



Mobile Mapping Field Software



Reference Manual

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1. Installing Mobile Mapping

Installing Mobile Mapping on Mobile Mapper CX is a three-step process:

1. Uploading Installation files from the Mobile Mapping CD to the MobileMapper CX through Microsoft ActiveSync.
2. Installing Mobile Mapping in MobileMapper CX. This step is automatically started in MobileMapper CX once all the installation files have been uploaded.
3. Unlocking Mobile Mapping by entering a product key in MobileMapper CX.

Installation Instructions

It is assumed that Microsoft ActiveSync is running on your office computer. ActiveSync can be installed using the installation files provided on the MobileMapper CX Companion CD.

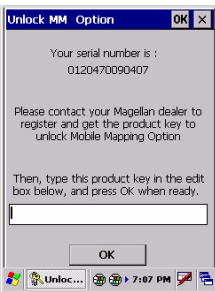
It is also assumed that MobileMapper CX's USB port has been set to "USB serial for ActiveSync". See "Setting the Mini-USB Port" in your MobileMapper CX Getting Started Guide.

1. Attach the I/O module to the back of the MobileMapper CX unit.
2. Connect the MobileMapper CX to your office computer using the USB cable. The USB cable is plugged into MobileMapper CX's I/O module.
3. Turn on MobileMapper CX.
4. Insert the Magellan MobileMapping CD into your CD drive of your office computer. Wait until the auto-run window opens on the computer screen. If the auto-run file fails to start automatically, browse the installation CD and run the Setup.exe file.
5. Choose your language.
6. Click on the **Install Mobile Mapping 1.3x with...** option corresponding to your area (US or European map).
7. Click **OK** when the **Install "Magellan Mobile Mapping 1.3x" using the default application install directory** message appears. This starts the installation. The message **Installing Magellan Mobile Mapping 1.3x...** is displayed while the installation files are transferred to the MobileMapper CX.

- At the end of the file transfer, the following message is displayed on the computer: Please check your mobile device screen to see if additional steps are necessary to complete this installation. Click OK to close this message box. During this time, the MobileMapper CX has started installing the software. A progress bar is displayed on the MobileMapper screen to indicate the different phases of the installation. The progress bar disappears when installation is complete. The MobileMapper CX workspace screen then shows the **Mobile Mapping** shortcut icon.

Unlocking Mobile Mapping

- Double-tap the Mobile Mapping icon. This opens the Unlock MM Option screen.
- Type the product key (a 13-character string) your Magellan dealer provided to you when you purchased the option.
- Tap OK. A message indicates that Mobile Mapping was successfully unlocked.
- Tap OK to close the message window.
- Select the Mobile Mapping interface language from the list of available languages.
- Press ENTER to accept the license agreement and to start using Mobile Mapping.

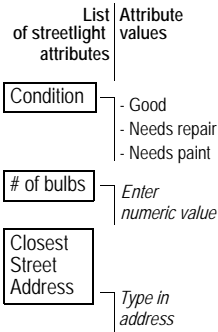


2. Collecting GPS/GIS Data

Introduction to Feature Libraries

A feature library is a hierarchical structure that guides you through the description process so you know you will describe thoroughly and quickly each feature you visit. You will not have to remember what attributes of each feature you should record: the feature library will tell you!

Example of a “streetlight” point feature, as may be described in a feature library



Feature libraries are created using the Feature Library Editor module in MobileMapper Office.

Feature libraries contain lists of features that you should be visiting during your field sessions.

Features are four types:

- Point feature: The geometrical representation of this feature is a point. Logging this type of feature requires static occupation at the point.
- Line feature: The geometrical representation of this feature is a line. Logging this type of feature requires that you move along this line.
- Area feature: The geometrical representation of this feature is an area. Logging this type of feature requires that you move along its contour.
- Grid feature: The geometrical representation of this feature is an array of evenly-distributed waypoints. Mobile Mapping will guide you to each of these waypoints where you should enter a measurement performed at this point.

Each feature also has a number of attributes. There are three categories of attributes:

- Menu style where the attribute values are words or phrases that you pick off a list (e.g. a list of values for the attribute Condition might include Good, Needs Repair, etc.; see opposite)
- Numeric style where you select a number within a specified range (e.g. the # of bulbs might be in the range 0 to 3)
- Text style where you type in a note that can contain both numbers and letters (e.g. the closest street address)

You can upload as many feature libraries as you want into your unit. Just remember that you can use only one feature library for logging data to an individual job.

Logging New GPS/GIS Data

1. Launching Mobile Mapping - Mobile Mapping Settings

Assuming the Mobile Mapping software has been installed as explained in *Installing Mobile Mapping on page 1* and MobileMapper CX has been started according to the instructions in *Preparing for first-time use in the MobileMapper CX Getting Started Guide*, do the following:



1. Turn on MobileMapper CX by pressing the power button. The unit turns on, starts the boot sequence and then displays the workspace screen.
2. Take MobileMapper CX to a location where there is clear view of the sky.
3. Double-tap the Mobile Mapping shortcut icon. This starts Mobile Mapping. You should now see the satellite status screen. If not, press the NAV key until you see this screen (see below).

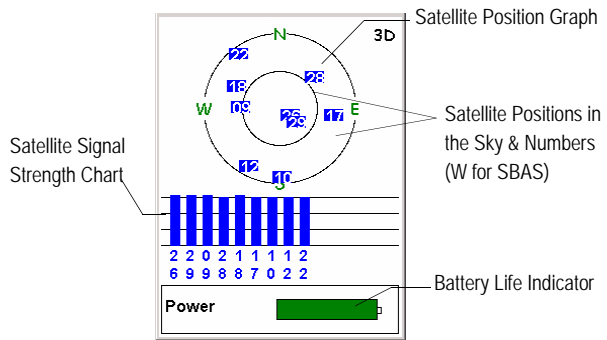
Watching the bars appear and turn solid on the screen, you can progressively see the unit lock onto satellites.

Satellite Signal Strength Chart:

Clear bars indicate that the unit is starting to get information from satellites. Solid bars indicate that the satellites are being used to compute your position.

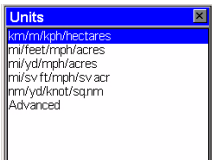
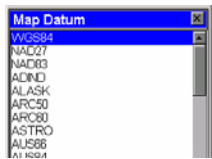
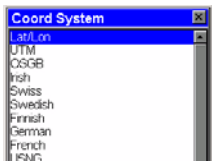
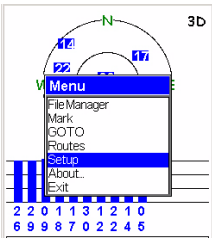
Satellite Position Graph:

The 2 circles indicate satellite elevation as seen from your current position. The outer circle represents the horizon and the inner circle represents 45° from the horizon. The center of the circle is 90° from the horizon, or directly overhead.



For best accuracy, it is important to hold the receiver at an angle of 45° from horizontal and not too close to you.





While the unit is acquiring satellites, take a minute to familiarize yourself with some of the Mobile Mapping setup functions. Press the MENU key and select **Setup**.

There are many options to select among, and all are explained in full in the section entitled *MENU key on page 44*. For the purposes of getting started, however, we will concentrate on just a few.

Language

Mobile Mapping supports multiple languages. You can select the language you are most familiar with by using this option.

Coordinate system (Coord System)

Mobile Mapping can display your position in a variety of coordinate systems, both geographic and grid systems. Unless you know which one you want to use, you can use the default choice (Lat/Lon) for the primary system. You can always transform any data you collect in the field to the coordinate system used by your GIS when you get back to the office.

Map Datum

You can select the map datum you want to display your data in. As with the Coordinate System option, you can use the default choice (WGS 84) for the primary map datum while you are getting started.

Mobile Mapping can calculate and display your position on two different map datums with each datum having its own coordinate system.

Nav Units

You use this option to set the units of measurement you want to use. The default for long distances, short distances, speed and area are kilometers, meters, kph and hectares. You can set this to miles, feet, mph, acres if you like or to three other standard sets of units. You can also create a custom mix of units by selecting the **Advanced** option that contains a wide variety of units for distance, speed, elevation, bearing and area.



Entering a job name

Note that Mobile Mapping includes a "Generic" library containing default features. This library contains a point feature, a line feature, an area feature and a grid feature. Each of these features has a single text-style attribute. Use this library only as a "backup" library.

4. Creating a Job and Selecting a Feature Library

- Press the LOG button
- Tap **Create New Job**. The screen displays the Job Name field in which you should enter the name of the new job. A keyboard is displayed underneath to let you enter this name.
To enter a name, tap on the corresponding letters on the keyboard.
- When you have finished entering the name, tap **↵** on the on-screen keyboard or press the ENTER key. A new screen is then displayed listing the feature libraries stored in your unit.
- Tap the name of the feature library you want to use. A new screen is then displayed asking you to choose the job mode:
 - **Real-time:** If you select this job mode, the receiver will record only feature positions and descriptions and GPS metadata. Jobs recorded in real-time mode cannot be differentially corrected later on.
 - **Post-processing:** Select this job mode to allow Mobile Mapping to record the job so that later on, it can be post-processed in MobileMapper Office. In this job mode, Mobile Mapping will record GPS measurements files in addition to the MMJ job file that is recorded in real time. **Warning!** This job mode can only be used after entering an activation code. For more information, see *Post-Processing Option* on page 25.
- Tap one of these modes. The screen now lists all the features available from the selected feature library.

5. Logging and Describing a Point Feature

Mobile Mapping uses a fixed, time-based logging interval (1 second) when you log a point feature. The logging interval parameter cannot be accessed when you log a point feature.

ref	
Str: Light	
Condition	
# of bulbs: 1	
Closest Ad: Unknown	
Logging:	
Time on Point: 00:00:08	
Num Sat	PDOP
6	2.9
Options	Done

Logging screen

The Logging screen also displays the time elapsed since you started logging at this point feature, the number of satellites currently received and the current value of PDOP.

If you start logging a new feature and you realize this is a mistake, then you can delete the new feature being logged by tapping the Options button and selecting Delete <feature name>.

Deleting features only applies to new features being logged, not to features already logged.

- Choose the type of feature you want to log from this list. You can tell by the name of this feature whether it is a point feature, a line feature or an area feature.
- Tap a point feature (you are supposed to be near one of these features) and tap the on-screen **Log** button. This starts feature logging. A sound is heard every time Mobile Mapping logs data.
The Logging screen is now displayed where you can see the list of attributes pertaining to this feature. You will now enter the “Description” phase of the feature.
- Tap the first attribute and enter the right attribute value describing the feature near you. This takes you back to the Logging screen.
- Highlight the next attribute in the list and repeat the previous step. Repeat this step until all the attributes have been properly described.
“Describing” the feature only takes a few seconds. By the time you are done with the feature description, the feature’s GPS position will have been saved in the job. You can also stay more time on the feature to let the receiver determine several positions. This will give an even more accurate position for the feature as Mobile Mapping will average all the GPS positions it has computed on the feature.
- To stop logging the feature, tap **Done**. This takes you back to the Feature List screen
- Move to the next feature and resume the above instructions to log this feature.

6. Logging and Describing a Line Feature

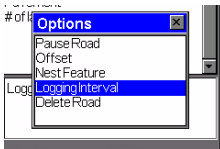
Basically, you use the same procedure as when you log a point feature (see 2. above). There are however two differences when you log a line feature:

- You need to define a logging interval when you start logging the feature
- And then you are supposed to move from the beginning to the end of the line feature before stopping the logging.

These differences are explained below.

After tapping a line feature from the Feature List screen (for example a road) and tapping the **Log** button, Mobile Mapping starts logging GPS positions from the position where you are. The default logging interval is 5 seconds.

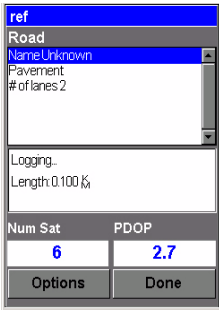
By decreasing the logging interval you can increase the level of detail in your maps. By increasing the logging interval, you can save memory. In general, you should set the logging interval to the smallest setting possible without running out of memory. Remember you can take multiple SD cards with you to the field. The only requirement is that you close the job file before replacing the SD card.



Selecting the logging interval option

To change this interval:

- Tap **Options** on the screen and then **Logging Interval**.



Logging screen

The Logging screen also displays the distance traveled since you started logging the line feature, the number of satellites currently received and the current value of PDOP.

Two options are then prompted:

By Time: Select this option when you want to log a new GPS position at regular intervals of time regardless of the distance traveled since the last position logged.

After tapping this option, tap the desired time interval. This takes you back to the Logging screen where you can see the list of attributes pertaining to the feature.

By Distance: Select this option when you want to log a new GPS position only after you have moved by a certain distance since the last position logged. After tapping this option, tap the desired distance interval. This takes you back to the Logging screen where you can see the list of attributes pertaining to the feature.

- As you would for a point feature, describe the feature by describing the different attributes pertaining to the feature
- When the description is finished, you can start walking along the line feature
- When you arrive at the end of the line feature, with your unit still displaying the Logging screen, tap **Done** to stop logging the feature.

