey shot is colored according to its input date.

Up to 10 date ranges can be determined (ordered from most recent to oldest) by their corresponding oldest limit (at 00:00:00). The number of date ranges can be increased or decreased using the arrow buttons. The first and last date ranges are open-ended: survey shots above or below the date limit respectively use their color.

Note: Date selectors are horizontally shifted purely for readability.

Tapping on a color picker allows selecting its color; dragging the stylus from one color picker to another swaps these color selections.

The **Spread** button spreads the survey shot date range of the cave or network over the current number of enabled date ranges. If the date range in days is less than the number of enabled date ranges, this number may be adjusted. Selecting the **Auto** checkbox automates this spread action every time the cave or network is recomputed.

The **Rotate** button rotates the color selection of enabled date ranges.

The **Rainbow** button sets the color pickers (even the disabled ones) as a rainbow.

Date ranges and colors can be saved as defaults or restored from defaults using the **Defaults** menu.

Menu: Defaults

The Statistics form

```
Statistics
Development: 81.0 m
Mapped length: 84.9 m
Vertical drop: 5.8 m
Survey shots: 27
Stations: 25
Series: 3
Sessions: 2
X min: -8.9 max: 17.8
Y min: -19.6 max: 0.0
Z min: -5.8 max: 0.0
```

[OK]

The Statistics form displays cave or network statistics. It may trigger an automatic XYZC coordinates computation if these are not up to date.

The **Development** is the sum of the length of every survey shot that does not have the **Dead Shot** or **Exclude from Statistics** attributes and that belongs to a series without the **Exclude from Statistics** attribute set (if series are used.)

The **Horizontal extent** is the sum of the horizontal projection of the survey shots described above.

See the note on the Map **North** in the the Coordinates section.

The **Mapped length** is the sum of the length of all survey shots.

The **X, Y and Z min/max** are the absolute bounding coordinates of the cave or network. **dX, dY and dZ** are the coordinates range, along with their scaled value (between []) according to the map scale (selected in the Computations tab of the Cave Details form), convenient when plotting the map on paper.

Statistics can be exported as memos to the built-in Memo Pad application for future viewing. The same menu also allows printing statistics or beaming them to another device.

Menu: Report.

Survey Shot and Loop Closure Error reports

Survey shot errors detected while computing the cave map coordinates can be viewed by tapping the *Shot Errors* item in the Cave menu. Possible errors are:

- *Invalid data*: the survey shot has above limits data or dive depth data greater than the survey shot length
- *Duplicate*: the survey shot duplicates another survey shot with same start and end stations
- *Incomplete*: the survey shot misses some data
- *Incomplete leg*: the survey shot is part of a (passage) leg connected to an incomplete survey shot
- *Orphan*: the survey shot is not connected to the rest of the cave, itself connected to the origin station (see the Computations tab of the Cave Details form)
- *Orphan leg*: the survey shot is part of an orphan (passage) leg
- *Wrong Azimuth*, *Wrong Slope* or *Wrong Backsights*: the survey shot has a foresight-backsight azimuth and/or slope measurement span that exceeds the tolerance set in the Map tab of the Preferences form

Survey shots that lead to computing the same station but with differing coordinates (beyond the station error tolerance input in the Computations tab of the Cave Details form) are grouped together.

Tapping on a survey shot name brings it up in the Survey Shot form.

Survey shot errors and loop error reports can be exported as memos to the built-in Memo Pad application for future viewing with the *Export to Memos* item of the Report menu; it may be advisable to create a memo category to store them.

Shot Errors

1.0–1.1 Incomplete
1.7–1.8 Orphan

OK

Closure Errors

3.4–1.3 Galerie basse du ruisseau
X=4.33 Y=-9.30 Z=-3.90
1.3–1.4 e(1.3) = 1.93 m
X=3.72 Y=-8.86 Z=-2.12

3.12–1.2
X=-1.14 Y=-7.77 Z=-3.09
1.2–1.3 e(1.2) = 1.54 m
X=-1.69 Y=-7.31 Z=-1.73

OK
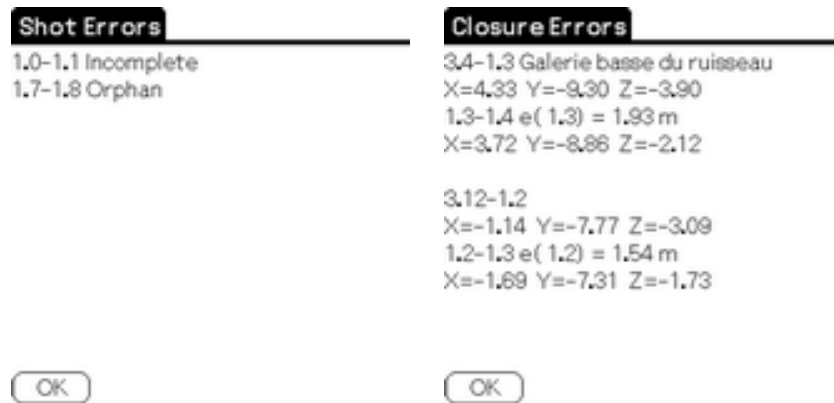
These errors can be visually detected in the map: for every station that is part of a loop, the difference between its theoretical location and its actual location (determined by the

survey shot used to compute the station location) is drawn with a dotted line.

Tip: With station markers displayed, any survey shot segment that does not reach a station marker at both ends reveals a loop error.

The Network Details form

This form displays information on a network, either existing or being created.

This form has 3 tabs, selected with the pushbuttons in the title bar.

The Network tab

The **Name** of the network can be any string of 26 characters or less and may include spaces. This corresponds to the name of the Auriga network PDB on the Palm OS device (with a 5-character suffix to distinguish it between PDB types.) Editing the name of an existing network actually renames it (an alert is issued before proceeding.)

The **Category** selector allows selecting the network category. Categories are edited in the usual Palm OS way by selecting the *Edit categories...* list item.

Select measurement units to be used for computing coordinates:

- **Lengths** unit (*meters* or *feet*)
- **Angles** unit (*degrees* or *grads*) for azimuths and projection angle
- **Slopes** unit (*degrees*, *grads* or *%*)
- **Slope 0** setting (*Up (zenithal)*, *Level* or *down (nadiral)*)

Note: Measures units selected in this form are used throughout Auriga to report

coordinates, lengths and angles between stations and statistics.

Select the format to be used to display **Positions** in the network map (*XYZ*, *d°m's"*, *d°m. m'*, *degrees* or *UTM*.)

If latitude/longitude or UTM geographical positions are to be input, select the proper topographical **Datum** to use for conversions; see Supported Geodesic Datum. Tap the **Datum** button to open the Datum form to view the geodesic parameters that define the selected datum or to input parameters that define a User datum.

Select the **Shot Navigation Mode** with navigation arrows in the Survey Shot and Map forms. Choices are:

- **Go to the next or previous series beginning** (default if the 6.6 format is selected)
- **Go to Next Cave Leg** (determined by a station naming change in the left subpart of the station name if the 6.6 format is selected)
- **Go to Next Session**
- **Move by n shots**, where n is user-chosen value between 1 and 255

If the network cannot be built due to a lack of memory, unselecting the following checkboxes may perhaps reduce the memory requirements down to a working level, at the expense of lost functionality:

- Unselecting **Retain Sketch & Closure** drops the sketch and closure error data; sketches and closure errors can no longer be displayed; the memory gain is 61% for survey shots (16/26 bytes)

  Note: If the closure error data is not retained, Auriga plots survey shots between the computed position of their start and end stations, regardless of the position resulting from actually computing the survey shot, which may differ in case of a closure error, thus forcing an artificial loop closure.

- Unselecting **Retain Passage Dimensions** drops the passage dimensions data; passage widths or cave walls can no longer be displayed; the memory gain is 31% for survey stations (14/44 bytes)
- Unselecting **Retain Session Statistics** drops the total length statistics for sessions; the sessions list in the List form remains sorted by session number; the memory gain is 12 bytes/session

Tap the **Note** button to edit the network note. 255 characters are permitted.

The Map tab

Select the network map **Grid** value. See the Map tab of the Preferences form for general grid preferences (that apply to all caves/networks.)

Select the **Automatic** checkbox so that the map grid gets resized when it cannot be displayed within the user-defined minimum and maximum number of lines. The grid value is then multiplied or divided by 2 and rounded to the lowest integer. Otherwise, the grid is hidden.

Select the **Automatic Subgrid** checkbox or indicate the value and length unit of the map **subgrid** for this network. The *Divisions* unit allows a relative subgrid, dividing the grid by a fixed number of divisions. In automatic mode, the value and unit are locked and indicate the automatic configuration.

Note: an automatic subgrid shows points spaced by the field length represented by the squares on the sketching paper (indicated in the Map tab of the Preferences) form, to scale with the network scale (indicated in the Map tab of the Network Details form.

Thus, with a 1:200 scale and 1 mm paper squares, the interval between subgrid points represents a distance of 20 cm in the field.

Select the **Wall Color same as Shot** checkbox so walls and dimensions are drawn in the map using the color of their corresponding survey shot. Otherwise, they are drawn using the default color selected in the Map tab of the Preferences form.

