

GPS Cube datalogger tracking performance

We get many queries regarding the real life GPS tracking performance that can be expected from our GPS Cube GPS datalogger. There are many technical standards that may be used for measuring GPS performance and accuracy. Some manufacturers use conflicting and sometimes misleading figures to describe the performance of their products. For this trial we used a setup that closely resembles what would be encountered in the field.

GPS Cube datalogger setup

- GPS antenna was mounted under a plastic vent between the hood of the car and the front windscreen.
- This position is not the ideal (middle of the roof) place but a good covert and anti-vandal tracking location.
- Car was driven around suburban areas - no high rise buildings but still most urban disturbances and features.
- The day (not by choice!) was overcast and raining which can sometimes drop GPS performance.
- The GPS antenna used was a 3V active antenna as supplied with the GPS Cube starter pack.
- Logging was set at one second intervals to highlight any dropouts in GPS coverage and position errors.

DGPS reference receiver setup

To gain a reference against which to compare accuracy the car was also fitted with a high-performance DGPS receiver that uses differential correction information from another set of satellites and is capable of consistent sub-meter accuracy while in DGPS mode. The antenna used with this receiver was a high quality (and expensive) reference style GPS antenna. For analysis we disregarded points when the DGPS receiver was unable to retrieve DGPS correction information, as in this case the receiver is no more accurate than a standard GPS receiver.

Analysis of GPS accuracy

The following summarizes the results of our testing over 30 minutes (1800 points):

- Average position error: 5.68 meters
- Minimum position error: 0.16 meters
- 95% maximum position error: 13.00 meters
- Maximum position error: 16.48 meters

Summary

While the average errors were slightly less than we were expecting the real surprise was the maximum error of 16 meters. Later analysis confirmed that while some points received from the GPS Cube datalogger showed the vehicle slightly off the road every point easily indicated the road on which the vehicle was travelling. If writing a GPS tracking application based on a vector map it would be quite easy to always display the vehicle at the center of the nearest road with near 100% confidence of correct placement.

Another big surprise occurred when replaying data from the DGPS receiver in which all records were included. While performance was excellent with 5 or more satellites in view and a valid DGPS signal being processed the receiver threw some really wild positions when the satellite coverage became degraded. While the GPS Cube datalogger continued to show positions that resembled the real location on the map the DGPS receiver often showed the vehicle in excess of 50 meters off-track. This was a DGPS receiver and antenna combination that costs in excess of \$US2,000 without any datalogging capability.

Conclusion

The GPS Cube based on the miniature UV40 GPS Engine provides ample accuracy for vehicle tracking applications. While a higher grade DGPS receiver may be necessary for precise positioning they can fail to perform at optimum for real-time GPS tracking when satellite coverage becomes degraded. For commercial applications software may be easily be written to determine the road on which a vehicle is travelling and show the vehicle in the center of the road.