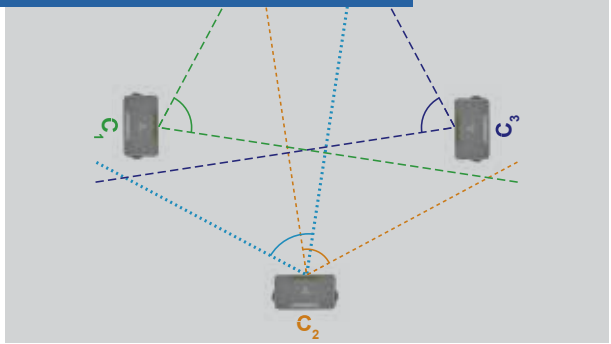
In the Issue:

BLM Report

BLM test report on TRIUMPH-LS and TRIUMPH-2 Base/Rover combination.

New Photogrammetry



Get about 2 cm accuracy with TRIUMPH-LS internal camera in offset survey.

Angle Measurement

Quickly measure angles with TRIUMPH-LS internal camera by pixel processing to about 10 angular minutes.

VB-RTK

BREAKING NEWS

RTK productivity improves when the base station is close to the rover. In technical terms, searching for “integer ambiguity” and having a correct “fixed solution” becomes much more reliable, much faster and more accurate, and is much more noticeable in areas with foliage, multipath, and obstructed satellites.

RTN and VRS systems provide a “virtual” base station near you, but this does not mean that the “virtual” base station is a “real” base station that eliminates the integer ambiguity problem. The difficulties of obtaining a fixed solution is still related to the nearest actual base station to your location.

There are two problems with depending on your own base station near your rover working area. The following are explanations of both and solutions:

First is the financial investment in an additional receiver. In fact, having a separate base station can be less costly, because it eliminates the need to pay for RTN services and communication costs. JAVAD GNSS offers a complete base/rover system (including J-Field, our state of the art controller software) for around $20K. In addition, the system includes “Base/Rover Setup” which can be used to painlessly configure the base and rover in about one minute. Another financial benefit is that productivity increases and more points per hour can be gathered: get a fixed solution and collect a point in seconds rather than minutes, particularly in difficult areas. Also, it eliminates the need to re-observe a point.

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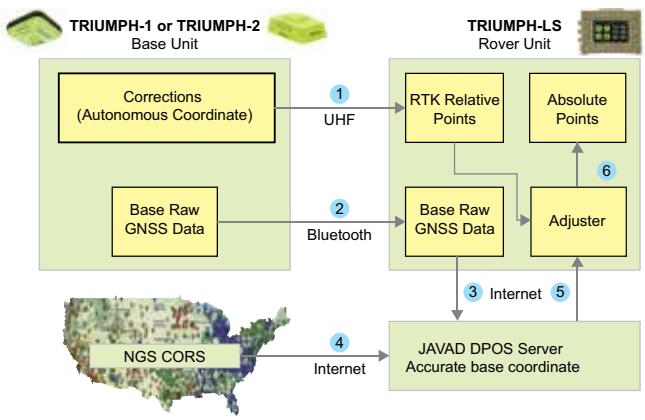
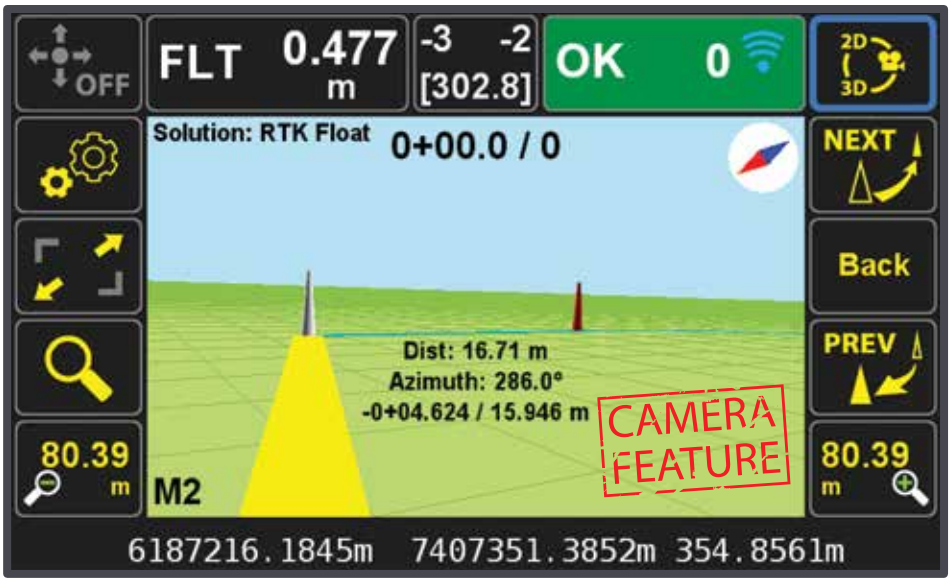
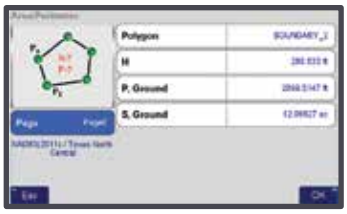
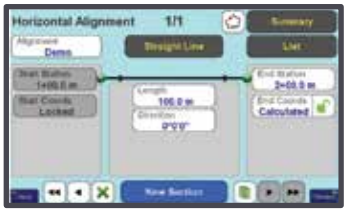