The receiver determines the length of a line feature by estimating the distance between successive points on the line feature with the assumption that each point is on a sphere of average Earth radius. The elevations of the points are not factored into the equation. Thus the receiver calculates the spherical distance rather than the horizontal or slope distance between the successive positions.

If you wish to change the logging interval while you are logging a line feature, do the following:

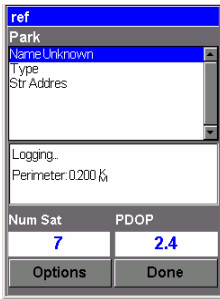
- Tap **Options** and then **Logging Interval**. Set the new logging interval as explained above. The receiver will continue to log the feature, but this time according to the new logging interval.

7. Logging and Describing an Area Feature

Basically, you use the same procedure as when you log a line feature, especially regarding the need for defining a logging interval (see 4. above). The only difference between a line and area feature is that for an area feature, the first and last position calculated by the receiver are connected when you close the feature.

Record the attributes of an area feature as you do for a line feature (see *page 8*):

- Tap the name of the area feature from the list of features and tap the **Log** button. Mobile Mapping starts logging the area feature.
- Choose a logging interval (see explanations given for a line area on *page 8*). This takes you back to the Logging screen where the list of attributes for the feature is displayed
- Describe each attribute by selecting or entering the appropriate attribute value for each of them.



Logging screen

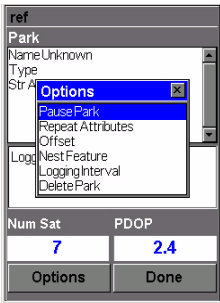
This screen displays the current values of perimeter and area measured since you started logging the feature (+ number of satellites and PDOP)

The receiver determines the perimeter of an area feature by estimating the distance between successive points on the line feature with the assumption that each point is on a sphere of average Earth radius. The elevations of the points are not factored into the equation. Thus the receiver calculates the spherical distance rather than the horizontal or slope distance between the successive positions. The perimeter of the area feature is the sum of all these distances. For the same reason, the measured area is that of a curved, not flat, feature.

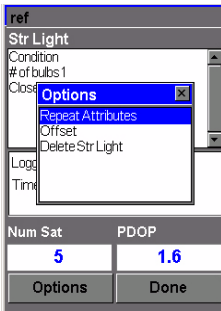
8. Pausing a Feature

When you are recording lines or areas, it is sometimes impossible to walk or drive the entire length of the feature because of obstacles in your way such as fences, buildings, bodies of water, etc. When you must interrupt the recording of any feature (excluding point features), follow these steps:

- Tap **Options** and then **Pause <feature name>**. This pauses the logging of the feature.
- Move around the obstacle to the next accessible portion of the feature
- To resume logging, tap **Options** and then **Resume <feature name>**. This resumes the logging.
- When you finish logging the feature, just tap **Done**.



Selecting the **Pause Park** option



Selecting the Repeat Attributes option

9. Logging New Features with Same Attributes as Those Set in the Previously Logged Feature

If you close a point, line or area feature and want to log the location of another feature of the same type and with an identical description, use the **Repeat Attributes** function. After closing a feature, Mobile Mapping takes you back to the Feature List screen on which the same feature type is still selected. Just do the following:

- Move to the next similar feature you want to log.
- Tap **Log** to start logging the new feature.
- Tap **Options** and then **Repeat Attributes**. As a result, all the attributes of the previously logged feature are immediately assigned to the feature being logged.
- After logging the GPS position(s) of this feature, tap **Done** to close the feature.

10. Nesting a Feature

When you are logging GPS positions to a feature, you may find another feature that you also want to log. Rather than log the entire feature and come back to record this other feature, you can simply pause the feature being logged, log the other feature, close it and resume logging the first feature.

Logging one feature while you have paused another feature is called “nesting.” You can nest any feature, point line or area, into any line or area feature. It is not possible to nest a point feature inside another point feature.

Nesting is particularly useful when you are mapping things such as a road with streetlights along the route or a shoreline with stretches of erosion along it and the locations of certain habitats.

Assuming you are logging a line feature and the Logging screen is displayed, do the following, for example to nest a point feature:

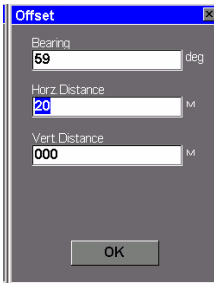
- Tap **Options** and then **Pause <feature name>**. This pauses the logging of the line feature.
- Tap **Options** again and then **Nest Feature**
- Move to the location of the feature you want to nest
- In the Feature List screen now displayed, tap the feature type you want to nest.
- Tap **Log** to start logging this feature.
- Describe the attributes of the feature as explained above
- Tap **Done** when you have finished logging the nested feature.
- Tap **Options** and then **Resume <feature name>**. This takes you back to the Logging screen from which you can normally finish the logging of the line feature.

11. Offsetting a Point Feature

Sometimes the feature you want to put on the map is in area of poor GPS reception or is not accessible. This is when you can map the feature using the offset utility. By combining the receiver's position with the bearing and distance to the feature, Mobile Mapping will automatically calculate and record the position of the feature.

To input an offset for a point feature, assuming the Feature List screen is now displayed, do the following:

- Tap one of the listed point features available from the selected feature library.
- Tap **Log** to start logging the feature
- Tap **Options** and then **Offset**.



Point Offset screen

If you do not have a compass, you can use the Compass screen (see also page 30) to determine the bearing to the offset feature. If you have been moving for 5 to 10 seconds along a straight line, the Compass screen will tell you your bearing. You can use this to determine the bearing to the offset feature. CAUTION! The receiver cannot determine direction while stationary and the compass direction remains the same even if you rotate the receiver.

Visual estimation for horz. & vert. distances is usually good enough in terms of accuracy.

This displays the Point Offset screen on which you should enter the following parameters:

Bearing: Compass direction to the feature from your current position. You need a compass to measure this angle (see also opposite). To input a value for **Bearing**, press ENTER and type in the new value from the keyboard or the on-screen keyboard. Then press ENTER again.

Press the down arrow to move the cursor to the next field.

Horz. Distance: Horizontal distance to the feature from your current position. To input a value for **Horz. Distance**, press ENTER and type in the new value from the keyboard or the on-screen keyboard. Then press ENTER again.

Press the down arrow to move the cursor to the next field.

Vert. Distance: Vertical distance to the feature from your current position ("0" if the feature and yourself are at the same elevation -on a flat area). To input a value for **Vert. Distance**, press ENTER and type in the new value from the keyboard or the on-screen keyboard. Then press ENTER again.

Press the down arrow to move the cursor to the next field.

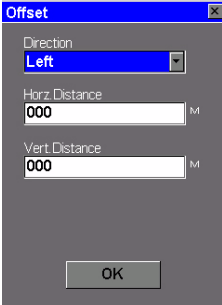
- Then tap **OK** to return to the Logging screen. This writes the offset into memory, but you can edit it later if you like by going through the same process. If you close the feature and return to the Map screen, you will see that the feature is offset from your position in the middle of the screen.

12. Offsetting a Line or Area Feature

For the same reasons as a point feature (see previous page), you may need to use the offset utility to map a line or area feature. By combining the receiver's position with the direction and the distance to the feature, Mobile Mapping will automatically calculate and record the location of the feature.

To input an offset for a line or area feature, assuming the Feature List screen is now displayed, do the following:

- Tap one of the line or area features available from the open feature library.
- Tap the Log button to start logging the feature.
- Tap Options and then Offset. This displays the Line or Area Offset screen on which you should enter the following parameters:



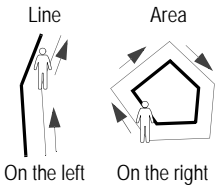
Line or Area Offset screen

Direction: Location of the feature with respect to your actual path. To input a value for **Direction**, tap the down arrow and then tap the desired option (Right or Left). Press the down arrow to move the cursor to the next field.

Horz. Distance: Horizontal distance to the feature from your current position. To input a value for **Horz. Distance**, press ENTER and type in the new value from the keyboard or the on-screen keyboard. Then press ENTER again.

Press the down arrow to move the cursor to the next field.

Vert. Distance: Vertical distance to the feature from your current position ("0" if the feature and yourself are at the same elevation -on a flat area). To input a value for **Vert. Distance**, press ENTER and type in the new value from the keyboard or the on-screen keyboard. Then press ENTER again.



Visual estimation for horz. & vert. distances is usually good enough in terms of accuracy.

Press the down arrow to move the cursor to the next field.

- Tap OK to return to the Logging screen. This writes the offset into memory, but you can edit it later if you like by going through the same process.
Note: Offsets to area features are applied in MobileMapper Office and not in the receiver.

13. Logging GIS Data on a Preset Grid Feature

To operate the grid mapping utility, you will need a measurement device - anything from a depth sounder to a ruler, your own sense of smell or your ability to make visual observations. You will also need a compass.

The Grid Mapping Utility is an easy way to automatically set up a series of GPS waypoints to facilitate the logging of data in an orthogonal grid. This utility assures that you gather measurements made using field sensors such as chemical detectors, depth sounders and magnetometers at an evenly distributed set of locations. This in turn assures the creation in your GIS of contour maps with a prescribed density of data and without any gaps that might force you to return to the field.

The Grid Mapping Utility deals with two different grid concepts: grid features and grid points.

- Grid features are arrays of uniformly spaced waypoints oriented in rows and columns
- Grid points are navigation features similar to waypoints.

Important Notice: Once you have logged a grid feature in a job (assuming the selected feature library allows you to do so), you cannot log any other feature type in the job, not even another grid feature. Conversely, once you have logged a point, line or area feature, you cannot log a grid feature even though the feature library selected for the job does initially include a grid feature type.

For this reason, you should collect your grid data in specific jobs.



GOTO will not be shown in the menu list if you press MENU while the unit displays the Map screen in cursor mode. In that case, just press NAV and then MENU again.

Grid Setup

Grid

Spacing: 0050 M

Columns: 010

Rows: 010

Heading: 000 deg

OK

Grid Setup screen

To log GIS data on a preset grid, do the following:

- If you have created a waypoint to help you locate the first grid point, you can use any of the navigation screens to get there. Press MENU and tap GOTO. Using the Left or Right arrow, make sure **Alphabetical** is selected at the bottom of the screen. Then tap **User Waypoint**. In the list of waypoints now displayed, tap the name of the waypoint you want to go to. Again, you may use any of the navigation screens to arrive at this waypoint
- Once you arrive at the point of beginning, you should open up the job file that includes the feature library describing the grid. If you opened an existing job, press LOG to take you to the New Feature screen. Then tap the grid feature type listed on the screen. Usually the term "grid" is included somewhere in the feature name so that you can easily recognize this type of feature. Tap the on-screen Log button. The Grid Setup screen appears on which you can read the definition of the grid (see opposite).

When you navigate to the location of the grid, you may decide to readjust the size and orientation of the grid based on field observations that you did not foresee back in the office. For example, you may find that navigating to waypoints with an east-west orientation is not feasible if the area of interest is situated on a narrow strip of land between two north-south running streams.

When you change the definition of a grid, Mobile Mapping always assumes that you are standing in the corner of the grid from which you can see the grid extend in front of you and to the right.

The definition of a grid is based on the following four parameters:

Spacing: Distance between any two consecutive waypoints in any row or column (default: 50 meters or 100 feet, depending on the units used)

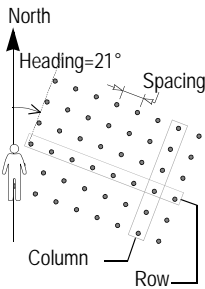
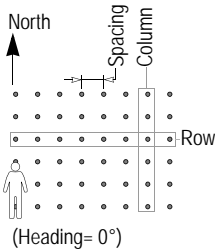
Columns: Number of waypoints along the axis facing you (default: 10; Max.: 100)

Rows: Number of waypoints along the axis perpendicular to the direction you are facing (default: 10; Max.: 100)

Heading: Direction you face when the grid's columns extend in front of you and the rows extend to your right.

- To change the above parameters, use the up/down arrows to move the cursor to each of these fields, press ENTER and edit the field using either keyboard. When you are done with the definition of a field, press ENTER. Then press the down/up arrow to access the next field, etc.

- **Record an observation or measurement:** Tap OK at the bottom of the screen. This takes you to the Logging screen that indicates that you have begun logging data to the feature and that the receiver is ready to log the feature's attributes. Remember that you remain stationary for all point features. Describe the feature as you would any other point feature.



In the two examples above:
Columns=8
Rows=6

It is also possible to navigate to any grid point (or any location for that matter) on the Map screen by tapping over another grid point. After you record data at this location, you will still be prompted to go to the next grid point .

- **Navigate to the next grid point:** When you have finished recording the first point feature, tap Done. A message prompts you to go to the next grid point. Tap Yes to navigate to the next grid waypoint and record the next point feature within the grid. This takes you to the Map screen where you can see your current position marked by the arrow and the next grid waypoint highlighted with a “crossed box” target symbol. Small hollow squares indicate the locations of all the unvisited grid waypoints. Small filled squares (“black” squares) indicate the locations of where you recorded point feature.

