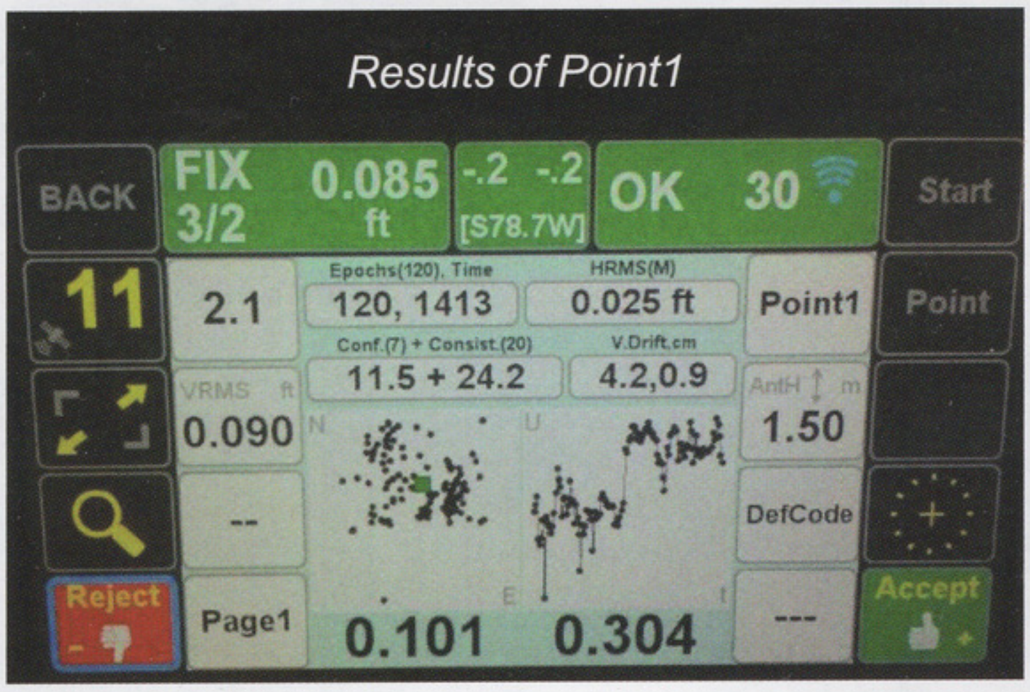
JAVAD TRIUMPH-LS – Accidental Extreme Multipath/Interference Test

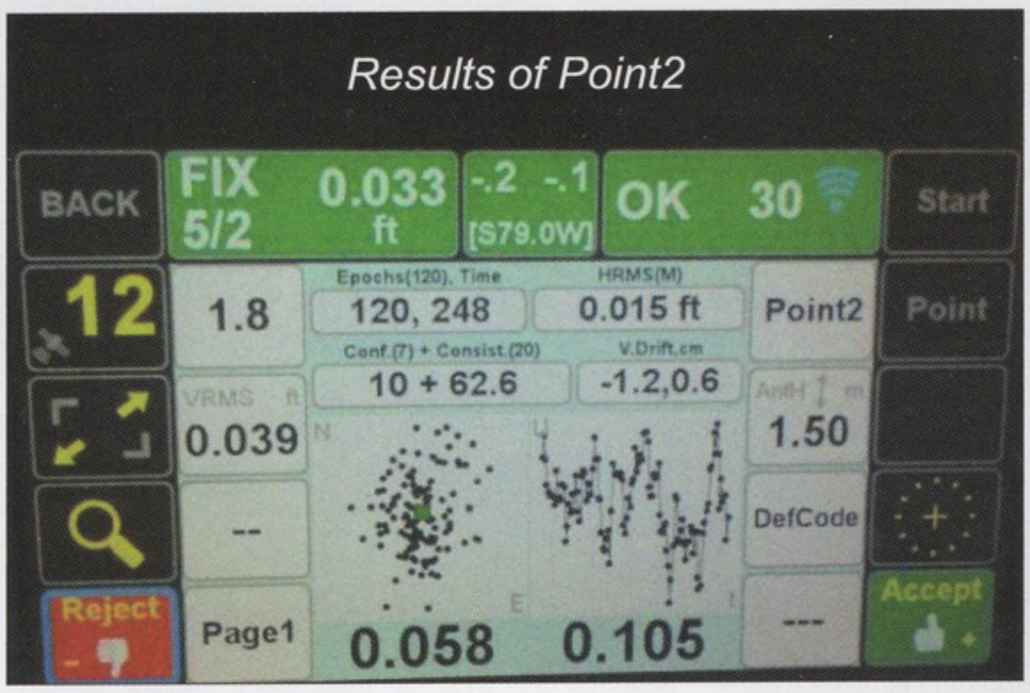
The following is an example of how well the JAVAD Triumph-LS deals with multipath and interference. The test was not conducted with any sort of scientific procedure or confirmation of results from an independent source. It was purely accidental as to how the test was even conducted but none the less the results amazed me and I wanted to share with others.

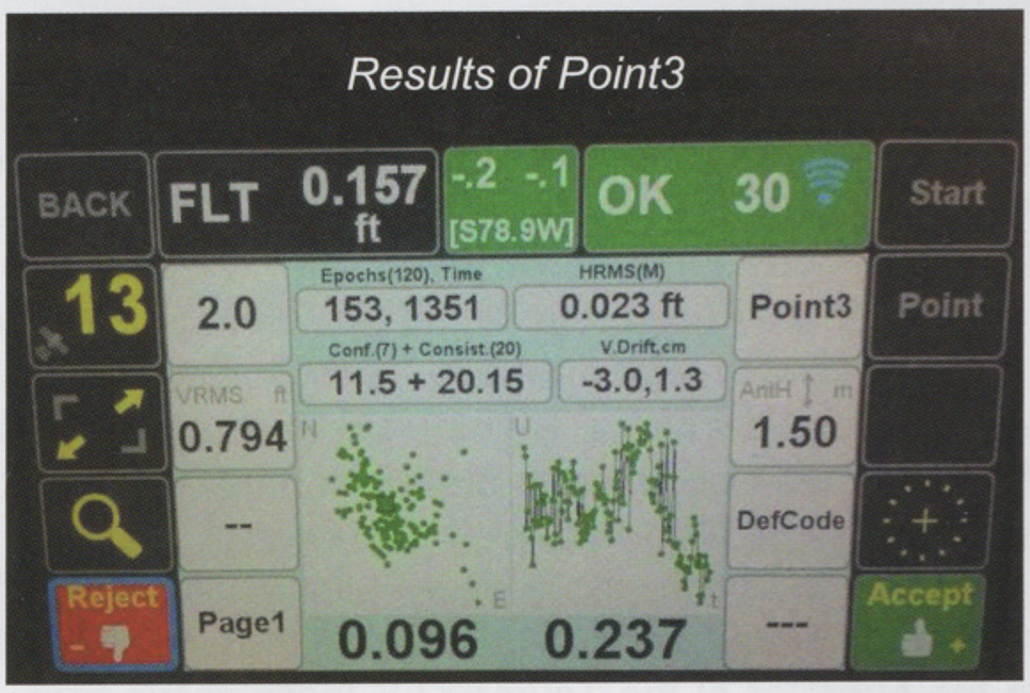
So the story goes: I was sitting at my kitchen counter playing around with DPOS on the LS and my 5 year old daughter was watching with some interest so I figured it was a good time to see if my daughter could figure out how to navigate the map screen. I went into the "collect" module and just went to next so it was in the "collect" action screen and allowed my daughter to start playing with the map. I just happened to have a job setup with corrections being received from the VRS/RTN network over my home WiFi connection and told my daughter to let me know if the solution type box turns green(Fixed solution). I was talking to my wife when I heard "Daddy its green" and looked at the screen and low and behold 4 out 6 engines were fixed! Without really thinking I had my daughter start observing the position(hit start button) and before I knew it the LS was collecting data in my house!! The RTK verification was "with reset" and I had it set to 120 epochs with 2 engines set for verify. Amazingly enough the LS finished the collection process (definitely took a little bit) and had results! I figured OK big fluke no way that just happened so I had my daughter start another observation expecting it to possibly get a result but I did not think it would be even close to the first point. Well it turns out that the results of the 2 points were impressive so I went ahead and had another observation taken. I repeated the observations 1 week later and about 7 hours earlier and the results were again impressive for the situation.