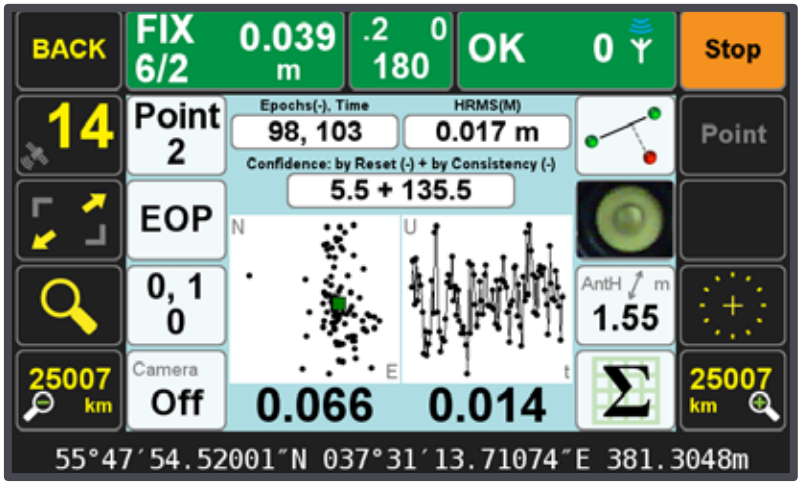
Store and Stake

Introducing GUIDE data collection in the TRIUMPH-LS. Visual Stake-out, navigation, six parallel RTK engines, over 3,000 coordinate conversions, advanced CoGo features, rich attribute tagging on a high resolution, large, bright 800x480 pixel display.
Versatile attribute tagging, feature coding and automatic photo and voice documentation.
The TRIUMPH-LS automatically updates all firmware when connected to a Wi-Fi internet connection.

View and Document your level

The downward camera of TRIUMPH-LS scans and finds the liquid bubble level mounted on the pole. Then focuses on the circular bubble automatically and shows its image on one of the eight white buttons of the Action Screen. You can:

- View the liquid bubble level on the screen.
- Document survey details including the leveling by taking automatic screen shots of the Action Screen, as shown here.
- Calibrate the electronic level of TRIUMPH-LS with the liquid bubble level for use in Lift and Tilt and automatic tilt corrections.



All these camera features are possible only in TRIUMPH-LS where camera, and GNSS antenna are co-located and all other modules integrated.

Evaluation of Javad RTK system for use by ES Cadastral Survey

By Monte L. King Bureau of Land Management Eastern States Cadastral Surveyor Dec 3, 2014

The following is an evaluation and information on the new JAVAD RTK system which includes the Triumph LS (Rover), the TRIUMPH-2 (base receiver), and a 35 watt base radio (HPT435BT). I am not a geodesist or programmer so this evaluation is solely based on my personal experience as a long time/expert user of GPS. I have been testing the JAVAD setup described in this document for about 3 weeks and have been able to learn to use the RTK set with great success implementing it into my work flow. I will break the evaluation into cost benefits and performance benefits based on my testing experience.

COST BENEFITS:

• The cost for the setup is as follows: Triumph LS $13,990 HPT435BT(base radio) $2,759 Triumph 2 $4,990 TOTAL=$21,739 half the cost of other brand setups.

• The Triumph LS has J-field (data collection software) built into the unit therefore there is no need for the extra cost of a data collector and collection software.

• J-field is designed with abilities to where there is no need for a separate software package to process RTK vectors, OPUS accepts JAVAD raw data directly, JAVAD provides free software to convert the JAVAD raw data file to a rinex file for post processing in any GNSS processing software(negates cost of new processing software).

• With the Galileo satellite constellation (Europe's GPS satellites) being developed, the JAVAD company has designed their units ready to accept a free upgrade once Galileo becomes functional whereas other units would have to be replaced to take advantage of the new constellation. The JAVAD units also track the Chinese constellation(still in development).

