Dr. Javad Ashjaee proudly displays the new Triumph LS all-in-one GNSS receiver at his high-tech San Jose manufacturing facility against a backdrop of nearly complete Triumph 1 receivers.

A New Triumph in San Jose

At an invitational event held at his US manufacturing facility in San Jose in September, Javad Ashjaee announced the release of a new series of GNSS receivers (availability slated for the first quarter of 2014). The flagship of the new lineup will be the Triumph LS ("LS" for Land Survey) which builds on the company's Triumph VS released a couple of years ago–a true all-in-one, GNSS receiver, antenna and data collector. At the heart of the new receivers is a new Triumph 2 chip that boasts 864 channels with three processors.

Somewhat skeptical of the need for so many channels, I pressed him to explain the benefit this would bring to surveyors. "Is it just because you can?" I asked. Javad smiled as he presented his case because this isn't the first time he's offered–and subsequently needed to defend–a product that exceeded the conventional wisdom of his market. In 1988, in the early days of GPS, he offered the first 12 channel receiver, the Ashtech XII–when there were only ten GPS satellites in the constellation (which would mean there were even less visible at any one time from an observer's position on Earth). Some could not understand the significance twelve channels would bring to precision surveying. By contrast, today's high end receivers are tracking well in excess of 100 channels–a need brought about by a full GPS constellation as well as other constellations such as the Russian GLONASS, the European Galileo and the Chinese Beidou systems and the various Space Based Augmentation Satellites (SBAS) such as the US WAAS, the European EGNOS, Indian GAGAN, and the Japanese MSAS and QZSS. Along with the added constellations are added signals. The Ashtech XII collected L1 only. Modern receivers collect as many as five signals from one GPS satellite: L1, P1, P2, L2C and L5. With a fully modernized GPS constellation, tracking 12 GPS satellites alone would call for 60 channels! Of course this still does not explain the benefit of 864 channels.

Javad's Triumph 2 chip dedicates 100 channels to signal interference monitoring which he insists is an increasing issue of concern as there are an increasing number of signal interference sources which can lead to slower or unobtainable initializations in the field. Most experienced RTK users have been faced with radio interference, requiring the user to change radio frequencies. For this reason it's a good idea to have a scanner that can detect radio interference before you begin your survey. The same is true for GNSS signals. Most experienced users have

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knowingly or unknowingly fallen victim to GNSS interference at some point. Unlike UHF scanners which are available at the local electronics store, GNSS scanners are not so easily accessible. The new Triumph 2 chip changes that. If a user has a good constellation, a good radio or cell link to his base or RTN, and experiences difficulty fixing or maintaining a fixed solution, checking for in-band interference of the GNSS frequencies is just a click away with the Spectrum Analyzer. Whereas before it was simply a matter of conjecture, now a surveyor can quantify interference instantly.

The remaining 700+ channels not designated to scan for interference receive all available GNSS signals. As I mentioned, a single satellite broadcasts multiple signals, with each signal requiring its own channel. Of course this doesn't require anywhere near 700+ channels even with all of the constellations and modernized signals, but with the extra channels each satellite signal can be received independently by 5-10 channels. If one channel loses a signal there are several others tracking that same signal, promoting more robust tracking. If all redundant channels have a good signal, the received signals are averaged to improve precision.

The receiver also has six RTK engines running simultaneously using slightly different methods to arrive at a solution, which Javad said provides an incredible amount of reliability in the RTK solution as each engine contributes to a weighted average of the receiver's reported position.

He went on to add that because the architecture of the Triumph 2 places all of this in a single chip the processing speed is substantially improved while the power requirements are reduced enough that the LS should run for an impressive 25 hours between charges in full RTK mode.

Also of interest, Javad stated that the new receivers will have a new software interface. Javad explained that in the development of the VS that the hardware "fascinated" him while the software was not prioritized. He is committed to mating this new hardware to a new software interface that works the way surveyors work and offer tools that no other data collectors currently offer even soliciting the input of American surveyors to accomplish this goal. I was pleased to be able to offer some insights myself and look forward to seeing how those suggestions will be implemented.

Attendees were also given a tour of the production facility–Javad EMS (Electronic Manufacturing Services) by Vice President Gary Walker. Mr. Walker showed how each complex circuit board was tested throughout the assembly process for defects before continuing to the next station. Many manufacturers test samples (one from every ten, or more) because the testing time slows production, but Javad EMS tests each board multiple times through multiple processes reducing the probability of a faulty product leaving their warehouse to statistical insignificance.

Along with the LS, Javad announced the Triumph LS NT which will have the same features as the LS without the integrated GNSS antenna (for dedicated use with an external antenna), the Victor LS which shares the same faceplate but has no internal GNSS receiver (for data collection with a Triumph-1 rover) and the Omega which has the GNSS receiver and no integrated GNSS antenna or touch screen (for use as a base station or office based reference station). Each is designed to give users a choice as to which platform best suits their needs. The venerable Triumph-1 receiver will also be benefiting from the new boards with better tracking and longer battery life.

Javad also discussed a program he will be commencing once production begins that will allow US Surveyors an opportunity to work with the new LS for a couple of weeks at no cost. As a product reviewer the announcement brings a lot of anticipation. While the concept sounds compelling, I'm eager to see how these channels and interference monitoring capabilities will translate in the field. Keep your dial tuned here for a full product evaluation coming soon.

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