The following are pictures of the point observations, COGO inverses, and average results.

Day 1 Observation Results:

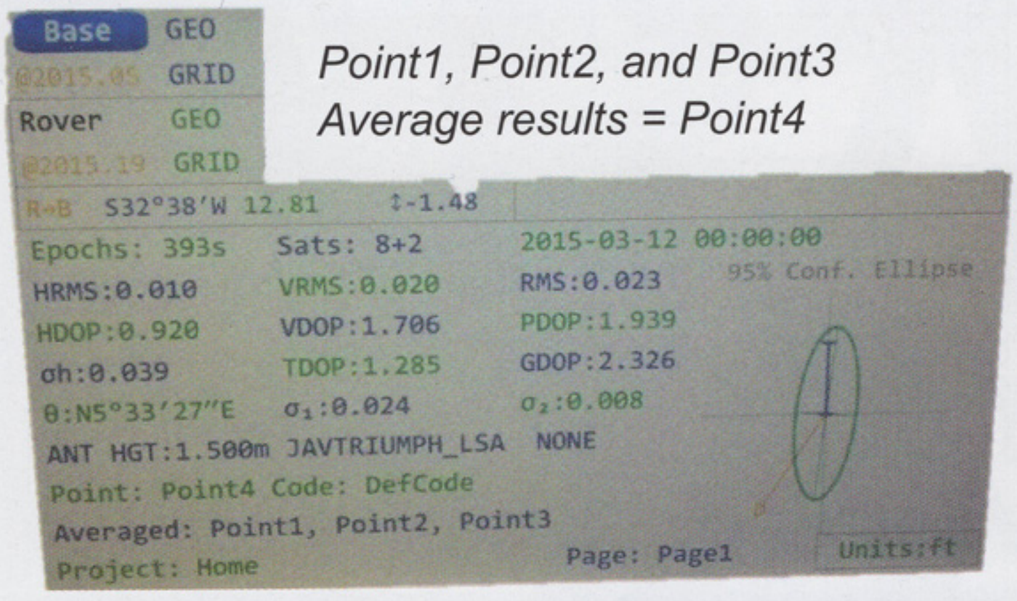




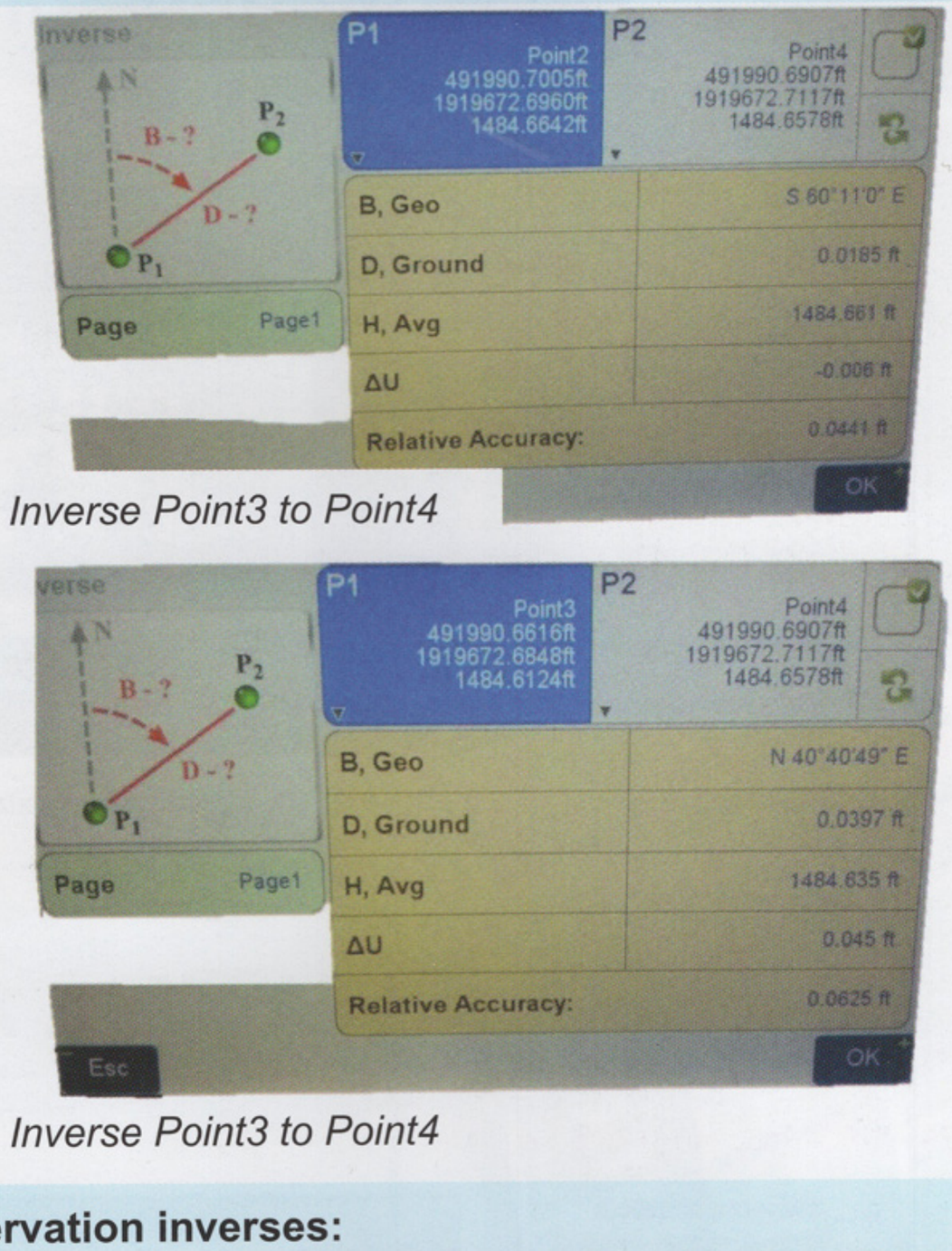


Continue reading next page

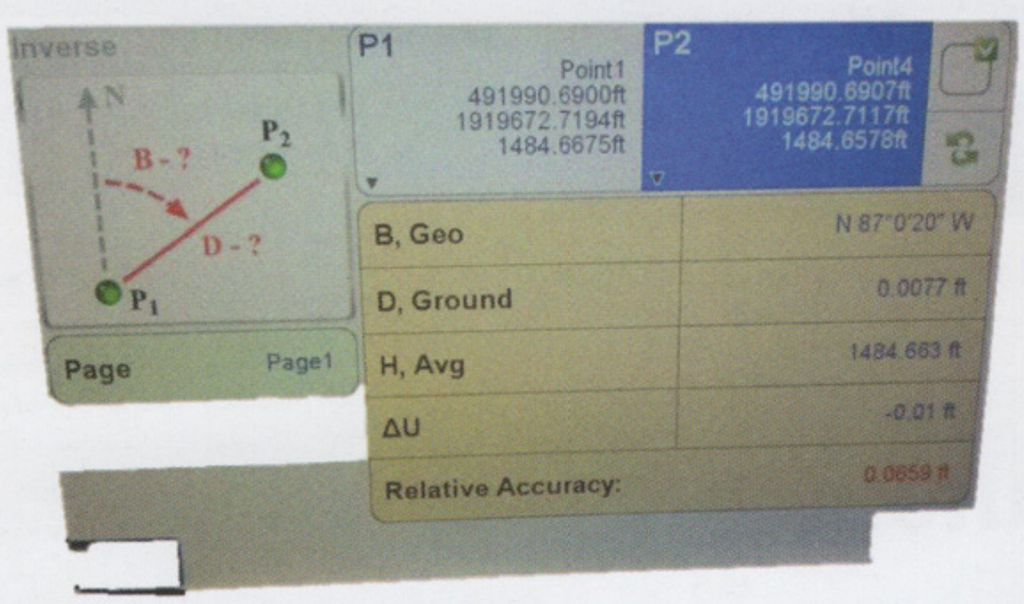
Day 1 Average Results and inverses:



