

Update to user manual for TRIUMPH-LS J-Field version of 3.0.5.280 or higher.

Introduction

Let's set the record straight: 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.

J-Mate is a bridge between RTK and areas that GNSS signal is not available.

As with the TRIUMPH-LS, with the J-Mate we also provide software improvement updates regularly and free of charge. Download the J-Mate update in your TRIUMPH-LS and then inject it to the J-Mate.

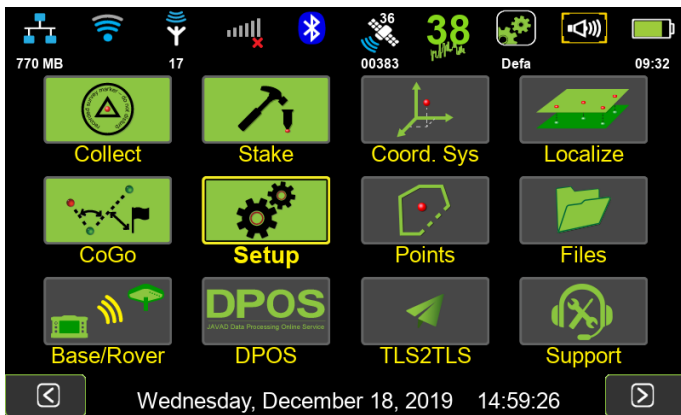
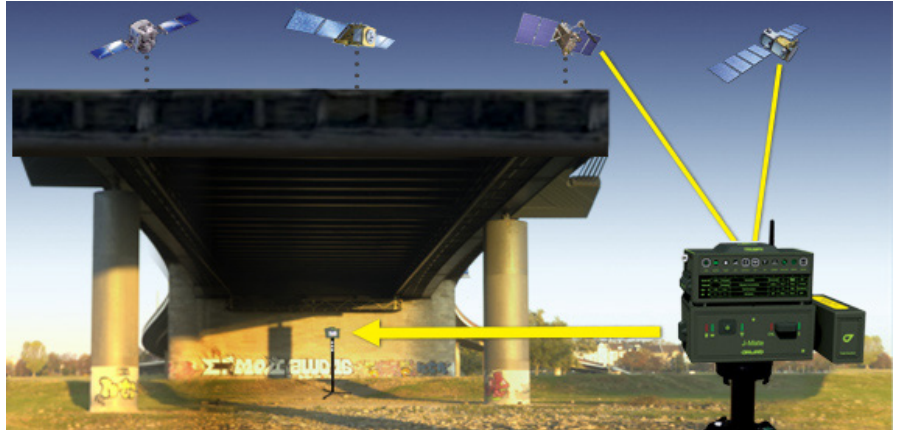


Figure 1

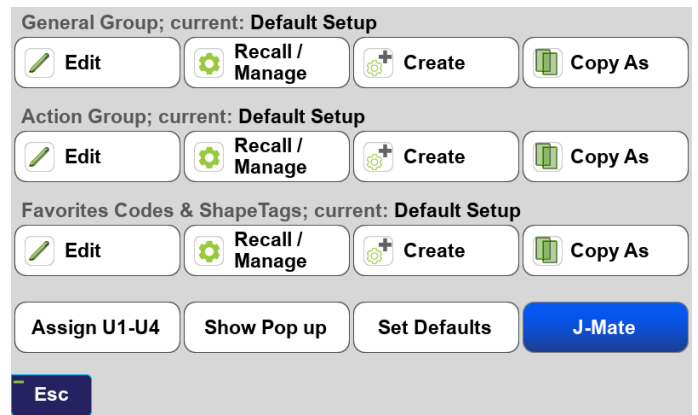


Figure 2

Connecting the TRIUMPH-LS to the J-Mate

TRIUMPH-LS communicates with the J-Mate through Wi-Fi. Turn on both the TRIUMPH-LS and the J-Mate. Click the Setup icon on the TRIUMPH-LS Home screen (Figure 1) and click “J-Mate” to connect to J-Mate. (Figure 2) The J-Mate SSID will be in JMatexxxxx format, where xxxxx is your J-Mate’s serial number. After Wi-Fi connection is established, click the “Collect” or “Stake” icons according to your job.

Prepare for Collect: Click “Collect” in Figure 1 to get to Figure 3 to a) prepare for your job (the first three rows), 2) execute it (by GNSS, J-Mate Direct, or J-Mate Remote), and 3) “Review” it.

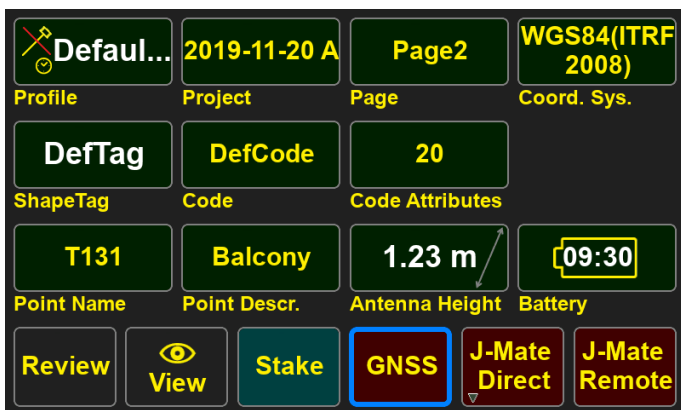


Figure 3

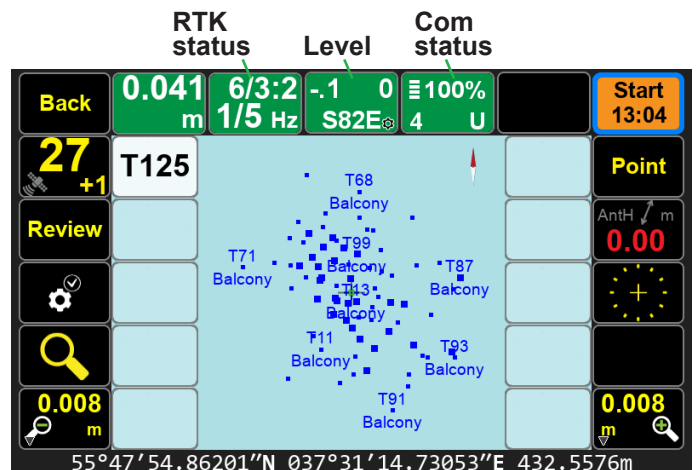


Figure 4

Collect by GNSS

Collect by GNSS performs RTK and other tasks as explained in other documents.

The RTK Status has the following format in the first row: number of engines fixed/Minimum number of engines to accept epochs: Minimum number of engines for Verify

The second row of RTK Status: Number of RTK corrections per second/Number of fixes per second.