Input the cave map **Scale** used to compute coordinates reported in the Sketch to Scale form; for example:

1 cm = 1 m corresponds to a scale of 1:100
1 inch = 20 feet corresponds to a scale of 1:240 (there are 12 inches in a foot)

Select the **Vertical** factor used in profile maps and coordinate computations to exaggerate the verticality of the network for display purposes. A factor less than 1 (ex. 0.5) actually flattens out a vertical network. This factor is applied to coordinates reported in the List form for drawing, but coordinates reported in the Map form are not affected.

Select the **Close Loops (by cave)** so as to force loop closure for each cave, if necessary, when computing the network coordinates.

Indicate the coordinates of the network **Origin** (0,0,0 by default), expressed in map units.

The Caves tab
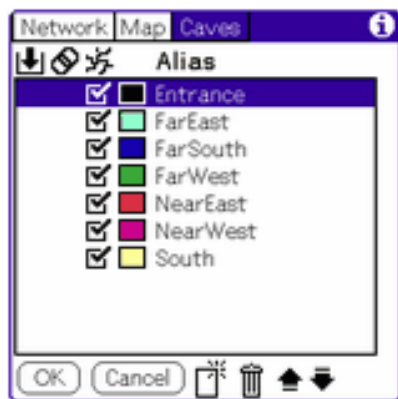
This tab allow selecting the caves that are part of the network.

Use the **Add** or **Remove** buttons to select caves; holding down the stylus on the **Add** button while caves were selected (see Selection form) adds these caves to the network.

Use the **Up** or **Down** arrow buttons to move the selected cave in the list; this order alters the search for linking stations when building the network (see the Network Cave form.)

Warning: The order of caves is not without consequence: the first cave that has a georeference determines the network georeference; it is thus mandatory to first add the cave with the most precise georeference.

From left to right, the 5 columns are:

- **Loaded**: cave data could be loaded by the network building process - this attribute is set by Auriga
- **Linked**: the cave could be linked to the network - Auriga only attempts to link loaded caves, and only linked caves can be displayed
- **Draw**: the cave is to be drawn in the network map
- **Color**: this color is used when selecting the *Color by Cave* option in the map settings popup list of the Map form
- **Alias**: prefix used before station names in the *Info* line of the network Map

The *Draw* and *Color* settings can be modified by holding down the stylus on them.

Tapping on the currently selected cave displays the Network Cave form.

Menus: Edit and Defaults.

The Network Cave form

This form displays information on a networked cave, either already selected or being added to a network.

Select the name of the networked **Cave**, either manually or with the drop-down list of caves present on the device. Caves already selected for this network do not appear in the list. If there are no caves present on the device or if all caves present on the device are already selected for the network, the list does not show.

Note: Inputting up to the first 5 characters of the desired cave name while the cave list is open triggers the list lookup.

The **Alias** is used as a prefix before station names in the *Info* line of the network Map. A

short alias is preferable.

Select the type of link that binds the cave to the network:

- **Automatic**: Auriga sets the first cave on the network origin, and tries to link other caves by georeference or by finding common stations with other caves

- **By Geo-Reference**: after a cave owning a georeference can be linked to the network, other caves owning a georeference can also be linked to the network through their geographic location

- **Origin Same as Network**: the cave origin station is set on the network origin

- **XYZ Offset from Network Origin**: the cave origin station is set on an XYZ shift from the network origin

- **Station Linked to Remote Cave**: the cave is linked to another cave through common stations. If the cave is the only one currently selected for the network, the drop-down list cannot be shown. If the **Station** and **Links to** fields are left empty, Auriga searches for identical stations in one or more caves; otherwise, a pair of different stations can be input. If the **of** field is left empty, Auriga searches for link stations in all other caves already linked; otherwise, the search is limited to a single cave. In any case, XYZ offsets can be input, they get added to the cave coordinates.

- **Use Cave Origin as Offset**: the cave origin station coordinates (set in the Computations tab of the Cave Details form) are used as an offset from the network origin

In *Automatic* mode, selecting the **Auto Update Link Type** checkbox updates the link type to that actually used by Auriga upon successfully building the network. Otherwise, the **Actual link** button allows knowing the type of link used by Auriga when building the network. This button only appears after the network is built.

Menu: Edit

The Selection form
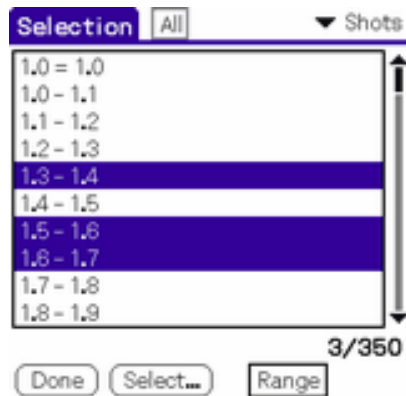
The Selection form allows to select a set of caves, survey shots, stations or sessions to act upon in the Beam, Export and (later) Operations forms.

Use the rightmost popup list in the title bar to select the **Caves**, **Shots**, **Stations** or **Sessions** view to indicate the type of items to select.

Use the selector trigger in the middle of the title bar to view **All** or only **Selected** items. In the case of survey shots, the list can be filtered to only show those belonging to the current session. In the case of caves, the list can be filtered by category.

Items can be selected or unselected from the list by tapping on them. In *Selected* mode, unselecting an item immediately removes it from the list.

A continuous range of items can be selected or unselected by first selecting the **Range** pushbutton and the desired action (+ to select, **-** to unselect), then selecting the bounds of the item range. The start of the range is highlighted by dotted lines. The desired operation is immediately performed when the second range bound is selected. In *Selected* mode, items can only be unselected, and are immediately removed from the list. The operation can be aborted by unselecting the *Range* pushbutton.

The **Select** button opens the Select form that offers various ways to select/unselect items.

Note: The Selection is flushed from survey shots and stations when a survey shot is added or deleted to/from the cave.

Tip: To break up a large cave into smaller more manageable subsets of that cave:

- Display the cave Map
- Use the *Select* stylus mode to graphically select the desired cave subset

- In the [Select](#) form, use the *Select from Map* operation to add the selected survey shots to the Selection
- If needed, repeat the previous operations to add or remove survey shots to/from the Selection
- Go to the [Export](#) form and export the selected survey shots into another (new) cave
- To export the other half of the current cave into another cave return to the Selection form, use the *Invert Selection* menu item and then repeat the export operation, this time into another (new) cave

Menu: [Selection](#).

The Select form

The Select form offers various ways to select/unselect items in the Selection.

Use the rightmost popup list in the title bar to select the **Caves**, **Shots**, **Stations** or **Sessions** view to indicate the type of items to select or deselect.

Select the + (select), **-** (unselect) or **Replace** pushbutton to determine the effect of the selection operation.

Select the type of selection to perform (depends on current view):

- **Caves**

  - **All** (un)selects all caves
  - **By Name** (un)selects caves with a given name pattern[1]
  - **By Note** (un)selects caves with a given note pattern[1]
  - **By Category** (un)selects caves that belong to a given category
  - **By Attribute** (un)selects caves that have a given attribute among *Unsorted*, *Disorganized* and *Read-only*
  - **By Datum** (un)selects caves with a given datum

- **Survey Shots**

  - **All** (un)selects all survey shots
  - **From Map** uses the selection made in the [Map] form; this option is not available if no selection were made in the [Map] form
  - **From Selected Stations** (un)selects survey shots that connect selected stations
  - **From Selected Sessions** (un)selects survey shots associated with selected sessions
  - **From Selected Loops** (un)selects survey shots associated with selected loops
  - **By Date** (un)selects survey shots during the given date range[2]
  - **By Name** (un)selects survey shots with a given station pattern[1]
  - **By Attribute** (un)selects survey shots that have either one or all given attributes
  - **By Note** (un)selects survey shots with a given note pattern[1]
  - **Virtuals** (un)selects virtual survey shots
  - **With Position** (un)selects survey shots with a position (ignored or not)
  - **With Splay Measures** (un)selects survey shots with splay measures
  - **Current Loop** (un)selects survey shots in current loop
  - **By Azimuth** (un)selects survey shots with an azimuth of a given direction (direct or reverse)
  - **By Slope** (un)selects survey shots with a slope of a given direction (direct or reverse)
  - **By Series** (un)selects survey shots that belong to the current series or a range of series
  - **By Error** (un)selects survey shots that have one given error among *Invalid*, *Orphan*, *Incomplete*, *Duplicate*, *Wrong Azimuth* and *Wrong Slope*
  - **By Series** (un)selects survey shots or stations belonging to the current series or to a range of series[3]
  - **Series Beginnings** (un)selects series beginnings survey shots

- **Stations**

  - **All** (un)selects all stations
  - **From Map** uses the selection made in the [Map] form; this option is not available if no selection were made in the [Map] form
  - **From Selected Shots** (un)selects stations that belong to selected survey shots
  - **By Name** (un)selects stations with a given station pattern[1]
  - **By Attribute** (un)selects stations that have one given attribute among