Point1, Point2, and Point3
Average results = Point4



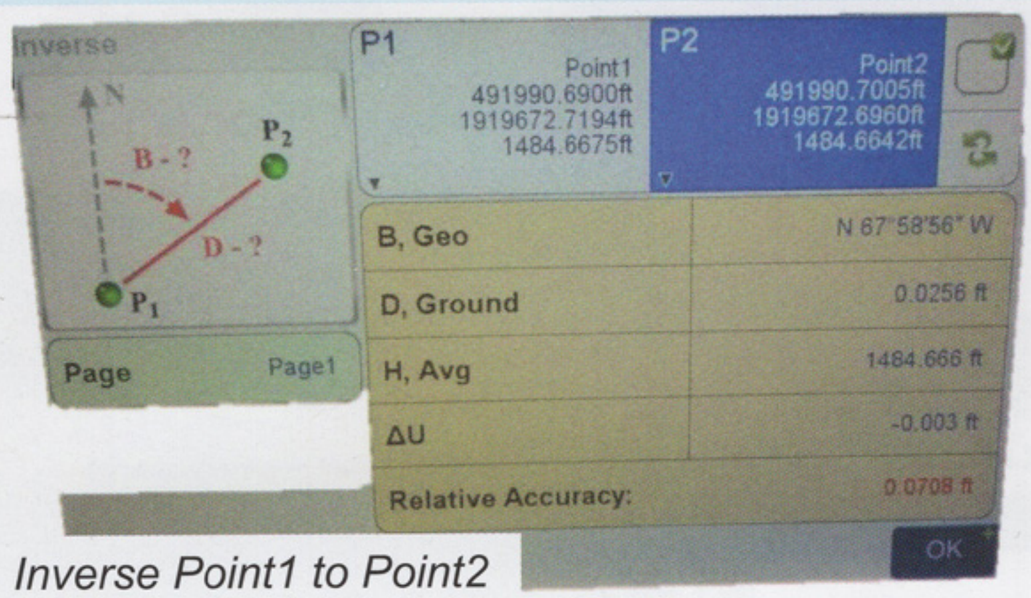
Inverse Point3 to Point4



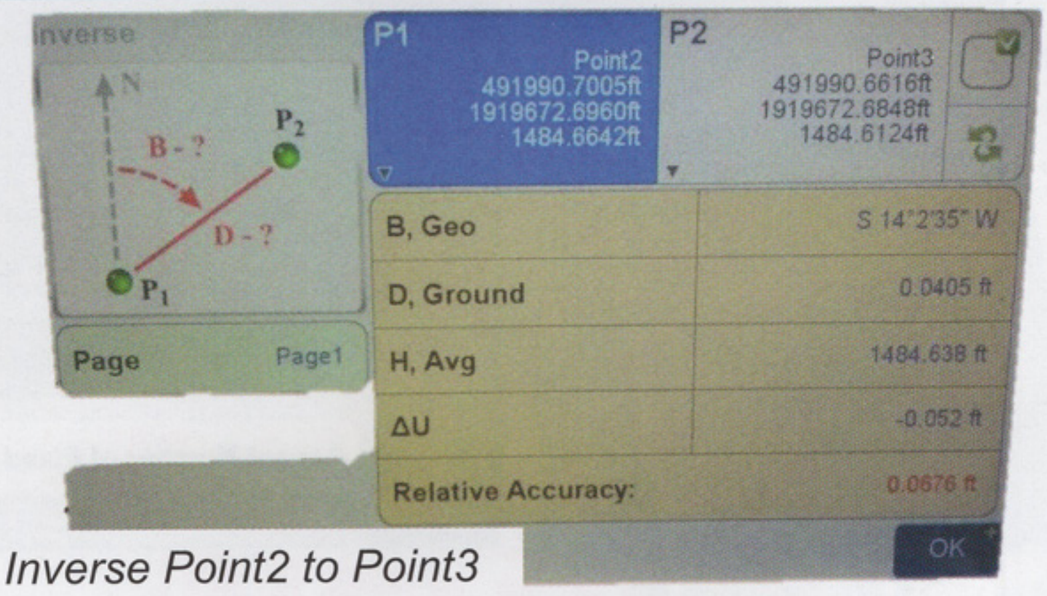
Inverse Point1 to Point4

Inverse Point3 to Point4

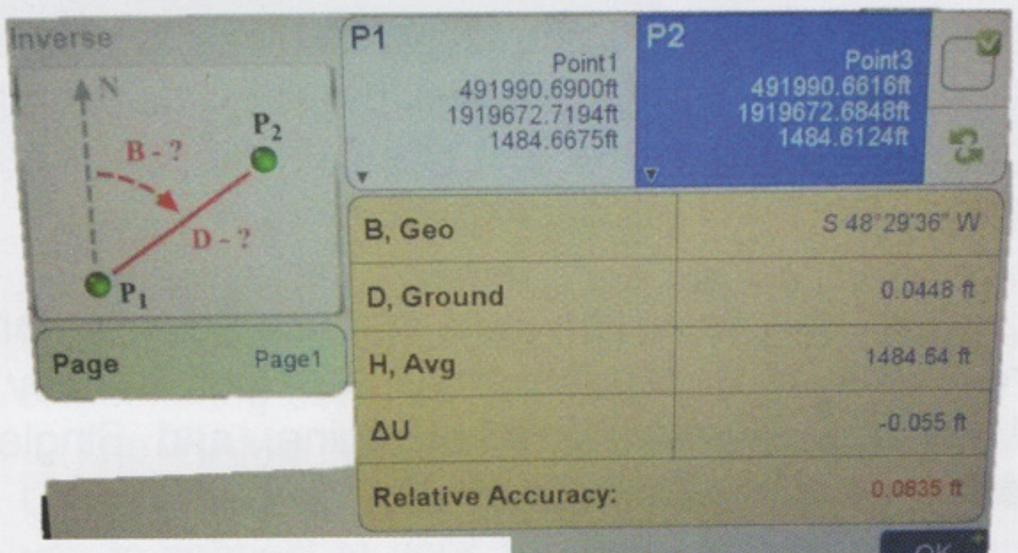
Day 1 Point observation inverses:



