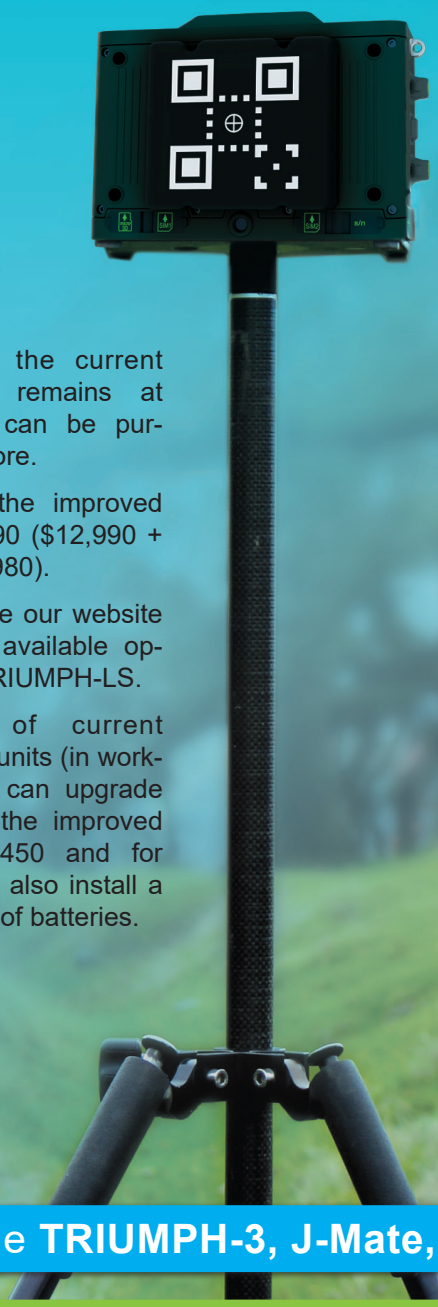
Upgrade to TRIUMPH-LS Plus

Option available for the TRIUMPH-LS with the following features, using the new ASIC:



- **Improved signal tracking and signal processing (wideband tracking) and adding Galileo and BeiDou L6 bands and Galileo AltBoc and BeiDou AltBoc signals.**
- **Improved multipath reduction due to wide band tracking.**
- **Improved spectrum analysis to show and reject spoofers and jammers option.**
- **Improved RTK with four "Super Engines". Each engine uses all signals of all satellites but with different parameters for different conditions.**
- **Improved internal Wi-Fi antenna that works both as directional and omnidirectional. No need for external Wi-Fi antenna.**
- **Improved internal Bluetooth antenna and longer range.**
- **Lower power consumption and extended battery life.**
- **J-Mate ready: Integrated J-Target painted on the back of TRIUMPH-LS.**

Price for the current TRIUMPH-LS remains at $12,990 and can be purchased as before.

Price of the improved option is $4,990 ($12,990 + $4,990 = $17,980).

Please see our website for additional available options for the TRIUMPH-LS.