As you begin moving toward the target symbol, you will see your heading indicated by the direction of the arrow marking your position. Adjust your movement as necessary until you are positioned over the target symbol. You may also use any of the other navigation screens available. The Arrival alarm is disabled when navigating to grid points. It is best to note your distance to the next point and stop when this value goes to zero. When you arrive at the next grid point, press the LOG button and you will see the same Logging screen you used for the earlier measurement or observation.

Each grid point is a geographic coordinate you should make every effort to occupy so that the data you record is evenly spaced and complete. However, each grid point is merely an aid for navigating to the ideal location for an observation or measurement. All the data you record is ascribed to the position of the receiver and NOT to the grid point.

If you cannot physically occupy this point, but can make the necessary visual observation, you should do so and record an offset estimating the distance and bearing to the grid point. If you are recording measurements made by an instrument, you should NOT record an offset but rather try to make a recording as close as possible to the position.

- When you have occupied as many of the grid points as you can and recorded the necessary observations and measurements at each, tap **Done** at the bottom of the Logging screen.
- Tap **No** when Mobile Mapping asks you to go to the next grid point.
- Press the LOG button and tap **Yes** to close the job.

14.Closing the Job

To close a job, from the screen showing the list of attributes, tap **Done** then confirm by tapping **Yes**.

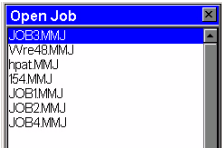
Revisiting and Updating Existing GPS/GIS Jobs

You can use Mobile Mapping not only to position and describe new GIS features but also to update information gathered previously. This is particularly useful when collecting data on things that change over time: streetlight bulbs burn out, new roads are added to housing developments, new crops are planted, etc.

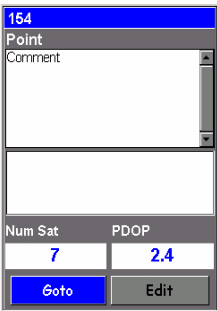
1. General Procedure

Return to the area where the original job was recorded, turn on your unit and double-tap the **Mobile Mapping** icon. When it has calculated a GPS position, follow the procedure below to update the job or to append more data to it.

- Press the LOG button and tap **Open Existing Job**.
- Tap the name of the job you want to revisit.
- Unless this screen is already displayed, press NAV repeatedly until the Map screen is displayed. The Map screen provides a geographical view of the different features present in the job. From this screen, you will now indicate the first feature you want to revisit. If necessary, press the IN or OUT button to adjust the scale so you can see this feature.
- On the Map screen, tap on the feature you want to revisit first. (The feature name appears in the lower part of the screen when the cursor is positioned over the feature.)
- When the map cursor is positioned over the feature to be updated, press ENTER. A new screen is displayed showing the attribute values currently ascribed to the feature. Note that the Goto field is highlighted at the bottom of the screen.

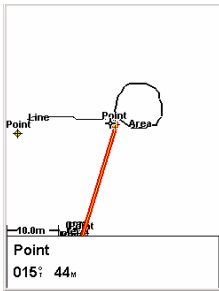


Job List screen



Screen prompting you to go to the selected feature

When you know which attributes must be changed for a point feature, which means you don't really need to visit the point, then tap Edit rather than Goto and change the attributes directly.



Map screen showing straight line to target

- Tap Goto to ask Mobile Mapping to guide you to this feature. By doing this, you will make the selected feature your destination and all the navigation screens will be set to help you reach that feature. The Map screen will also be automatically displayed showing a straight line connecting your current destination to the selected feature.
- Walk to the feature according to the navigation instructions provided on the Map screen. You can use other navigation screens if you prefer (see also Navigation Screens on *Navigation on page 28*). You will know when you are close to the feature when the distance to the feature goes to zero or close to zero, or simply because you can identify it visually. Another nice way of being informed that you have arrived at the feature is to set the **Alarms** option.
- After arriving at the feature, press the LOG key. This takes you to the Feature Attributes screen.
- Now that you are near the feature and you can see which of its attributes need to be changed, tap successively each of these attributes and change them.
- After reviewing the attributes, tap the **Done** field at the bottom of the screen. This ends the review of this feature and displays the Map screen again.
- Follow the same steps described above to revisit and update the other features present in the job.

2. Repositioning a Point Feature

If a point feature appears to be mislocated on the Map screen, do the following after you have arrived at the feature:

- Press the LOG key and tap the on-screen Log button. Let Mobile Mapping recompute the point position and then tap the Done button to close the feature.

Note that only point features can be repositioned. If you wish to reposition a line or area feature, you should record a new feature and then delete the old one in MobileMapper Office.

3. Adding More Features and Attributes to the Job

If you want to add more features and descriptions to the existing job, you just have to record them exactly as you record features into a new job.

4. Closing the Job

To close a job, from the screen showing the list of attributes, tap Done then confirm by tapping Yes.

Num Sat	PDOP
8	1.8

GPS quality indicators

Tracking 3 satellites will in principle allow you to calculate a 2D position (lat/lon) using the last altitude recorded by the receiver. You need to track at least 4 satellites to get a 3D position (lat/lon/altitude). To achieve the specified accuracies, you will need to track 5 or more satellites.

Quality Indicators

At the bottom of each logging screen, you can see two numbers that give you a good indication of how accurate the unit should be.

The first is the number of satellites that the receiver is tracking. A “W” will appear after the number of satellites if SBAS is used. The presence of this letter is indicative of an even better accuracy level.

The second number is the Positional Dilution of Precision (PDOP), which is an estimate of accuracy that the receiver constantly calculates using the geometry of satellites in the sky. The more satellites that are being tracked and the more evenly they are distributed around the sky, the better the accuracy. PDOP values less than 4 or 5 are good. If the PDOP value is over 5, you should consider moving to an area with a clearer view of the sky and recording features with offsets.

Mobile Mapping may warn you if the PDOP, and therefore the accuracy, of your positions has dropped below the level you selected during Setup (see *page 54*, the PDOP alarm option). If you see this warning you may press the ESC button and continue logging.

However, if you are recording line or area features, you might want to return to the field when the GPS satellites are in a better configuration overhead (the constellation changes slowly but constantly).

And if you are recording a point feature, you should strongly consider moving to another location with better satellite reception and recording an offset (distance and bearing) to the feature.

Quitting the Mobile Mapping Function

Press the MENU key and tap Exit. This takes you back to the workspace screen.

3. Post-Processing Option

Note: MobileMapper Office does not need an activation code. If the jobs you download to MobileMapper Office have been recorded using the “Post-processing” job mode, then MobileMapper Office will let you post-process them.

MobileMapper Office includes a differential correction utility that can post-process GPS measurements recorded by MobileMapper CX for submeter accuracy. To record GPS measurements with Mobile Mapping in a MobileMapper CX receiver, you need to first purchase a post-processing option. When you purchase this option, you are given an activation code that you should enter into your MobileMapper CX receiver. Because it is tied to the serial number of your MobileMapper CX receiver, the activation code is valid only for one receiver.

Enabling the Post-Processing Option

- Press the LOG key and select Create New Job.
- Name the new job and press ENTER.
- Select a feature library and press ENTER.
- Select **Post-processing** as the job mode. This opens the Activation Code screen.
- Overwrite the “0000000000” field with the activation code intended for your receiver. Use the on-screen keypad to enter your code.
- After entering the code, press ENTER. This enables the post-processing option in the receiver. Mobile Mapping comes back to the Setup menu where **Post-processing** is still highlighted but you can no longer access the Activation Code screen.



Creating a New Job with the Post-Processing Option



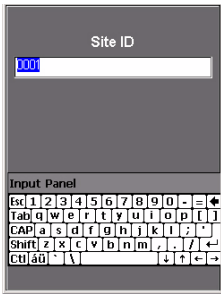
Welcome screen



Job Mode screen

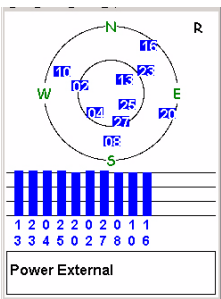
- If there is a job that is currently open, close it by pressing MENU and selecting **Close Job**
- Press LOG. MobileMapper CX displays the Welcome screen. This screen shows three options (instead of two when the post-processing option is not enabled).
- Highlight **Create New Job** and press ENTER.
- Enter the job name as explained earlier (see *page 6*).
- After entering the name, highlight the OK key on the screen and press ENTER. A new screen is then displayed listing the feature libraries stored on the receiver's SD card.
- Highlight the library you want to use and press ENTER. A new screen is then displayed asking you to choose the job mode:
 - **Real-time**: If you select this job mode, the receiver will record only feature positions and descriptions and GPS metadata. Jobs recorded in real-time mode cannot be differentially corrected later on.
 - **Post-processing**: Select this job mode to allow MobileMapper CX to record the job so that later on, it can be post-processed in MobileMapper Office. In this job mode, MobileMapper CX will record GPS measurements files in addition to the MMJ job file that is recorded in real time.
- Use the down/up arrow to highlight **Post-processing** and then press ENTER. The screen now lists all the features available from the selected feature library.
- At this stage, use Mobile Mapping in exactly the same way as you would without the post-processing option being enabled. See page 6 and following.

Using MobileMapper CX as a Reference Station



Site ID screen

- Mount MobileMapper CX on a tripod placed over a control point, turn it on and press ENTER at the agreement screen
- Press LOG. MobileMapper CX displays the Welcome screen.
- Highlight Reference Station and press ENTER. The Site ID screen is now displayed.
- Enter a Site ID (there is a four-character limit) as you would enter a job name, highlight OK on the screen and press ENTER.



From now on, MobileMapper CX will operate as a reference station until you exit Mobile Mapping. It is therefore important that you not move the receiver or any optional external antenna until you exit from Mobile Mapping. Before leaving the reference station for your work, press the NAV key until you can see the Satellite Status screen. The letter “R” appears in the upper-right when the receiver is recording reference station data.

4. Navigation

Mobile Mapping offers very helpful navigation functions that you can use while performing your field operations.

The present chapter tells you how to use the navigation screens, how to create waypoints and how to work with the GOTO and Routes functions.

Navigation Screens

The Map screen has two modes: Position and Cursor. Using the stylus, tap anywhere on the map, or press any arrow key, to select Cursor mode. Press ESC to return to Position mode.

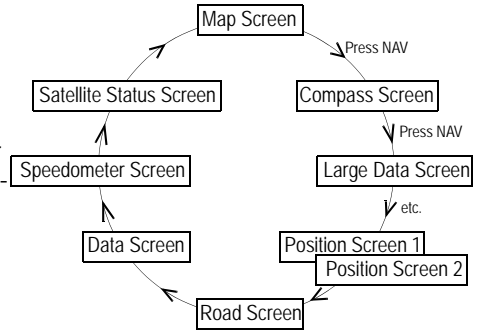
When a Position screen is displayed, press the Left or Right arrow key to display the other. Press this key again to return to the previous screen.

Except for the Satellite Status screen, all navigation screens can be customized.

Mobile Mapping offers 7 different navigation screens to help you locate yourself or navigate to waypoints or GIS features in an existing job. From any displayed screen,

simply press the NAV button to access the last-used navigation screen. To display the next navigation screen, press NAV again. The sequence of navigation screens is as shown above. It can be scrolled in the reverse direction by pressing ESC once any of these navigation screens is displayed.

You may find that you do not regularly use all of these screens. To make it faster to move among those screens that you do use, you may turn off individual navigation screens (except the Map and Satellite Status screens) by pressing the MENU button, selecting the Setup option and then the Nav Screens option.



Select either On or Off for each screen until you see the Setup menu once more. Note that you must cycle through all the screens in order to put your selections into effect.

The following is a description of each of the navigation screens.

Map Screen

The Map screen shows a map of the area surrounding your current location. Use the IN and OUT buttons to adjust the scale.

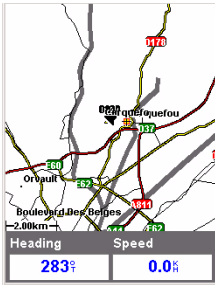
The Map screen is always in the Position mode when you access this screen. In this mode, your present position is indicated by the large arrow icon in the center of the display. If you are moving, the arrow will point in the direction that you are heading. At the bottom of the screen is the scale for the map displayed and two data fields that can be customized, or turned off, depending upon your needs.

The present position icon will change to an hourglass when Mobile Mapping is unable to compute a position fix due to poor signal reception.

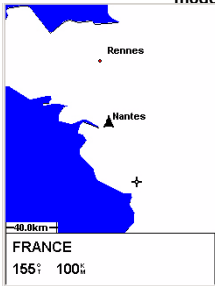
Tap anywhere on the Map screen or press any of the arrow keys to switch to the Cursor mode. In this mode, you are provided with a cross hair cursor that can be moved using the stylus (you tap directly where you would like the cursor to be) or, for a step-by-step move, by using the arrow keys.

