SPOOFER BUSTERS

Spoofers are not only of the Black Sea type, as reported in the press, kids are going that direction too. It is time to take spoofers seriously.

Spoofers are completely different from jammers that block GNSS signals. Spoofers create GNSS-like signals that fool receivers to provide false location solutions.

We combat spoofers in two ways:

1. Detect and alarm that spoofer exist.
   We ignore the spoofer and use valid satellite signals.
2. Help find the direction that spoofed signals are coming from.

PATENTS PENDING

Spoofer detection is available in all of our OEM boards.

See details inside

Spoofer Detection

With 864 channels and about 130,000 quick acquisition correlators in our TRIUMPH chip, we have resources to assign more than one channel to each satellite to find ALL signals that are transmitted with that GNSS satellite PRN code.

If we detect more than one reasonable and consistent correlation peak for any PRN code, we warn you that you are being spoofed and identify the spoofed satellites.

When we detect that spoofing is in effect, we use the position solution provided by all other clean signals (L1, L2, L5, etc... GPS, GLONASS, Galileo, Beidou, etc...) to ignore the spoofer signal and use the real satellite measurement. If all signals are spoofed, then we alarm you to ignore GNSS and use other sensors in your integrated system.

The screenshots below are from a real spoofer in a large city. The bold numbers are for the peak that is used in the position solution.

Satellite Name	Signal above noise level	Range mod 1 ms	Doppler	Signal above noise level	Range mod 1 ms	Doppler	Delta range	Delta Doppler	Noise level
	First Peak			Second Peak					
SAT	SNR 1	Range 1	Doppl 1	SNR 2	Range 2	Doppl 2	dRange	dDoppl	Noise
GPS1	**15**	**2.51**	**-4130**	13	28.59	-4030	25.06	-100	26
GPS4	15	46.49	2849	5	0.32	4350	18.34	-1501	25
GPS8	12	52.64	713	6	53.52	714	0.14	-1	25
GPS10	**19**	**24.95**	**1020**	12	58.07	1121	31.39	-101	26
GPS11	**16**	**3.66**	**-3392**	13	2.37	-3392	0.28	-100	26
GPS13	11	51.31	2103	5	52.19	1804	0.14	299	26
GPS14	**16**	**45.03**	**-3699**	14	62.31	-3599	16.26	-100	26
GPS15	14	62.46	812	5	34.04	413	27.40	399	25
GPS18	**12**	**63.21**	**1878**	13	45.76	1979	16.43	-101	26
GPS20	13	31.68	2275	5	32.27	2076	0.43	199	26
GPS22	12	15.54	-4100	5	16.42	-4200	0.14	100	26
GPS24	**17**	**45.74**	**-881**	12	7.65	-781	26.42	-100	26
GPS27	13	33.87	2603	8	34.75	2704	0.14	-101	25
GPS28	10	7.62	-746	4	15.24	-3446	6.60	2700	26
GPS32	21	41.21	-2660	4	20.54	-2560	19.65	-100	26
GLN-5	23	50.48	-2500	5	8.43	3500	22.47	-6000	22
GLN-3	8	52.83	3840	5	6.30	-1359	17.98	5199	22
GLN-2	9	54.07	-3871	3	15.55	-8671	25.99	4800	23

Esc | 1 | 2

The first or the second peak is the spoofer. Ignore gray numbers which are insignificant peaks.