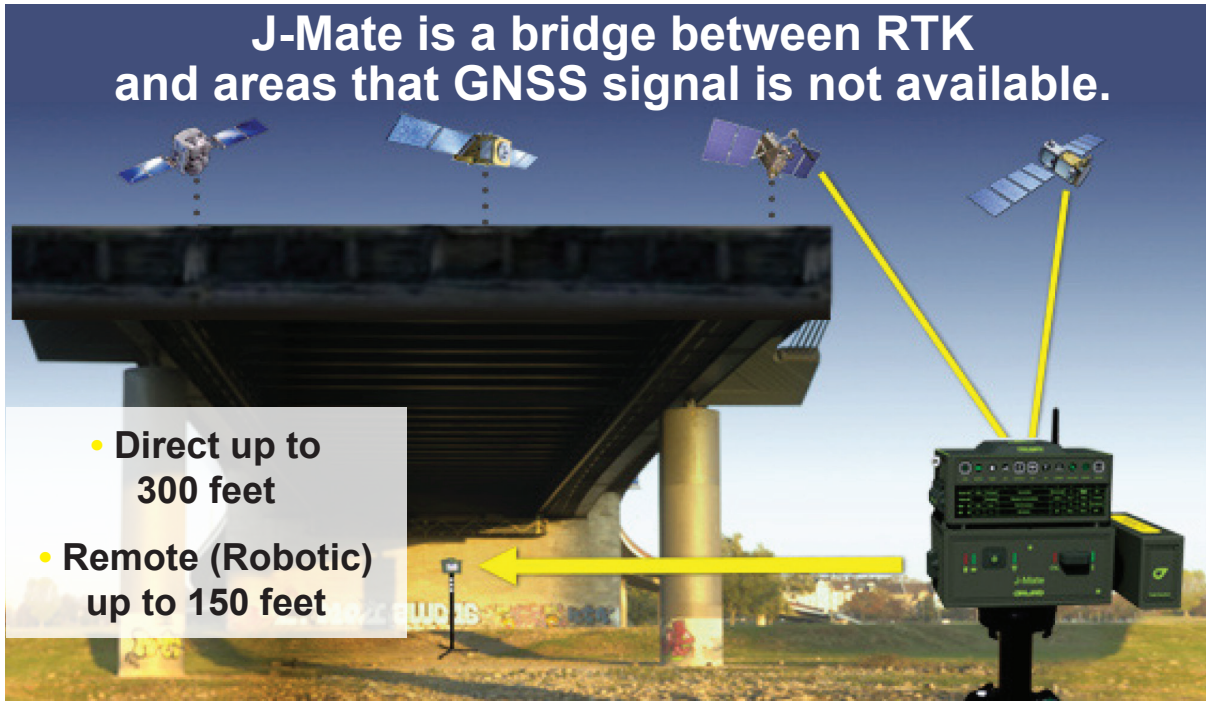
Owners of current TRIUMPH-LS units (in working condition) can upgrade their units to the improved option at $5,450 and for $5,700 we will also install a brand new set of batteries.