Inverse Point1 to Point2



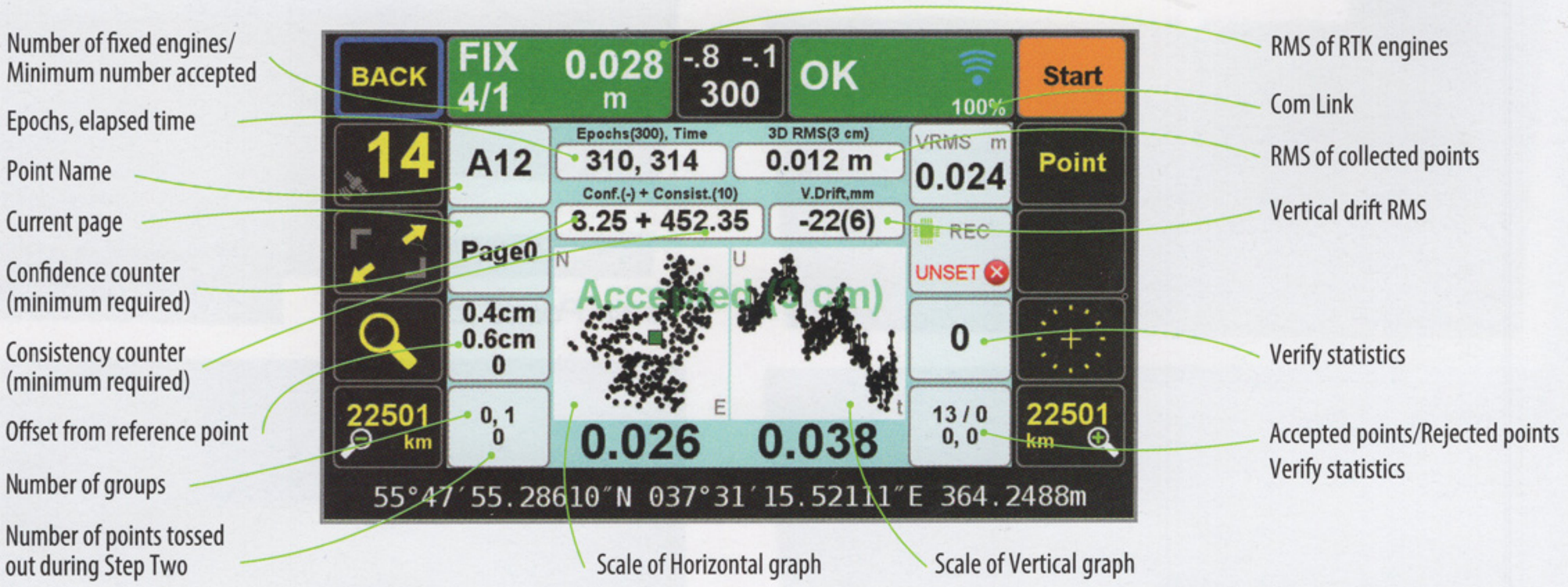
Inverse Point2 to Point3



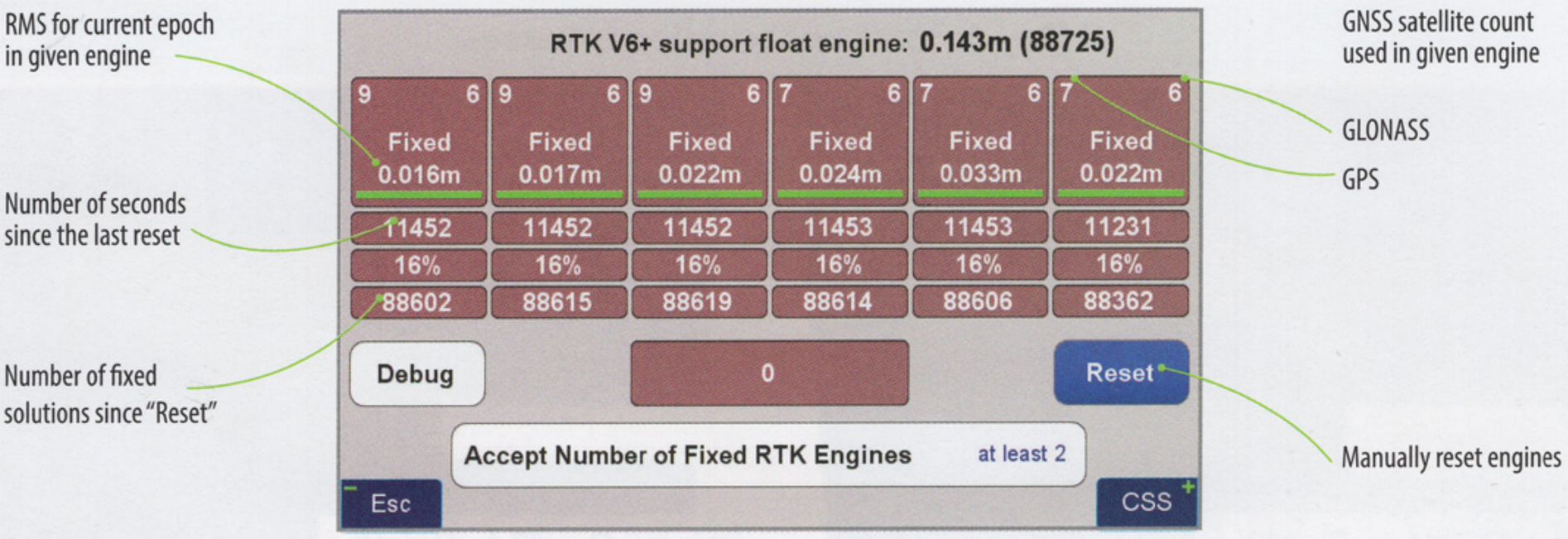
Inverse Point1 to Point3

I personally was impressed with the results considering the observations were in a house. I don't even know where to begin with the multipath issues with GNSS in a building. The location the LS observed these points was on a counter top about 12 ft. from south wall with a door window and a large picture window. The east wall has no windows(interior wall) so no satellite signals from that direction, the west wall was about 10 ft. away with 2 windows (one 2½x5 ft. and one 2x2 ft.), and the north wall was about 12 ft. away with a small door window. I would provide pictures but my wife was not too keen on that idea! Anyway the room has no skylights and 8 ft. ceilings so as you can guess they was not much for clear signals and the LS warning light was on the entire time indicating severe interference in the GNSS signals. In my opinion this is an excellent example of the LS's ability to isolate interference and eliminate it from an observation. If it can produce repeatable results in a house then with proper RTK field procedures I can definitely feel confident in my results on projects particularly in the areas that have satellite signal interference from sources other than multipath. Another little detail is the fact that my corrections were from a VRS system that is provided by my Minnesota DOT and as many already know there is a big difference between a base on site and RTN/VRS as far as speed and quality of fixed solutions. I won't get into details but suffice it to say that a base on

RTK V6+
six engines plus one support



Auto Verify... Auto Validate...