• One savings realized by any cable free RTK setup is the cost of new cables as they wear and/or break due to normal use, one more benefit to the JAVAD setup is that the base radio is connected to the T2 (TRIUMPH-2) through Bluetooth eliminating the cable data connection normally used on a base setup.

PERFORMANCE BENEFITS:

• I am used to being way behind the technology curve so to me the technology being

used in the Triumph LS is not only cutting edge but forward compatible/thinking with many upcoming technologies. The concepts and abilities I have experienced with the LS have been extremely impressive especially the willingness of the company to listen to suggestions from users. In my opinion the company designed the software to be very customizable and very flexible as far as many ways to do one thing so the individual user can become very comfortable with their own processes. The tech support is very helpful and reactive to whatever issue is brought to their attention. The company has a very self-supportive tech team, they are more than willing to communicate within themselves to solve the issue in the most efficient manner possible.

• The flexibility of the software's features like codes (layers)/Tags and such would allow us (ES-BLM) to customize these to assist in the automated production of field notes. The export functions of J-field are also customizable, however they can't be customized to export CMM files as of yet (I have this in to the company as a request). Currently I export a *.csv file for import into CMM. The export function can also directly export a *.dwg or *.dxf file and it can also export shape files. There is an ability to export vector data in NGS G-file format but as I mentioned above there is no need for RTK vector processing/ adjusting if a certain process is used (minimally described later). The import abilities are also customizable and I just export a *.csv file from CMM and import it into J-field.


Stone stood up and reset-Triumph LS observing the final location

• The COGO package is very powerful and has lots and I mean lots of functions and tools. One big one for BLM cadastral is the fact that the comps and inversing can be done with true bearings and ground distances and other combinations as desired by the user. I have personally compared the results with CMM-adjstuf and they match exactly! Another function that I would use is the averaging function which will average multiple occupations of the same point. This average function actually combines the RTK vector data of multi obs and creates a point with the combined data which is separate from the original points and the statistics of the averaged point can be viewed/exported. Another issue we have all dealt with and I eluded to it above is we will set up a base station using an autonomous position (collecting raw data for later submission to OPUS or other processing) and start RTK'ing points from it creating vectors from an autonomous position. I usually export the vector data for later adjustment in processing software from my corrected position. However in

J-field when the corrected base coordinates are obtained you can edit a point RTK'd from the autonomous base position and change the base coords to the corrected ones and J-field will use the vector data to shift the point to the corrected position. An option comes up to apply this change to all points surveyed from that base station.

• One bit of technology that is of great benefit is the RTK Verification that JAVAD has implemented into the LS receiver. I am not a software engineer but I believe I understand the process enough to give a basic run-down of how I believe it works and how it is a benefit. First off the LS actually has 6 RTK engines all running at the same time where as far as I know other GPS units only have 1 engine. These 6 engines are all fixing their ambiguities with different satellite sets creating 6 separate RTK solutions. The settings allow a user to define how "tight" they want settings for the verification process, ie how many engines are required for the process and how many epochs. I have mine set to 3 (have been told this is extremely tight) engines and 120 epochs so an occupation would be as follows: Phase 1-start occupation-all engines reset ambiguities, one engine fixes records epoch and resets, another engine fixes records epoch and resets, and so on until the software is confident that the solutions are verified within the user defined settings. Phase 2 the engines no longer reset and any epochs outside the confidence guard will be rejected(bad fixes) and the engines record the epochs until 120 are recorded. The verification process is much more complex than I described and is explained more thoroughly in the User Manual for the LS. The point is with this process the user walks away very confident of the results and therefore eliminating the need for reoccupation so many times. In the testing I have pushed the LS to its limits as far as multipath and it puts our current equipment to shame, it is still GPS so it has its limits. I personally have experienced many bad fixes with my current setup but with the JAVAD LS the RTK Verification quickly eliminates those bad fixes without user interaction. One reason for this is the fact that the LS has 864 satellite channels with 100 dedicated to dealing with in-band interference whereas my current receiver for example has only 440 and none dedicated to in-band interference. I have issues with GLONASS at certain times of day and for example, ever experience having wide open sky and tons of satellites but no fix-try turning off the GLONASS satellites in this situation and odds are it will be insta-fixing in no time using only GPS satellites. The JAVAD equipment seems to deal with this issue better than my current set.

• The JAVAD Triumph LS is also ready for Real Time Networks (RTN) in that it is WIFI capable so connecting to mobile hotspots for RTN/VRS corrections is very simple and reliable. The LS can also have a SIM card installed directly in the unit so it can connect to the cell network directly for RTN corrections. RTN is a very beneficial tool and should be utilized where and when possible.