Communication Status box shows the signal strength with four bars, Line quality %, and Base ID number or seconds of delay when communication is lost. **U**: UHF, **W**: Wi-Fi, **F**: Frequency Hopping, **C**: Cellular, **L**: LAN

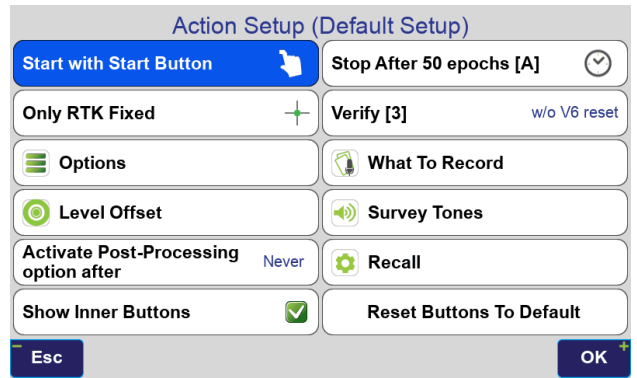


Figure 5

You can show/hide the inner white buttons by **holding** the “Level” button of Figure 4 or click it and check/uncheck the “Show Inner Buttons” of Figure 5. In J-Mate screens button works similar to this “Level” button.

Hold the “Back” button of Figure 4 to customize the highlighted buttons (with red borders). By customizing the side buttons, you may have less need to use the white buttons and have wider screen for viewing points. Hold the “Back” button again to release the customization mode. “Rest Buttons to Default” re-established the factory button assignments.

White buttons are explained at the end of this section.

There are three **types** or RTK engines: 1) 6 engine GPS + GLONASS; 2) 6-engine multi constellation, and 3) 2-engine multi constellation. “Engine Type” 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.

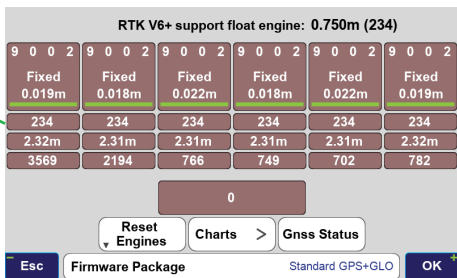
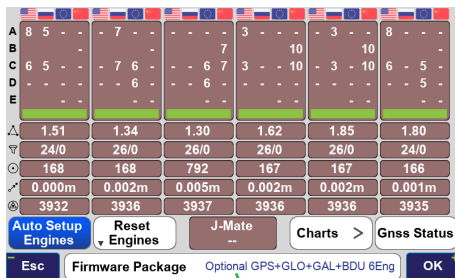
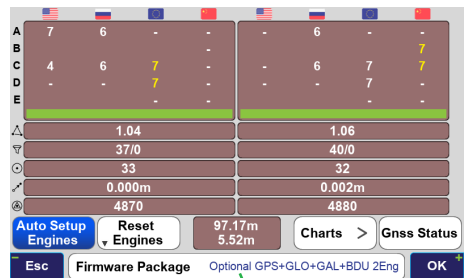


Figure 6



Engine Type Selection



Engine Type Selection

“Auto Setup Engines” button selects signals for each engine automatically. You can click on each engine to reset it, and long click to assign signals manually. The number assigned to each signal in Figure 7 is the “Figure of Merit” of that signal according to the number and strength of that signal. “0” is perfect. “10” is very bad. “GDOP” of used satellites are shown below each engine. Below that is the number of signals used and number of signals rejected. High number of rejected signals indicates of bad environment and large multipath. Below that is number of seconds since last engine reset. Below that is the engine differences in mm. Below that is the continuous running time.

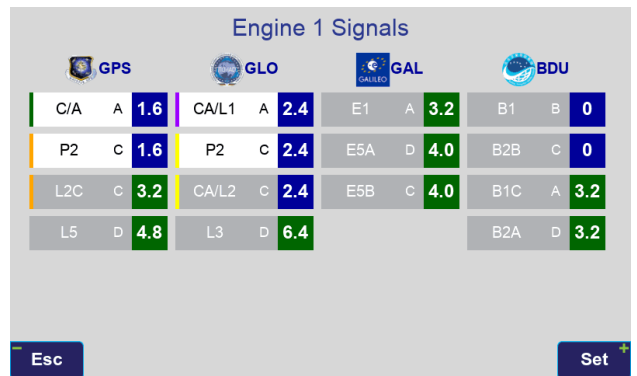


Figure 7

“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.

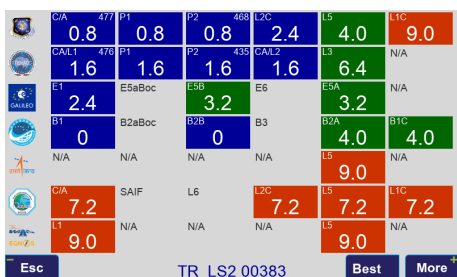
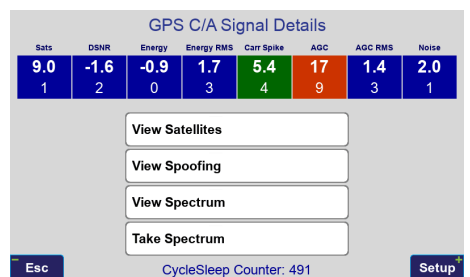
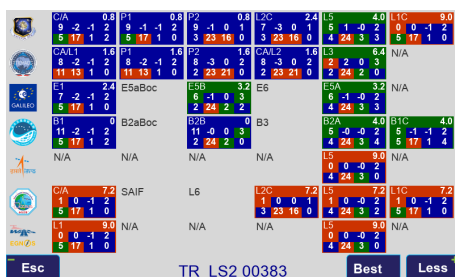


Figure 8










Collect by J-Mate Direct (Figure 9)

You can aim at targets manually or automatically.


Aiming at targets manually:


There are five ways that you can manually aim the J-Mate towards your targets:

1. Each click of the Left/Right/Up/Down buttons , , ,  moves the J-Mate according to the value that you assign to them via the setup button , Motor in Horizontal and Vertical Motor Step (Figure 10). Two horizontal buttons allow you to assign buttons with different step and speed.


2. While holding these buttons , , J-Mate rotates with the speed that you assign to them in the J-Mate Motor Settings screen.

3. You can point J-Mate towards targets by touching points on the screen and by gestures (moving finger on the screen).


4. You can rotate the J-Mate manually while it is not held by motors as shown by the Green Hand icon . If this icon is red, click it to release the motor. Limit rotation by hand to small amounts, not to apply back-pressure to motor. Motor manufacturer does not prohibit manual motion, but we think it is better to avoid it as much as possible.


5. The viewing angle of the TRIUMPH-LS camera is 60-degree wide, while that of the J-Mate is about 5 degrees. The viewing area of the J-Mate camera is represented on the TRIUMPH-LS by a small red rectangle (Figure 11). While TRIUMPH-LS is sitting on top of the J-Mate, you can view your target on the TRIUMPH-LS camera , bring it to the rectangle by touching the target or using the navigation buttons, and then switch to the J-Mate camera.