This vigorous, automated approach to verifying the fixed ambiguities determined by TRIUMPH-LS gives the user confidence in his results and saves considerable time compared to the methods required to obtain minimal confidence in the fixed ambiguity solutions of other RTK rovers and data collectors on the market today. The methods required by other systems are not nearly so automated, often requiring the user to manually reset the single engine of his rover, storing another point representing the original point and then manually comparing the two by inverse, all to achieve a single check on the accuracy of the fixed ambiguities. Acquiring more confidence requires manually storing and manually evaluating more points. Conversely, J-Field automatically performs this test, resetting the multiple engines, multiple times (as defined by the user), provides an instant graphic display of the test results, and produces one single point upon completion.

Read details inside and compare with other receivers that require Multiple Point survey, Manual Evaluation, Single Engine, and Single Ambiguity Check per Point.

With TRIUMPH-LS you need Single Point survey, Automated Evaluation, Multiple Engines, and Multiple Ambiguity Checks per Point.

Read more at **www.javad.com**

Introducing

RAMS

Remote Assistance & Monitoring Services

JAVAD has gone and done it again! The brilliant minds at JAVAD GNSS have created yet another incredible first in surveying history: Remote Assistance & Monitoring Services (RAMS).

The RAMS Viewer is an elegant web interface. Using your own web browser, RAMS Viewer allows you to connect to your Triumph-LS from anywhere in the world when both your computer and Triumph-LS have access to the Internet.

RAMS is much more than just a remote data manager. Every function of J-Field that is available to the operator of the Triumph-LS that's in the field, is available to the remote viewer!

This incredible tool has many uses including facilitating live support by the PLS Support Team directly to Javad customers in the field, structural monitoring, training and other educational opportunities presented to large audiences in real time.

Using the Files tab, upload files to the Triumph-LS remotely from the office to the field... or right there on your desk in the office. Likewise you can download files wirelessly to the cloud or your own PC using RAMS Viewer.

Using the Status tab, quickly collect 18 screen shots in close succession showing your receiver's vital statics and bringing it all together at that very moment.

RAMS Server, the program running on the hosting computer, is at the heart of it all. This means you can set up RAMS Server locally on your own PC and keep it all in-house, or leverage the Internet using Javad's hosting server.

www.javad.com

VB-RTK

Reliable, Fast, Accurate, Less Cost

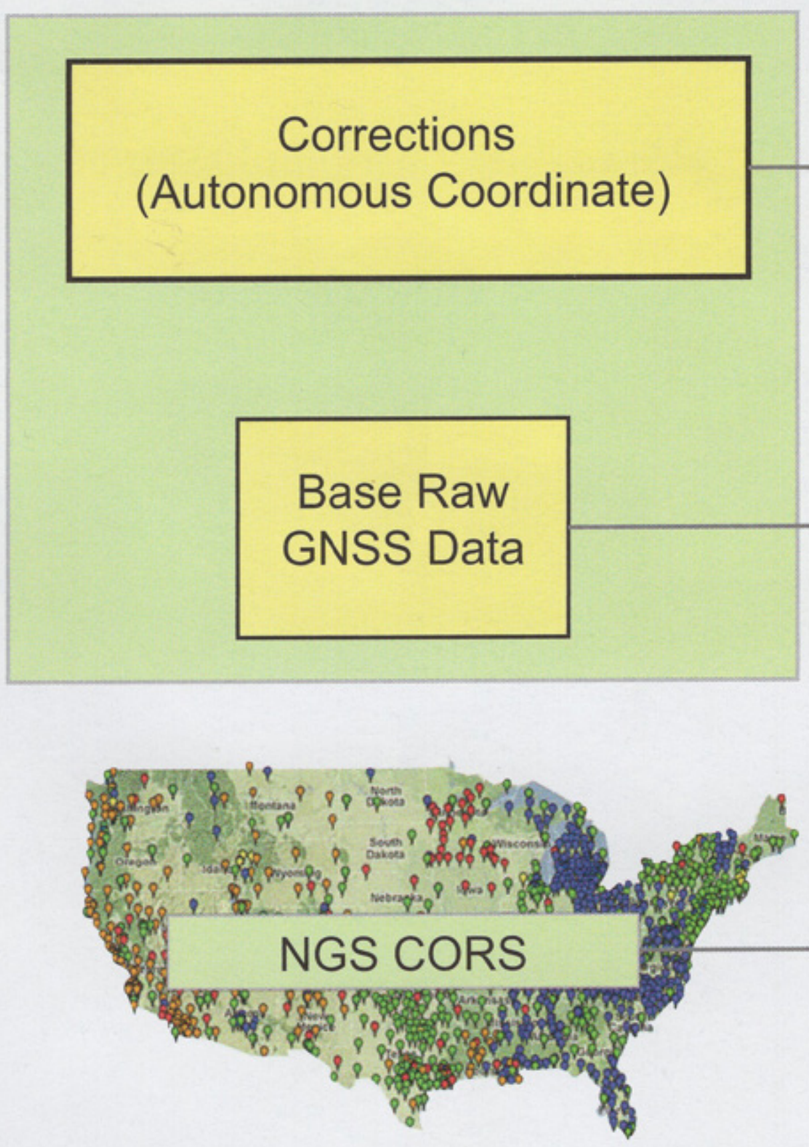
Get on the Grid with VB-RTK. For over a decade American surveyors have been using the National Geodetic Survey's Online Positioning User Service. Surveyors employing RTK have been a significant share of the user segment of OPUS.

A significant share of OPUS users are surveyors using RTK. Often a surveyor will set up his base on a new, unknown position and allow an autonomous (or standalone) position to be used for the base coordinates. While he is performing his RTK work with fixed vectors between his base and rover, he stores data at the base to be submitted at a later time to OPUS. Once he is finished with his work, he downloads this file to his computer, converts the file if necessary, and submits it to OPUS. He then receives an email response back with a precisely determined coordinate for his base station. He then must take this coordinate, relate the coordinate to his project coordinate system, and then translate the work from the autonomous (or standalone) position he used in the field to this new coordinate. This procedure can produce excellent results and anchors the survey to the NSRS. The down side to this is that there are several steps that must be carefully observed and each of these error prone steps costs time.

With J-Field data collection software, JAVAD has been automating many tasks that surveyors have been doing for years, making the tasks more efficient and reducing sources of potential error. One example, "**Verify RTK with V6 Resets**", is being recognized by surveyors across the country as the most accurate and efficient way to confidently determine RTK positions. Rather than taking a shot, manually resetting (or dumping) the receiver and taking a second shot for comparison, Verify RTK does this automatically with a user defined number of reset iterations.