There are many more bells and whistles that a user can use to streamline the process of collecting data but I believe I covered the main items that make this RTK system a very useful tool.

I will be clear that in no way am I affiliated with JAVAD company and I do/did not receive any sort of incentives for my evaluation of the RTK set. Again my opinion is solely based on my experience as an expert user of GPS equipment and in my opinion the JAVAD RTK system as described should be purchased ASAP and future purchases should consider the JAVAD company as a first resource for this type of technology.

-One last note is that I have been able to figure out the radio settings so that I can reliably/accurately run my current Rover off of the JAVAD T2 base setup while also running the LS on the same corrections. 2 rovers one base-we still can make use of the “legacy” units we still have!

The stone below was set by William Ward in 1887, during a resurvey of the South Boundary of the White Earth Indian Reservation, to perpetuate the original standard corner of sections 31 and 32 of T141NR40W, 5th P.M., Minn. The corner was originally established by Jacob Myer in 1860 during the survey of the 10th Standard Parallel. Mr. Ward recovered the 1860 post and trees and set the stone in place of the post marking the stone W.E.I.R. on the North face and notches on east and west edges. No intervening record of being recovered was located. The stone is located about 5 feet at S. 45 W. of a very old fence corner and evidence of the original NE bearing tree was recovered at record (+/- 1 link). The WEIR is obviously visible however the notches were not so easy to distinguish. Recovered by BLM-Eastern States Cadastral Survey crew on December 2, 2014.

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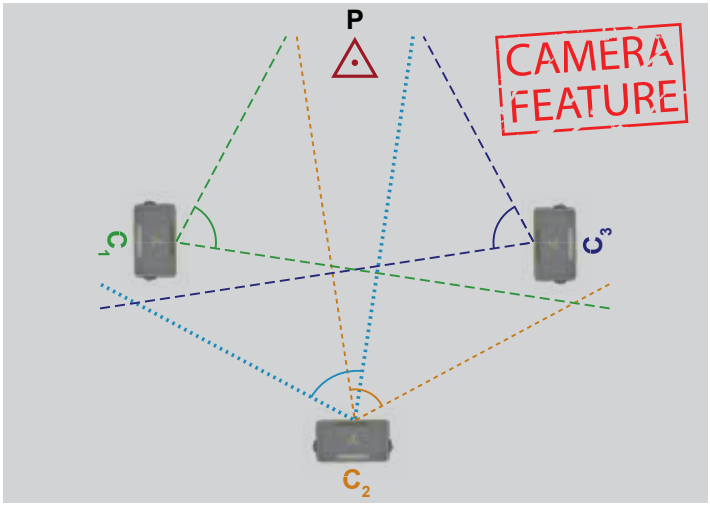
Offset Survey with built in camera

You can survey points with internal TRIUMPH-LS camera with accuracy of about 2 cm. Take pictures from at least three points. Leave a flag on points that you take pictures from, otherwise accuracy will be about 10 cm.

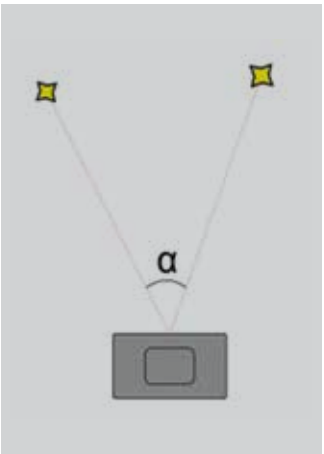


Visual Angle Measurement with Triumph LS

The new Visual Angle Measurement function of the TRIUMPH-LS allows measuring angles between points by using photos taken by the TRIUMPH-LS camera and use in CoGo tasks with the Accuracy of about 10 angular minutes.

To measure an angle:

- just take an image containing both objects of interest and open it in the Measure Angle screen
- select first and second point (using zoom to focus on necessary features)
- The angle between points is immediately displayed on the screen.