At the bottom of the display is the information for the position of the cursor relative to your present position (heading and distance). Also any points of interest or GIS features that the cursor is over will be shown.

To return to the Position mode, press ESC. The cursor will disappear and the present position icon will appear centered on the map.



Map screen in Position mode

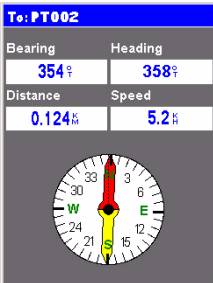


Map screen in Cursor mode

Compass Screen

The two data fields on top are customizable. The lower portion of the Compass screen displays your heading in a graphical manner.

The Compass screen contains the following information, from top to bottom:



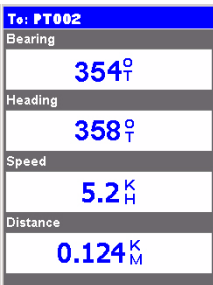
Compass screen

- In the title bar: destination name if you are using the Goto function
- Data Fields: customizable data fields (see **Customize** option on page 58). Some of the data displayed requires you to be moving to be computed. Invalid data is indicated by dashes.
- Icon representing destination: Displayed outside the compass when you are using the Goto function. This provides you with the direction you need to head to arrive at the destination. When you are on course and heading straight for the destination, the destination icon will be lined up with the heading marker.
- Compass/Heading marker: Using the compass and the heading marker, you can view your heading information in a familiar manner. Note that you need to be moving for this data to be valid.

Large Data Screen

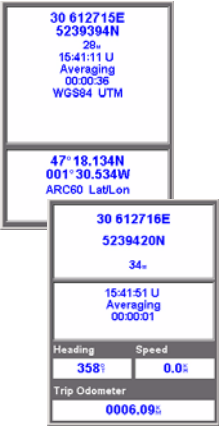
The Large Data screen is similar to the Compass screen but here the compass has been removed to allow for large display of the navigation data. This screen is ideal for when you have your unit mounted on the dashboard of a vehicle. Even from a distance the customizable information can be read with ease.

The Large Data screen contains the following information, from top to bottom:



Large Data screen

- In the title bar: destination name if you are using the Goto function
- Data Fields: customizable data fields (see **Customize** option on page 58). Some of the data displayed requires you to be moving to be computed. Invalid data is indicated by dashes.



Position screens 1 & 2

To switch from a screen to the other, just press the Left or Right arrow key.

The same data as on Position screen 1 is displayed on Position screen 2 except that the lower part of the screen, containing the two data fields and the trip odometer field, is replaced with the current position's coordinates expressed in the chosen secondary coordinate system and map datum.

Position Screens

Position screens #1 and #2 display your present position using the coordinate systems that you have selected (see how to select these systems in the two sections *Coord System on page 51* and *Map Datum on page 52*).

This screen shows all of the basic position, time and satellite information. Additionally, on Position screen #1, current navigation information is shown in the bottom half of the screen. For the sake of comparison, Position screen #2 provides the coordinates of your present position both in the selected primary coordinate system and map datum, and in the selected secondary coordinate system and map datum.

Position screen #1 contains the following information, from top to bottom:

- Coordinates and elevation of your current position: Displays your current position in the chosen coordinate system. Also displays the elevation of the current position. If Mobile Mapping is not computing position fixes, the last computed position is displayed.
- GPS Satellite Status/Position Status: Provides information on the current status of the GPS receiver (see table below).

Message	Description
Searching - 1st sat	Searching for 1st satellite.
Searching - 2nd sat	1st satellite found; searching for 2nd satellite.
Searching - 3rd sat	2 satellites are being tracked; searching for a 3rd.
Searching - 4th sat	3 satellites are being tracked; searching for a 4th.
Collecting Data	All satellites needed for position fix are being tracked and position is being computed.
Averaging	Mobile Mapping is computing fixes; speed is near 0.0 and so position is being averaged.
WAAS Averag	Mobile Mapping is computing fixes using SBAS; speed is near 0.0 and so position is being averaged.
EPE xxx.	Estimated Position Error. Mobile Mapping is computing fixes while moving.
DGPS DGPS Averag	Computed fixes are being differentially corrected using RTCM corrections ("DGPS Averaging" when speed near 0.0).

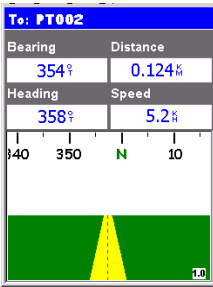
- Data Fields: customizable data fields (see **Customize** option on page 58). Some of the data displayed requires you to be moving to be computed. Invalid data is indicated by dashes.
- Trip Odometer: The odometer performs like the odometer in your car. It can be reset through the MENU button.

To customize the Position screens, use the functions described below. The first of these context-sensitive functions is prompted when you press the MENU button while a Position screen is displayed. Some of these functions also exist in the Setup menu.

Road Screen

The Road screen presents your route as if you were travelling on a road. When you need to make a turn, the road will graphically display the turn and the direction. Waypoint and destination icons will be displayed relative to your position as they come into view. Above the road is a compass that displays your heading and above that are four customizable data fields.

The Road screen contains the following information, from top to bottom:



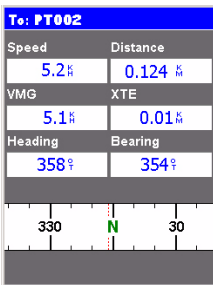
Road screen

- In the title bar: destination name if you are using the Goto function
- Data Fields: customizable data fields (see *Customize* option on page 58). Some of the data displayed requires you to be moving to be computed. Invalid data is indicated by dashes.
- Compass: Displays your heading in a familiar compass format.
- Road: This graphically displays the route (Goto) that is active. As you move left or right of your intended track, the road will move on the display indicating which way you need to steer to get back on track. Ideally, the road would be centered on the display. Also, you will see upcoming turns in advance allowing you to make necessary preparations.
- Scale indicator: Use Zoom In/Out to change the scale.

Data Screen

When you need to see a lot of information in one place then you will appreciate the Data screen. The Data screen provides you with six data fields and an active compass that is the same as the one used on the road screen. You have the option of customizing this screen by selecting what data is displayed in the upper six fields. The lower portion of the screen is occupied by a compass providing your heading.

The Data screen contains the following information, from top to bottom:



Data screen

- In the title bar: destination name if you are using the Goto function
- Data Fields: customizable data fields (see *Customize* option on page 58). Some of the data displayed requires you to be moving to be computed. Invalid data is indicated by dashes.
- Compass: Displays your heading in a familiar compass format.

Speedometer Screen

The Speedometer screen displays your speed in a familiar graphical format. There are four additional data fields at the top of the display that can be customized to display the data that you need. The bottom of the screen contains a trip odometer that will record the distance travelled since the last time the odometer was reset.

The Speedometer screen contains the following information, from top to bottom:



Speedometer screen

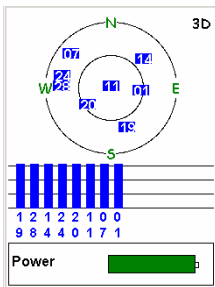
- In the title bar: destination name if you are using the Goto function
- Data Fields: customizable data fields (see *Customize* option on page 58). Some of the data displayed requires you to be moving to be computed. Invalid data is indicated by dashes.
- Speedometer: Displays your speed using a familiar speedometer display. The scale of the speedometer is not adjustable but will change dynamically to best display your speed.
- Trip Odometer: The odometer performs like the odometer in your car. It can be reset through the MENU button.

Satellite Status Screen

Although the Satellite Status screen is part of the navigation screen sequence, it is not actually a navigation screen.

When Mobile Mapping is computing your position, an additional information appears in the right-upper corner with two possible values: 3D or 2D. 3D means the computed position is 3-dimensional (elevation computed). In 2D (2-dimensional), elevation is not computed. Mobile Mapping assumes that the last computed or entered elevation is the elevation for all computed positions.

See also *page 4*.



Satellite Status screen

GOTO Function

Purpose

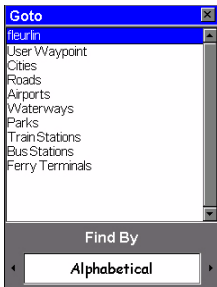
You use the GOTO function to ask Mobile Mapping to guide you from your current position to a destination point.

After you will have specified which destination point to go to, you will select your favorite navigation screen. You will then be able to read the information computed by Mobile Mapping to help you reach the destination.

Destination Point Types

Mobile Mapping can guide you to:

- Any point of interest (POI) pre-loaded in the unit.
- Any waypoint created using the Mark function. This type of point is listed as a “User Waypoint” category in the POI (Point Of Interest) database.
- The active background map (as set in the **DetailMap** field on the **MENU>Setup>Select Map** screen), which appears on top of the POI list (see opposite).
- Any feature logged in the open GIS job which you will select graphically on the Map screen.



List of POI categories



GOTO will not be shown in the menu list if you press MENU while the unit displays the Map screen in cursor mode. In that case, just press NAV and then MENU again.

Selecting a POI as the Destination Point

Press MENU and tap GOTO. The possible categories of POIs are now listed on the screen. Use the Up/Down arrow keys to highlight the category the destination point belongs to.

Before pressing ENTER to list all the points stored in this category, choose how you want these points to be listed by setting the **Find By** field. Press the left/right arrow to set this field. Two values are possible in this field:

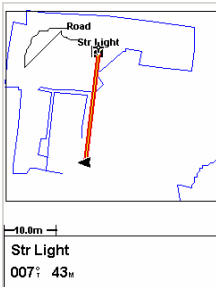
- **Alphabetical:** Points will be listed in alphabetical order. Mobile Mapping will then help you find the desired point through one of the following two methods: *Keyboard Search* and *Alphabetic Scroll*.
Keyboard Search: Before displaying the list of points in alphabetical order, Mobile Mapping displays a keyboard that you can use to enter the first few characters of the point you are looking for. When you press ENTER, you are taken to the alphabetical list with the point you began typing at the top of the display. Anytime you are viewing the list of points, you can re-access the keyboard by pressing ESC.
Alphabetic Scroll: When the alphabetical list is displayed, you can use the IN and OUT buttons to step up or down the alphabet. If you were viewing points beginning with the letter "A", pressing OUT would take you to the first waypoint beginning with "B", and then "C" and so forth. Pressing IN does the same function but only in reverse.
- **Nearest To:** Only the 20 points from this category the closest to either your position or another POI will be listed.

When these 20 points are listed, Mobile Mapping indicates the bearing and distance to your current position from the first point in the list. You can change the point from which the nearest points are found. With the **Nearest To** field now highlighted, press ENTER and scroll to the category where this new point can be found. Select a new point and press ENTER. If you have already pressed the arrow keys and one of the nearest points in the list is highlighted, use the ESC button to scroll back to the **Nearest To** field.

Selecting a GIS Feature as the Destination Point

Assuming a GIS job is open and contains already logged features:

- Press NAV until the Map screen is displayed.
- Using the IN and OUT buttons, adjust the scale in such a way that you can see the feature you want to go to.
- Using the stylus, tap this feature. You know that the cursor is positioned over the feature when the "Cursor" indication at the bottom of the screen is replaced with the name of that feature. You may use the arrow keys to refine the position of the cursor over the feature.
- Press ENTER. A new screen appears giving the current description of the feature. At the bottom of the screen, simply tap **Goto** to enable the Goto function with this feature as your destination. Then select your favorite navigation screen, using the NAV button, and navigate to this feature.



Selecting a GIS feature as the destination

Saving Your Current Position as a Waypoint

Saving your current position as a waypoint is very easy and can be done from within the Survey or GIS function.

From any screen, just press the MENU button, and select the Mark option. The Mark screen appears. This screen provides the description of the waypoint you are about to save.

You can accept all the defaults by simply pressing ENTER (Save field already highlighted).

You can also edit the **Icon**, **Name** and **Message** fields using the arrow keys to access these fields. Obviously you should keep the **Location** and **Elevation** fields unchanged as they contain the coordinates of your current location.

Waypoints recorded using the receiver's Mark feature are not exportable by MobileMapper Office. If you wish to record waypoints in the field and export them to GIS formats, you should use MobileMapper Office's Feature Library Editor to create a "Waypoint" feature type. You can then log a "waypoint" as a point feature while recording a job file.

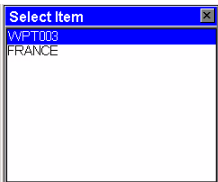


Mark screen

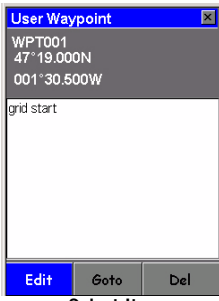
Editing/Deleting a User Waypoint

You can edit/delete a waypoint from the Map screen:

- Press NAV until the Map screen is displayed
- Use the IN or OUT button, or move the cursor so that the waypoint you want to edit or delete is visible on the screen
- Position the cursor over that waypoint. The name of the waypoint then appears at the bottom of the screen.
- Press ENTER. This opens the Select Item screen on which Mobile Mapping lists the names of the items present in the vicinity.