Entrance, *Permanent* and *Lead*
- ❍ **Current Loop** (un)selects stations in current loop
- ❍ **By Series** (un)selects stations that belong to the current series or a range of series[3]

- **Sessions**

  - ❍ **All** (un)selects all sessions
  - ❍ **By Number** (un)selects sessions within a given number range
  - ❍ **By Name** (un)selects sessions with a given name pattern[1]
  - ❍ **By Date** (un)selects sessions taken during the given date range[2]
  - ❍ **From Selected Shots** (un)selects sessions associated with selected survey shots
  - ❍ **By Note** (un)selects sessions with a given note pattern[1]

- **Loops**

  - ❍ **All** (un)selects all loops
  - ❍ **By Quality** (un)selects loops according to their quality index (see the *Loops* view of the [List](#) form)
  - ❍ **By Error %** (un)selects loops according to their relative error
  - ❍ **By Number of Shots** (un)selects loops according to their number of survey shots
  - ❍ **By Length** (un)selects loops according to their length
  - ❍ **By Station** (un)selects loops associated with a given station
  - ❍ **From Selected Shots** (un)selects loops associated with selected survey shot
  - ❍ **From Selected Stations** (un)selects loops associated with selected stations
  - ❍ **From Selected Sessions** (un)selects loops associated with selected sessions
  - ❍ **Current Loop** (un)selects the current loop (selected in the *Loops* view of the [List](#) form)

1. The **Wildcards** checkbox allows performing a search using wildcards:
   - ❍ ***** substitutes any character string of 0, 1 or more characters
   - ❍ **?** substitutes exactly one character
2. When using a date range, it spans from 00:00:00 on the start date to 23:59:59 on the end date
3. If the **Current** checkbox is not selected, fields are displayed to input a range of series

Menu: [Edit](#)

The Operations form

The Operations form offers various maintenance operations that can be applied on caves, survey shots, stations or sessions.

Select the target extent: all or only selected items. In the case of cave operations, maintenance can also be restricted to the current cave (if any.)

Select the maintenance operation: (depends on target type):

- **Caves**

  - **Set Category** sets the category of target caves
  - **Add Attributes** adds the Read-only, Public or Searchable attribute to target caves
  - **Remove Attributes** removes the Read-only, Public or Searchable attribute from target caves
  - **Sort** sorts target caves; caves are normally kept sorted automatically
  - **Reorganize** reorganizes target caves (number of shots, sessions, etc.)
  - **Validate** validates the record sizes of target caves; this operation is automatically applied before any database format migration
  - **Purge Deleted Records** removes the deleted survey shot and session records from target caves
    Warning: Purging deleted records indiscriminately may result in the conduit not properly detecting deleted records
  - **Recount Shots in Sessions** recounts the total number of survey shots associated with each session
  - **Compute Coordinates** computes coordinates for target caves
  - **Set Datum** sets the geodesic datum of target caves; a pushbutton allows applying the same operation to all survey shots with a geographic position in target caves; no actual datum conversion is performed, only the datum reference is changed
  - **Delete** deletes target caves
  - **Beam** beam target caves

○ **Backup to Card** backs up target caves to the memory card

● **Survey Shots**

   ○ **Set Color** sets the map color of target survey shots
   ○ **Set Date** sets the input date of target survey shots
   ○ **Associate to Session** sets the session to which target survey shots are associated
   ○ **Swap Left-Right** swaps left-right passage dimensions of target survey shots
   ○ **Set Azimuth Direction** sets the azimuth direction of target survey shots; the direction can also be toggled from its current state
   ○ **Set Slope Direction** sets the slope direction of target survey shots; the direction can also be toggled from its current state
   ○ **Set Dimension Station** sets the station to which passage dimensions are associated for the target survey shots; the station can also be toggled from its current state
   ○ **Convert Length** converts the numeric value of the length data of target survey shots; standard conversions are proposed, and a user-input custom factor is also possible; a pushbutton allows extending the conversion to passage dimensions (LRUD)
   ○ **Convert Passage Dimensions** converts the numeric value of passage dimensions of target survey shots
   ○ **Convert Azimuth** converts the numeric value of azimuth of target survey shots; a pushbutton allows extending the conversion to backsight azimuth
   ○ **Convert Backsight Azimuth** converts the numeric value of backsight azimuth of target survey shots
   ○ **Convert Slope** converts the numeric value of slope of target survey shots; a pushbutton allows extending the conversion to backsight slope
   ○ **Convert Backsight Slope** converts the numeric value of backsight slope of target survey shots
   ○ **Add Attributes** adds selected attributes to target survey shots
   ○ **Remove Attributes** removes selected attributes from target survey shots
   ○ **0-length Shots => Virtuals** converts zero-length survey shots into virtual survey shots
   ○ **Set Datum** sets the geodesic datum of survey shots with a geographic position; no actual datum conversion is performed, only the datum reference is changed
   ○ **Beam** beam target survey shots
   ○ **Self-adjusted->Fixed Sketches** and **Fixed->Self-adjusted Sketches** convert the mode of sketch elements
   ○ **Flip Sketches** used to update sketches drawn in left-developed extended

profile to make them direction-independent; **this only works with fixed sketches**

- ❍ **Convert Sketches** converts the length unit used internally to store sketches of target survey shots (the cave length unit at the moment of sketching)
- ❍ **Convert Splay Measures** converts the numeric value of the length data of splay measures of target survey shots; standard conversions are proposed, and a user-input custom factor is also possible;
- ❍ **Delete** deletes target survey shots

- **Stations**

  - ❍ **Add prefix** adds a prefix to the number (or series, if applicable) of selected stations
  - ❍ **Add suffix** adds a prefix to the number (or series, if applicable) of selected stations
  - ❍ **Left-justify numbers with 0s** padds the rightmost group of digits (if any) in the name of selected stations with 0s up to a user-selected number of digits (2-6)
    ex. A01 becomes A0001
    Warning: This operation can produce duplicate survey shots if more than one station converts to the same resulting station:
    ex. both A1 and A01 convert to the same resulting station
  - ❍ **Shift** shifts the number (or series, if applicable)

    Note: Before actually applying the operation, Auriga first checks the target stations to make sure it would neither duplicate stations nor create invalid station names

  - ❍ **Rename One Station** renames the one selected station
  - ❍ **Beam** beam target survey shots linked to target stations

- **Sessions**

  - ❍ **Set Color** sets the map color of target sessions
  - ❍ **Set Date** sets the creation date of target sessions
  - ❍ **Merge into Session** merges sessions into a target session; merged sessions can optionally be deleted after merge
  - ❍ **Magnetic Deviation** sets the magnetic declination of target sessions
  - ❍ **Add Attributes** adds selected attributes to target sessions
  - ❍ **Remove Attributes** removes selected attributes from target sessions
  - ❍ **Beam** beam target survey shots linked to target sessions
  - ❍ **Delete** deletes target sessions

- **Loops**

    - **Add Attributes** adds the Close attribute to target loops
    - **Remove Attributes** removes the Close attribute from target loops
    - **Re-compute Loops** recomputes the statistics (length, error and quality) of target loops
    - **Close Loops** applies loop closure to target loops
    - **Export into New Cave** exports target loops into separate caves, with the option of combining all target loops into a single new cave; if the target cave (s) already exist(s), it/they get(s) overweritten; the category can be set when not combining target loops into one cave
    - **Export Itinerary** exports target loops itineray to the built-in Memo application or as a text file on the memory card, with the option of combining all itineraries into a single memo or file; loops are exported in the same order they currently appear in the [List](#) form
    - **Analyse Loops** applies loop analysis to target loops; logs are stored as memos in the built-in Memo Pad or as plain text files on the memory card
    - **Beam** beam target survey shots linked to target loops

Menu: [Edit](#).

The Datum form

This form displays the parameters used to perform geodesic conversions based on the selected datum, or to input the parameters that define a User datum.

Select the desired **Datum**; see [Supported Geodesic Datum](#).

If the selected datum is the *User* datum, the **Ellipsoid** can be selected, otherwise, it shows the standard ellipsoid associated with the selected datum.

The **a** and **1/f** fields represent the ellipsoid semi-major axis and flattening. They can only be edited if the selected ellipsoid is the *User* ellipsoid, otherwise, they show the standard values for the selected ellipsoid.

The **TX**, **TY** and **TY** fields represent the XYZ datum offset from WGS84. They can only be edited if the selected datum is the *User* datum, otherwise, they show the standard values for the selected datum.

Menu: Edit.

The Geodesic Converter form

This form allows performing geodesic conversions.

Select the **Unit** for both input and resulting positions among *d°m's"*, *d°m.m'*, *Degrees*, *UTM*, *MTM* and *Lambert*.

Select the input and resulting positions **Datum**. The *User* datum is offered only if the current cave or network defines it. Inputting up to the first 5 characters of the desired datum name triggers the list lookup.

Note: Lambert coordinates are only supported for the NTF (France) and the BD72, Lambert 2005 and Lambert 2008 (Belgium) datum.

Input the position to convert and tap the **Convert** button. If the position cannot be converted (inconsistent location, format or datum), a '?' is displayed. The Paste menu item pastes the resulting position into the fields of the position to be converted. Back into the Survey Shot form (if it is the calling form), the Paste menu item pastes the resulting position into the survey shot if insertion point is in a position field.