To calibrate the camera of J-Mate with the camera of the Triumph-LS, while TRIUMPH-LS sitting on top of the J-Mate do the followings:


1. Click  and clear existing Horizontal and Vertical Frame Offsets (if non-zero).

2. Aim J-Mate laser to the target.


3. While in J-Mate camera, click  to set the first position of the offset angle.

4. Click  to switch to the TRIUMPH-LS camera and note the small rectangle that represents the J-Mate camera viewing area.

5. Aim the J-Mate to bring that target to the center of the rectangle.

6. Click  to finish measuring the offset angles between the laser center and the rectangle.

7. Save them to a location on the scratch pads.

8. Click  to recall the measured offsets from the scratch pad that you saved in.

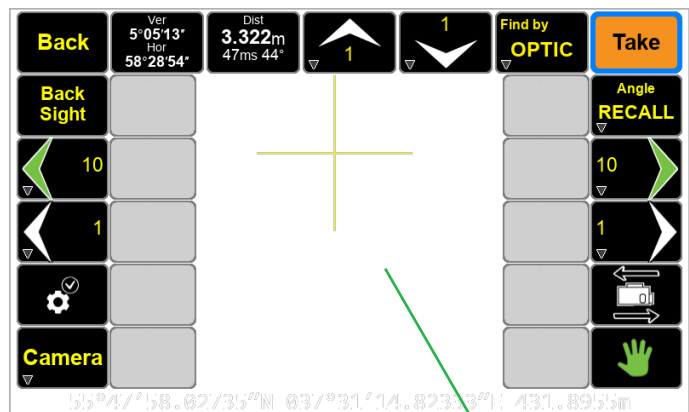


Figure 9 Touch area

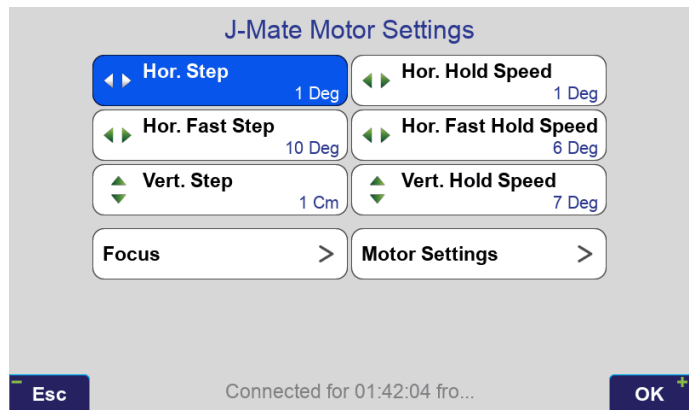


Figure 10

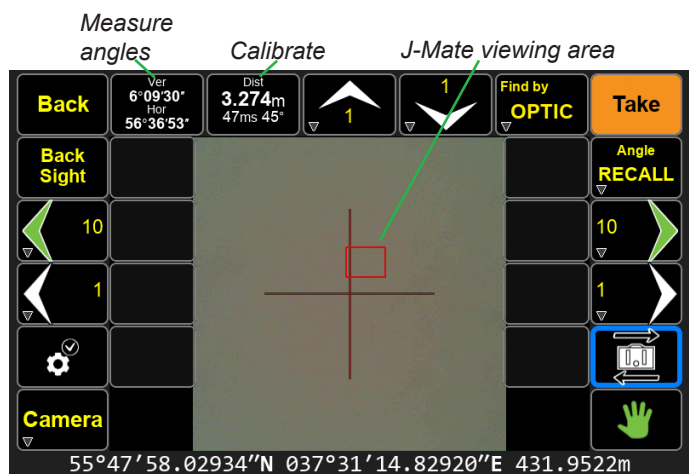


Figure 11

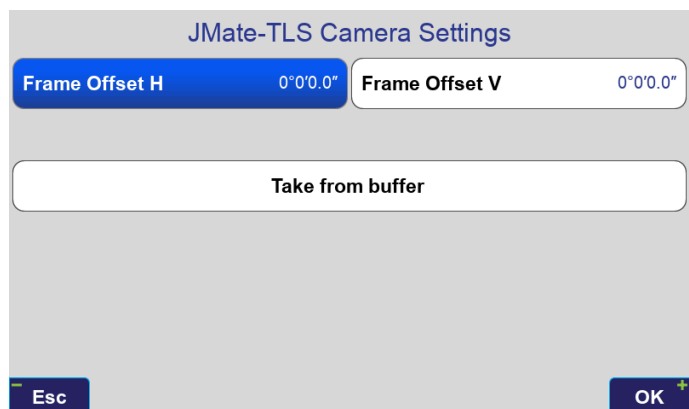


Figure 12



Camera operation and settings



Click the **Camera** button to the to the camera settings screen Figure 13.

White balancing the J-Mate camera when the light setting changes:

1) Put a white paper in front of the J-Mate camera about few meters away, such that it covers at least half of the viewing angle of the camera.

2) Click **WB** to start white balancing. It will take about 10 seconds to finish.

Zoom buttons:  

Contrast/Brightness buttons:  

Focus: use buttons   to focus manually.

Click  for autofocus on the subject.

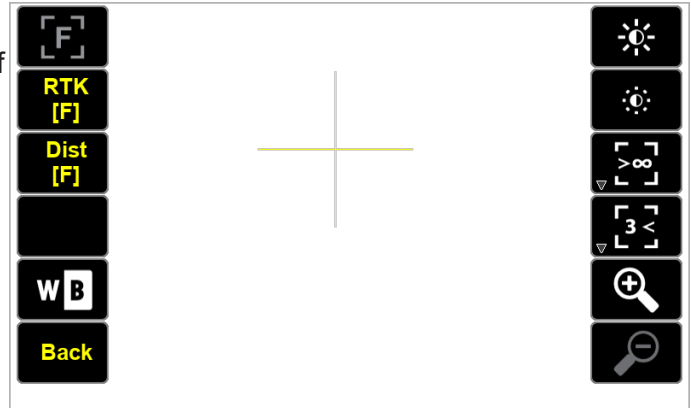






Figure 13

Occasionally you may need to calibrate the Focus motor. Click “Calibrate” icon in the second Home screen and select “J-Mate Focus”. Click the  button until focuses to infinity and then click OK.


If you cannot see the target but you want to prepare the camera to find it, you can enter the distance estimate to pre-focus the camera for that target by clicking the  icon and entering the distance.


In cases like in Backsight when RTK base in on top of the J-Mate, click the  button to measure the distance to the J-Mate by RTK and use it to pre-focus the camera.

Measure angles between two points

Aim at the first point and click button . Then Aim to the second point and click this button again. You will see the horizontal and vertical angles and the distance between the two points. You can save the measured angles in clip boards and use it elsewhere when you need.

Taking a Point

Aim at your target and click . J-Mate will take 10 readings and average them. The average, RMS and spread of the ten readings are shown.

Optionally, you can specify four points around the target point to be measured too, to ensure that you have aimed at the desired target. To specify the radius of four points around the target, hold . This feature will come in future version.