SAT	SNR 1	Range 1	Doppl 1	SNR 2	Range 2	Doppl 2	dRange	dDoppl	Noise
GPS2	6	41.95	1899	6	11.58	0	29.34	1899	23
GPS4	10	22.72	2502	5	31.40	1803	7.65	699	23
GPS7	22	28.15	1303	6	49.56	4	20.39	1299	23
GPS8	14	1.77	-472	5	1.18	-2472	0.43	2000	23
GPS9	13	16.57	2858	5	44.72	6459	27.13	-3601	23
GPS11	7	50.88	-4100	6	13.34	2100	26.97	-6200	23
GPS13	17	17.59	-3371	5	57.93	-2571	24.17	-800	23
GPS15	12	55.88	-4315	4	33.15	-7015	21.71	2700	24
GPS20	12	60.42	-1249	4	31.10	-2549	28.30	1300	24
GPS21	10	56.01	410	6	17.46	1411	25.97	-1001	23
GPS27	10	58.35	1535	5	48.25	-1164	9.08	2699	23
GPS28	20	51.02	-2485	4	53.95	1815	1.91	-4300	24
GPS30	23	19.51	-219	4	32.87	1981	12.33	-2200	24
GLN-7	23	31.11	-751	4	35.51	4249	3.37	-5000	23
GLN-5	11	40.72	-4899	5	55.18	0	13.43	-4899	22
GLN-4	14	32.50	-4899	4	12.61	2800	18.88	-7699	23
GLN-3	18	36.02	1065	4	15.11	-934	19.89	1999	23
GLN-2	20	42.92	2510	4	30.22	7511	11.68	-5001	24

Esc | 1 | 2

No spoofer. Only one reasonable peak for each satellite.

FL

J-Tip
Integrated Magnetic Locator

$850

No need to carry heavy magnetic locators any more. The J-Tip magnetic sensor replaces the tip on the bottom of your rover rod/monopod. Its advanced magnetic sensor send 100 Hz magnetic values to the TRIUMPH-LS via Bluetooth. TRIUMPH-LS scans the field and plots the 2D, 3D and time view of magnetic characteristics. It also shows the shapes and the centres of the objects under the ground and guides you to it.

J-Tip advantages:

• J-Tip does not have "null" points around the peak and will not produce false alarms.

• J-Tip is fully automatic for all levels of magnets. There is even no "Gain" button to adjust.

• J-Tip senses the mag values in all directions. You don't need to orient it differently in different searches.

• J-Tip gives a 2D and 3D view of the field condition when you have RTK and will guide you to the object. You can actually see the shape of buried object.

• J-Tip, In Time View, shows positive and negative mag values of the last 100 seconds and the Min and the Max since Start.

• J-Tip shows the instantaneous magnetic vector in horizontal and vertical directions.

• J-Tip works as a remote control for the TRIUMPH-LS

• J-Tip weighs 120 grams and replaces the standard pole tip. In balance, it weighs almost nothing.

• The built in camera of the TRIUMPH-LS documents the evidence after digging.

• And... you don't need to carry another bulky device.

J-Pod
A rugged Transformer-Pod

J-Pack
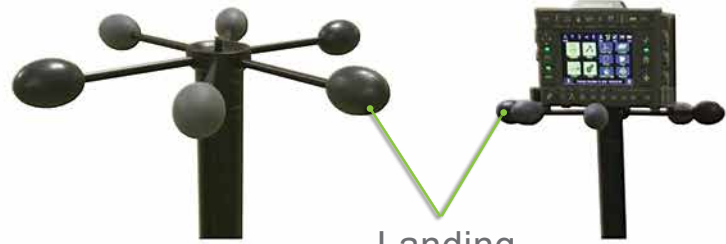## Convenient survey bag

Landing Pads

Javad......Bravo!!!!

The J-Pack is nicest bag I have ever seen for surveying. I especially like the pocket in the back and all of the places to tie down equipment and stuff.

Adam Plumley, PLS

J-Pod Inside bag.

Monopod >>> to + Bipod >>> to + Tripod…
On demand.

J-Field
## Application program of TRIUMPH-LS

Who moved my 🛆 base?

It is well known that having your own base station near your job site provides you with faster, more accurate, more reliable and less expensive solutions. If you don't know the accurate position of your base, our DPOS service will find it. Read details in the following pages.

After you start your base, If during your survey somehow your base is moved, all your rover points will be inaccurate to the amount of the base movement. But...

...But! Don't Worry, Be Happy:

We will let you know instantly during your survey if your base has moved. We use:

1. Inclinometer which shows the tilt value.

2. Accelerometer which shows motion and shocks.

3. We calculate displacement. This value is accurate to 2 cm.
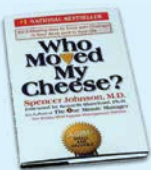
By the way, a must read book for adult professionals

1) Set the displacement threshold here. "Off" means ignore displacement. Our default is 5 cm.