Note: Upon opening, the form displays the last position seen in Auriga, if any. The input

position can be cleared by tapping the **Clear** button.

Menu: [Edit](#).

The Pit Sounder form
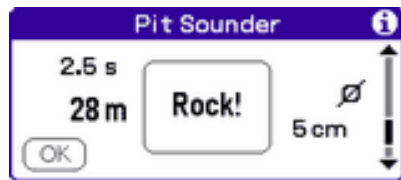
This form allows estimating the depth of a pit from the fall time of a rock. Computations lay on the numerical resolution of the differential equation that describes the fall of a spherical body in air. The parameters of this equation are the mass and diameter of the rock, Earth's gravitational constant, air density and the Reynolds number of a sphere, that in turn depends on the diameter and instantaneous speed of the rock, as well as air density and viscosity.

Only the rock diameter is input by the user. The rock mass is computed from this diameter, using the average limestone density of 2520 kg per cubic meter. The gravitational constant used corresponds to a 45° latitude at the surface of the Earth. Air density and viscosity depend on temperature and humidity, but values used correspond to 20° Celsius in a saturated atmosphere (100% humidity.)

The equation solution yields the distance travelled by the rock over time with the help of a constant-step 4th order Runge-Kutta method. The computed pit depth takes into account the speed of sound in air.

Find a rock, ideally spherical, and select its **Diameter** with the scroll bar.

At the moment the rock is dropped (with no initial speed), hit the **Rock!** button or any one of the 4 hardware application buttons to start the stopwatch.

When the sound of the rock hitting the bottom of the pit is heard, hit the **Boom!** button or one of the 4 hardware application buttons to stop he stopwatch. The estimated depth is displayed after computations that can last a few seconds. The algorithm accepts fall times of up to 15 seconds.

It is possible to manually input a fall time measured outside of Auriga by tapping the stylus on the time field to make it editable and to write that fall time. Hit the **Boom!**

button to display the corresponding depth.

For a detailed explanation of the physical model and the underlying mathematical treatment; see the *ProfondeurPuits.pdf* document (in French) available in the *Support* page of the Auriga Web site.

Research and algorithm: Pierre Beauchemin

Menu: none.

The Font form

The Font form allows choosing various fonts.

The **Notes** font is used to display network, cave, survey shot and session notes. It is also used for error reports.

The **Survey Shot** font is used to display station names in the Survey Shot form. If the cave has long station names containing letters, the standard font may be preferred.

To avoid cluttering the map, prefer a small font for **Map Stations**. It is possible to load fonts other than the usual basic choices by installing **FontBucket** (www.handshigh.com/fontbucket). FontBucket does not work on Sony Clié devices with high-resolution screen, but Auriga nonetheless offers an accrued font selection.

Menu: none.

The Page Setup form
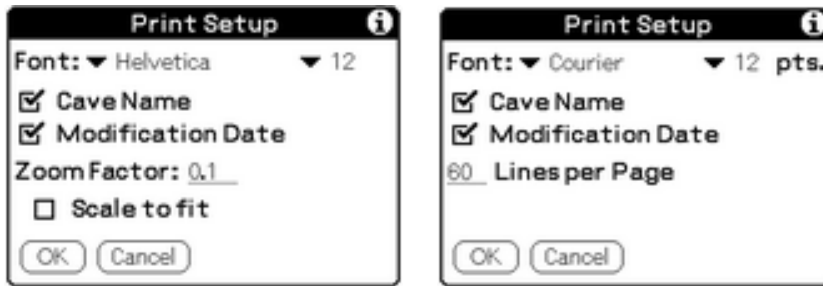
This form pops up when printing and allows configuring the print feature.

Select the print **Font** (Courier, Times or Helvetica) and **Size** (9, 10 or 12 points.) Printing the List form imposes the use of the Courier fixed-width font for column alignment.

Input the number of **Lines per page** for lists (use 0 for continuous paper.)

Input the cave **Map Zoom Factor** used for map printing. This can be determined by experimenting with the target printer and paper size.

Select whether the **Cave Name** and the **Current Date** must be printed too.

Menu: Edit.

Auriga menus

The Cave menus
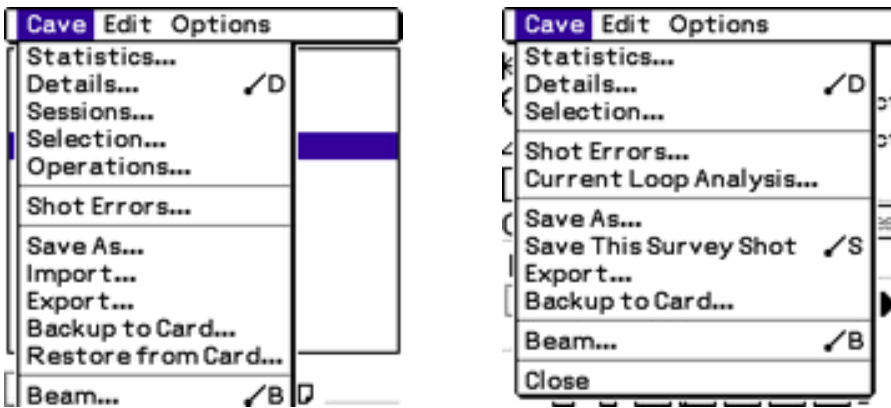
- **Statistics** leads to the Statistics form, that displays statistics for the open or selected cave
- **Details** leads to the Cave Details form that displays details for the open or selected cave
- **Sessions** leads to the Session form. When the Session form is launched via this menu, navigating between sessions does not affect the current shot session setting

(unlike when launched with the *Session* selector in the [Survey Shot](#) form)

- **Selection** leads to the [Selection](#) form
- **Operations** leads to the [Operations](#) form, allowing various Auriga cave maintenance operations
  (available in [Main](#) form only)
- **Shot Errors** computes XYZC coordinates and displays a report of erroneous shots (incomplete or orphan), if any (see the [Map](#) form)
- **Current Loop Analysis** displays the [loop analysis log](#) produced in the [List](#) form
- **Save As** leads to the [Save As](#) form, allowing to save the whole cave or part of it into an existing cave or a new one
- **Import** leads to the [Import](#) form, allowing importing caves from files in various cave survey formats and present on the memory card
  (available in [Main](#) form only)
- **Export** leads to the [Export](#) form, allowing exporting cave data to files in various cave survey formats
- **Backup to Card** saves the current cave in the memory card (see [Database backup/restore on memory card](#))
- **Restore from Card** pops up a list of caves backed up in memory card to be restored into the device main memory
  (available in [Main](#) form only)
  (see [Database backup/restore on memory card](#))
- **Beam** leads to the [Beam](#) form
- **Close** closes the currently open cave (if any) and returns to the [Main](#) form
  (not available in [Main](#) form)

The Network menu
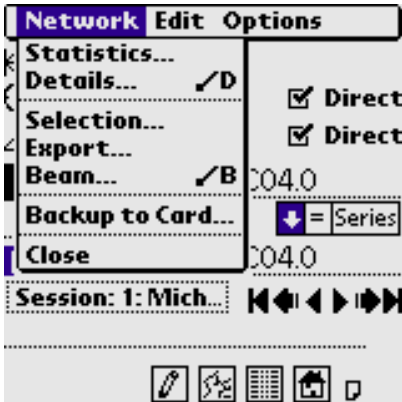
- **Statistics** leads to the Statistics form, that displays statistics for the open or selected network
- **Details** leads to the Network Details form that displays details for the open or selected network
- **Export** leads to the Export form
- **Beam** leads to the Beam form
- **Backup to Card** saves the current network in the memory card (see Database backup/restore on memory card)
- **Restore from Card** pops up a list of networks backed up in the memory card to be restored into the device main memory
  (available in Main form only)
  (see Database backup/restore on memory card)
- **Close** closes the currently open network (if any) and returns to the Main form
  (available in Main form only)

The Edit menu

- **Undo**
- **Cut**
- **Copy**
- **Paste**
- **Select All**
- **Keyboard**
- **Graffiti Help**
- **Swap Stations** swaps the survey stations in the Survey Shot form
  (available in Survey Shot form only)
- **Swap Left-Right** swaps the left-right passage widths in the Survey Shot form
  (available in Survey Shot form only)
- **Slope Calculator** leads to the Slope Calculator form
  (available in Survey Shot form only)
- **Add to Selection** selects the current survey shot in the Selection
  (available in Survey Shot form only)
- **Remove from Selection** deselects the current survey shot in the Selection

(available in Survey Shot form only)