Instantaneous angular and range measurements are shown in boxes  and .

Collect by J-Mate Remote

Click J-Mate Remote on Figure 3 to collect points in robotic mode. Aim J-Mate roughly in the direction of the point that you want to collect to make robotic operation faster. (Figure 14).

In Figure 14, you can rotate the J-Mate by TRIUMPH-LS as a Joy Stick. Click the JS button and J-Mate will follow the rotation that you apply to TRIUMPH-LS to aim it the direction that you want. Click JS again to stop this mode.

If the selected target (J-Target or Zebra pole) is not in view of the J-Mate camera, click the Scan button to find it according to the search zone that you have selected in the Setup screen.

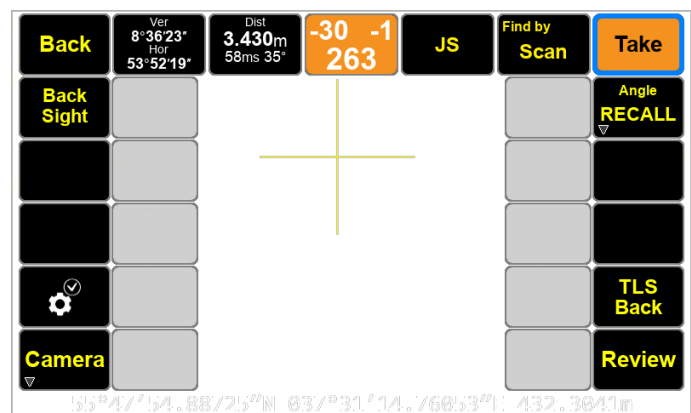




Figure 14

You can select the laser reading from the target, or click the “TLS Back” button for the laser to move to the back up TRIUMPH-LS and scan its width and height to verify that you are aiming at the correct target. Then it measures the range to the back of the TRIUMPH-LS and applies its offset.

Scanning for selected objects

Hold  to select search mode by laser or optic. Click  to initiate search. (Figure 14)

Saving and recalling orientation of J-Mate

Hold  to save the current orientation of the J-Mate to a scratch pad.

Click  to select the saved orientation that you want to orient to. (Figure 14)

In Recall screen the following options are available too:

Reverse: Rotates J-Mate 180 degrees horizontally and vertically to test to aim at the same point.


Transport: Rotates the side section upwards to prepare for transportation.

Level: Moves the side section to horizontal level.

Down: Faces the side section downwards, to measure height, for example.

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.

Following targets are defined:

J-Target is a printed pattern of 166 x 166 mm and about 25 mm thick. It can have a backing of 226 x 226 mm which provides flaps around the pattern. Select check boxes related to Sides, Top and Bottom flaps, if they exist and you want J-Mate to consider the depth of the flaps (about 25 mm).

If the J-Target is not sitting on another object and its bottom boundary is clear, then check the box Measure to Bottom. If not checked, J-Mate will measure to the top and will come down half of the height to aim at center. This feature applies to other target types too.

Figure 15

Only J-Target can be searched by laser and by optical. In laser scanning the pattern on the J-Target has no effect. The pattern is only for optical searching.

Zebra is a pattern of black and white rings around the pole. Zebra can be searched only by optical search.

All other items below are searched by laser scanning.

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.

Search Tube: Searches to find a tube with given diameter and height. If Measure to Bottom is not checked, it will go to the top of the tube and then come down half of the specified height, irrespective of the actual height of the tube.

Measure Tube: Searches for a tube that has the given width and then it measures the tube depth.

Corner identifies an abrupt change on a flat surface.

Snap: scans with the resolution given in "Step" and stops when range changes by "Edge Depth".

Scan: Scans according with the resolution given in "Step" and saves the scanned files if the box is checked. The scanned files can be viewed in the Main screen / File icon.

Selected objects and their parameters can be saved and recalled by "Save" button on this and "Recall" button of the previous screen.

Viewing the inclinometer

Assign "Inclinometer" to a white button or User defined button to view the embedded 0.001-degree electronic inclinometer of the J-Mate as shown in Figure 3. It updates 10 times per second.

The embedded inclinometer monitors and corrects for tilts automatically.

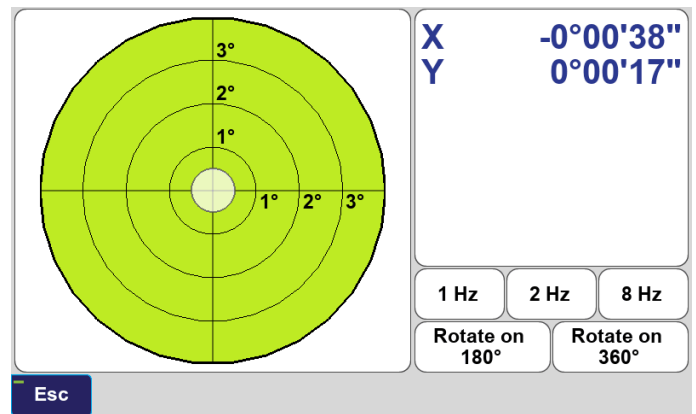


Figure 16

Calibrating the J-Mate laser and camera offset

Click Calibrate screen of the second Home page (Figure 17) and select "J-Mate Laser Spot" (Figure 18). Click start. While reflecting laser from a large white object, walk away from the J-mate as guided by tones. When commanded come back to J-Mate in similar steps.

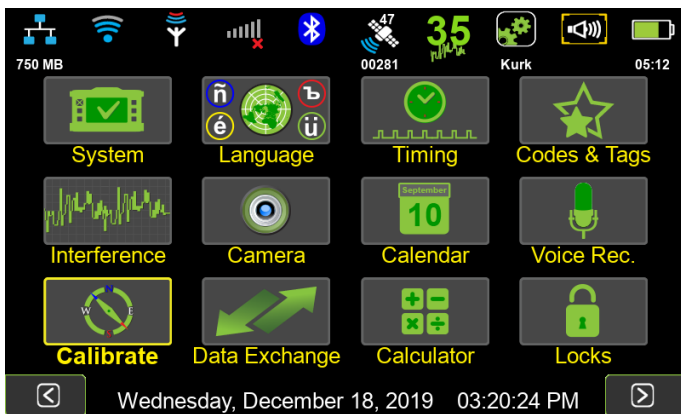


Figure 17

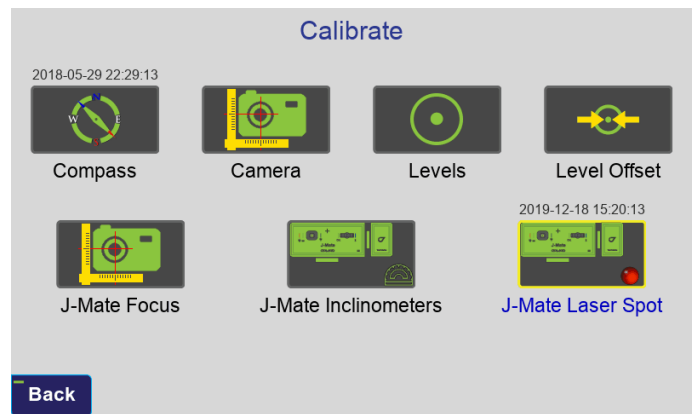


Figure 18

Backsighting

You can calibrate the encoders by Backsight in a single shot or a double shot. You can use Zebra pole or attach the J-Target to the Zebra pole as the target to be followed by the J-Mate.