Select Item screen



Select Item screen

- Tap the waypoint you want to edit/delete. This opens the User Waypoint screen on which you can see the definition of the waypoint (coordinates+comments). At the bottom of the screen are three command fields that you can use for the following tasks:

Edit (default choice): Select this field if you want to edit the definition of the waypoint. The following parameters can be changed: icon, name, coordinates, elevation and comment.

Goto: Select this field if you want Mobile Mapping to guide you to this waypoint

Del: Select this field if you want to delete the waypoint. Mobile Mapping will then ask you to confirm that you really want to delete the selected waypoint.

Clearing the GOTO function

To ask Mobile Mapping to stop guiding you to a destination while the Map screen is displayed in position mode:

- Press MENU
- Tap GOTO. A message appears asking you to confirm that you would like Mobile Mapping to stop guiding you to this point.
- Tap Yes
- Press ESC to return to the Map screen.

Routes

As explained below, Mobile Mapping can handle two types of routes: GOTO route and multi-leg route.

GOTO Route

This in fact a route that you define when:

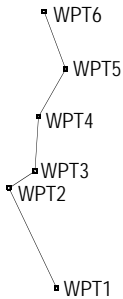
- You select a waypoint on the Map screen, you press ENTER twice to display the properties of this waypoint, and you tap GOTO to enable the Goto function to this waypoint . The same can be done to choose a POI or a GIS feature as the destination point.
- You use the GOTO option after pressing MENU and you choose a POI or waypoint as the destination point.

GOTO routes are not saved in memory. When you turn your unit off and then back on, the GOTO route is gone. You need to create a new GOTO route if you intend on completing the route.

A GOTO route is a one-leg route whose two ends are your current position and the chosen destination point.

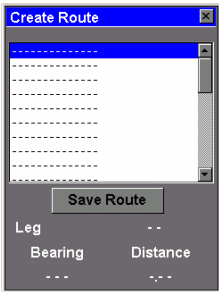
Multi-leg Route

A multi-leg route consists of several waypoints or POIs that you should reach one after the other. The segment between any two consecutive waypoints or POIs is called a “leg.” Unlike GOTO routes, multi-leg routes can be stored in memory. The *backtrack* route also belongs to the category of multi-leg routes (see *page 42*).



1. Creating a Multi-leg Route

- Press MENU and tap Routes. The Route List screen is now displayed.
- Tap the first **Empty** route in the list.
- Press MENU and tap Create New Rte. The Create Route screen is now displayed and the first line on this screen is highlighted.
- Press MENU and tap Insert WPT. The Insert WPT screen is now displayed.
- Press the Left or Right arrow to select **Alphabetical** at the bottom of the screen.
- Tap **User Waypoint**
- Browse the list of available waypoints and tap the name of the waypoint you want to define as the first waypoint in the route. You are then prompted to define the second waypoint in the route.
- Resume the previous 4 steps to define the next waypoints in the route.
- When the last point of the route is defined, tap the **Save Route** button on the Create Route screen.



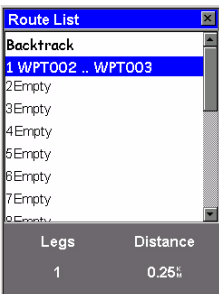
Create Route screen

2. Activating/deactivating a Multi-Leg Route

- Press MENU and tap Routes.
- In the Route List screen now displayed, tap the route you want to activate.
- Press MENU and tap **Activate Route**. Mobile Mapping comes back to the Route List screen where the activated route now appears in bold characters. Press NAV to navigate along this route.

To deactivate this route:

- Press MENU and tap Routes,
- Tap the activated route in the list
- Press MENU and tap **Deactivate Route**. The route is now deactivated.



Route List screen

3. Asking Mobile Mapping to Retrace your Steps

If the Track Mode is active (see *page 49*), Mobile Mapping automatically creates and stores hidden points into memory as you move. This series of points is called the “track” or “track history”. To retrace your steps, do the following:

- Press MENU and tap Routes.
- Select Backtrack.
- Press MENU again and tap Activate Backtrk. A message appears warning you that the Track History Logging is now disabled.
- Tap OK and press NAV to return to the Map screen. Now let Mobile Mapping guide you along the existing track, using the track’s hidden points as navigation waypoints, to go back to the track’s start point.

4. Creating a Route from the Track History

- Press MENU and tap Routes.
- Select Backtrack.
- Press MENU again and tap Save Trk to Rte. Mobile Mapping converts the track’s hidden points into User Waypoints. The new route then appears on the Route List screen. It consists of waypoints that are numbered “TxxPyy” (where xx is the route number in the list and yy is the order number of the waypoint in the route).

For example the created route could be named “T01P01 .. T01P07”.

Note that the the route is a copy of the track and not the backtrack.

5. Other Functions Tied to Routes

You can also do the following on the highlighted route using the functions available from the MENU button (see also diagram on page 47):

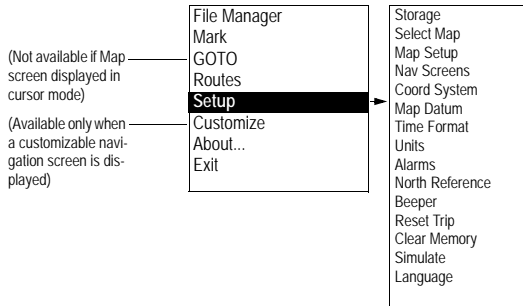
- Viewing the route on the Map screen by pressing MENU and tapping **Map View Route**. The Map screen then appears showing the route. Press ESC to come back to the Route List screen.
- Editing the route by pressing MENU and tapping **View/Edit Route**. From the View/Edit screen you can then press the MENU button to access options allowing you to insert, delete, replace the highlighted waypoint and then to save the changes made to the route.
- Reversing the route, i.e. reversing the direction of travel along the route, by pressing MENU and tapping **Reverse Route**. This instantly reverses the route. Note that the first and last waypoints in the route name have been swapped.
- Deleting the route by pressing MENU and tapping **Delete Route**. A message will appear asking you to confirm this operation.
- If a route has been activated, selecting the leg you want to follow by pressing MENU and tapping **Select Leg**. The screen then shows the list of points making up the route. Tap the waypoint you want to navigate to. A warning message will appear asking you to confirm the leg change. After choosing **Yes** or **No**, press ESC twice to return to the navigation screen.

5. MENU key



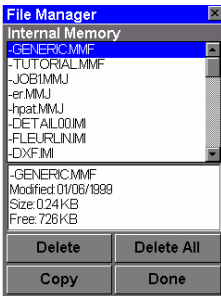
The MobileMapper CX MENU key is inactive until you double-tap the Mobile Mapping icon.

The diagram below shows the available functions when pressing MENU. When you select the **Setup** option in the menu list, another menu is displayed containing a number of options, as shown in the diagram below.



All the options available from the Menu screen are described below.

File Manager



This option allows you to list the files stored in the internal memory or SD card, depending on the choice you have made through **Setup** and **Storage**.

A sign is placed before each filename. The meaning of this sign is as follows:

- + Indicates that the file has not yet been downloaded from the handheld
- Indicates that the file has been downloaded from the handheld.

The name, last modification date and size of the selected file is shown at the bottom of the screen. Only the following file types are listed:

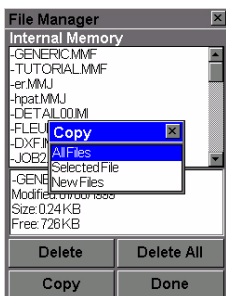
- R*.* (Raw data files)
- *.MMJ (GIS job files)
- *.MMF (GIS feature library files)
- *.IMI (Map files)

You can delete the selected file or all the files by tapping respectively **Delete** or **Delete All** and then **Yes** to confirm.

(**Delete All** does not delete waypoints, track, routes and user settings but only the listed files, as opposed to **Clear All** in **Clear Memory** which deletes all waypoints, track and routes but does not impact user files; see *page 56*.)

When the internal memory is selected for storage, you can copy files to the SD Card you have previously inserted in the unit. Tap the **Copy** button and then one of the following options:

- **All Files**: All listed files are copied to the SD Card
- **Selected File**: Only the highlighted file is copied to the SD Card
- **New Files**: Only the files with filenames preceded by “+” are copied to the SD Card.



Mark

This option allows you to quickly create a new waypoint whose default coordinates will be those of your current location.

A typical use of this option is when you are located at a new point of interest and you wish to log its position.

When you select **Mark** in the menu list, the **Mark** screen is displayed with the following default values:

- Default icon in the **Icon** field
- “WPTxxx” as waypoint name in the **Name** field. “xxx” is a number that the unit automatically increments as you create new waypoints
- Coordinates of your current location in the **Location** and **Elevation** fields

If you agree with all these parameters, and as the **Save** field is already selected at the bottom of the screen, you just have to press **ENTER** to create the new waypoint. This is the fastest procedure to create a new waypoint.



On the other hand, if you have to change any of these parameters or add a comment in the **Message** field, then you have first to edit the corresponding fields before selecting the **Save** field and pressing **ENTER**

The **Route** button gives direct access to the **Route List** screen where you can insert the newly created waypoint into a new or existing route.

If you would like to add more description or if you would like to export a waypoint to your GIS, use a feature library that includes a point feature called “**Waypoint**” and whatever level of attribution that you need. Then, when you want to record a waypoint, you can select the **Waypoint** feature type from the feature library and record a fully describable and exportable point feature.

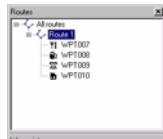
GOTO

This option is discussed in detail on *page 35*.

Routes

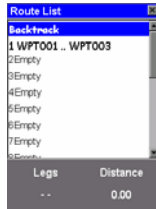
This option is discussed in detail on page 40. The MENU button gives access to a list of specific options when the Routes option is enabled. This is summarized in the diagram below.

Insert WPT
Delete WPT
Replace WPT
Save Route



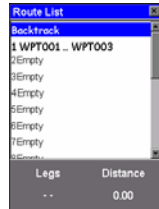
From View/Edit Route screen

Deactivate
Advance Leg
Save Trk to Rte



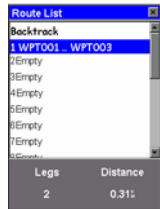
From Route list screen, backtrack route highlighted, activated

Activate Backtrk
Save Trk to Rte



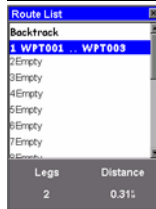
From Route list screen, backtrack route highlighted, not activated

Activate Route
View/Edit Route
Reverse Route
Delete Route
Save Trk to Rte
Map View Route



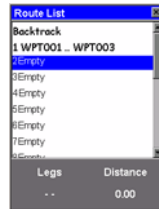
From Route list screen, route highlighted, not activated

Deactivate Route
Select Leg
View/Edit Route
Reverse Route
Delete Route
Save Trk to Rte
Map View Route



From Route List screen, route highlighted and activated

Create New Rte
Save Trk to Rte



From Route List screen, empty route highlighted

Setup Menu

Storage

This option allows you to choose the media to which the unit will save the data collected in the field. There are two possible choices:

- Internal Memory
- SD Card

Select Map

This option is mainly used to choose the background maps (vector map and/or raster map) that the unit will display on the Map screen. The following parameters can be set on the Change Map screen:

- **Basemap:** Only the **Default Map** option can be selected in this field. The default map – an American or European map – is always present in the unit.
- **Detail Map:** Select the desired vector map from the list attached to this field.

Vector maps are IMI files downloaded into the unit using MobileMapper Office. Only one vector map can be displayed at a time.

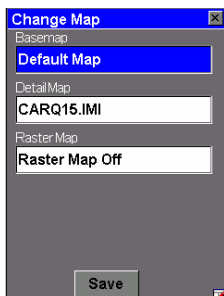
The list attached to the **Detail Map** field includes IMI files from both the internal memory and the SD card, whatever the storage setting.

If you did not upload any vector map to the unit, then **Empty** is the only option available for this field. The extent of a vector map is usually limited to the extent of the area you are working in.

- **Raster Map:** Raster Maps are not supported by Mobile Mapping. This field should always be set to “Raster Mapp Off”.

After choosing the desired options for these parameters, tap **Save**.

Maps are arranged as follows on the Map screen: raster map at the front, basemap at the back, vector map in between.



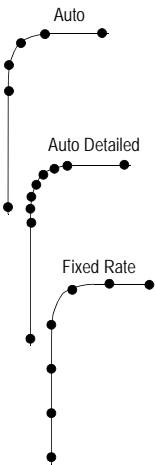
Map Setup

This option allows you to set the viewing options for the Map screen.