The Options menu
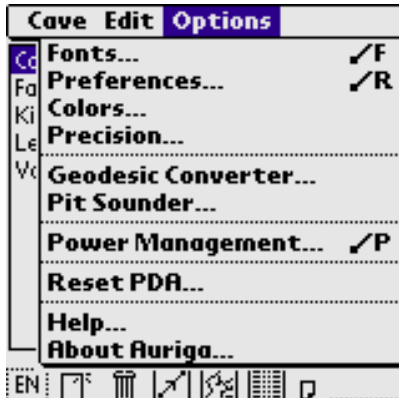
- **Fonts** leads to the Fonts form. The font selected are used in reports, note fields and map display
- **Preferences** leads to the Preferences form
- **Precision** leads to the Precision form
- **Display** leads to the Display form
- **Geodesic Converter** leads to the Geodesic Converter form
- **Pit Sounder** leads to the Pit Sounder form
- **Power Management** leads to the Power Management form
- **Reset PDA** resets the PDA; useful when Bluetooth must be reinitialized
- **Help** displays form-specific help in forms where an **i** button is not present
- **About Auriga** displays the current Auriga version, where a **Limits** button displays the minimum number of computable survey shots; see the Limits section

The Session menu

- **Select as Active Session** selects the displayed session as the active session
- **Go To Active Session** displays the active session
- **Beam** leads to the Beam form

The Defaults menu

- **Save Settings as Defaults** saves the current form settings as defaults
- **Load Default Settings** loads the default settings relevant for the current form

The Preferences menu

- **Initialize** initializes preferences to their default values
- **Beam** beams the preferences to another device

The Map menus
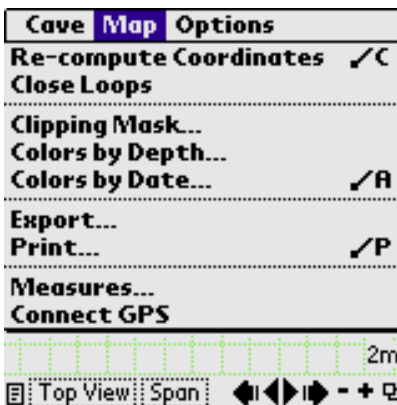
- **Re-compute Coordinates** forces a re-computation of XYZC coordinates
- **Close Loops** triggers the loop closure process
- **Clipping Mask** leads to the Clipping Mask form
- **Colors by Depth** leads to the Colors by Depth form
- **Colors by Date** leads to the Colors by Date form
- **Export** leads to the Map Export form
- **Print** prints the cave map
- **Measures** leads to the Measures form
- **Connect** connects a GPS (for position tracking on the surface) or an acquisition device (DistoX, SAP, TruPulse, etc.) to input splay measures
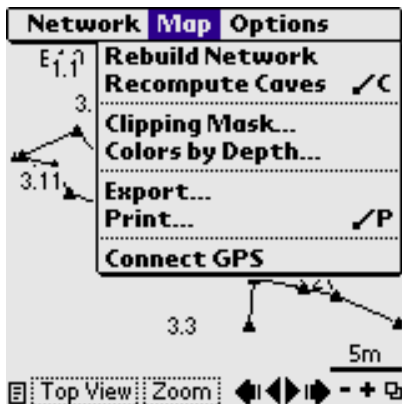
- **Rebuild Network** reloads station coordinates of caves in the network and rebuilds links between them
- **Re-compute Caves** forces a re-computation of XYZC coordinates of all caves in network
- **Clipping Mask** leads to the Clipping Mask form
- **Colors by Depth** leads to the Colors by Depth form
- **Colors by Date** leads to the Colors by Date form
- **Export** leads to the Map Export form
- **Print** prints the network map
- **Connect** connects a GPS for position tracking on the surface

The List menu
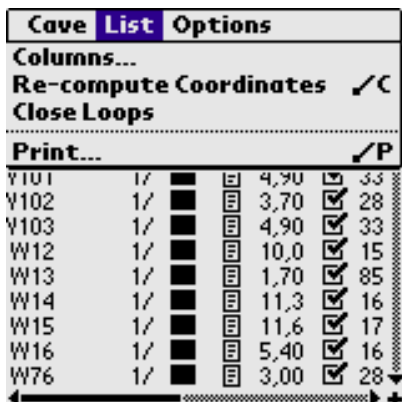
- **Columns** leads to the Columns form
- **Re-compute Coordinates** forces a re-computation of XYZC coordinates
- **Print** prints the current list

The Report menu

- **Export as Memo** exports the report to the built-in Memo application
- **Save to Card** saves the report as a text file in the memory card
- **Beam** beams the report to another device
- **Print** prints the report

The Position menu

This menu is available in the Auriga Keypad when editing the start station of a virtual survey shot or a series beginning. It allows selecting the type of position given to the start station (if any.)
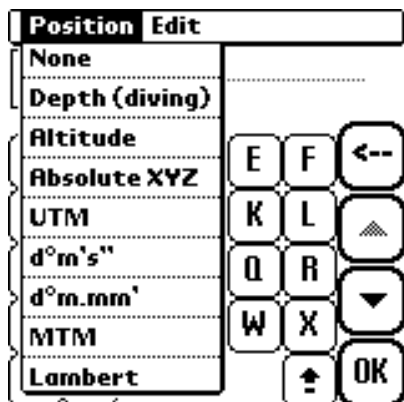
The Selection menu

- **Select All** selects all items in the current view
- **Unselect All** unselects all items in the current view
- **Invert Selection** inverts the current selection in the current view
- **Select Shots from Stations** selects all survey shots for which either one of its stations is already selected
- **Select Stations from Shots** selects all stations referenced by selected survey shots
- **Export** leads to the Export form
- **Beam** leads to the Beam form

The Measures menu
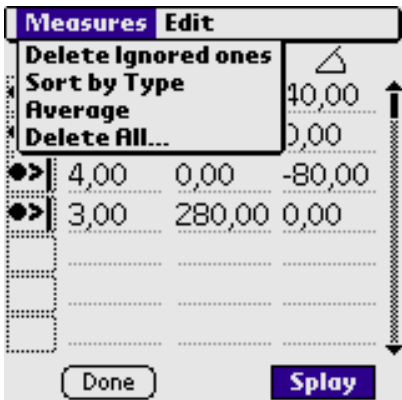
- **Delete Ignored ones** deletes all lines with *Ignored* or *Undetermined* type
- **Sort by Type** sorts measures by type
- **Average** performs averaging on measures in regular mode (foresight, backsight and passage dimensions)
- **Delete All** deletes all measures (emptying the list)

Miscellaneous

Beaming

"Beaming" can be launched in Auriga with the *Beam* item of the *Cave* menu or the *Beam* icon in the command bar menu (displayed when writing a slash ("/") Graffiti gesture.) The Beam form is displayed:
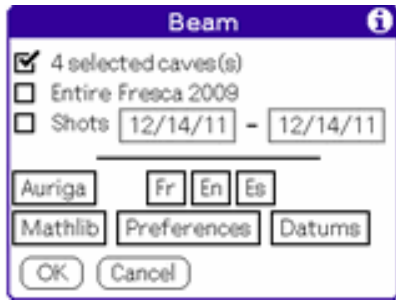
The Beam form offers a choice of beam options; these options are context-dependent and thus, not all of them may always be available.

When launched from the Main form, it is possible to beam Auriga components (executable, language resources, math library, preferences and datums.)

Note: When beaming a networked cave, inputting up to the first 5 characters of the desired cave name while the cave list is open triggers the list lookup.

When using a date range, it spans from 00:00:00 on the start date to 23:59:59 on the end date.

Note: With any beam option, if the beamed cave already exists on the destination device, beamed data is added to the existing cave, or updates it. Nothing gets overwritten in the existing cave.

Cave details are always beamed to the receiving device so as to make beamed data interpretable. Similarly, all sessions relevant to beamed survey shots accompany these survey shots in the beamed data.

Note: By default, infrared transmission is performed; if Bluetooth is available on the device, the link type can be selected.

On the receiving device, the reception of beamed data pops up a form:
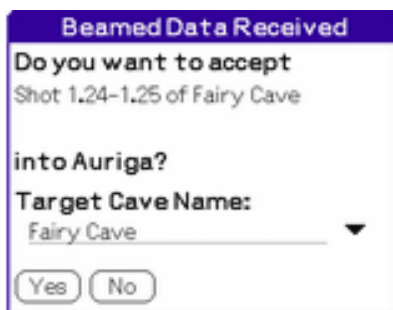
The Beamed Data Received form allows to change the target cave name; this allows creating caves of subparts of caves or to compensate for cave name differences between two devices. The vertical arrow pops up a list of existing caves on the device; inputting up to the first 5 characters of the desired cave name while the cave list is open triggers the list lookup.