TRIUMPH-1 or TRIUMPH-2
Base Unit

TRIUMPH-LS
Rover Unit



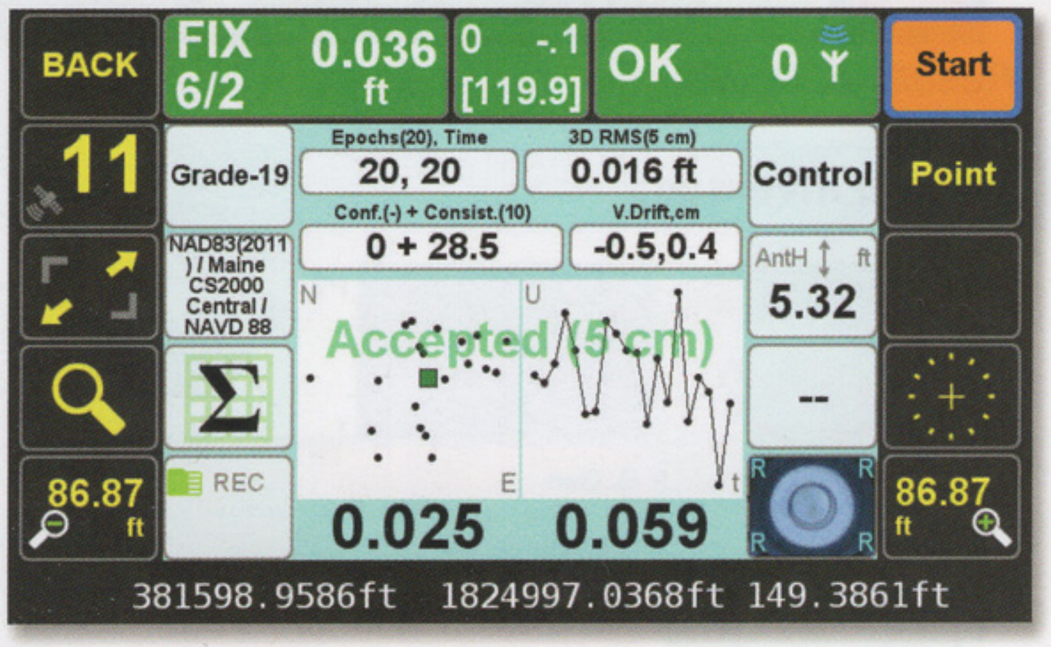
You do 1, the rest is automatic

Read more at **www.javad.com**

Double Bubble

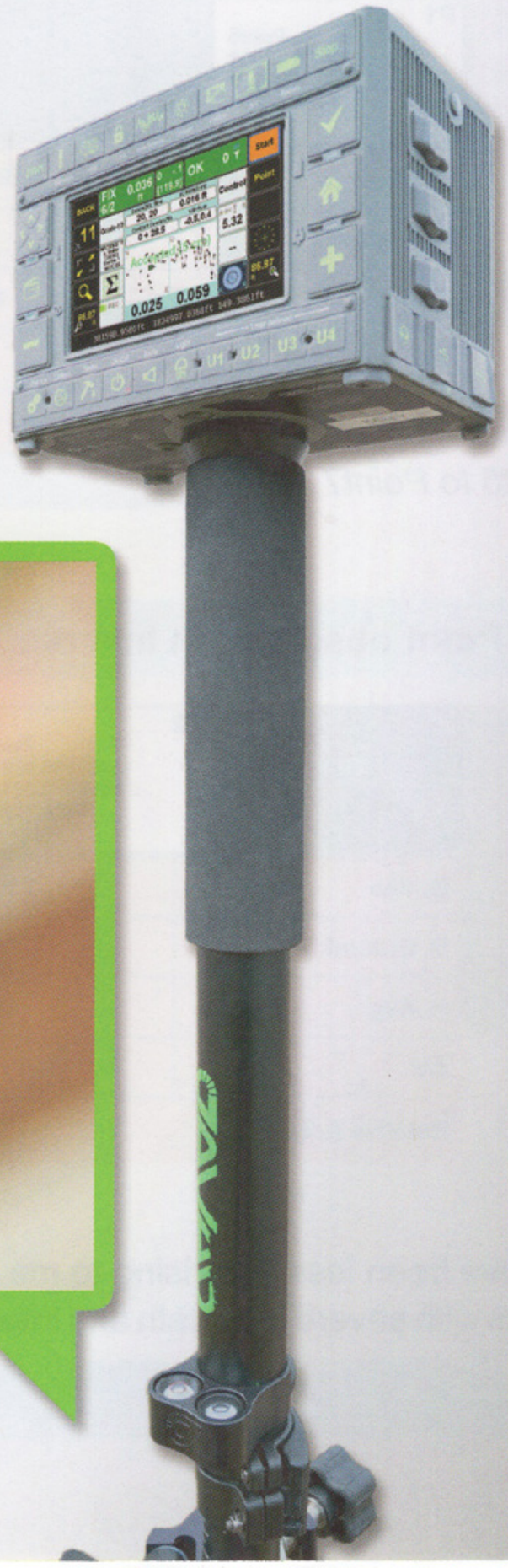
A 40 min vial for fast set up. Next to it is an 8 min vial for precision set up. All in a small package.

The vials can be viewed on the TRIUMPH-LS screen via the bottom camera.

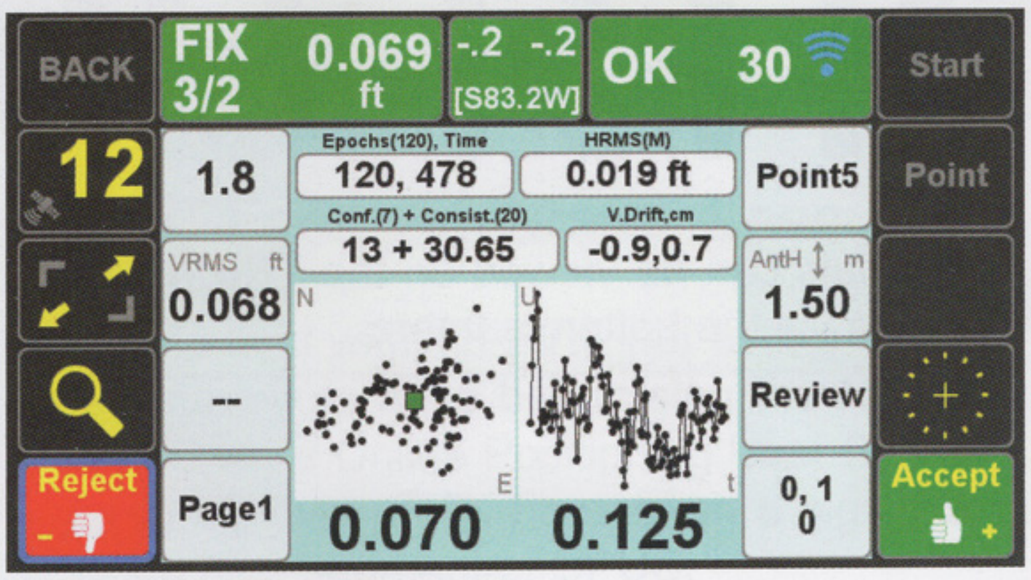


Survey results can be documented with the on-screen image of the vial.

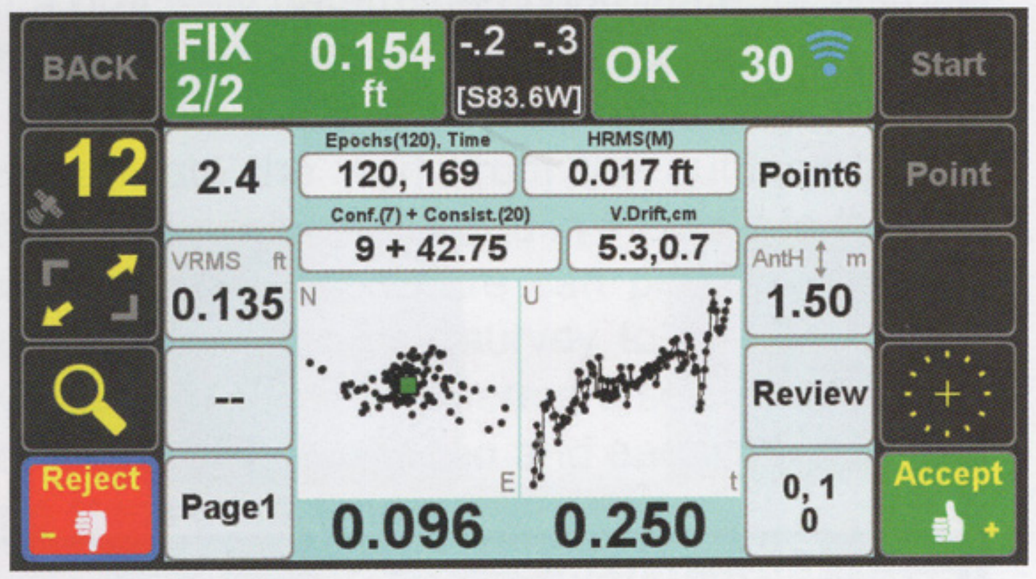
The internal electronic levels can be calibrated with the mounted vials.