See inside **TRIUMPH-3, J-Mate, GNSS Signals** and more **>>**

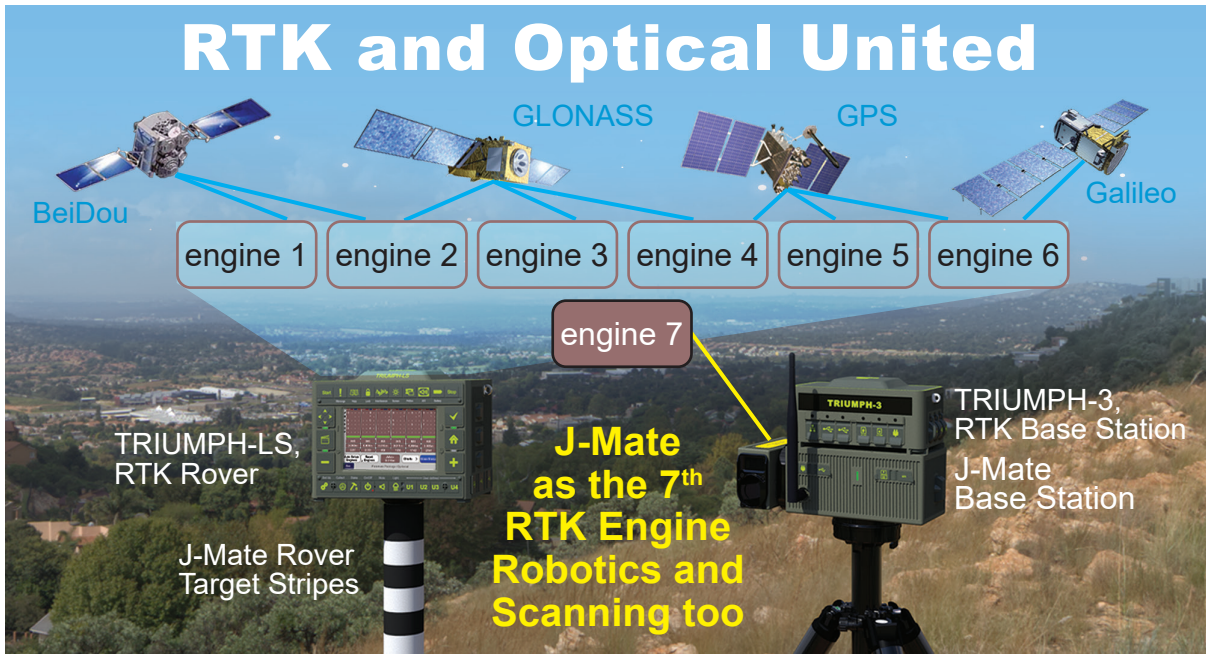
JAVAD

www.javad.com

J-Mate



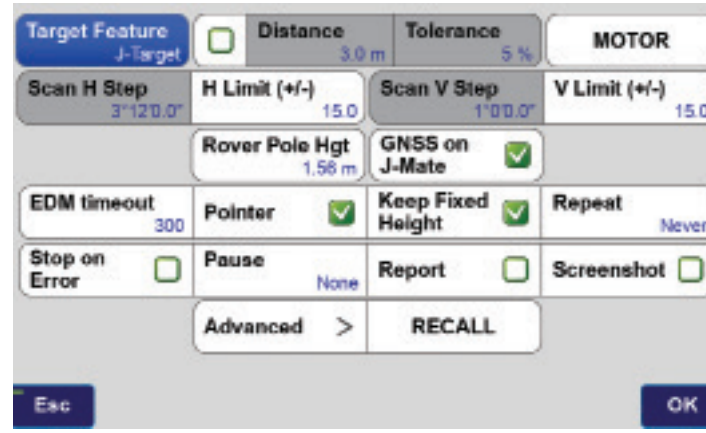
J-Mate is not a total-station. J-Mate and TRIUMPH-LS together make the “Total Solution” which is a combination of GNSS, RTK, camera, angle encoders and laser range measurements that together do, conveniently and cost-effectively, a lot more than a total station. For long distances, you use GNSS and for short distances (maximum of 300 feet in Direct mode and 100 feet in Remote/Robotic mode), you use the J-Mate along with the TRIUMPH-LS. Together they provide RTK level accuracy (few centimeters) in ranges from zero to infinity.



Searching and finding objects by laser and by Optics

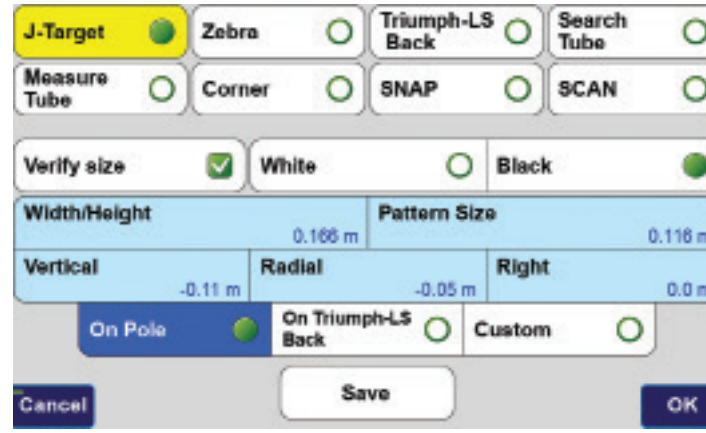
J-Mate has the unique feature of searching for objects by laser and by optics (camera).

Click button  and select “Target Feature” to see the setup screen for target selection and parameters. If you know the approximate distance to the target, click the check box and enter the distance and accuracy percentage. This will help J-Mate to ignore targets that are outside the range.



Horizontal and Vertical Limits are the limits that J-Mate will search around the starting point to find targets.

“Keep Fixed Height” check box, scans horizontally on fixed target height. You may rarely need to use this feature. It will reduce the scanning speed by a factor of 2.



