

GPS / Satellite Navigation Terminology

Some of the terminology used around GPS and Satellite Navigation is not universally well defined. Term usage varies among related standards, websites, documents, devices and software vendors. In some cases, the same terms are used to mean different things and in others, different terms are used to mean the same thing.

This document is an attempt to provide some clarification. It is based on one person's understanding of common usage around the GPX file standard¹ and Garmin's extensions² to that standard. Unfortunately, those standards define format more than content. What follows is certainly not authoritative.

GPS	<p>Global Positioning System. A system of satellites maintained by the US government which supports navigation around the globe. A few other countries maintain similar systems to support satellite based navigation.</p> <p>"GPS" is also commonly used, especially in the U.S., to refer to Satellite Navigation Devices – see below.</p>
GPS Receiver	<p>A device which receives signals from GPS satellites and uses them to determine its current location anywhere around the globe. The receiver must have a view of the sky to receive satellite signals.</p>
SatNav	<p>Satellite Navigation Device – commonly called a "GPS" in the United States. An electronic device incorporating a GPS receiver plus a display, map(s), and software with the ability to store locations around the globe and to calculate routes between locations. Many have additional capabilities as well.</p> <p>Examples include most smart phones, "the GPS" installed in a car, boat, airplane, motorcycle, etc.</p>
Route Planning Application	<p>Software with mapping, display, route calculation and planning capabilities. Capabilities are similar to a SatNav but without a GPS Receiver; used for planning but not for active navigation. Examples include mapping software on a personal computer or a website.</p> <p>Some SatNav manufacturers offer companion personal computer, web based, and / or smart phone applications to support route planning for subsequent navigation guided by their devices.</p>
GPX	<p>GPS eXchange format. A digital file format for storing and exchanging GPS based navigation information such as Waypoints, Routes and Tracks among various SatNavs and applications.</p> <p>There is a common GPX standard supported by many devices and applications however the standard is extensible. Not all extensions are supported by all vendors.</p>
Point	<p>Any location on or near the earth can be specified by latitude, longitude, and elevation. In many non-aviation applications, elevation is optional since it is generally reasonable to assume that the location is on the earth's surface.</p>

¹ <https://www.topografix.com/gpx.asp>

² <https://www8.garmin.com/xmlschemas/GpxExtensions/v3/GpxExtensionsv3.xsd>

	<p>In the context of satellite navigation, several types of Points are defined – all of them represent locations specified by latitude, longitude and, optionally, elevation.</p> <p>It is important to note that not all devices and applications support all point types. This can lead to challenges when GPX files are exchanged between devices and/or applications.</p>
Waypoint	<p>A Point (see above). In addition to location, a Waypoint may include additional helpful information such as a name, description, address, etc.</p> <p>Some navigation devices and software refer to any specified Point as a Waypoint. Others define a Waypoint more narrowly.</p> <p>A Waypoint is a location. It may or may not be part of a Route or Track..</p> <p>Some vendors refer to any Point, or at least any point used to specify a Route, as a Waypoint.</p>
Track Point	A Point (see above) which is specified as a part of a Track – see below.
Route Point	<p>A Point (see above) which is specified as a part of a Route – see below.</p> <p>Again, some vendors refer to any point used to specify a Route, as a Waypoint. Garmin, and some others, do not. They differentiate Waypoints from Route Points, although Waypoints can be used to define Route Points.</p> <p>Garmin has extended the GPX standard to define two subtypes of Route Points, Via and Shaping. The subtypes are equivalent during route calculation. A calculated route will always pass through all specified Route Points (as long as they are located on roads or paths of the appropriate type). The subtypes are treated differently during active navigation – see below.</p> <p>Garmin’s GPX extensions also define Route Point Extensions – see below.</p> <p>Some, but not all vendors support Garmin’s extensions.</p>
Via Point	A Route point subtype. Intended to indicate a more important point on a route during navigation. Via Points “alert” on arrival, must be explicitly skipped if so desired, and may be selected as destinations when starting or restarting a route.
Shaping Point	A Route point subtype. Intended to indicate a less important point used to “shape” a route to follow a particular path. Shaping points do not alert during navigation, can be skipped automatically and are not available to select as destinations.
Route Point Extension	<p>These Route points are not specified by the user. They are generated by software during route calculation and are generally not visible to the user. They are sometimes called hidden or ghost points. They will be located along a Route between user specified [via and shaping] Route Points. They are intended for internal use only.</p> <p>Route Point Extensions can be a major source of confusion and frustration when exporting and importing routes via GPX files.</p> <p>Where supported, exported GPX files containing Routes will include Route Point</p>

	<p>Extensions. On import, the Route Point Extensions, as well as the Route Points, will be used to initially draw the imported route. The Route Points will be displayed but the Route Point Extensions will not be displayed.</p> <p>It is important to recognize that Routing Point Extensions are the <u>result</u> of Route calculation. They are <u>not</u> used to re-calculate a Route. This is why an imported route can change significantly when the route is re-calculated.</p>
Hidden Point	See Route Point Extension.
Ghost Point	See Route Point Extension.
POI	Point Of Interest. Examples might include National Parks, gas stations, hotels, coffee shops, etc. Some devices and software define POIs more narrowly.
Track	<p>As an initial, simplified definition, a Track is where you, or someone else, have already been.</p> <p>As a GPS receiver or SatNav moves around, on or near the earth's surface, it will nearly continuously determine its current position. That position can be saved periodically. By saving location frequently, the device can generate an ordered series of Points (aka breadcrumbs) representing the path that was traveled. These saved "Track Points" form a "Track". The saved points may optionally include the date and time when the point was reached.</p> <p>It is important to note that no map is associated with a Track. A Track is made up only of Points. It is independent of any map.</p> <p>Most SatNavs and Routing Applications are capable of visually displaying a Track by overlaying Track Points on a map and connecting them with straight lines. Although visually useful, this is simply a line drawn on a map. The Track and the map remain independent of each other. A Track cannot provide turn-by-turn directions. A Track cannot be used directly to calculate or modify a Route.</p> <p>Many devices and applications can generate a track from a route but that does not change what a track is, an order set of locations independent of a map.</p>
Route	<p>As an initial, simplified definition, a Route is where you intend to go.</p> <p>A Route is an intended path between two or more Points determined using an appropriate map (or chart for aviation or marine applications). A routable digital map indicates possible paths of travel – e.g. paved or dirt roads, single tracks, hiking trails, etc. Given two or more specified Points, a Navigation Application or SatNav can use a routable digital map to calculate a Route from each Point to the next. With a few settings – e.g. car vs hiker, fastest vs shortest, etc. – an appropriate path can be calculated – e.g. a Route over paved public roads from Point A to Point B.</p> <p>In common use, a user might search for and select a single, previously defined Waypoint, such as a gas station, as a destination and allow the SatNav to determine the best Route from the current location to that destination.</p>

	<p>In other cases, when developing a carefully planned route, a user might indicate multiple Points by clicking locations on the roads on a map displayed by a Navigation Application, asking the application to calculate a Route with particular characteristics including all of those Specified “Route Points”.</p> <p>Most SatNavs and Routing Applications allow search and selection of previously defined Waypoints to be included as Route Points. Most also support Route Point selection by clicking locations on a map.</p>
Ride	An alternate name for a Route.
Trip	An alternate name for a Route.

The above, and additional related information, can be found in video form in the “Route Planning and GPS Navigation” playlist here <https://www.youtube.com/@retiredtwotiredtraveler/playlists>

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