Day 2 Observation Results:

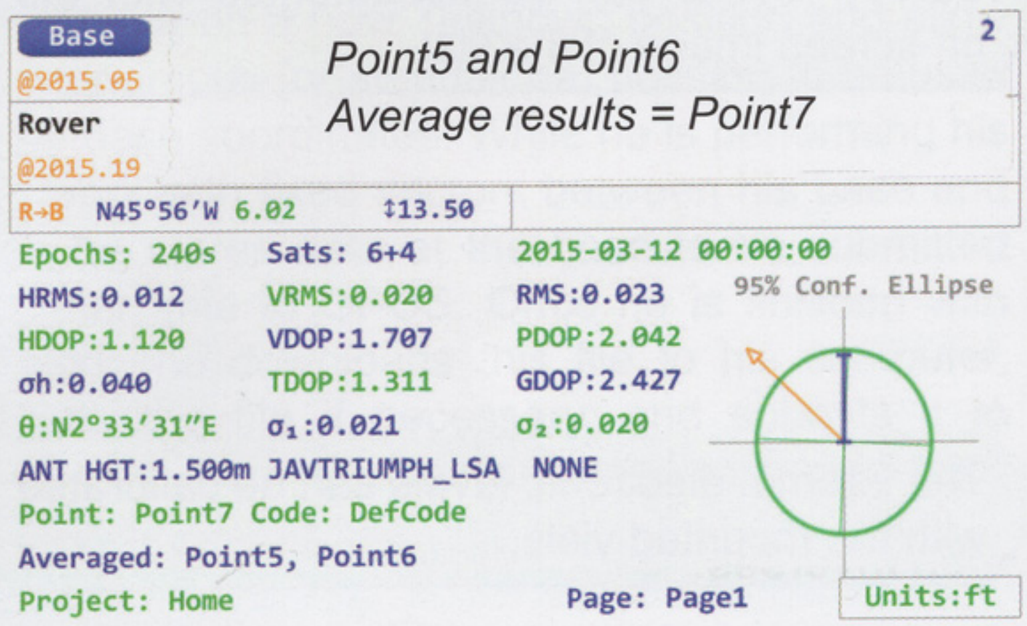


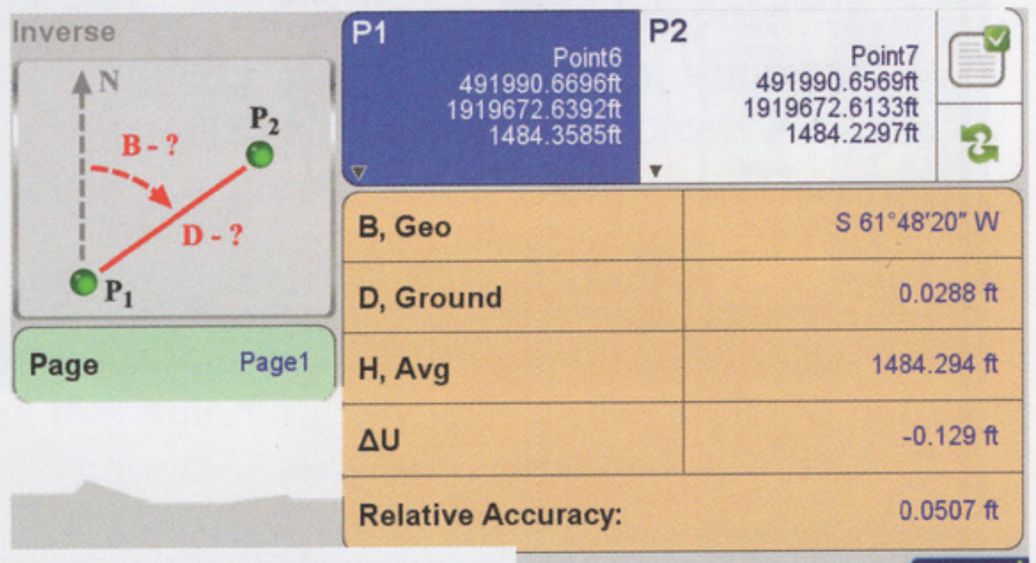
Results of Point5



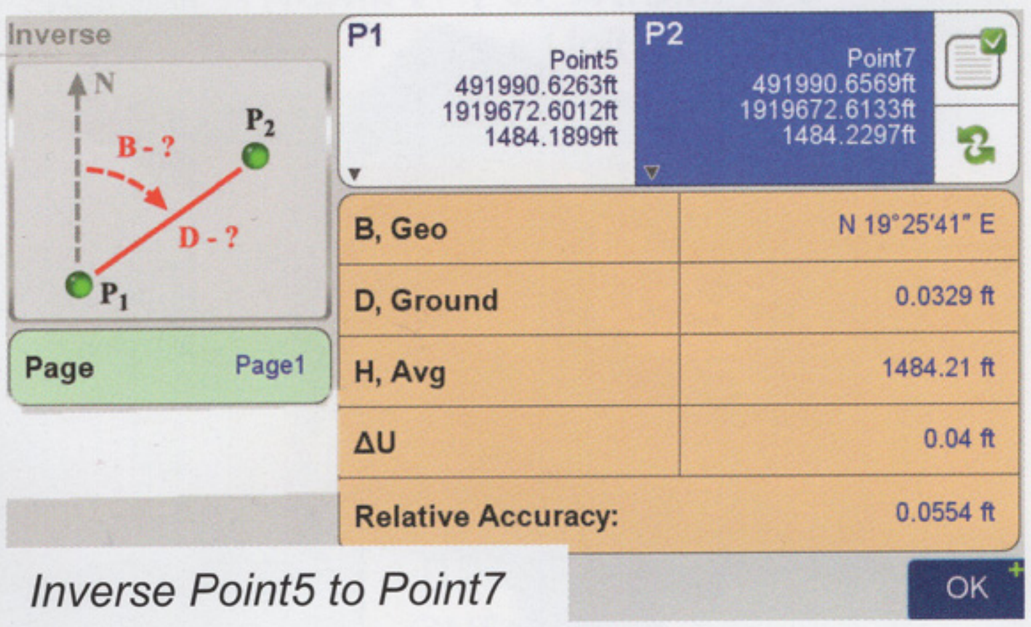
Results of Point6

Day 2 Average Results and inverses:

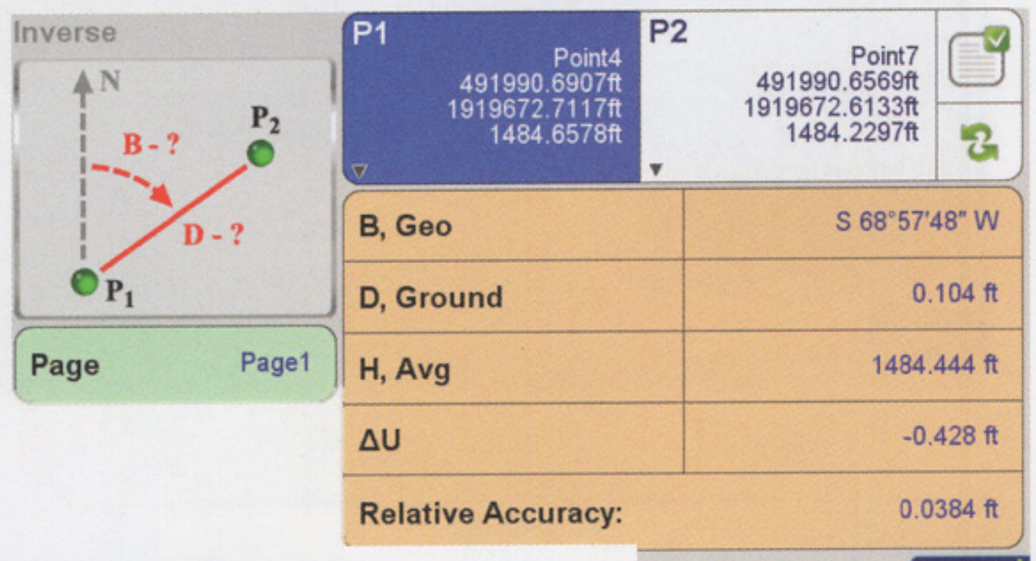




Inverse Point6 to Point7

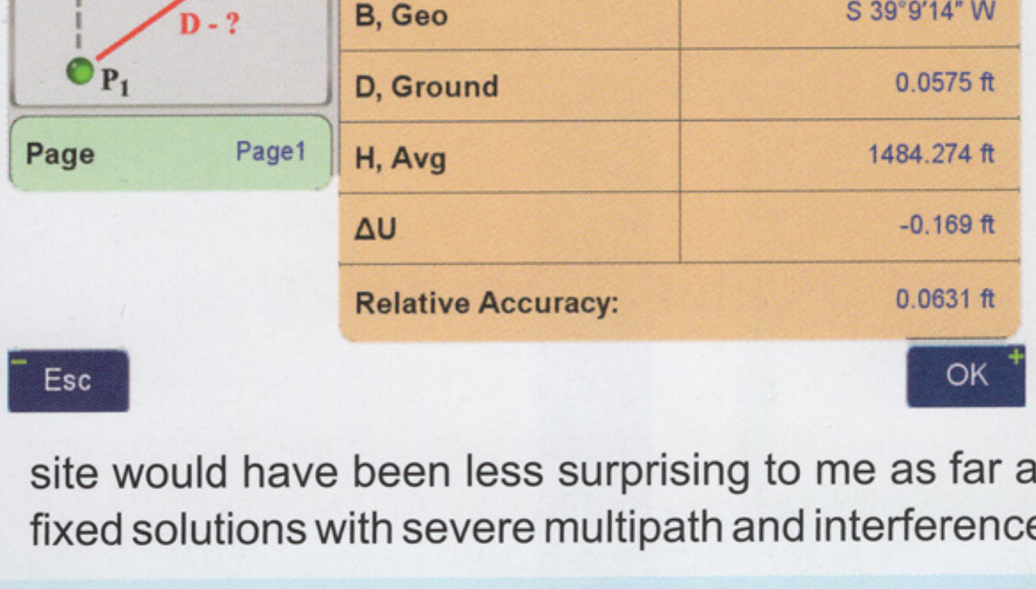


Inverse Point5 to Point7



Inverse Point4 to Point7
Day1 average to Day2 average

Day 2 Point observation inverse:



site would have been less surprising to me as far as fixed solutions with severe multipath and interference.

I would like to thank Minnesota DOT for providing such a robust VRS system for FREE!!! If your state provides a RTN/VRS system like Minnesota then make sure and thank your provider as you have it better than many states!!!

Well there you have an example of what JAVAD Triumph LS can do, but PLEASE DO NOT use this test as a reason to start pushing your RTK into buildings or ridiculously bad locations for GNSS, after all it is just another tool not the great black box that can measure anything in any environment-use your professional judgement!

BTW: All coordinates and projection info were eliminated from pictures to protect the innocent and remain anonymous!!

The one and the only Digital Radio Transceiver in the world!

Unique adaptive digital signal processing, which has benefits: the full UHF frequency range and all channel bandwidths worldwide • the best sensitivity, dynamic range, and the highest radio link data throughput • embedded interference scanner and analyzer • compatibility with another protocols Cable free Bluetooth connectivity with GNSS receivers and Internet RTN/VRS access via embedded LAN, Wi-Fi, and 3.5G

And all this with competitive prices!

HPT435BT/HPT135BT/HPT225BT*

$2,710

35 W UHF/VHF Transceiver

HPT404BT/HPT104BT/HPT204BT*

$1,640

4 W UHF/VHF Transceiver

HPT401BT/HPT101BT/HPT201BT*

$2,040

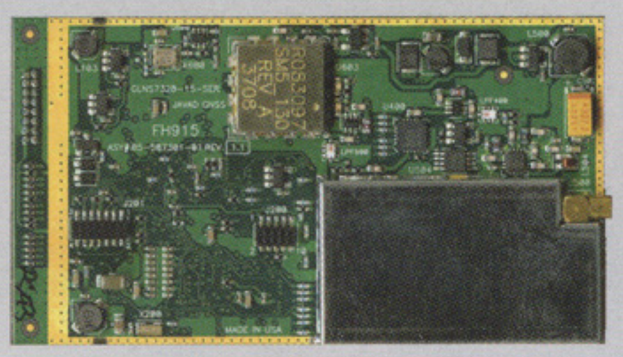
1 W UHF/VHF with internal battery

L-Band/Beacon

$1,550

Receivers for multiple applications

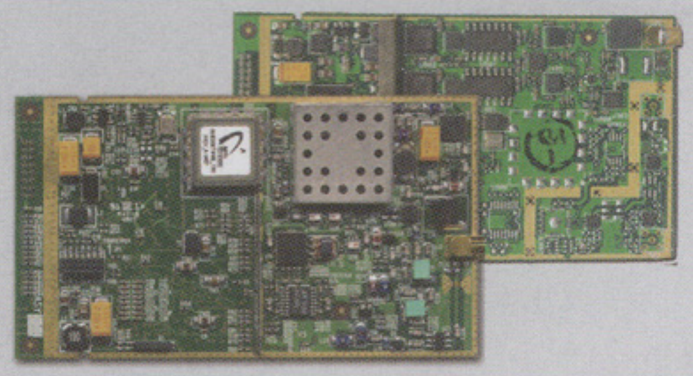
ISM Radio



$840

CEPT 868-870 MHz, FHSS 902-928 MHz

OEM Solutions



$840

902-928, 360-470, 225-255, 138-174 MHz

JLink 3G*

$2,375

Web-interface Wi-Fi, Ethernet, 3.5 G, UHF/VHF/FH915

JLink 3G BAT*

$2,735

Web-interface Wi-Fi, Ethernet, 3.5 G, UHF/VHF/FH915, internal battery

*Power, data cables and antenna are included.