



Static and Rapid Static GPS

The next few newsletters discuss the “traditional” way of computing baselines with GPS – **Static Surveying**. This newsletter looks into the background of **Static** and **Rapid Static** GPS surveys and discusses how much data should be collected for such survey.

Future newsletters will describe the post-processing of data within SKI-Pro and discuss the effects of the ionosphere on surveying with GPS.

A Little History

In the early days of GPS, all baselines were measured using **Static GPS**. Data was typically collected at greater intervals (say 30sec) over a period of more than 3 hours with baselines of all lengths being measured.

In 1992, Leica introduced **Rapid Static GPS** which allowed baselines of up to around 20km to be measured with greatly reduced occupation times of around 15 minutes. This was achievable using ambiguity resolution techniques and the **FARA** (Fast Ambiguity Resolution Approach) algorithms developed by **Dr Erwin Frei** of Leica (**Wild** in those days). This was a big breakthrough in GPS surveying at that time.

Mainly for historical reasons, the terms Static and Rapid Static surveys are still used today. However, it is actually difficult to precisely define the difference between a Rapid Static survey and a Static survey, or to say when a Rapid Static survey becomes a Static survey.

Maybe the best way to describe any difference between a Rapid Static and a Static survey is as follows.

If a baseline is being computed using longer occupation times (maybe >1 hour) then this could be described as a Static survey. If a baseline is being computed using shorter occupation times (maybe <1 hour) then this could be described as a Rapid Static survey.

Obviously, because more data is then being collected during a Static survey than a Rapid Static survey, the resulting co-ordinates from a Static survey will generally be more accurate than a Rapid Static survey (this is discussed further in a future newsletter).

The Big Question

The question asked by most “newcomers” to Static and Rapid Static GPS is “**For how long should I collect data**”? (These newsletters still use the words “Static” and “Rapid Static”, even though we have just said there is no definable difference!)

This question is impossible to answer, because it depends on the conditions under which the data is collected – the length of the baseline being measured, the number of satellites being observed, the DOP of the satellites, the rate at which the data is being collected, the ionospheric activity, etc.

However, we do provide guidelines to address this question. The table below is taken from the **General Guide to Static and Rapid-Static** manual.

Obs. Method	No. sats. GDOP ≤ 8	Baseline Length	Approximate observation time	
			By day	By night
Rapid Static	4 or more	Up to 5 km	5 to 10 mins	5 mins
	4 or more	5 to 10 km	10 to 20 mins	5 to 10 mins
	5 or more	10 to 15 km	Over 20 mins	5 to 20 mins
Static	4 or more	15 to 30 km	1 to 2 hours	1 hour
	4 or more	Over 30 km	2 to 3 hours	2 hours

Some users rely on the **Stop and Go** indicator built into the System 500 sensor for Rapid Static surveys. This is a set of algorithms which estimates for how long data should be collected. The algorithms take into account the rate at which the data is being collected, the number of satellites being observed and the DOP values with the user only having to enter the length of the baseline being measured. As data is being collected, the system will indicate how much data needs to be collected.

However you decide how much data to collect, remember – it is always better to collect too much data than too little!

Get Into Good Habits

The GPS data being collected should always be as “clean” as possible. This means always try to choose the best possible locations to site the GPS antenna. A suitable site should have no obstructions above 15 degrees, there should be no reflecting surfaces nearby that could cause multi-path, and also no powerful transmitters (TV, radio etc) close by.

In particular for Rapid Static surveys, it is important that the survey should be performed when the GDOP is less than 8 – ideally less than 5. Remember to use the **Satellite Availability** software to compute GDOPs at the locations to be surveyed.

Remember

- Mainly for historical reason, the terms “Rapid Static” and “Static” are still used although there is no clearly definable difference between the two.
- Read the manual **General Guide to Static and Rapid-Static** for useful tips and guidelines on collecting data for static or rapid static surveys.