

Using the Garmin GPS Receivers: A guide to some basic field tools

The Geography department has Garmin GPS76 and GPSMap76 receivers, in addition to some higher-end Trimble units. This document describes the Garmins. You may find the manual useful in the field to deal with peculiarities of operating each receiver but this handout contains the essential information you need. These instructions are designed to provide basic skills for a variety of geographical field questions, in particular locating points, navigating to existing points and mapping using the GPS receiver. There are some subtle differences between GPS76 and GPSMAP76 receivers and in both systems there are multiple ways you can achieve the same results, so this requires a certain amount of exploration and perseverance.

1. Getting started

Switch on and off: hold the power button (red light bulb icon). It may give a warning message deferring responsibility to you, to which you press the **PAGE** button. Once turned on the receiver will try to 'acquire' satellites and produce a location.

Once the signals are received and the location is computed, the location, elevation, time and accuracy will be displayed. The latter is based on the PDOP and satellite clock errors and whether the receiver receives the differential signal (DGPS) from WAAS. Always make careful note of the accuracy value – this isn't stored by default. Always check the time, elevation and location as well to make sure they seem reasonable (this is a basic check that the receiver is not malfunctioning and you have selected a sensible datum for your coordinate system).

To explore through the receiver options, use the **MENU** key. Note that when pressed once it provides a menu for the *existing* page, while a second time brings up the basic menu options for the receiver. Use the **rocker** to scroll up down, left and right and **ENTER** to select the highlighted option. To get out of a window, use the **QUIT** button.

Setup

Press **MENU** twice to get to the Main Menu, and scroll down to **Setup**. You can change the options by highlighting the option you want to change using the **rocker** and pressing **ENTER**. This will provide you with sub-options which you select by highlighting with the **rocker** and pressing **ENTER**. Some setting tabs:

- **General:** Enable **WAAS** unless you're low on batteries and don't need accuracy.
- **Units:** **Elevation** units should be set to meters, unless you really want feet.
- **Location:** **Location Units** can be set to UTM UPS (easiest to work with) or one of the geographic coordinate systems of decimal degrees (hddd.ddddd°), minutes or seconds. **Map Datum** should be WGS84 or NAD83. Note that the receiver easily moves between formats and datum so for example, you could store waypoints in GCS, then change format to UTM and then navigate to the same waypoint in UTM co-ordinates.
- **Time:** You'll probably want your local time zone.

What's happening?

My GPS isn't seeing any satellites!

Are you indoors, or in a dense forest or canyon? If you *should* be getting a signal, check the date and time. If the GPS has been stored for a while without batteries, you may not pick up a satellite signal because the date is wrong – it can't see satellites it's not looking for. If so, you'll find a **Stored Without Batteries** choice in one of the first menus. You may have to set the date and time.

2. Storing a waypoint

The receiver also has a built in memory which allows you to store point or track information. This can be used for applications like setting a benchmark for surveying or locating a sampling point for later return. You could simply write down the location information (including accuracy) that your receiver calculates and/or you can store the waypoint in the receiver. This has the advantage that you can later task the receiver to navigate you to that waypoint. The disadvantage is that someone might erase the waypoint from memory (hence the notebook for redundancy).

To store a point location (waypoint), first get a fix on the location with a reasonable (and recorded in your notebook) PDOP accuracy and then hold (as opposed to *press*) the **ENTER** button. This produces the **Mark Waypoint** page with the coordinates and elevation (that the receiver last calculated). With this page you have several options:

- To name the waypoint, use the **rocker** to scroll to the top right option which is the name (typically the default is three numbers, which increment automatically). Highlight this option, press **ENTER**. This will highlight the first digit. Use the **rocker** to scroll up or down through the basic alphanumeric digits you can insert. Keep the name simple but informative (and 10 digits or less). *Hint: You can also just write down the numeric id it automatically generates.*
- If you press the **MENU** button, this brings up a choice to average points. If you select this, the unit will start collecting multiple points to average, while you are staying at the same location. This can greatly improve the accuracy of your collected points, if the errors are random (some are biased – e.g. from multipath effects near buildings). While the position fixes are coming in to the unit (one per second), you will see displayed the PDOP accuracy of each reading, the count of collected readings, and the resulting average coordinates. You will probably find that the average values will stop changing after 50 or 60 positions. Press **ENTER** to save the average and return to the **Mark Waypoint** page. From there you can save your waypoint, which now uses the averaging result.
- You can also locate your point on a map (here is one place where the two models differ.)
- Once you have completed the name, highlight **OK** and press **ENTER**.

Discovering with Menus

The Garmins have more capabilities and options than the manual describes. You can discover these by pressing the **MENU** key while a screen is displayed. Since the first menu displayed is context-sensitive, you may learn about a useful option. This is how we discovered waypoint averaging – which is not documented in the manual.

