

GPS Newsletter – General

A Newsletter On System 500 GPS, Vol. 02, No. 11.

Data links are crucial in RTK but they are also the weakest element in the entire chain

It is almost impossible today to think of modern surveying without **GPS RTK techniques**. GPS RTK has quickly evolved to become one of the most simple yet most productive ways of surveying.

RTK centimetre (cm) accuracy is obtained by broadcasting the code and phase measurement data from the reference station to one or more rover units. The rover units then combine this reference data with its own data in order to compute cm accurate positions.

The data is transmitted from the reference to the rovers using small, lightweight portable data links. It is therefore obvious that this data link plays a crucial role in the world of real-time GPS cm surveying.

There are various means to generate a permanent data link between a reference and a roving station.

Digital cell phone based communication devices are now a part of every day life and are also playing an increasingly important role in GPS RTK.

This newsletter however focuses on the more traditional and widely used data link - small and compact **data radios**.

Radios Used

The radios used typically operate in the UHF (400-475MHz) band or VHF (170MHz-220MHz) spectrum.

Irrespective of the frequency band, radios at temporary field reference stations tend to be larger, heavier, and use more powerful modems in order to increase the operating range of a rover from the reference station.

The radio models used at the rover, however, are more designed towards compactness, easiness to carry, low power consumption, and high reception sensitivity.

Despite the steady progress in technology, data radios have always remained a somewhat mysterious world to surveyors.

Perfect and flexible solutions for Surveyors

Leica Geosystems designed System 500 in such a way to provide the user with the highest-performing radio solutions.

To achieve this, we closely collaborate together with the world's most renowned experts in the field of rugged data communication solutions for GPS applications, **Pacific Crest Corporation** in the US and **Satel Oy**, based in Finland, for Europe.

Pacific Crest Corporation (www.paccrst.com) and Satel Oy (www.satel.fi) have developed radio modems for GPS which can be easily integrated into the System 500 communication modules which thus provides a large degree of freedom and flexibility.

Both the Pacific Crest and Satel Oy solutions are used throughout the world with Leica GPS Systems.

This newsletter focuses on the Pacific Crest solution in more detail.

Pacific Crest PDL radio family



It is the latest generation of Pacific Crest's Positioning links PDL that gives the ultimate GPS RTK performance.

PDL radio modules can be obtained in different configurations.

Base Station radios

The highest performance can be obtained by using powerful 35 Watt (W) amplifiers – but in many countries, local legal restrictions do not allow such powerful radios to be used.

A particular strength of Pacific Crest's PDL family is the product offering in those countries where output power is limited.

For such countries 0.5W and 2W LPB (low power base) versions are available with an extensive set of accessories enabling a high performance set-up.

The accessories enable an **easy fixing** of the radio modem directly to the reference station tripod – no second tripod needed!



Leica Base Station with PDL

Besides the output power of the radio modem and the technical quality of the modem, it is the height of the reference antenna which largely determines the operating range of the RTK data link. Always remember to get the radio antenna as high as possible!

Lightweight RTK Rover radio

Regardless of whether there is a powerful amplifier or a compact LPB at the reference station, the surveyor only needs to carry a lightweight compact receive-only module on the rover.

This not only minimises the weight of the rover (leading to a more comfortable use of the rover when working for long periods) but also minimises power consumption on the rover.

The communication module does not restrict the flexibility of the use of the rover set-up and can therefore be used for both static RTK set-ups with tripods or dynamic applications with an “all on the pole” or “backpack” set-up.



Communication Module attached to System 500 sensor

Other unique PDL features

The PDL radio family offers other unique features.

- It is accompanied with a user-friendly Windows based **configuration software** allowing users to check the configuration of the radio. This facilitates trouble shooting but also the modification of the modem settings for special application such as hydrological surveys.
- PDL radios can also be configured to be compatible with Trimble data radio protocols. This then of course allows the combined surveying of Leica customers and Trimble users on one and the same project site.
- The entire PDL family together with its accessory system are **designed for rugged field use**, perfectly combining with the Leica RTK field system.

Excellent Guide explaining radio basics

The Leica Advantage Website has a link to *The Guide to Wireless GPS Data Links* at http://www.leicaatl.com/support/gps/GPS_Technical_Papers_Home.htm written by Pacific Crest or visit their website at <http://www.paccrst.com/products/products.htm> It is a comprehensive guide introducing surveyors to the basics of data links technology and its implications for daily surveying tasks.

System 500 enhancing your PDL

The range of the radio link and therefore the surveyor's productivity is limited by the output power of the reference radio, frequency and topography.

However, the morphology (how the surveying system can be set up) of System 500 enables the simultaneous use of both a radio based communication links (such as the PDL) and also the use of digital cell phones.

With such a set-up, the user can always choose to use the communication technology that is most suitable to the current task and environment.

Remember...

- 0.5W, 2W and 35W models of the PDL family are available for RTK reference stations.
- The models are available in the **VHF and UHF band**.

- It is possible to **simultaneously use radio and digital cell phone** at any time with any set-up.
- At the rover, compact and lightweight receive-only modules are used.
- You either work with the native Pacific Crest communication protocol or one of Trimble's protocols allowing to mix receivers from different manufacturers.
- Windows-based configuration software for PDL radios facilitates trouble shooting and re-programming for special applications.

If you are further interested in using a Pacific Crest PDL radio together with System 500, please contact your local Leica representative or your closest Pacific Crest dealer (www.paccrst.com).