“Laser time limit”

The time that it takes for a laser measurement depends on the reflective surface of the target and weather conditions (dust and moisture in the air).

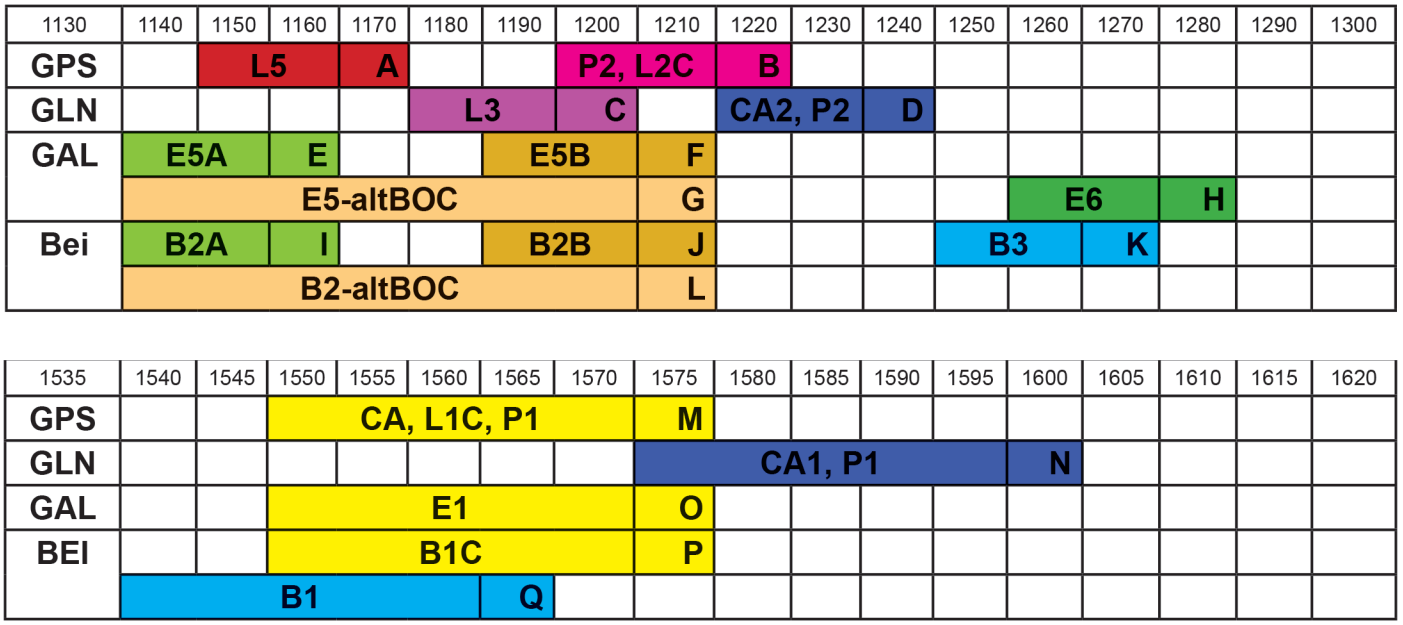
On a good white reflective surface and in clean air, it takes about 50 milliseconds to have a laser reading. If there is no reflective surface, or the reflective surface is black, it may take up to 4 seconds to have a laser reading.

If the surface of the object that you want to scan is a good reflective surface, limit the laser time to a fraction of a second. This will cause the laser to skip points that do not reflect enough energy in the time limit that you specified. This will significantly increase the scan speed and will ignore points that are not possibly your target and reduces the chance of identifying a wrong object.

Target Features and its offset from the top of the pole are shown in the “Target Features” screen. You can change the parameters by selecting the “Custom” button.

TRIUMPH-LS Back: You can use this feature to search for the back of TRIUMPH-LS and measure to its center to make sure laser range measurement is not from an unintended object.

GNSS Signals in the improved TRIUMPH-LS with the new chip



GNSS bands for GPS, GLONASS, Galileo and BeiDou signals are depicted in the above figure.