A single shot Backsighting:

- Setup J-Mate and TRIUMPH-3 at Occupation Point.
- Do Base/Rover setup TRIUMPH-3 with TRIUMPH-LS and do Auto position.
- Aim J-Mate roughly towards the Backsight point
- Take TRIUMPH-LS Rover to the Backsight.
- Focus J-Mate at your rover (J-Target or Zebra)
- Do "Backsight" with option "J-Mate is at Base".

Double shot Backsight 2:

- Setup TRIUMPH-3 at an arbitrary point as your RTK base or use other RTK base.
- Setup J-Mate and TRIUMPH-LS at Occupation point.
- Take Occupation Point with "Take Occupation Point for Backsight".
- Aim J-Mate roughly towards the Backsight point
- Take TRIUMPH-LS Rover to the Backsight.
- Focus J-Mate at your rover (J-Target or Zebra)
- Do Backsight with "Take Occupation Point for Backsight".

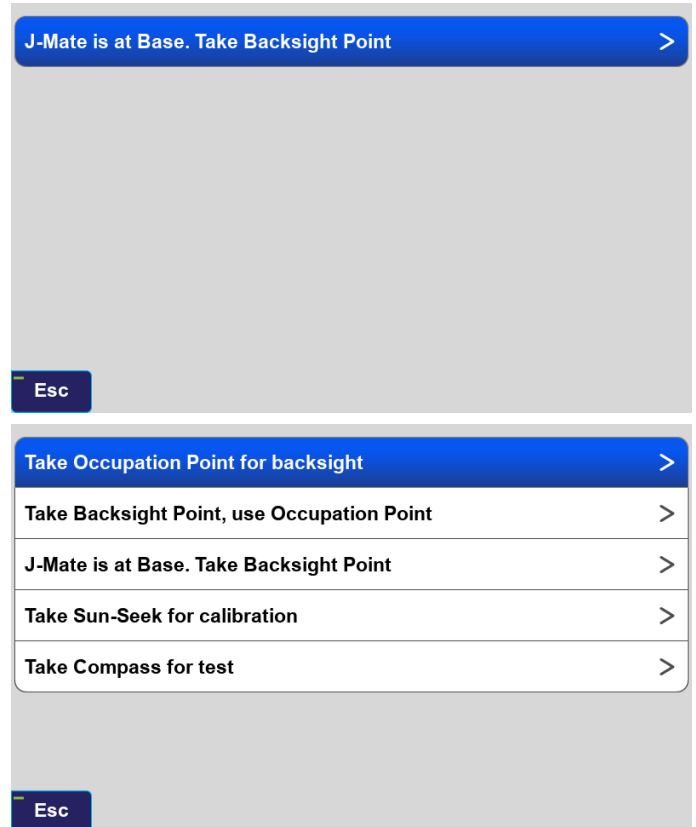


Figure 19

Astro-Seek feature: Sun as the Backsight point!

We have added a new innovative feature to the J-Mate that it can automatically calibrate itself via its automatic Sun Seeking feature.

Attach the Sun filter to the camera of the J-Mate, select the "Take Sun-Seek for calibration" option of the "Backsight". J-Mate will automatically find the Sun and use its position to calibrate the angular encoders automatically.

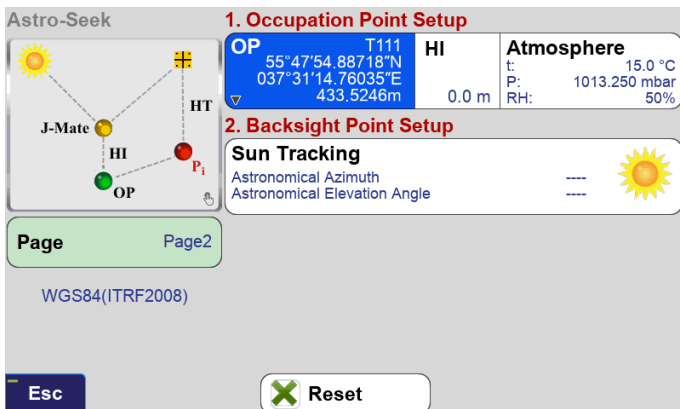


Figure 20



Figure 21

Stake by GNSS

In Stake prepare screen (Figure 21) click GNSS. Stake by GNSS performs RTK and other tasks as explained in other documents (Figure 22). Show/hide the inner white buttons are available in here too.

Hold the “Back” button, and similar to the white inner buttons, customize the main buttons that are highlighted. By customizing the main buttons, you may not need for inner white buttons so to have wider screen for viewing points.

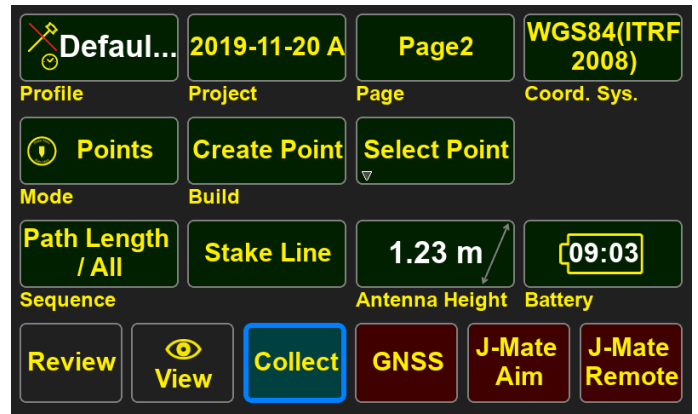


Figure 21

Stake by J-Mate Aim

This is a fast way to stake. Select your stake point in and click “J-Mate Aim” in Figure 21. J-Mate will aim at your target and screen of Figure 23 appears. Follow the laser with a large white paper and observe the Distance to Target. When you reach your target, stake it and then survey it.

The “Next” and “Prev” buttons prepares the J-Mate to aim to the previous or next stake point.