If the target cave already exists, a merge process is launched:

- If the merge is about to duplicate survey shots with same survey stations but with differing data, an alert is popped up, and a log is produced in Palm OS Notes. **Stopping at this point is a good idea, the target cave is left unaltered and potential duplicates can then be fixed before repeating the operation to perform the merge**

- Cave Details from the beamed cave are compared with those of the local (existing) cave and the following differences are reported:
    - station name format (6.6 or 12 characters) and character sets; if these differ, a user confirmation may be asked to proceed with the merge process as beamed series beginning could become incompatible with the resulting cave and thus require a prior conversion into virtual survey shots. If beamed and local caves differ by station name character sets, the most permissive sets are assigned for the local cave
    - XYZ coordinates of the cave origin
    - origin station
    - geographic reference station
    - altitude reference station
- beamed survey shots that do not exist in the local cave (with same start/end stations) are inserted in the local cave
- beamed survey shots that already exist in the local cave are compared:
    - local incomplete (missing survey data) survey shots are updated with their complete counterpart from the beamed cave (if available)
    - local survey shots without passage dimensions are updated with passage dimensions from beamed identical survey shots (if available)
    - local survey shots without a note are updated with notes from identical beamed survey shots (if available)
    - beamed survey shots differing from local survey shots with regards to session number, survey data (length, azimuth, slope or passage dimensions) or note are duplicated in the local cave and sorted **before** their corresponding local survey shot
- beamed sessions that do not exist in the local cave (with same session number) are

inserted in the local cave.
- beamed sessions that already exist in the local cave are compared:
    - local sessions without a note are updated with notes from identical beamed sessions (if available)
    - beamed sessions differing from local sessions with regards to instruments calibration, survey shot settings or note are added to the local cave but get renumbered with the first available session number on both sides. Received survey shots associated with these sessions get assigned to the new session numbers.

If the beam merge process modified the local cave, a merge report is generated and written as a memo in the built-in Memo Pad application. This report indicates:

- differences in cave details
- the list of renumbered sessions
- duplicated or updated survey shots
- renumbered or updated sessions

Note: If survey shots or sessions were duplicated by the beam merge process, the user should **immediately clean up** the cave by removing superfluous records, eventually manually merging their data into one. A cave with duplicate survey shots or sessions is bound to create confusion.

Tip: If two or more teams survey a cave, upon exiting the cave,

1. all teams should first beam their cave to one of the devices
2. the cave of this device should be cleaned up from duplicate survey shots and sessions resulting from the merge process
3. the existing cave should be removed from other devices
4. the merged cave should be beamed to these other devices

At the end of this operation, all devices will contain the entire cave data. Failing to remove the existing cave from the devices (step 3) before receiving the merged cave may again result in duplications and require a subsequent clean-up on receiving devices.

Warning: Beaming Auriga caves with file managers like FileZ does not trigger a beam merge process; instead, the beamed cave simply overwrites the local (existing) cave.

Data Save

Saving cave survey data works the same as [Beaming](), except that saved data is stored into a local cave. This allows splitting a cave into subparts (for example, to reduce computation delay) or, on the opposite, to merge into one several parts of a cave mapped separately. Options offered by the Save As form:

are the same as those of the [Beam]() form, but in this case, the edited target cave name must be different from the current cave name.

Note: When saving a subset of a cave into an empty cave, if the original cave has non-zero origin coordinates (see [Computations]() tab of the [Cave Details]() form) and the origin station is not saved to the target cave, the first station of the target cave is set as the origin station and the origin coordinates are computed accordingly.

When saving from the [Survey Shot]() form, if caves are selected in the *Caves* view of the [Selection]() form, it is possible to choose these caves as a target (e.g. when propagating a survey shot data change to loops stored as subcaves.) Conversely, when saving from the [Main]() form, it is possible to choose these caves as the data source so as to merge them all into a single cave (e.g. when returning back into the main cave survey shots managed as subcaves.)

When the **Update Only** pushbutton is selected, only survey shots and sessions that exist in both source and target caves are updated with the source data; other survey shots and sessions are ignored.

Backup/restore on memory card

Auriga can backup or restore its caves or networks to/from a memory card via items in the Cave or Network menu. Restoring a cave/network can only be performed while in [The Main form]()

Requirements are:

- a device with a Secure Digital or Memory Stick slot
- an unlocked card this slot (i.e. not in read-only mode)

In backup mode, the current cave/network DB, or the selected cave/network DB in The Main form, is written in the /PALM/applications/Auriga directory on the memory card. Typing the first letters of the cave or network name allows to reach it faster. A confirmation is required prior to overwriting an existing cave/network.

In restore mode, a list of caves stored in the /PALM/applications/Auriga directory on the memory card is popped up for restore.

This backup/restore feature can be used as a faster alternative to beaming caves/networks between devices. However, data merge is not yet implemented; the restored cave/network can only overwrite the (existing) local cave/network.

Use of silkscreen icons and hardware buttons on 4-button devices

Form/ Key	Calendar	Contacts	To Do	Notes	Calculator[1]	Page Up[2]	Page Down[2]
Survey Shot	Previous series	Previous survey shot	Next survey shot	Next series	Slope Calculator[3]	Previous field	Next field
Survey Shot with Assistant	Sketch to Scale[5]	Keypad	Save + New shot	Map	Calculator	Previous field	Next field
Map (Zoom)	Zoom out	Pan left	Pan right	Zoom in	Calculator	Pan up	Pan down
Map (Info)	Previous series	Previous survey shot	Next survey shot	Next series	Calculator	Previous station	Next station
List	Left border	Scroll left	Scroll left	Right border	Calculator	Scroll up	Scroll down
Auriga Keypad	Symbols	Accents	Alphabet[4]	Numbers	Slope Calculator[3]	Previous field	Next field

Sketch	Exit	Shot Data	Toggle View	Toggle View	Calculator	-	-
Sketch	Exit	Shot Data	Toggle View	Toggle View	Calculator	-	-
Others	Leftward tab	Keypad	-	Rightward tab	Calculator	Previous field	Next field

1. Upper right button in Graffiti area
2. The Palm 5-way Navigator in up/down directions behaves like these buttons
3. If the insertion point is currently in the **Slope** or **Reverse Slope** field; otherwise, pops up the application linked with this button (calculator or other)
4. If the keypad layout is already alphabetic, pops up the Palm OS keyboard
5. The Sketch to Scale form must not confused with the on-screen sketching of passage walls and details

Use of silkscreen icons and hardware buttons on 2-button devices (Palm Zire) and side buttons on the Aceeca Meazura 1500

Form/Key	Calendar	Contacts	Star (HotSync)	Page Up[1]	Page Down[1]
Survey Shot	Previous survey shot	Next survey shot	Slope Calculator[2]	Previous field	Next field
Survey Shot with Assistant	Keypad	Save + New shot	Calculator	Previous field	Next field
Map (Zoom)	Pan left	Pan right	Calculator	Pan up	Pan down
Map (Info)	Previous survey shot	Next survey shot	Calculator	Previous station	Next station
List	Scroll left	Scroll right	Calculator	Scroll up	Scroll down
Auriga Keypad	Palm OS keyboard	Rightward layout	Slope Calculator[2]	Previous field	Next field
Sketch	Shot Data	Toggle View	Calculator	-	-
Others	Keypad	Rightward tab	Calculator	Previous field	Next field

1. The Palm 5-way Navigator in up/down directions behaves like these buttons
2. If the insertion point is currently in the **Slope** or **Reverse Slope** field; otherwise,

pops up the calculator

Use of the brightness button of the Aceeca PDA32 and Meazura 1500

In the Survey Shot form under *Assistant* control, the brightness button creates a new survey shot or saves the current modified one.

In the Measures form, the brightness button pops up the Auriga Keypad.

Use of Sony JogDial and Palm 5-way Navigator

Form/ Action	Jog Up	Jog Down	Jog Push	Jog Back	Navigator Left	Navigator Right	Navigator Select
Main	Scroll up	Scroll down	Open cave	Exit	-	-	-
Survey Shot	Previous field	Next field	Menu	Previous form	Previous field	Next field	Connect device
Survey Shot with Assistant	Previous field	Next field	Menu	Exit	Previous field	Next field	Connect device
Session	Previous session	Next session	Menu	Previous form	Previous field	Next field	-
Map	Previous station	Next station	Menu	Survey Shot form	Left pan	Right pan	-
List	Scroll up	Scroll down	Menu	Exit	Scroll left	Scroll right	Connect device
Auriga Keypad	Previous field	Next field	-	Previous form	Leftward layout	Rightward layout	-
Others	Previous field	Next field	-	Previous form	Leftward tab	Rightward tab	-

Limits

- Maximum number of survey shots per cave: up to 65,534 (depending on device)

- Maximum number of survey sessions: up to 65,535 (depending on device) minus the number of survey shots
- Maximum number of survey shots per survey session: up to 65,534 (depending on device)
- Maximum number of caves on Palm OS device: only limited by memory
- Cave name maximum length: 26 characters
- Maximum number of caves per network: 255
- Precision of survey data:
    - 0.01 unit for length data (meter or foot); 1 inch for feet-inches data
    - 0.01 unit for azimuths and slopes (degree or grad); 1 centidegree for sexagesimal data
    - 0,1 second for theodolite angles
    - 0.1 unit for depths (meter or foot)
    - 1 unit for altitudes (meter or foot)
    - 1 cm (i.e. 2 decimals) for geodesic grid positions
    - 1 microdegree for latitudes/longitudes
- Maximum survey shot length: 655.33 units (meters or feet)
- Maximum passage size at station: 655.33 units (meters or feet)
- Depth range: -3276.7 to 3276.6 units (meters or feet)
- Altitude range: -32767 to 32766 units (meters or feet)

The **maximum number** of computable survey shots is limited by available memory (RAM), as well as the amount of this memory the OS allocates for applications use ("heap"); this depends on device model and Palm OS version.