There are total of 22 signals in 17 frequency bands labeled “a” to “q”. Note that GPS C/A, L1C and P1 are in the same band (m) and GLONASS CA/L2 and P2 also are in the same band (d) of the same satellite. In selecting signals for RTK processing, as an option, we may choose to select only one of such signals in the same band. We label this option as “No Same Frequency” option in signal selection strategy screen, discussed later.

GPS				GLN				GAL				BEI			
C/A M	1.0	8	8.0	C/L1 N	1.0	8	8.0	E1 O	1.0	6	6.0	B1C P	1.1	8	8.8
P1 M	0.8	8	6.4	P1 N	1.2	8	9.6	E5B F	1.2	8	9.6	B1 Q	1.0	9	9.0
L2C B	1.0	8	8.0	C/L D	1.0	8	8.0	E5A E	1.2	7	8.4	B2B J	1.2	9	10.8
P2 B	0.8	7	5.6	P2 D	1.2	7	8.4	Eboc G	1.5	6	9.0	B2A H	1.2	8	9.6
L5 A	1.1	5	5.5	L3 C	1.2	2	2.4	E6 H	1.1	8	8.8	Bboc L	1.5	8	12.0
L1C M	1.1	8	8.8									B3 K	1.1	10	11.0

We categorize the GNSS signals as shown in the above figure. The first column is the name of the signal and its designated signal letter (e.g. GPS C/A m). Signals with the same color are those that we discussed earlier as being in the same frequency band of the same system.

The second column is the quality indicator of that signal. Because GPS P1 code, for example, is encrypted and in recovery we lose about 10db of its signal strength we give this signal the quality indicator of 0.8. GLONASS signals also get lower score because of their FDMA signal structure which results in inter-channel biases, even though we reduce such inter-channel biases in our signal processing techniques. Galileo AltBoc and BeiDou AltBoc signals get quality score of 1.5 because of their wide band and signal quality.

The third column is the number of available signals for RTK.

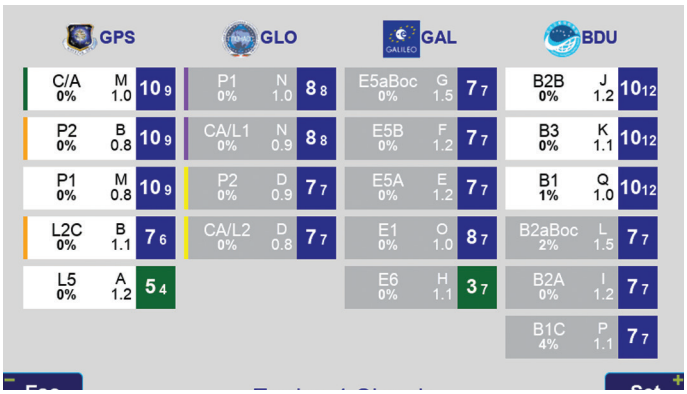
The multiplication of the second and third column is shown in column four, which is an indication of the value of that signal for RTK.

The four super engines

This screenshot shows the four super engine screens. Each engine shows the signals that are used for that engine.

The numbers below each engine are:

- First line is the GDOP of the selected satellites for each engine.
- Second line is the number of signals used / number of signals rejected.
- Third line is epochs since the last reset.
- Fourth line is the solution difference from the first engine.
- Fifth line is the total run time.
- Clicking on each engine, restarts the RTK fix process.
- Long click on each engine to select signals for that engine manually as shown in the figure below.



This screen shows all signals tracked by the TRIUMPH-LS which is real-time indication.