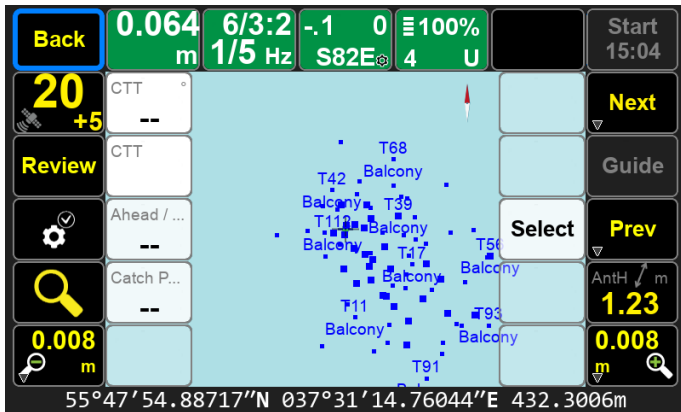


Figure 22

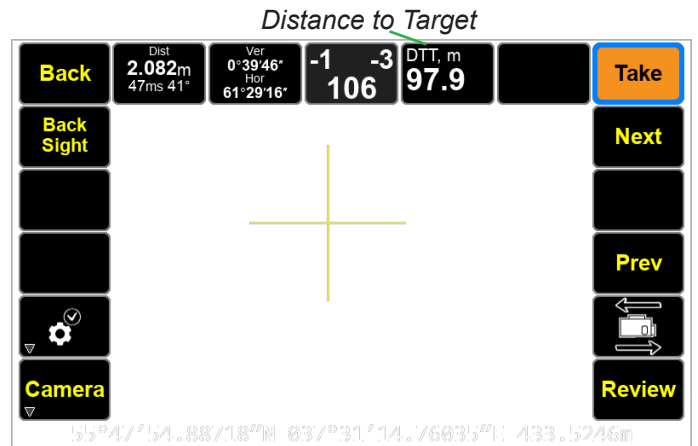


Figure 23

Stake by J-Mate Remote (Figure 15)

In Stake with J-Mate remote, you select the stake point in the prepare screen and J-Mate will find you, follow you and guide you to the stake point.

In walking towards the stake point, go in small steps not to get out of the camera view quickly and allow a fraction of time for the camera to follow your step.

J-Mate also measures the distance to the Target optically, and shows distance and tilt on top and the bottom of the J-Target image.

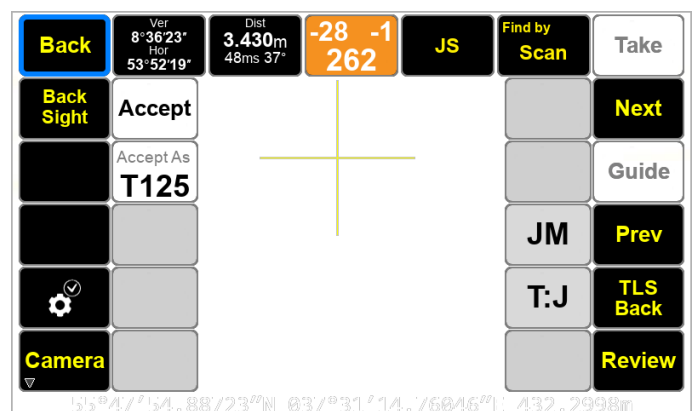

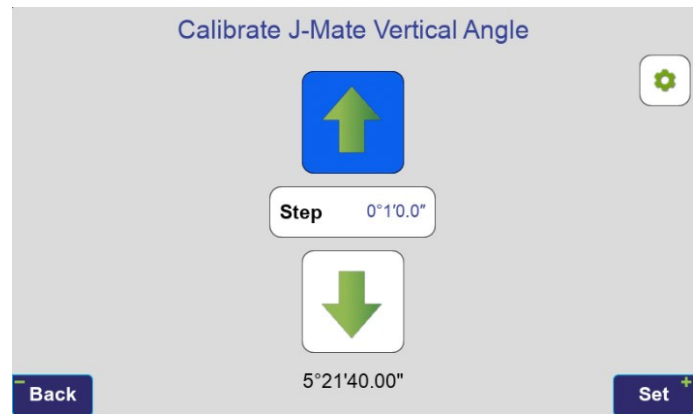



Figure 24

To Calibrate the side horizontal level

Click the  → “Advanced” → “Calibration” → “Vertical Zero”. In that screen using the up and down arrows (according to the “Step”) level the side box and click “Set”. This will set up the zero level and will not let the side box to travel beyond the lock points. If the zero level is not calibrated, side motor may try to push it beyond the lock point and damage the motor.



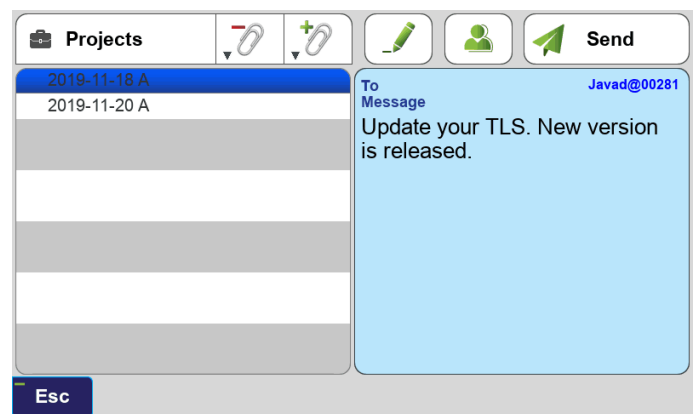
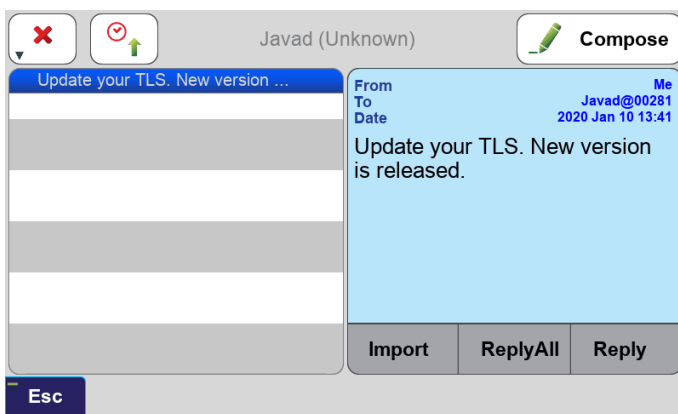
TLS2TLS

You can send and receive text messages and files from and to other TRIUMPH-LS units. In the Main screen click TLS2TLS and then in the “Compose” screen, click  and enter names and serial numbers of the TRIUMPH-LS units that you want to communicate with. You can attach Projects, Screenshots, Images, Audio, GNSS RAW files to your text messages and send to the selected TRIUMPH-LS units.

The received messages are shown in the first screen. You can “Import” the attached files, if any, to your local unit. Click “Reply” to reply to a message.

You can reply to received messages by clicking the “Reply” (only to sender) or “ReplyAll” (to all recipients) buttons.

You may receive “Public” messages from Javad GNSS team. You do not to reply to them.