The **minimum number** of computable survey shots can be obtained with the *Limits* item of the *Options* menu. This estimate assumes an equal number of survey shots and stations. The maximum number of computable survey shots may be higher than the number reported if the cave has many interconnected passages, thus reducing the stations/shots ratio (and stations require almost twice as much computation memory as survey shots.) This estimate does not take into consideration memory used by sessions when computing caves (networks do not require memory for sessions.) If your cave has several sessions, the actual number of computable survey shots might be reduced. Moreover, this assumes that you are simply computing a cave and not displaying lists, which also require memory. If you display a list and later are unable to compute a cave, you might want to try exiting and reentering Auriga to then go straight to computing the map. Obviously, these manoeuvres are only necessary if your cave is close to the device memory limit. When computing a network, see the Network tab of the Network Details form for options to reduce the memory required by computations.

Device	OS	RAM (Mb)	CPU (MHz)	Heap memory	Min. Cave Shots	Min. Network Shots	Min. Network "Light" Shots[1]	Screen Width (mm)
Palm III	3.0	1	4	90.9 Kb	871	897	1,525	56
Palm III	4.1[2]	1	4	121.3 Kb	1,138	1,172	1,992	56
Palm IIIe	3.1	2	16	122.7 Kb	1,322	1,361	2,313	56
Palm IIIx	3.1	4	16	122.7 Kb	1,276	1,313	2,233	56
Palm IIIx	4.1[2]	4	16	249.3 Kb	2,919	3,004	5,100	56
Palm IIIxe	3.5-4.1	8	16	250.0 Kb	2,957	3,044	5,176	56
Palm IIIc	3.5	8	16	250.0 Kb	3,199	3,293	5,598	56
Palm m105	3.5	8	16	250.0 Kb	3,016	3,104	5,278	46
Palm m125	4.0	8	33	249.3 Kb	2,791	2,873	4,884	46
Palm m130	4.1	8[3]	33	249,3 Kb	2,952	3,039	5,167	46
Palm Zire	4.1	2	16	121.3 Kb	1,045	1,076	1,829	46
Palm Zire 22	5.4.9	24	200	4,0 Mb	47 792	48 157	65 535[5]	43
Palm Zire 31	5.2	8[3]	200	1,0 Mb	13,773	14,178	24,103	?
Palm Tungsten E	5.2	32[3]	126	2.0 Mb	28,436	29,272	49,763	54
Palm Tungsten 2[6]	5.2	32[3]	144	800.0 Kb	9,782	10,070	17,119	53
Palm Tungsten 3[6]	5.2	64[3]	400	11.0 Mb	65 535[5]	100,000	100,000	53
Palm T5[6]	5.4.8	256[3]	416	4.0 Mb	42,389[5]	42,389	75,563	56
Palm TX[6]	5.4.9	128[3]	312	6.0 Mb	65,535[5]	100,000	100,000	53
Life Drive[6]	5.4.8	65,2[3]	460	6,0 Mo	63 232[5]	65 018	108 363	?

Sony Clié S-360	4.1	16[4]	33	249.3 Kb	2,462	2,534	4,309	?
Sony Clié SJ-22	4.1	16[4]	33	1.0 Mb	13,572	13,971	23,752	?
Aceeca PDA32[6]	5.4.9	128[3]	312	6.0 Mb	65,535[5]	100,000	100,000	53

1. Reached by deselecting the memory options in the Network tab of the Network Details form
2. After OS upgrade
3. Features a Secure Digital card slot
4. Features a Memory Stick card slot
5. Maximum number of survey shots computable by Auriga regardless of heap size
6. Has Bluetooth

Owners of devices not listed above are invited to run the *Limits* item of the *Options* menu and to report the results obtained.

Tip: if a cave is too large to be computed on a given device (Auriga then reports it could not allocate the graph), or if computations take too much time, it is possible to fragment the cave by exporting to another new cave only areas of current interest (as distinguished by specific sessions and/or series.) After adding new survey shots to this sub-cave, it is possible to merge this new data with the original cave by exporting the sub-cave back into the original cave. All this can obviously be done on the PC, but also in Auriga itself, because although a large cave may not be computable on some older hardware, importing and exporting caves is still possible.

For you information, here is a study on the battery duration of various devices.

Storage

Each Auriga cave is stored in a distinct Palm OS database (PDB.) The cave database consists of general information about the cave, followed by shot and session records, sorted by start and end stations or session number respectively.

- Cave database general information is 380 bytes + note (1 byte/character) + 78 bytes for Palm OS management
- Survey shot records are 56 bytes + note (1 byte/character) + 8 bytes for Palm OS management
- Session records are 138 bytes + note (1 byte/character) + 8 bytes for Palm OS management

Thus, a cave containing 100 survey shots is at least 6 Kbytes in size.

Requirements

Minimum: Palm OS 3.0 or higher (runs on any Palm OS device since the Palm III)
Recommended: Palm OS 3.5 or higher

Uses 1 Mb of RAM.

Supported Geodesic Datum

Note: The *User* datum is offered only if the current cave or network defines it.
Note: Inputting up to the first 5 characters of the desired datum name triggers the datum list lookup in every form.
Note: With some datum, such as European 1950, Auriga offers the mean datum as well as local variants; make sure you select the datum really used by your map or GPS.

Adindan	Mean for Ethiopia, Sudan
Adindan Burkina Faso	Burkina Faso
Adindan Cameroon	Cameroon
Adindan Ethiopia	Ethiopia
Adindan Mali	Mali
Adindan Senegal	Senegal
Adindan Sudan	Sudan
Afgooye	Somalia
Ain el Abd 1970 Bahrain	Bahrain
Ain el Abd 1970 Saudi Arabia	Saudi Arabia
American Samoa 1962	American Samoa Islands
Anna 1 Astro 1965	Cocos Islands
Antigua Island Astro 1943	Antigua (Leeward Islands)
Arc 1950	Mean for Botswana, Lesotho, Malawi, Swaziland, Zaire, Zambia, Zimbabwe
Arc 1950 Botswana	Botswana
Arc 1950 Burundi	Burundi
Arc 1950 Lesotho	Lesotho

Arc 1950 Malawi	Malawi
Arc 1950 Swaziland	Swaziland
Arc 1950 Zaire	Zaire
Arc 1950 Zambia	Zambia
Arc 1950 Zimbabwe	Zimbabwe
Arc 1960	Mean for Kenya, Tanzania
Arc 1960 Kenya	Kenya
Arc 1960 Taanzania	Taanzania
Ascension Island 1958	Ascension Island
Astro B4 Sorol Atoll	Astro B4 Sorol Atoll
Astro Beacon E 1945	Iwo Jima
Astro DOS 71/4	St Helena Island
Astro Tern Island (FRIG) 1961	Tern Island
Astronomical Station 1952	Marcus Island
Australian Geodetic 1966	Australia, Tasmania
Australian Geodetic 1984	Australia, Tasmania
Ayabelle Lighthouse	Djibouti
Belgium 72	Belgium
Bellevue (IGN)	Efate and Erromango Islands
Bermuda 1957	Bermuda
Bissau	Guinea-Bissau
Bogota Observatory	Colombia
Bukit Rimpah	Indonesia (Bangka and Belitung Islands)
Camp Area Astro	Antarctica (McMurdo Camp Area)
Campo Inchauspe	Argentina
Canton Astro 1966	Phoenix Islands
Cape South Africa	South Africa
Cape Canaveral	Bahamas, Florida
Carthage	Tunisia
CH1903	Switzerland
Chatham Island Astro 1971	New Zealand (Chatham Island)
Chua Astro	Paraguay
Corrego Alegre	Brazil

Dabola	Guinea
Deception Island	Deception Island, Antarctica
Djakarta (Batavia)	Indonesia (Sumatra)
DOS 1968	New Georgia Islands (Gizo Island)
Easter Island 1967	Easter Island
Estonia Coordinate System 1937	Estonia
European 1950	Mean for Austria, Belgium, Denmark, Finland, France, W Germany, Gibraltar, Greece, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland
ED50 Cyprus	Cyprus
ED50 Egypt	Egypt
ED50 England	England, Ireland, Scotland, Shetland Islands
ED50 Finland	Finland, Norway
ED50 Greece	Greece
ED50 Iran	Iran
ED50 Italy (Sardinia)	Italy (Sardinia)
ED50 Italy (Sicilia)	Italy (Sicily)
ED50 Malta	Malta
ED50 Gulf	Mean for Iraq, Israel, Jordan, Lebanon, Kuwait, Saudi Arabia, Syria
ED50 Portugal/Spain	Portugal, Spain
ED50 Tunisia	Tunisia
ETRS89	Europe
European 1979	Mean for Austria, Finland, Netherlands, Norway, Spain, Sweden, Switzerland
Finland Hayford	Finland Hayford
Fort Thomas 1955	Nevis, St. Kitts (Leeward Islands)
Gan 1970	Republic of Maldives
Gandajika Base	Gandajika Base
Geodetic Datum 1949	New Zealand
Graciosa Base SW 1948	Azores (Faial, Graciosa, Pico, Sao Jorge, Terceira)
Guam 1963	Guam
Gunung Segara	Indonesia (Kalimantan)