2) Click the "Start Base". it will change to "Stop base."
RTK corrections as well as motion values will be transmitted to the rover.
Maximum values of the motion parameters will be kept at all time.

3) Maximum values of the three sensors can be shown in a white box in the action screen. Top left is the acceleration in milliG, bottom left is tilt and bottom right is displacement in centimeter.

4) If any of the threshold values exceeds, a pop up will alert you and shows the maximum value of the sensors since you started the base. The bottom number is time since the threshold(s) exceeded.

5) To setup for base movement alert, go to base rover setup screen and click on the left side of the screen.

6) You can set up threshold limits for accelerometer, inclinometer (tilt) and displacement values to create alert when these thresholds are exceeded.

7) Set Acceleration limit here. The units are in milliG (mG). G is acceleration in free fall. "Off" means ignore this sensor. Our default is 5 mG

8) Set the tilt threshold here. Units are in degree. "Off" means ignore tilt.
Our default is 5 degrees.
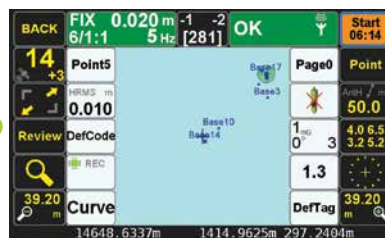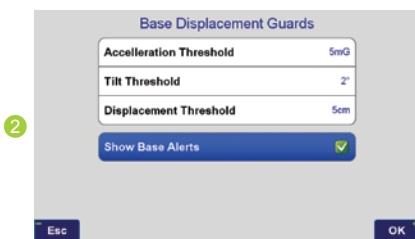
Receivers

TRIUMPH-1M

$8,990

864 channel chip, equipped with the internal 4G/LTE/3G card, easy accessible microSD and microSIM cards, includes "Lift & Tilt" technology.

TRIUMPH-2

L1 $1,990 **L1/L2 $3,490** **with RTK $4,990**

Total 216 channels: all-in-view (GPS L1/L2, GLONASS L1/L2, SBAS L1) integrated receiver.

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

*Power, data cables and antenna are included.

And all this with competitive prices!

Cellular antenna
GNSS antenna
RGB LED indication
BT/WiFi antenna
SIM card and microSD card slots
DB26 connector
Power connector

JLINK LTE*

$1,499

Connects all types of devices via UHF, WiFi, Bluetooth, and 4G/LTE for reliable IP communication in the field.
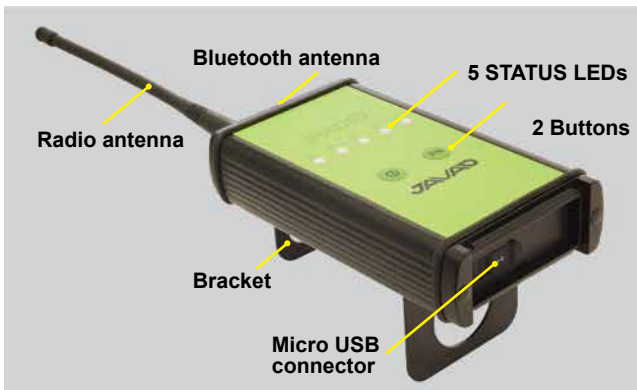
HPT401BT*

$2,010

1 W UHF transceiver with internal battery. Suitable for TRIUMPH-2 Base or as repeater.

HPT435BT*

High power (up to 35 W) UHF transceiver. Suitable for TRIUMPH-1M/TRIUMPH2 Base or as repeater.

$2,710

JRADIO*

Bluetooth antenna
5 STATUS LEDs
2 Buttons
Radio antenna
Bracket
Micro USB connector

$1,190

Tri-band UHF receiver with Bluetooth, USB, and internal battery. Suitable for TRIUMPH-2 Rover.