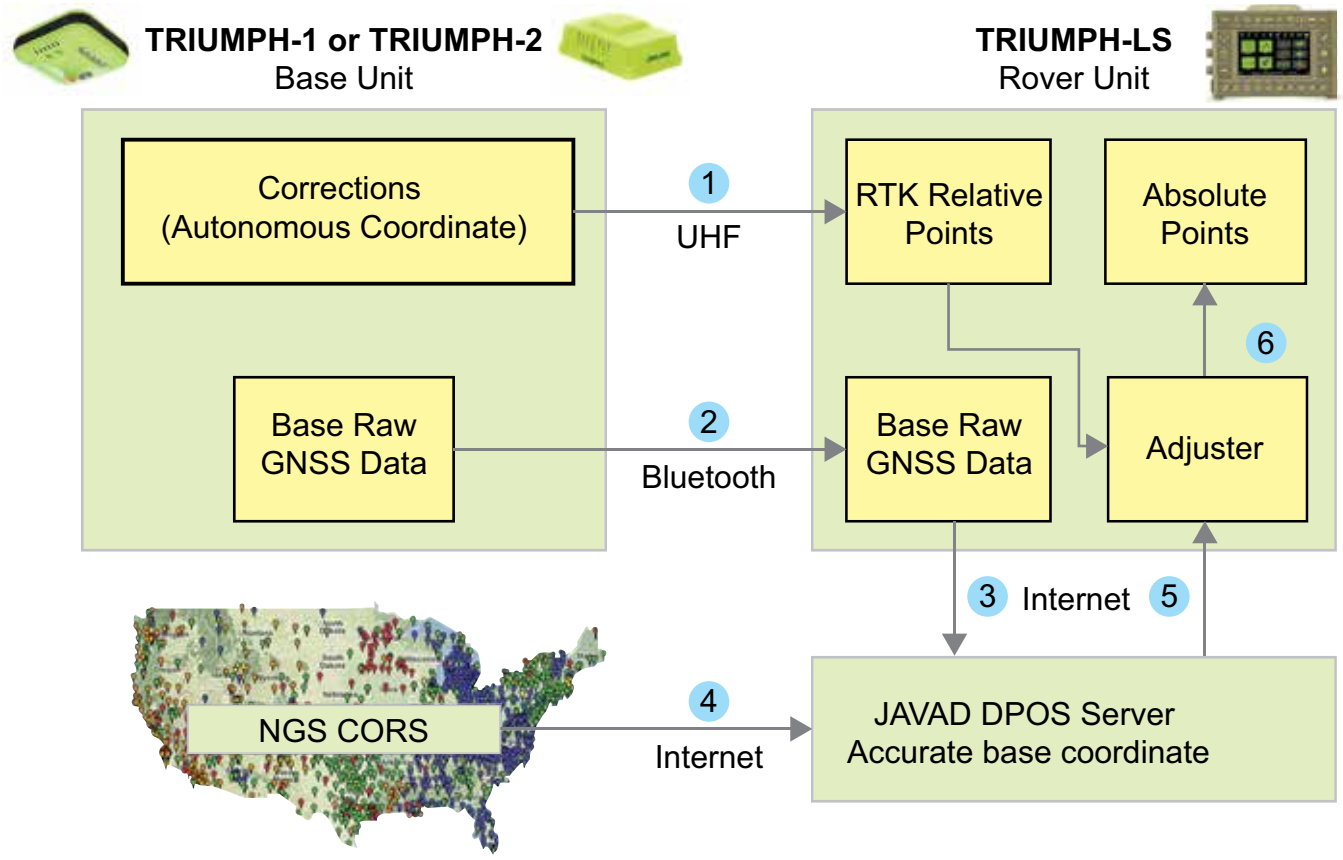


Second, the user may not have a known point to set the base station on, or lack confidence in the coordinates of the point. JAVAD GNSS has solved this problem reliably and automatically by offering “Verified-Base RTK” (VB-RTK). It is automatic, reliable, faster, less expensive, and it is traceable. Of course, the system can be used with RTN networks, too. It works much better than RTN, because usually the nearest actual “real” base station is many miles away, while a user can set up a base station near the RTK work area, usually less than a mile away.

VB-RTK records raw GNSS data at the base station while transmitting corrections to rover. At the end of work, the user returns to the base and again connects to it with the TRIUMPH-LS rover and stops the base. The rover then downloads the raw data from the base. The base station’s raw data is then sent to our own DPOS (Javad Data Processing Online Service) and processed to NGS CORS data. The results are then returned to the TRIUMPH-LS rover. The coordinates from DPOS are compared against the base coordinates used for all RTK points collected from that particular base session and then (upon the user’s confirmation) the RTK rover points are translated. All these steps are done automatically.

VB-RTK is useful even in situations in which the base was setup on a known point as the processed DPOS results can be compared against the known point coordinates to prove the base was setup on the right monument, that the point had not been damaged, that the coordinates were properly entered, that the instrument height was correct, etc.

As a separate note: Our Auto-Verify RTK system will never give a wrong fix without a clear warning. We are offering $10,000 to any US PLS who can prove otherwise and show even one bad fix without a clear warning.



You do 1, the rest is automatic