On the **Format** tab, you can set the following parameters:



Map Setup screen,
Format tab



- **Orientation:** You can change how the map is orientated on the screen to either North Up, Course Up or Track Up. Default is North Up.
- **Detail:** Use this field to set the detail *for both the basemap and the detail map*. This field can be set to highest, high, medium, low or lowest. This changes the zoom level that different map objects (cities, highways, labels, etc.) are displayed. If you have set a zoom level and the display is too cluttered, set the map detail to a lower level; conversely set it to a higher level to view more detail.
- **Track Mode:** Allows you to set how often the unit stores track points:
 - **Off:** Stops the unit from saving any new track points.
 - **Auto:** The unit uses a method for track point storage that maximizes memory. Using **Auto**, you will see more points on and near turns and less points on straight stretches of the map.
 - **Auto Detailed:** Same as **Auto** but with more track points on and near turns.
 - **2.0 km, 1.0 km, ..., 0.05 km, 0.01 km:** Fixed time intervals for track point storage.

Please note that the Track Mode will be automatically set to Off when you start logging a new feature in the open GIS job. This is to avoid confusion on the Map screen between features and track points. The Track Mode will be automatically restored with its initial settings when you close the GIS job.

- **Primary Usage:** The unit can be set to either **Land** or **Marine** usage. When in Land (default), the map displays land areas in white and water areas in blue. For marine applications it may be desirable to reverse the display, showing water as white and land as blue. This will make reading some of the data information on the water easier.



Map Setup screen,
Display tab

From the **Display** tab, you can customize the Map screen by specifying the items that the unit should display on the map:

- **Show Map Info:** Use this option to show or hide the two data fields displayed at the bottom of the Map screen. To customize these fields, see *Customize on page 58*.
- **Waypoints** (default: checked)
- **Track Lines** (lines connecting track points if **Track Mode** different from **Off**; see page 49)
- **Pos-Dest Line** (line connecting current position to destination)
- **Depart-Dest Line** (line connecting initial position to destination)

Check the items you want to show and clear those you want to hide. You can also check or clear all these items in a single operation by respectively selecting **Mark All** or **Clear All** just above these items.

Press ESC or NAV to quit the Map Setup screen.

Nav Screens

This option allows you to remove the navigation screens that you do not need from the navigation screen sequence that you scroll by pressing NAV repeatedly (see page 28). When selecting this option, you are asked to turn off or on each of the available navigation screens. Tap “Off” for all these screens that you are not currently using. Note that the Map screen cannot be turned off. You must cycle through all the screens in order to save any changes to the On/Off status of any screen.

Coord System

This option allows you to define a primary coordinate system, and also a secondary coordinate system if you need one.

By defining a coordinate system, you tell the unit how the calculated coordinates should be expressed. For example, if you choose **Lat/Lon**, all coordinates will be expressed as angles (latitudes and longitudes) and if you choose **UTM** or any other system, coordinates will all be distances (Northings and Eastings) from the chosen origin.

When you select the **Coord System** option from the Setup menu, the unit asks you to specify which system you want to define (primary or secondary). Tap one. In the list that appears, tap the coordinate system you want to use.

Depending on your choice, the unit may then ask you additional information:

- If you select Lat/Lon, you are then asked to select the display format (DEG/MIN.MMM, DEG/MIN/SEC.SS, etc.)
- If you select any system other than Lat/Lon or UTM, you are asked to choose a scaling factor for displaying position coordinates: 1 meter, 10 meters or 100 meters. If you choose 1 meter, a northing coordinate will be displayed as, for example, 249143N. If you chose the 10-meter factor, the same coordinate will be displayed as 24914N. And if you select the 100-meter factor, the coordinate will be displayed as 2491N.
- For some systems, you are asked to supply information on grid zones or types

- For the User Grid, you are asked to supply a projection type (Transverse Mercator, Lambert Conic, Stereographic, Oblique Mercator or Polyconic), coordinates of origin, scale factor, unit to meters conversion and false Easting and Northing at origin

Notes on Coordinate Systems:

- The unit always uses the WGS 84 coordinates to locate the features and waypoints on the Map screen, even if you select some other coordinate system/datum.
- The coordinate systems and datums used to display anything on the Map screen are only for display. When you select some other coordinate system/datum, only the numbers of the coordinates of a feature/waypoint are changed. The map screen is not changed in appearance.

Map Datum

This option allows you to define a primary map datum, and also a secondary map datum if you need one.

A map datum is a geographic reference that the unit will refer to to calculate the coordinates of your position. The unit holds more than 70 different map datums in its memory.

After selecting the **Map Datum** option from the Setup menu, tap the map datum that applies to your country and working area.

User Datum [X]

Delta A (meters)
+0000.0000

Delta F (X 10,000)
+0.00000000

Delta X (meters)
+0000.0

Delta Y (meters)
+0000.0

Delta Z (meters)
+0000.0

Next >

User Datum [X]

Rotation X (sec)
+00.00000

Rotation Y (sec)
+00.00000

Rotation Z (sec)
+00.00000

Scale factor (ppm)
+00.00000

Done

To enter a user map datum, select the term “USER” in the list of datums arranged in alphabetical order. Depending on the type of map datum you want to define, up to nine different parameters, distributed on two different screens, may have to be defined:

1st screen:

- Delta A (meters)
- Delta F (X 10,000)
- Delta X (meters)
- Delta Y (meters)
- Delta Z (meters).

2nd screen (select Next> at the bottom of the 1st screen to access this screen):

- Rotation X (seconds)
- Rotation Y (seconds)
- Rotation Z (seconds)
- Scale factor (ppm).

Tap **Done** to complete the definition of the user map datum. This takes you back to the Map Datum list where “USER” is selected. Tap [X] twice to return to the last displayed navigation screen.

Time Format

This option allows you to select the time format you want to use in the unit. You can choose from three different time formats: Local 24Hrs, Local AM/PM or UTC. After selecting the **Time Format** option from the Setup menu, just tap the time format you want to use.

Units

This option allows you to select the units of measurement that will be used when displaying navigational data or features being logged.

All sets of units are formatted as follows: **long distance unit/short distance unit/speed unit/area unit**. You can select from 5 different sets of units.

You can also create your own set of units by selecting **Advanced** at the end of the list. You are then prompted to specify the unit you wish to use for each type of possible measure, i.e. Distance, Speed, Elevation, Bearing and Area.

After selecting the **Units** option from the Setup menu, tap the set of units you wish to use. If you have selected **Advanced**, a new list appears prompting you to choose a unit for each type of measure. Tap the first measure in the list and then tap the desired unit. This takes you back to the former screen where you can select the second measure, etc. When all units are defined, press ESC to come back to the Setup menu.

Alarms

All of the Alarm options are set in the same way. The instructions below apply to all of the Alarm settings. When the beeper is turned on for alarms (see **Beeper** option) an audible beep will be sounded for the alarm. A visual alert is displayed for the alarm whether the beeper is turned on or off.

Setting the Arrival Alarm: The arrival alarm alerts you that you have arrived at the destination of your GOTO route or to the destination of any leg in a route you are navigating on.

This option allows you to set how close you must come to the destination before the alarm begins to sound.

After the alarm sounds, you can reset the arrival alarm to a shorter distance, but this shorter distance will apply to the next target and not to the current one. If you want the alarm to sound again when you come within a shorter distance to the current target, first select another target destination and then reselect the original target.

Setting the PDOP Alarm: This turns on or off the alarm that can sound whenever the unit has lost its ability to compute accurate position fixes due to poor geometry of the GPS constellation. Generally, PDOP values less than or equal to “5” are indicative of good operating conditions. So it is a good idea to set this alarm to “5.” To turn off the PDOP alarm, enter “00.”

Note: Apart from the Arrival and PDOP alarms, the unit will generate a warning message on the screen in each of the following two cases:

- “Low Memory.” This message will appear when the receiver is running out of memory. If raw data is being collected, then the occurrence of this message will automatically stop data logging. You will however be allowed to enter the attribute values of the current GIS feature before the job is closed.
- “Out of Memory.” This message will appear when the memory is full. The occurrence of this message will immediately end raw data collection or close the currently open GIS job and you will not be able to log anything until you free some space in memory.

North Reference

This option allows you to define the type of North reference you want the unit to use. This can be True North, Magnetic North, Military True North or Military Magnetic North.

After selecting the **North Reference** option from the Setup menu, tap the desired North Reference from the displayed list.

Beeper

This option allows you to enable (On) or disable (Off) the beeper.

After selecting the **Beeper** option from the Setup menu, tap the desired option.

Reset Trip

If you tap this option, a warning message is displayed asking you to confirm your choice. To reset the trip odometer, tap the **Yes** button.

Clear Memory

This option allows you to clear one of the following data sets from the unit's memory:

- **Track history:** Will clear the track shown on the Map screen.
- **Wpts/Routes:** Will clear all waypoints and routes from memory.
- **Routes:** Will clear all routes from memory.
- **Reset default:** Will reset the receiver by restoring all factory defaults.
- **All:** Will clear all memory.

(Clear **All** does not delete files but only waypoints, routes, track and user settings (language), as opposed to **Delete All** in **File Manager** which deletes all listed files but does not impact waypoints, track and routes; see *page 44.*)

After selecting the **Clear Memory** option from the Setup menu, tap the desired choice. The unit will ask you to confirm your choice. If you have selected **All**, the unit will then exit from the current application to return to the workspace screen. It will then automatically re-launch the same application for which re-initialization will be required (user language).

Simulate

This option allows you to set the simulator. It shows you how the unit uses its various functions based on a simulated journey. The simulator is useful for learning or demonstrating the unit's GPS functions when indoors and there is no GPS reception. When the simulator is on, the unit quits normal operation to operate in the simulator mode. You can choose one of the following three options when you access the **Simulate** option:

- **Off:** Will turn the simulator off. The unit will return to normal operation
- **Auto:** Will turn the simulator on. A predefined heading and speed rate will be used.
- **User:** Will turn the simulator on. A user-defined heading and speed rate will be used.

After selecting the **Simulate** option from the Setup menu, just tap the desired choice.

If you have selected **User**, the unit will then ask you to enter heading and speed data.

Language

This option allows you to select the language that the unit will use to display text.

TIP: If you accidentally set the language to one you cannot read and want to get back to the Language Select screen, follow these instructions. Press MENU. Tap the fifth item in the list and then tap the last item in the new list. You are back at the Language Select screen.

The Map screen must be in Position mode if you wish to customize data fields. If the Map screen is in cursor mode (cursor is a cross-hair), press ESC to return to the Position mode.

*Available data:
BEARING
DISTANCE
SPEED
HEADING
VMG (Velocity made good)
CTS (Course to steer)
ETA (Estimated time of arrival)
ETE (Estimated time enroute)
XTE (Crosstrack error)
Turn
Elevation
Time
Date
EPE (Estimated Positional Error)
Avg. Speed (Average speed)
Max Speed*

Customize

Except for the Satellite Status screen, all navigation screens can be customized through the following procedure:

- Press NAV repeatedly until the desired navigation screen is displayed
- Press MENU
- Tap **Customize**. Additionally for the Map screen, tap **Customize Fields**.
- On the Navigation screen now shown in edit mode, highlight the data field to be changed using the left/right arrow and press ENTER
- Choose the data in the list that you wish now to display in this field. Press ENTER. Data change in the field is immediate.
- Resume this procedure for all the fields that need to be changed on this screen and on the other navigation screens.

If you select **Customize** when the Map screen is displayed, another option an additional menu is displayed showing two options:

- **Customize Fields**: This option is described above
- **Street info**: If you select this option, the bottom of the Map screen will display the name of the street you are currently walking or driving along. To re-activate the first option, press MENU, tap **Customize** and then **Two Data Fields**.

About...

The About... screen displays the current status of your unit. Using the About... screen you can see the serial number of the receiver, the version of software, the version and memory size of the basemap and the memory space percentage occupied by data & maps, routes and waypoints.

Exit

This option allows you to quit the Mobile Mapping application that is currently running and return to the unit's workspace screen.

6. Office Work

About Download Procedures

The easiest way to download field data collected with Mobile Mapping to your office computer is to remove the SD card from the MobileMapper CX and insert it into the card reader on your computer. This implies the following:

1. You are using the SD card, and not the MobileMapper CX internal memory, to store all your data (see setting on page 48).
2. Your computer should be equipped with an SD card reader.

If you do not have a card reader on your computer, then you should connect the MobileMapper CX to your computer via the USB cable provided and make sure the USB device switcher is set to “USB serial” (refer to the *Receiver Description* chapter in the *MobileMapper CX Getting Started Guide* to set this port).


You can also use COM1 available on the I/O module (Serial data cable not provided).

In this chapter, it is assumed that Mobile Mapper Office has already been installed on your computer **and the USB port on MobileMapper CX is set to operate as a serial USB port (and not as a USB port for ActiveSync).**



Downloading GIS Data via USB

1. On MobileMapper CX:
 - Clip the I/O module to the back of the MobileMapper CX.
 - Connect the USB cable between the MobileMapper CX and your office computer.
 - Turn on the receiver.

 The first time you connect MobileMapper CX to the office computer, you may be asked to install a USB driver on the computer (although this driver should normally have been installed when installing MobileMapper Office). This driver is located on the MobileMapper Office CD in the “.../USB Driver/PROMARK/” folder. Once you have inserted the CD in your CD drive, ask the computer to search for this driver on the installation CD and then follow the on-screen instructions to complete the driver installation.