White buttons explanation

1. Overall Statistics

- **Accept/Reject Statistics:** It shows A/B in first line and C/D in the second line. A: Number of Accepted points. B: Number of Rejected points. C: Number of points not validated (if validate is selected.) D: Number of points rejected because of too many epochs outside the Confidence Guard. Clicking this button clears the statistics.
- **RTK Statistics:** Goes to a screen which shows Epoch by Epoch statistics during data collection, or statistics of all epochs for a collected point or before Accept/Reject. This can also be accessed via the point list by clicking the blue pane of the point list. Clicking the up navigation button shows the points that are close to this point.
- **Recording Statistics:** Shows number of points with recorded data.
- **Verify Statistics:** Number of Step One restarts, number of groups, number of rejected epochs that fall outside of the confidence guard during Step 2, if Verify with Reset is selected).

2. Point info: Codes/Attributes/Pages

- **Attributes:** Shows Code attributes. Click it to get to the Code Attribute selection screen.
- **Code:** Click to select the code for the points.
- **Page:** Click to select the page.
- **Point Description:** Shows point description. Click to change.
- **Point Name:** Shows point name. Click to change.
- **Point Symbol:** Shows point symbol. Symbols should be imported first as AutoCAD Blocks, Icons or PNG images.
- **Shape Tag:** Click to change the shape tag.

3. Audio/Video/Recording/Sounds

- **Audio Record:** Click it to set the amount of time that microphone opens automatically at the beginning of each point collection and audio file gets attached to the point.
- **GNSS Recording:** Click to enable recording raw GNSS data, select recording media, and type of data (for each point or continuous.)
- **Photo Record:** Shows the status of photo recording at surveying. Switch status from red cross to green check mark if photo was shot at survey.
- **J-Tip Sound:** Click to select sounds for the J-Tip.

4. Setup/Margins

- **Azimuth/Bearing:** Click to toggle to show angles in Azimuth or Bearing format.
- **Base Guard:** Click to set the conditions for alarming the base movement and the check box to activate it.
- **Base Ref. Frame:** Click to set the Base Reference Frame.
- **Coord. System:** Shows current coordinate system.
- **Signals:** Click to select GNSS signals to track.
- **Recall Profile:** Open Action profiles screen where you can recall profile with different settings
- **Anth:** Shows current antenna height and type (slant or vertical)

5. Screen, displays, links

- **RTK Charts:** Shows RTK horizontal and vertical epochs.
- **Rotate CCW:** Rotate the map counter clockwise by two degrees.
- **Rotate CW:** Rotate map clockwise by two degrees.
- **Map Zoom in:** Click to zoom in
- **Map Zoom out:** Click to zoom out
- **Autoscale:** Switches Map scale relative to receiver position and distances to current points
- **Camera:** Activate TLS cameras. Click to switch to front and bottom cameras.

- **Level Vial Camera:** Shows the pole level vials via the bottom camera. Clicking it will do nothing.
- **Offsets:** Click to go to the select by offset screen and continue there.
- **Screen Center:** Centers the screen on receiver position
- **Review:** Open Review screen.
- **Communication type:** Shows symbol of active communication channel for receiving the corrections

6. Information

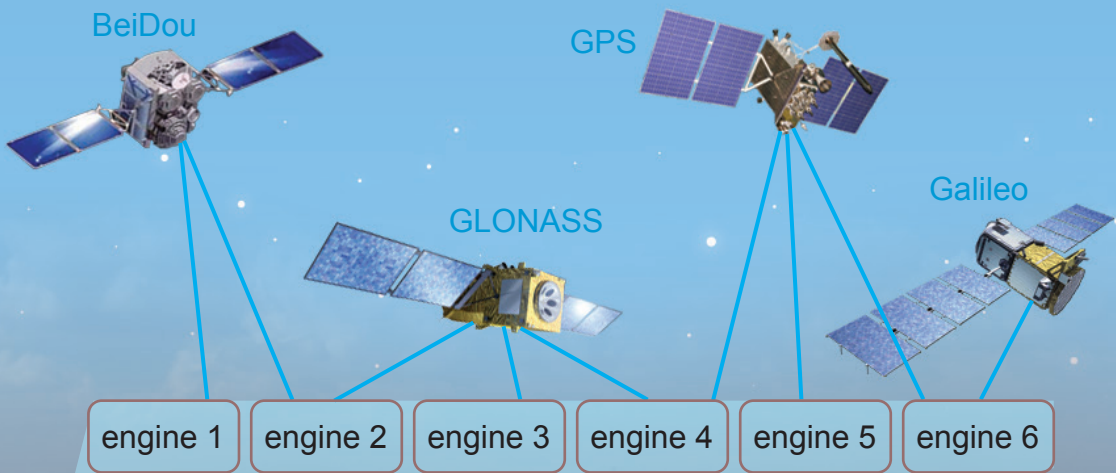
- **Collect Time:** It shows elapsed time since collection of a point started.
- **Dist to last:** Horizontal and vertical distance to the last accepted point.
- **Dist/Dir to Last:** Horizontal and vertical distance and direction to the last accepted point.
- **HRMS:** Shows Horizontal RMS of positions. Clicking it will do nothing.
- **Velocity (Horiz.):** Horizontal velocity calculated by standalone position.
- **PDOP:** Shows PDOP. Clicking it will do nothing.
- **Pdelta:** Current position offset from selected 1-st point
- **Pdelta2:** Current position offset from selected 2-nd point
- **Pdelta3:** Current position offset from selected 3-rd point
- **VRMS:** Vertical RMS of RTK position
- **RMS Status:** Shows RMS for RTK solution

7. Stake

- **Accept:** Same as regular right bottom 'Accept' button. Accept stake point "as staked". Adds survey coordinate to design point.
- **Accept as:** Accept as new point. Creates new survey point. Original design point is not changed.
- **Ahead/Back:** Shows direction to target by moving Ahead or Back
- **CTT:** Course to target point by angle of difference between direction to design point and current device orientation.
- **CTT Arrow:** Course to target point by blue/green arrow
- **Catch Point:** Calculate catch point offset. Catch point is the point where the alignment design side slope intersects with the ground.
- **Cut/Fill:** Shows how much need to pour or dig along a vertical profile (depend of Design Elevation)
- **DTT:** Shows distance to current stake point
- **Design Elevation:** Displays target point altitude. Depends on Antenna height.
- **East/West:** Shows distance for moving to East or to West.
- **North/South:** Shows distance for moving to North or to South.
- **Offset:** Distance from current position to alignment line by perpendicular to that line.
- **Right/Left:** Shows distance for moving to Left or to Right
- **Select From Map:** Selecting point for Stake-Out directly from the map.
- **Sequence:** Set up sequence in which existing points are staked and select subset of points to be staked.
- **Station:** Distance from current position to initial station along alignment line.
- **Target Name:** Displays current Stake-Out point

RTK and Optical United

J-Mate as the 7th RTK Engine
Robotics and Scanning too

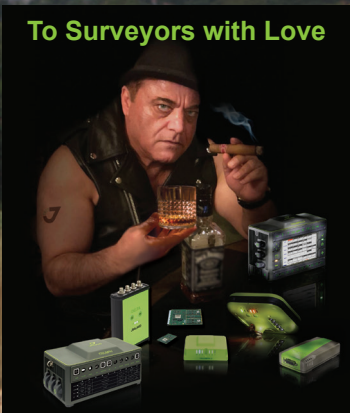


engine 7

TRIUMPH-LS, RTK Rover



J-Mate Rover
Target Stripes



TRIUMPH-3, RTK Base Station



J-Mate Base Station

Your Own Complete RTK & Optical

Setup TRIUMPH-3 on top of J-Mate. Set up TRIUMPH-LS on top of the Zebra rod.