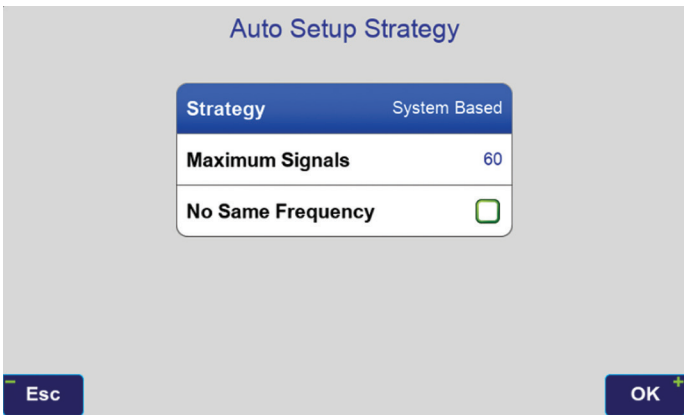
For each system, the name of the signal and its designated signal letter and quality indicator (e.g. GPS C/A M 1.0) are shown. GPS and GLONASS Signals with the same color sideband are those that we discussed earlier as being in the same frequency band of the same system.

Next to the signal name, the top number in each cell is the number of signals tracked by the Rover and the number below that is the number of signals tracked by Base. The smaller number of the two represent the number of common signals between base and rover.

You can long click on the signal name to change the quality indicator of that signal.

Each system is sorted by the number of common signals multiplied by the signal quality indicator.

The number below the signal name is the percentage of noise in that band. Numbers above 30% hint possible spoofing in that band. In case of jamming the original signal and adding a spoofed signal, this percentage may raise to even 200%.



"Auto Setup Engine" button selects signals for each engine automatically according to the strategy option selected by user.

For selection strategy, hold the "Auto Setup Engine" which leads you to the following screen.

"Maximum Signal" box allows you to limit the number of signals used for each engine. Numbers above 60 limits RTK solutions to one per second. Numbers below 30 allows 5 Hz RTK.

The "No Same Frequency" check box selects only one of the GPS and GLONASS signals in the same band as explained earlier.

Click "Strategy" button to select the strategy for automatic signal selections for each engine.

You can long click on each engine and select signals for that engine manually.

In "System based" strategy, for the first engine all GPS signals are used (subject to the check box and Maximum Signal parameters) and then complemented with the best other signals up to the "Maximum Signal" limit. The other three engines are similarly selected by giving preference to GLONASS, Galileo and BeiDou, respectively

In "All the Best" strategy, the best signals among all systems are selected and identical signals are given to the four engines (subject to the Maximum Signal number and the No Same Frequency Check box).

No signal type will be selected unless at least four satellites transmit that signal.

Each engine can accept maximum of 8 signal type. And each signal type can have maximum of 10 signals.

Clicking the "Reset Engines" button, resets all engines.

You can switch between "Convention Tracking" and Independent Tracking by clicking on this button. Conventional tracking users information from the L1 band to help other bands.

The number of the bottom right of the Figure 3 is the number of lost data from the base since the last reset. Long click to reset it to zero.

New feature

There are three types or RTK engines:

1) 6 engine GPS + GLONASS;

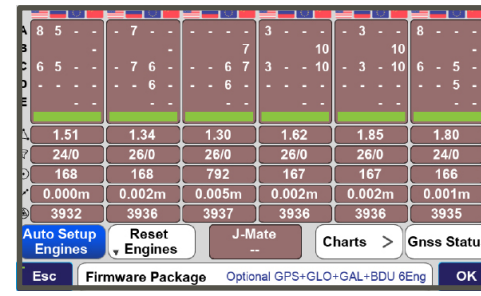
2) 6-engine multi constellation, and

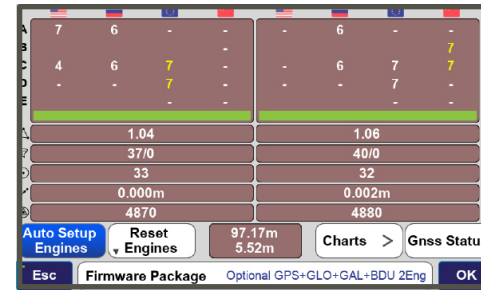
3) 2-engine multi constellation.