If the USB connection fails, disconnect the USB cable and plug it back. Quit MobileMapper Transfer on the computer and restart it.







Do not forget to double-tap the Mobile Mapping icon or else no communication will be possible between MobileMapper CX and the computer.

Please connect the MobileMapper CX to the computer BEFORE running MobileMapper Transfer.

- Make sure the USB device switcher ( >Settings> Control Panel) is set to “USB Serial”.
 - Double-tap the **Mobile Mapping** icon.
 - Make sure the MobileMapper CX **Storage** option setting will allow the MobileMapper Transfer utility to access the desired files. For example, if the files to be downloaded are on the SD Card, make sure SD Card is selected as the Storage option. To set this information, press the MENU key then select Setup then Storage.
2. On the office computer:
- From the Windows task bar, select Start>Programs>MobileMapper Office>MobileMapper Transfer. This launches MobileMapper Transfer.

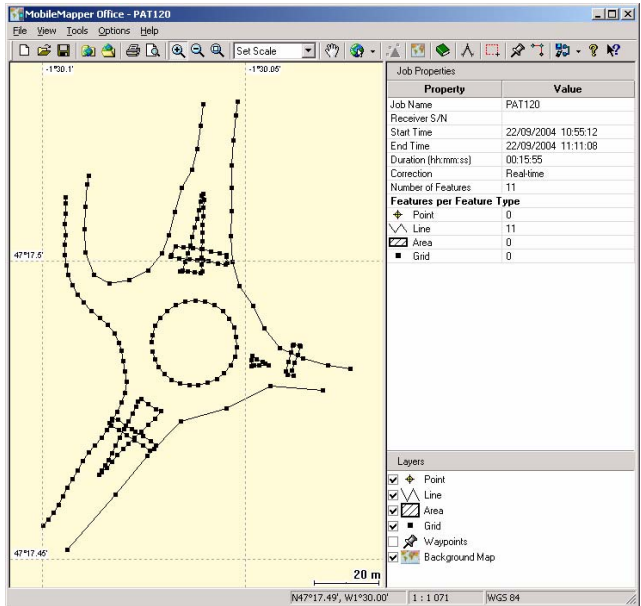
(Double-click  in the right side of the window if you want to access the parent directory and open another folder on your office computer.)
 - In the MobileMapper Transfer window, select File>Connect>GPS Device via Cable. After a few seconds, the left side of the MobileMapper Transfer window lists the files stored in the MobileMapper CX.
 - Select the MMJ files you want to download. If necessary, hold down the Ctrl key to make a multiple selection.
 - Press the **F5** key. A Copying file dialog appears during data transfer.
IMPORTANT! For a job performed in post-processing mode, follow the same procedure (nothing more to be done). In fact, in this case, MobileMapper Transfer will also copy automatically the corresponding raw data file (a <job_name>.Rxx file) and split it into files usable by MobileMapper Office.
 - Close the MobileMapper Transfer window.
3. On MobileMapper CX, quit the MobileMapping function, turn off the receiver and remove the cable between the office computer and MobileMapper CX.

Downloading GIS Data from the Card Reader

- Extract the SD card from the MobileMapper CX and insert it into your local SC card reader.
- From the Windows task bar, select **Start>Programs>MobileMapper Office>MobileMapper Transfer**. This launches MobileMapper Transfer.
- (Double-click  in the right side of the window if you want to change to the parent directory and open your job folder on the office computer.)
- In the MobileMapper Transfer window, select **File>Connect>PC drive**. As a result, the left side of the window shows the file structure of your office computer.
- On top of the left side of the window, click on the down arrow and select the letter corresponding to your local SD card reader (for example **"G:"**). You can now see the field data files stored on the SD card.
- In the left side of the window, select the MMJ files you want to download. If necessary, hold down the Ctrl key to make a multiple selection.
- Press the **F5** key or drag and drop the selected files from the left to the right side of the window. A **Copying file** dialog appears during data transfer.
IMPORTANT! For a job performed in post-processing mode, follow the same procedure (nothing more to be done). In fact, in this case, MobileMapper Transfer will also copy automatically the corresponding raw data file (a <job_name>.Rxx file) and split it into files usable by MobileMapper Office.
- Close the MobileMapping Transfer window once the downloading is complete.

Viewing/Analyzing the Content of a Job

Run MobileMapper Office and then use the **File>Open** command to open one of the MMJ files you have previously downloaded. As a result, MobileMapper Office shows the content of this job in the main window. Here is an example of a job open in MobileMapper Office:



NOTE: For a job performed in post-processing mode, please refer to the *MobileMapper Office User Manual* for more information.

First of all, you can see the list of layers present in this job in the lower-right corner of the screen. Clear or check the buttons for the layers you want to see in the Map Display area (the pane occupying the left part of the window).

The main purpose of viewing a job in MobileMapper Office is to get a view of the features that were logged during field operations. If enabled for display, these features are represented on the Map Display area according to the viewing choices made for the corresponding layers. You can do more than just view these features. You can also view the conditions in which these features were logged. To do that, just click on these features, one after the other in the Map Display area. This opens a new window in which you can see the properties of these features. In the example below, MobileMapper Office shows the properties of the selected point being part of an area feature:

Feature Properties	
Property	Value
Feature	Park
Geometry	Area
Number Of Points	144
Perimeter (m)	205.574
Area (hectare)	0.082
Observation	
Date/Time	24/09/2004 17:56:17
Duration	00:00:00
Current Position	
Latitude	47° 10' 13.93455" N
Longitude	1° 44' 16.76599" W
Altitude (m)	62.007
Num. Sat.	8
PDDP	1.7
Correction	Post-processed
Accuracy Estimation	
Horizontal Error (m)	0.724
Vertical Error (m)	0.857
Offset	
Direction	Left
Horz. Distance (m)	0.000
Vert. Distance (m)	0.000
Attributes	
Name	Unknown
Type	
Str Address	

The Feature Properties window provides the following information:

- Feature name and geometry, number of points for lines and areas only, measurement(s), user-settable **Updated** field. Apart from the **Updated** field, these are non-editable properties.

The nature of the measurements performed is presented below:

Length: MobileMapper Office determines the length of a line feature in the same way used by the receiver: by estimating the distance between successive points on the line feature with the assumption that each point is on a sphere of average Earth radius. The elevations of the points are not factored into the equation. Thus the software calculates the spherical distance rather than the horizontal or slope distance between the successive positions. The length of the line feature is the sum of all these distances..

Perimeter: MobileMapper Office estimates the perimeter of an area feature in the same way it estimates the length of line features.

Area of area features: MobileMapper Office determines areas by estimating the area enclosed within point locations recorded in the field with the assumption that each point making up the feature is on a sphere of average Earth radius. Thus the area is that of a curved, not flat, feature.

- **Observation** data (non-editable): date/time, duration of point logging.
- **Current Position** for the selected point (non-editable): latitude, longitude, altitude, number of satellites used, PDOP and correction type.

The correction type may be one of the following:

- “WAAS”
- “RTCM”
- “Post-processed”
- “Uncorrected” (for autonomous positions)

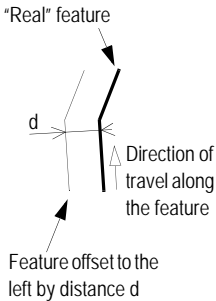
- **Accuracy Estimation** for the selected point: horizontal error, vertical error (non-editable).
- **Offset** data (editable): direction (for line or area) or bearing (for point), horizontal distance, vertical distance.

This set of properties can be used to artificially move the receiver's GPS antenna by a certain distance from the real position it occupied in the field.

For example, if the receiver was held at 5 feet (1.52 m) from the ground, you can enter “-1.52” m in the vertical distance cell to artificially bring the GPS antenna position down to ground level.

Likewise, you can offset a line or area feature to the right or left by a certain distance that you enter in the horizontal distance cell. The Left and Right directions for the offset are defined with respect to the direction followed by the field operator along the feature while logging this feature (see example opposite).

- **Attributes** (editable): list of attributes and values currently assigned to these attributes. You can freely change these values or enter new ones if blank.



There are many other functions that you can use in MobileMapper Office such as creating feature libraries or background maps, importing/exporting GIS data, downloading reference station data, post-processing jobs, etc. Please refer to the *MobileMapper Office User Manual* for more information.

Exporting Data to a GIS

The most important processing of your field data is its export to a GIS. Exporting field data has two processes: conversion of the data files to a standard format a GIS can read and then the actual transfer of the file.

1. On your office computer, launch MobileMapper Office
2. From the menu bar, select **File>Open**
3. Select the folder where you downloaded your files.
4. Select the MMJ file you want to open and then click **Open**. MobileMapper Office now views the data collected in the field.
5. From the menu bar, select **File>Export**.
6. Select one of the formats displayed and you will see a “Browse for Folder” window that allows you to select the directory to which the reformatted file will be transferred. If you don't know where to put this file, just select a temporary location.
7. Click **Export**. Your job will be automatically formatted and transferred to the selected folder. You can select any folder that is accessible by your office computer - including any GIS folders that may be on your network. When you start recording real data to export to a GIS, you will typically export data to a GIS database.

Uploading a Vector Background Map

Vector background maps are generated from DXF, SHP or MIF files imported in MobileMapper Office's Map Editor.

Note that raster background maps CANNOT be uploaded to MobileMapper CX in its current version.


All or part of the background map attached to MobileMapper Office's Map Display area can be uploaded.

The background map is output as an IMI file. The IMI file can be directly uploaded to the MobileMapper CX, or copied to the SD card inserted in the local SD card reader, or stored on the PC hard disk. In all cases, a connection to the MobileMapper CX is a prerequisite to the upload sequence.


Assuming the MobileMapper CX unit has been connected to the office computer via the USB¹ or RS232 cable, it has been turned on, you have double-tapped the **Mobile Mapping** icon and you have selected the storage medium on which to upload the map, do the following on office computer side:

- Launch MobileMapper Office.

To attach the desired vector map to the Map Display area:

- Click 
- On the **Vector Maps** tab, select this map from the left-hand list and then click the **Attach Map** button.
- Click **OK** to close the window.


If you want to upload only a region of the background map:

- Click 
- Drag a rectangle around the desired region and then release the mouse button.

The limits of the region are now represented with a rectangle. You can still resize or reshape the rectangle by dragging its control points (corner and mid-side points). You can also move the whole rectangle by dragging the mouse cursor from inside the rectangle.

- When the location and size of the region is okay, click outside of this region. The region is now defined and its limits are represented by a thick green line.

NOTE: To delete the region and start over, resume the above three steps.

1. Make sure the USB device switcher ( >Settings>Control Panel) is set to "USB Serial".

Start the upload procedure as such by selecting **File>Upload to GPS>Background Map**. MobileMapper Office tests the connection to the MobileMapper CX (the software needs to know which type of receiver the map is intended for). Once the data link is established, you can make one of the following three choices:

- **Upload to GPS Unit** if you want to upload the map directly to the MobileMapper CX.
- **Upload to SD Card Reader** if you simply want to copy the background map to the SD card inserted in the local SD Card Reader (you will use that SD card later in a MobileMapper CX).
- Or **Store on Hard Drive** if you just want to create now the IMI file on your hard disk so that later you can copy it to an SD card using the local SD card reader.

1. If you select **Upload to GPS Unit**, then:

- Click **Next >**
- After the GPS unit has been detected on the USB or RS232 port, click **Next >** again.
- MobileMapper Office indicates the size of the map file and the remaining memory space on MobileMapper CX. Click **Finish**.
- If the map filename uses more than 8 characters, MobileMapper Office will warn you that this name will be truncated. Keep the truncated name or type a different name and then click **OK**.
- Wait until the uploading messages on the office computer and MobileMapper CX disappear.
- When the upload procedure is complete, press **MENU** on the MobileMapper CX, tap **Setup** and then **Select Map**.
- Tap in the **Detail Map** field and then select the name of the file you have just uploaded
- Tap **Save**. MobileMapper CX starts loading the new map. After a while, the Map screen is displayed.
- Use the **IN**, **OUT** and scrolling buttons to get a full view of the new map on the Map screen.

2. If you select **Upload to SD Card Reader**, then:


- Click **Next >**.
- Select the drive letter corresponding to the local SD card reader (e.g. "G:")
- Click **Next >** again. MobileMapper Office indicates the size of the map vs. the remaining memory space on the SD card and the name of the background map file.
- Click **Finish** if you agree. The background map file is transferred to the SD card.

3. If you select **Store on Hard Drive**:

- Click **Next >**. MobileMapper Office indicates the size of the map vs. the remaining memory space on the hard disk, the folder where the file will be saved and the name of the background map file.
- Click **Finish** if you agree. The background map file is saved on the hard disk.

Uploading Jobs and Waypoints

To create a waypoint in a job:

Click on  in the MobileMapper Office toolbar and then click where to create the waypoint on the Map Display area. If necessary, adjust its coordinates, icon and name in the edit box on the right.