GUX 1 Astro	Guadalcanal Island
Herat North	Afghanistan
Hermannskogel Datum	Croatia -Serbia, Bosnia-Herzegovina
Hjorsey 1955	Iceland
Hong Kong 1963	Hong Kong
Hu-Tzu-Shan	Taiwan
Indian Nepal	India, Nepal
Indian Pakistan	Pakistan
Indian Bangladesh	Bangladesh
Indian 1954 Thailand	Thailand
Indian 1960 Con Son Island	Vietnam (Con Son Island)
Indian 1960 Vietnam	Vietnam (Near 16 N)
Indian 1975 Thailand	Thailand
Indonesian 1974	Indonesia
Ireland 1965	Ireland
ISTS 061 Astro 1968	South Georgia Islands
ISTS 073 Astro 1969	Diego Garcia
ITRF92	
Johnston Island 1961	Johnston Island
Kandawala	Sri Lanka
Kerguelen Island 1949	Kerguelen Island
Kertau 1948	West Malaysia and Singapore
Kusaie Astro 1951	Caroline Islands
Korean Geodetic System	South Korea
L. C. 5 Astro 1961	Cayman Brac Island
Lambert 2005	Belgium
Lambert 2008	Belgium
Leigon	Ghana
Liberia 1964	Liberia
Luzon Philippines	Philippines (Excluding Mindanao)
Luzon Mindanao	Philippines (Mindanao)
M'Poraloko	Gabon
Mahe 1971	Mahe Island

Marco Astro	Marco Astro
Massawa	Ethiopia (Eritrea)
Merchich	Morocco
Midway Astro 1961	Midway Islands
Minna Cameroon	Cameroon
Minna Nigeria	Nigeria
Montserrat Island Astro 1958	Montserrat (Leeward Islands)
Nahrwan Oman	Oman (Masirah Island)
Nahrwan Saudi Arabia	Saudi Arabia
Nahrwan United Arab Emirates	United Arab Emirates
Naparima BWI	Trinidad and Tobago
NAD27 Alaska	Alaska (Excluding Aleutian Ids)
NAD27 Bahamas	Bahamas (Except San Salvador Id)
NAD27 Canada	Mean for Canada
NAD27 Canal Zone	Canal Zone
NAD27 Caribbean	Mean for Antigua, Barbados, Barbuda, Caicos Islands, Cuba, Dominican Republic, Grand Cayman, Jamaica, Turks Islands
NAD27 Central America	Mean for Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua
NAD27 Conus	Mean for Conus
NAD27 Cuba	Cuba
NAD27 Greenland	Greenland (Hayes Peninsula)
NAD27 Mexico	Mexico
NAD27 San Salvador	Bahamas (San Salvador Island)
NAD83	Canada USA
North Sahara 1959	Algeria
Nlle Triangulation Française	Nlle Triangulation Francaise
Observatorio 1966	Observatorio 1966 Azores
Observatorio Meteorologico 1939	Azores (Corvo and Flores Islands)
Ocotepeque 1935	Costa Rica (Stentz)
Old Egyptian 1907	Egypt
Old Hawaiian	Mean for Hawaii, Kauai, Maui, Oahu
Oman	Oman

Ordnance Survey UK 1936	Mean for England, Isle of Man, Scotland, Shetland Islands, Wales
Pico de las Nieves	Canary Islands
Pitcairn Astro 1967	Pitcairn Island
Point 58	Mean for Burkina Faso and Niger
Pointe Noire 1948	Congo
Porto Santo 1936	Porto Santo, Madeira Islands
Provisional South American 1956	Mean for Bolivia, Chile, Colombia, Ecuador, Guyana, Peru, Venezuela
Prov S Am 56 Bolivia	Bolivia
Prov S Am 56 N. Chile	Chile (Northern; Near 19 S)
Prov S Am 56 S. Chile	Chile (Southern; Near 43 S)
Prov S Am 56 Colombia	Colombia
Prov S Am 56 Ecuador	Ecuador
Prov S Am 56 Guyana	Guyana
Prov S Am 56 Peru	Peru
Prov S Am 56 Venezuela	Venezuela
Provisional South Chilean 1963	Chile (Near 53 S) (Hito XVIII)
Puerto Rico	Puerto Rico, Virgin Islands
Pulkovo 1942	Russia
Qatar National	Qatar
Qornoq	Greenland (South)
Reunion	Mascarene Islands
Rome 1940	Italy (Sardinia)
RT 90 Sweden	RT 90 Sweden
S-42 (Pulkovo 1942) Hungary	Hungary
S-42 (Pulkovo 1942) Poland	Poland
S-42 (Pulkovo 1942) Czechoslovakia	Czechoslovakia
S-42 (Pulkovo 1942) Latvia	Latvia
S-42 (Pulkovo 1942) Kazakhstan	Kazakhstan
S-42 (Pulkovo 1942) Albania	Albania
S-42 (Pulkovo 1942) Romania	Romania
S-JTSK	Czechoslovakia (Prior 1 JAN 1993)

Santo (DOS) 1965	Espirito Santo Island
Sao Braz	Azores (Sao Miguel, Santa Maria Ids)
Sapper Hill 1943	East Falkland Island
Schwarzeck	Namibia
Selvagem Grande 1938	Salvage Islands
Sierra Leone 1960	Sierra Leone
South American 1969	Mean for Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Trinidad and Tobago, Venezuela
SA69 Argentina	Argentina
SA69 Bolivia	Bolivia
SA69 Brazil	Brazil
SA69 Chile	Chile
SA69 Colombia	Colombia
SA69 Ecuador	Ecuador
SA69 Galapagos	Ecuador (Baltra, Galapagos)
SA69 Guyana	Guyana
SA69 Paraguay	Paraguay
SA69 Peru	Peru
SA69 Trinidad and Tobago	Trinidad and Tobago
SA69 Venezuela	Venezuela
South Asia	Singapore
Southeast Base	Southeast Base - Maderia
Southwest Base	Southwest Base - Azores
Tananarive Observatory 1925	Madagascar
Timbalai 1948	Brunei, E. Malaysia (Sabah Sarawak)
Tokyo	Mean for Japan, South Korea, Okinawa
Tristan Astro 1968	Tristan da Cunha
Viti Levu 1916	Fiji (Viti Levu Island)
Voirol 1960	Algeria
Wake Island Astro 1952	Wake Atoll
Wake-Eniwetok 1960	Marshall Islands
WGS 1960	Global Definition
WGS 1966	Global Definition

WGS 1972	Global Definition
WGS 1984	Global Definition
Yacare	Uruguay
Zanderij	Suriname

Frequently Asked Questions

Numbers cannot be entered with a comma/period decimal separator

Auriga uses the decimal separator selected in the Palm OS Prefs program

Survey shots cannot be saved without inputting passage dimensions

The *Passage Dimensions* checkbox in the *Shots* tab of the *Sessions* form determines whether passage dimensions are mandatory or optional

When saving new survey shots, Auriga keeps asking whether to create a new survey shot or to replace the current (existing) one

The proper way to create new survey shots is to tap the *New* (square with a star) button in the *Survey Shot* form; this auto-increments station names and clears other input fields. On the other hand, editing the input fields to enter a new survey shot "over" an existing one naturally prompts Auriga to ask whether to replace the current survey shot or to create a new one

The cave map is empty or incomplete

An empty or incomplete cave map can be due to several causes:
- ❍ the current zoom ratio or pan factor puts all survey shots off screen
- ❍ no survey shot could be computed (try the *Re-compute Coordinates* item in

the *Map* menu to see what happens)

○ the state of the *Draw* checkbox in sessions, series or individual survey shots prevents survey shots from being drawn

○ the *Line Plot* item is unselected in the *Map Settings* popup list (leftmost icon at the bottom of the Map form)

○ the cave contains orphan legs while the *Orphan Legs* item is unselected in the *Map Settings* popup list (check the *Shot Errors* item in the *Cave* menu to display survey shot errors)

○ the selected default, session, series or individual survey shot colors (depending on the *Map Coloring* option in the *Map Settings* popup list) are invisible against the currently selected background color (black or white)

Auriga repeatedly starts with a crash

When Auriga is launched, it re-opens the cave and the form it was left in when last exited. So, if for some reason the last opened cave/network crashes Auriga, re-starting Auriga will repeatedly crash. This cycle can be broken by holding down the **Up** button while tapping on the Auriga icon; an alert will then ask whether to start Auriga without opening the previous cave/network. Select **OK**. If things still go bad, repeat the operation, but this time select the **Reset** button to reset all Auriga preferences; note that this does not affect cave-specific settings. After that, you should report the bug to me, along with the faulty _Cave.PDB file.

The screen appears lighter on a Palm IIIxe when running Auriga

Due to a quirk in the graphic controller of some Palm IIIxe devices, when Auriga turns on the 4 bits/pixel mode to enjoy 16 shades of gray in the cave map, blacks tend to become lighter.

The vertical scroll bar does not work in the List form

On devices with Palm OS version prior to 3.5, vertical scroll bars did not always work. Use the **Up** and **Down** buttons instead.

Auriga Web site:

www.speleo.qc.ca/Auriga

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