Note, you can bring up your waypoint in a number of ways, including **MENU**, **Points**, **Waypoints**. You will then either scroll through the list of Waypoints arranged by distance from current location (**Nearest Waypoints**) or by typing in the waypoint by name (**Waypoints by Name**). You can go between either of these options for selecting the waypoint by pressing **MENU** once and selecting the top option (which will be the one you don't have). Anyway, now you've highlighted the waypoint of interest, press **ENTER** to bring up the waypoint of interest. You can also enter a new waypoint by providing the coordinates (perhaps obtained from a map or GIS). Bring up the waypoint page holding the **ENTER** button as above but change the name, elevation (if known) and coordinates for your new entry.

3. Navigating to a waypoint

Used for finding a location for which you have been provided coordinates or returning to a point of interest for which you have marked a waypoint (see above). To navigate to a waypoint, bring up the waypoint page for the waypoint of interest. You will notice one of the options is **Goto**. Highlight this and press **ENTER**. The receiver will now provide the information to direct you to that waypoint. You can use this information in various ways depending on the page view you have. Press **PAGE** repeatedly to scroll through the various view options, including maps of varying resolution (**IN** to zoom in, **OUT** to zoom out), compass heading to waypoint, distance to waypoint, current speed, heading etc. Use the displays that are most effective for you to navigate to the waypoint. As you get close, a warning message pops up (**Arriving at Destination**). You have arrived at the location when distance to waypoint = 0 or the waypoint coordinates match the current location coordinates.

4. Using *tracks* to map a line or polygon

You may want to use the receiver to map a linear feature or the boundaries of an area, such as the shape of a landform or sample plot. To store a line or polygon, you can either convert a set of waypoints into line vertices (if you know how to do this) after downloading, or use the tracks it collects while it's receiving positions. Note that the receiver will keep saving tracks of positions between uses, so you may want to separate tracks as separate features. Press **MENU** twice and select **Tracks**. Here you can:

- **Save** or **Clear** the current track log, naming it by the date (or optionally changing the name). You will be prompted to select when to start the track by time and date.
- Select a previously saved track (move the cursor to select a track), to note its properties, rename or delete it, or use it to track back. You can store up to 10 tracks.
- Note how much memory is used. If low, you may want to clear the current track log, or clear previously saved tracks you don't need.
- Go to the **menu** to either delete all saved tracks (this does not clear the track log), or change the setup by scrolling to **Setup Track Log**. You can either record by **Time** or **Distance** interval and set that interval accordingly (**Interval**). The frequency is a tradeoff between the distance you have to cover, the speed with which you will cover it, the level of detail required and the amount of memory available. For example mapping a stream on foot with meanders 100 m apart, you might select about 10 second or 10 meter (0.01 km) intervals (for some reason the distances are in km).

So to save a track to create a line or polygon, you'll just need to know when you started it, then save it at the end of the track. The best way to do this is to first clear the track log, then save it at the end; do this for each track and you won't end up with extra stuff in the track by accident. You should make sure to write in notebooks times and locations of start and end points and any other notable points along the route that maybe useful for later interpretation (e.g. a bridge across the stream, etc.)

5. Downloading data from receivers onto PC

There are two methods we can use: (1) using MapSource; and using (2) the MxGPS extension with ArcMap. Both are available on computers in the HSS 290 and HSS 272 computer labs. For each, connect the Garmin adaptor cable (available from the Map Library) to both the GPS receiver (four pin connector) and the PC (nine pin connector). If there is more than one 9-pin port on the PC, use the uppermost one (this should be COM1).

MapSource

Start the software and go to **Transfer, Receive from Device**. This brings up a dialogue box and you should see your device GPS76 or GPSMAP76 in COM1. If not, check the cables are connected properly and the receiver is turned on and select **Find Device**. You can then select what it is you wish to receive (Maps, Waypoints, Routes, Tracks) – if in doubt check all boxes then click **Receive**. The data will be downloaded from your GPS receiver. Play around with the mapping functions in MapSource to view your waypoints and tracks. You can save this information as a Garmin GPS Database file (.gdp) for later use in MapSource or export it as a text file to be read by other programs. To export these files to a text file select **File, Export**, provide a name and file directory and select text (.txt) type.

To process these downloaded files and bring them into ArcMap, see the ***Importing Garmin GPS76 Data into ArcMap*** exercise document. This document also describes using the MxGPS extension.

MxGPS

This is the best way to go if you are going to bring your data into ArcGIS, since it comes in with the correct coordinate system and the process is simple. In ArcMap, use the MxGPS toolbar with the Garmin attached and turned on to download your points and tracks. On the “Get Waypoints from GPS” or “Get Tracks from GPS” window, the leftmost button is the download button; after downloading you’ll see them displayed. You can select multiple points or tracks by checking them, and then save these with the “save” disk button. With tracks, you can also select which line segments to include. You provide a shapefile name, and after it saves to disk you’ll see it as a layer on the map.