For more detail, please refer to the Using the Waypoint/Route Editor Chapter in the MobileMapper Office User Manual.


Jobs and waypoints associated with jobs are uploaded through the same procedure.

The way waypoints are uploaded and made available on the MobileMapper CX depends on whether the uploaded job is “empty” (i.e. there is no GIS data in it, just waypoints) or not:

- If the job is “empty”, the uploaded waypoints will replace the list of existing waypoints stored in the MobileMapper CX. Prior to uploading, a message will warn you that the waypoints currently stored in MobileMapper CX will be deleted.
- If the job is not “empty” (i.e. it contains GIS data), waypoints are uploaded as a separate MMW file associated with the MMJ job file. On MobileMapper CX, these waypoints will be visible only when you open the corresponding job. These waypoints will add up to the list of existing waypoints.


Assuming the MobileMapper CX unit is connected to the office computer via the USB¹ or RS232 cable, it has been turned on and you have double-tapped the **Mobile Mapping** icon, do the following on office computer side:

- Launch MobileMapper Office.
- Open the MMJ job file you want to upload
- Click  to read the list of waypoints associated with the job. If you change the list, save the job before continuing.
- Select **File>Upload to GPS>Job**.
 - If the job is “empty”, a message will warn you that all waypoints currently stored in the MobileMapper CX will be lost if you continue. Click **Yes** if you agree and then wait until the upload procedure is complete.
 - If the job is not “empty”, MobileMapper Office will successively upload the MMJ file and then the MMW file.

1. Make sure the USB device switcher ( >Settings>Control Panel) is set to “USB Serial”.

Uploading Jobs and Waypoints to the Local SD Card Reader

If you are using the SD card in the field rather than the MobileMapper CX's internal memory, you can also copy your MMJ and MMW files to the SD card using the MobileMapper Transfer utility and your local SD card reader.

- Extract the SD card from the MobileMapper CX and insert it into your local SC card reader.
- From the Windows task bar, select **Start>Programs>MobileMapper Office>MobileMapper Transfer**.
- (Double-click  in the right side of the window to access the folder containing the MMJ and MMW files you want to upload.)
- In the MobileMapper Transfer window, select **File>Connect>PC drive**. As a result, the left side of the window shows the file structure of your office computer.
- On top of the left side of the window, click on the down arrow and select the letter corresponding to your local SD card reader (for example "**G:**"). You can now see the field data files stored on the SD card.
- In the right side of the window, select the MMJ and MMW files you want to upload. If necessary, hold down the Ctrl key to make a multiple selection.
- Press the **F5** key or drag and drop the selected files from the right to the left side of the window. A **Copying file** dialog appears during data transfer.
- Close the MobileMapper Transfer window once the uploading is complete.

7. Appendices

Naming Conventions for Rover and Reference Files (Post-Processing Option)

Suppose you have created a new job named “JOB1.MMJ.” You selected the post-processing job mode in MobileMapper CX so that it records GPS measurement files in addition to JOB1.MMJ. The table below illustrates how these files will appear at various stages of the differential correction process:

Rover file seen on receiver	JOB1.MMJ
Rover file seen on MobileMapper Transfer's left window, before download	JOB1.MMJ
Rover file seen on MobileMapper Transfer's right window, after download	JOB1.MMJ
Rover files seen with Windows Explorer, after download	JOB1.MMJ, JOB1.B00, JOB1.D00 and JOB1.E00
Rover file seen on MobileMapper Office's Differential Correction window	JOB1

Suppose you have logged a reference station file on MobileMapper CX. The table below illustrates how the resulting files will appear at various stages of the differential correction process:

Reference file seen on receiver	Not Seen
Reference file seen on MobileMapper Transfer's left window, before download	0001a04.034 (for the first file recorded at reference station site ID 0001 on the 34th day of 2004)
Reference file seen on MobileMapper Transfer's right window, after download	b0001a04.34, d0001a04.34 and e0001a04.34
Reference files seen with Windows Explorer, after download	b0001a04.34, d0001a04.34 and e0001a04.34
Reference file seen on MobileMapper Office's Differential Correction window	b0001a04.34

The rover files with a B, D or E in the extension represent files with different GPS measurements all related to the original rover file. MobileMapper Office handles the information in these files automatically. But if you archive your files, you should include them in the archived directories.

The reference files that start with B, D or E are similarly handled automatically by MobileMapper Office but should be archived together with the rover files.

Reference files recorded by non-MobileMapper CX receivers may have other naming conventions.

Defining a User Map Datum

Mobile Mapping allows you to define the full set of 9 parameters defining a map datum.

After pressing MENU and selecting

Setup>Map

Datum>Primary/Secondary and "USER" in the prompted list, you now have access to two different screens on which these 9 parameters are presented:

1st screen:

Delta A (meters)
Delta F (X 10,000)
Delta X (meters)
Delta Y (meters)
Delta Z (meters).

2nd screen (select Next> at the bottom of the 1st screen to access this screen):

Rotation X (sec)
Rotation Y (sec)
Rotation Z (sec)
Scale factor (ppm).

Whether you are in the office using MobileMapper Office, or in the field working with your receiver, the system lets you create the user map datum you need.

However you will not use the same methods with mobile Mapping (in the receiver) and in MobileMapper Office to define the semi-major axis and flattening for your user datum.

In MobileMapper Office, you will use the conventional way of defining a user datum, i.e. by entering the semi-major axis (a), the inverse flattening ($1/f$) and the other 7 parameters.

The method used in the receiver with Mobile Mapping is different as it is based on the use of parameters Δa (Delta A) and Δf (Delta F) –known as the *Molodensky* parameters– instead of a and $1/f$. The other 7 parameters are exactly the same as those in MobileMapper Office.

Δa and Δf are defined as follows:

$$\Delta a (m) = a(\text{WGS 84}) - a(\text{Local Datum})$$

$$\Delta f = f(\text{WGS 84}) - f(\text{Local Datum})$$

Note that the flattening (f), instead of the inverse flattening ($1/f$), is used in the expression of Δf . So we have:

$$\Delta f = \left[\frac{1}{\frac{1}{f}(\text{WGS84})} \right] - \left[\frac{1}{\frac{1}{f}(\text{Local})} \right]$$

Because the resulting Δf is a very small quantity, it is multiplied by 10 000 to make it easier to handle. (The resulting value is closer to 1.) It is *this* value that you have to enter in the Delta F field in Mobile Mapping.

Calculation example:

	WGS 84	Local Datum
a	6 378 137	6 378 388
1/f	298.257 223 563	297



Complete the fields below on the receiver screen using the values of Δa and $10000 \times \Delta f$, below, left):

Δa	- 251 m	Delta A (meters)
$f_{\text{WGS 84}}$	$3.352\ 810\ 665 \times 10^{-3}$	
f_{Local}	$3.367\ 003\ 367 \times 10^{-3}$	
Δf	$-- 0.014\ 192\ 702 \times 10^{-3}$	
10 000 x Δf	- 0.141 927 02	Delta F (X10,000)

Δa and Δf of Frequently Used Datums

Name	a	1/f	Da	Df x 10 000
Airy	6377563.396	299.3249646	573.604	0.11960023
Australian National	6378160.0	298.25	-23.0	-0.00081204
Bessel 1841	6377397.155	299.1528128	739.845	0.10037483
Bessel 1841 (Nambia)	6377483.865	299.1528128	653.135	0.10037483
Clarke 1866	6378206.4	294.9786982	-69.4	-0.37264639
Clarke 1880	6378249.145	293.465	-112.145	-0.54750714
Everest	6377276.345	300.8017	860.655	0.28361368
Fischer 1960 (Mercury)	6378166.0	298.3	-29.0	0.00480795
Fischer 1968	6378150.0	298.3	-13.0	0.00480795
GRS 1967	6378160.0	298.247167427	-23.0	-0.00113048
GRS 1980	6378137.0	298.257222101	0.0	-0.00000016
Helmert 1906	6378200.0	298.3	-63.0	0.00480795
Hough	6378270.0	297.0	-133.0	-0.14192702
International	6378388.0	297.0	-251.0	-0.14192702
Krassovsky	6378245.0	298.3	-108.0	0.00480795
Modified Airy	6377340.189	299.3249646	796.811	0.11960023
Modified Everest	6377304.063	300.8017	832.937	0.28361368
Modified Fischer 1960	6378155.0	298.3	-18.0	0.00480795
South American 1969	6378160.0	298.25	-23.0	-0.00081204
WGS 60	6378165.0	298.3	-28.0	0.00480795
WGS 66	6378145.0	298.25	-8.0	-0.00081204
WGS 72	6378135.0	298.26	2.0	0.0003121057
WGS 84	6378137.0	298.257223563	0.0	0.0

Glossary

Attribute: A description item of a feature.

Attribute value: One of the possible values that can be ascribed to a feature.

Base Station: See Reference Station.

B-File: A binary file containing GPS measurement data.

Carrier phase data: Phase angle measurements for the 1575 MHz radio wave carrying the GPS coded messages. Using carrier phase data greatly improves GPS accuracy.

Datum: A mathematical definition of a surface from which coordinates of a given system are referenced.

D-File: A binary data file created by field collection software and stored in the receiver.

DGPS: Differential Global Positioning System. Commonly used to refer to real-time differential correction techniques.

Differential Correction: The process of:

(1) calculating how much to adjust GPS measurements to reduce the difference between a location's surveyed coordinates and the coordinates calculated by a GPS receiver that is kept stationary over that point; and

(2) the application of these adjustments to the GPS measurements recorded by any number of receivers within a few hundred kilometers of the "reference receiver."

Differential GPS: See DGPS.

E-File: A binary file containing GPS ephemeris data.

Ephemeris Data: Information transmitted from a satellite which allows the GPS receiver to determine the satellite's position in space.

Export: Converting data files to GIS Formats and writing them to any directory visible to the PC.

Feature: Any element located in the field that you wish to record for further uploading into a GIS database for example. A feature can represent a real object (streetlight, park, electrical transformer, etc.) or on the contrary, something invisible or impalpable (gas, noise level, dose of fertilizer, etc.).

Each new feature that you log in the field can only be an "emanation" or "offshoot" of one of the feature types described in the feature type library associated with the job in progress.

The logging procedure will be different depending on the type of the feature you are logging.

To log a feature: Means to save the characteristics of a feature into memory. The user is in charge of entering the description of this feature whereas the receiver is responsible for saving the GPS position(s) it has determined on this feature.

To describe a feature: Means to give each attribute of the feature one of the prompted values for this feature.

Feature Library: A file containing all the feature types required for a given job. (In fact we should say “Feature Type Library”.)

Feature Type: An item present in a feature library. Each feature type is defined by a geometry type, a name, a certain number of possible attributes and the list of possible values for each attribute. There are four different geometries in feature types: point, line, area and grid.

Field: Any area on the receiver screen dedicated to displaying the value of a parameter. Some fields are user-editable, some others are not.

Geographic Information System: A system of digital maps, data analysis software and a database of features, attributes and geographic locations.

GIS: See Geographic Information System.

Global Positioning System: A system of satellites providing worldwide coverage for positioning information. Although installed and maintained by the United States, the broadcast signals are available to anyone anywhere in the world.

GPS: See Global Positioning System

GPS satellite geometry: The satellite distribution at a given location. measured by the PDOP index

GPS signal multipath: Occurs when the GPS signal arrives at the antenna by a path other than a straight line. Multipath signals make the receiver think that a GPS satellite is farther away than it is and the resultant position is inaccurate.

Job file: File containing a feature type library and a collection of features that grows as you log new features in the field with this job file open. All the features in the job file necessarily “originate” from the feature types present in the job file’s feature type library.

Nesting: This word is used to describe a feature that you are logging whereas another feature is already being logged.

PDOP: Positional Dilution of Precision. An accuracy factor derived from the geometry of the constellation of GPS satellites used to calculate a position. In general, the more widely distributed the satellites are in the sky, the greater the accuracy. In general, PDOPs less than 10 are good.

Post-processing: Differential corrections applied to GPS positions in a PC - after both rover and reference data are logged and downloaded. Post-processing is slower but more accurate than real-time differential correction.

RTCM: Radio Technical Commission for Maritime Services. Commonly refers to a format of real-time DGPS format.

Reference Station: A stationary GPS receiver logging, or broadcasting, data from a known point. The data is used for differential correction. Reference Station is synonymous with Base Station.

RINEX: Receiver Independent Exchange Format. A “universal” GPS measurement data format designed to allow compatibility between different brands of GPS receivers.

Shapefile: A set of GIS files invented by ESRI but published as an open file standard readable by most GISs. A shapefile consists of a map file (SHP), a file containing feature descriptions (DBF), a file relating the map locations with the feature description (SHX) and sometimes a file containing coordinate system information (PRJ).

Waypoint: A pre-determined coordinate point to which a GPS receiver can navigate. GPS receivers can also log waypoints in the field for later navigation. GPS for GIS receiver have largely replaced waypoints with point features.

WGS-84 coordinate system: World Geodetic System, 1984. The coordinate system is used by GPS receivers for computing their positions.

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