Modems

Spoofer Orientation

When you detect that spoofers exist, you can also try to find the direction that the spoofing signals are coming from. For this, hold your receiver (e.g. TRIUMPH-LS) horizontally and rotate it slowly as shown in the picture (one rotation about 30 seconds) and find the direction that the satellite energies become minimum. This is the orientation that the spoofer is behind the null point of the antenna reception pattern.

After one or more full rotations observe the resulting graph that shows approximate orientation of the spoofer as shown in figure below.
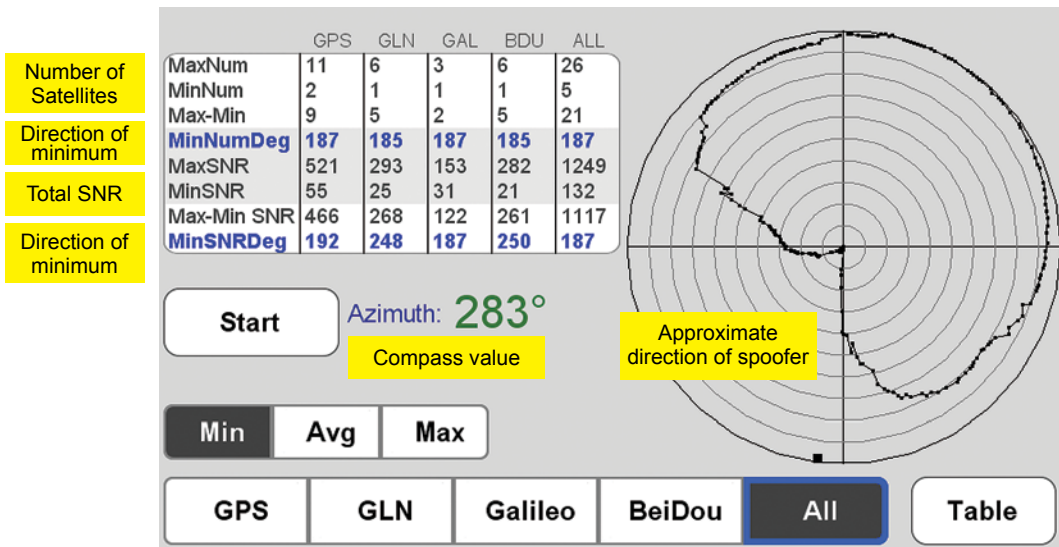
This screenshot is from the experiment within the anechoic chamber. That is why the picture is so clean.

I am on a job now with 143 iron pins found so far. The J-Tip has been awesome for me.

I was out with another local surveyor on this same job last Saturday, and he carried his classic Schoenstedt. There were signals that his detector did not really give a definite reading on, that the J-Tip did. There was also a railroad spike 6 inch deep in the road that the J-Tip missed, and his Schoenstedt did find. When I put the J-Tip over his spot, I only had a 1.8 positive reading, which did drop back to zero when I moved away. When the spike was exposed, the J-Tip reading was 11 while in contact with the spike.

I am also getting good at judging depths before we dig in the road. I am usually within an inch.

John Evers

As for the performance, you can't beat it. However, I want to put out a kudos to the support team from Javad. My LS had a hiccup a couple weeks back. John Evers worked tirelessly into the evening trying to fix it. When it came time to send it in for repair, Michael Glutting sent me his personal LS to keep me going for the few days until the rental unit arrived. THANKS. I don't think you would see that kind of service from any vendor any where.

Bob Farley

I needed it, the LS and the J-tip found it. Another game changer from Javad.

David M. Simolo

Here is an interesting shot. I wanted to shoot the rebar, on the ground. But, post was in the way. I drove a 16d nail, with it's head cut off, (leatherman did that) and used a plumb bob to get it just right. Then, took the LS off the pole, and there is a small hole in the "handle" which I placed over the headless nail. It sat and shot it, while I did other things.
As you can see, by the tree, and shade, this is not a shot for just any GPS.

Nate

SW Arkansas, USA, Planet Earth