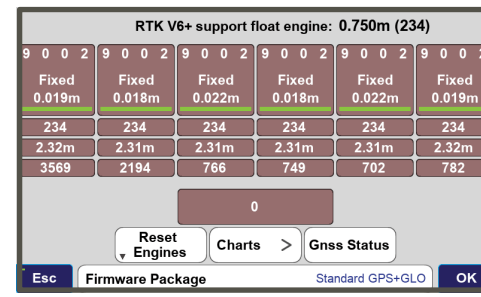
The engine selection button is on the bottom of the "engine view" screens. Changing the engine type takes about one minute for the TRIUMPH-LS to reboot.

"Auto Setup Engines" button selects signals for each engine automatically. You can click and hold on each engine to assign signals manually. The number assigned to each signal is the "Figure of Merit" of that signal according to the number and strength. "0" is perfect. "10" is very bad.

"GDOP" of used satellites are shown below each engine. "GNSS Status" button shows the Figure of Merit number for each signal. Click on any signal number to get details. The lower the number, the better the signal.







TRIUMPH-3

The new TRIUMPH-3 receiver inherits the best features of our famous TRIUMPH-1M.

Based on our new third generation TRIUMPH chip enclosed in a rugged magnesium alloy housing.

The TRIUMPH-3 receiver can operate as a portable base station for Real-time Kinematic (RTK) applications or as a receiver for post-processing, and as a scientific station collecting information for individual studies, such as ionosphere monitoring and the like.

It includes options for all of the software and hardware features required to perform a wide variety of tasks.

- UHF or Spread Spectrum Radio
- 4G/LTE module
- Wi-Fi 5 GHz and 2.4 GHz (802.11 a, b, g, n, d, e, i)
- Dual-mode Bluetooth and Bluetooth LE
- Full-duplex 10BASE-T/100Base-TX Ethernet port
- High Speed USB 2.0 Host (480 Mbps)
- High Speed USB 2.0 Device (480 Mbps)
- High Capacity microSD Card (microSDHC) up to 128GB Class 10;
- “Lift & Tilt”
- J-Mobile interface

Ideal as a base station

Who Moved My Base?

Real story by Shawn Billings

I was surveying in a rural neighborhood with lots of trees near a Corps of Engineers lake. There were not many base locations nearby, so I had to find a place about a mile by road (or 3500' straight-line) from my site to set up the base. The choices were few, but I found a place that was clear near the side of a public road about 600-700 feet from a house. I set up and started my job. All was going well and I had about 30 minutes - an hour left before I would be finished with the job. It was promising to be a productive day! Then my LS reported that my base had moved!!! I ran for my truck and quickly navigated the windy roads back to where I set it up. Adrenaline was pumping as I considered that my base was likely stolen. I showed up, semi-relieved, to see a woman standing by her car, arms folded near where my base once stood. I immediately figured this was the property owner where I put my base and she wasn't happy with my trespass. She gave me a good verbal lashing. I simply wanted my base back so I sheepishly agreed that I was in the wrong for putting my threatening equipment on her property a five feet or so from the top bank of the road ditch. About thirty feet away, they had some old culvert pipes stockpiled. There, the owner had stuffed my still-running Triumph-2 on the tribrach and tripod into one of the culverts. The HPT435BT, also still running, was plugged into my large deep-cycle battery which was placed behind the culverts. I still don't know how she didn't damage any of it by moving it from the setup and shoving it into the 12" pipe. She took my picture as I loaded up my truck and I waived affably offering to give her a business card so she'd know who I was. She replied with a few more expletives and I was on my way. I ended up completing the job with my total station (the first time I've used it in many months). But I was extremely thankful for the base guard feature that immediately warned me of trouble at my base and even more thankful that I was able to recover it and that it is still in good working order.

To take advantage of the base guard feature, make sure that your Javad base receiver is calibrated. You can do this by connecting to the base in base/rover setup and then going to the calibrate screens in J-Field. Calibrations made while the base is connected will calibrate the base instead of the LS. Once done, be sure the base guard feature is checked on.