TRIUMPH-3 is the RTK base station and TRIUMPH-LS the RTK rover. J-Mate is the optical base station and the Zebra rod is the optical rover.

Now RTK and optical solutions are available simultaneously and can verify each other's solutions. They also can cover each other, when one is not available.

RTK has six engines. We treat the J-Mate solution as the seventh engine of the system.

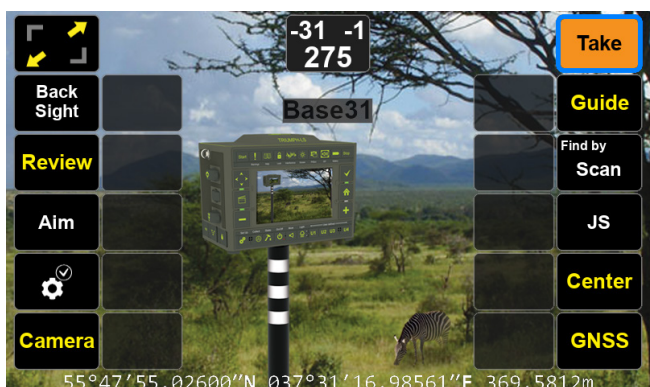
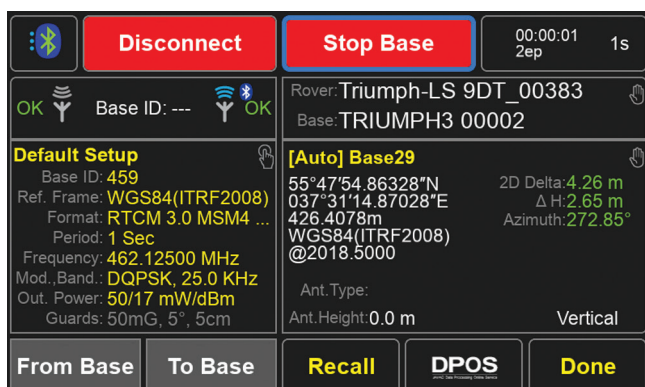
The system is self-sufficient for all jobs. No need to pay RTN service providers for RTK base stations and no need to pay communication service providers. The communications are done via integrated and included Bluetooth, UHF, and Wi-Fi embedded in the system.

Another major advantage is that because your own RTK base station is not far from your rover, RTK solutions will be provided much faster and more reliably.

We added the "Aim" option for stake-out. In this mode J-Mate points to the selected stake point and you follow the laser to reach the intended point. This is in addition to the robotic mode which J-Mate follows your Zebra pole.

At TRIUMPH-LS = 2.13 kg (4.40 lb), TRIUMPH-3 = 1.26 Kg (2.20 lb), and J-Mate = 2.17 kg (4.41 lb), The total package of 5.6 kg (11.02 lb), weighs less than one conventional optical total station alone.

J-Mate does have complete geodetically encoded scanning (3 points per second) and robotic features too.



Take Backsight with a Single Shot



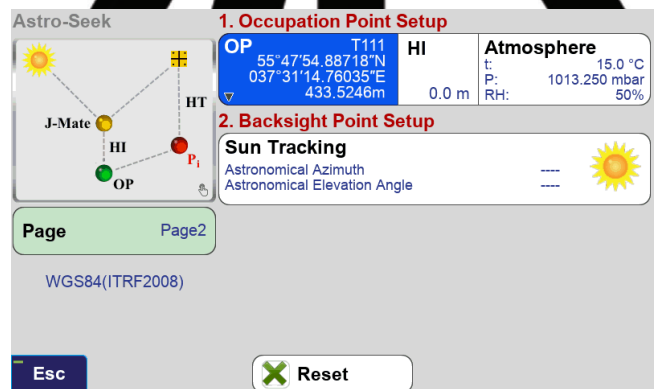
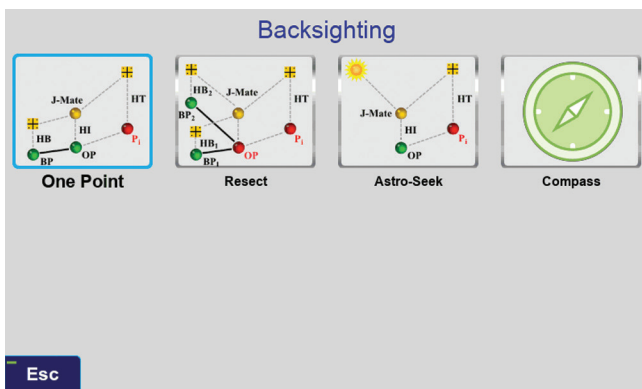
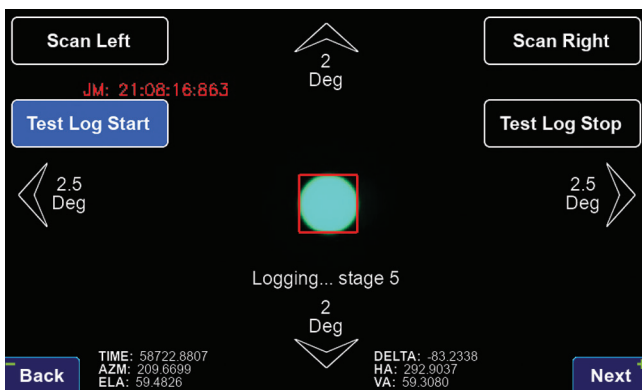
To calibrate the J-Mate, take few seconds of RTK at the Backsight point, and click “Backsight” button. There is no need to locate Occupation Point and the Backsight point, because Occupation point is the RTK Base station and one point is enough to determine the azimuth to calibrate the J-Mate angular encoders.

J-Target <input checked="" type="checkbox"/>	Zebra <input type="checkbox"/>	Triumph-LS Back <input type="checkbox"/>	Search Tube <input type="checkbox"/>
Measure Tube <input type="checkbox"/>	Corner <input type="checkbox"/>	SNAP <input type="checkbox"/>	SCAN <input type="checkbox"/>
Side Flaps <input checked="" type="checkbox"/>	Top Flaps <input checked="" type="checkbox"/>	Bottom Flaps <input checked="" type="checkbox"/>	Verify size <input type="checkbox"/>
Width/Height 0.166 m	Pattern Size 0.116 m	Wing Span 0.226 m	Wing Depth 0.025 m
Vertical -0.11 m	Radial	Right -0.05 m	0.0 m
Predefined <input checked="" type="checkbox"/>		Custom <input type="checkbox"/>	
Cancel	Save	OK	

Target Feature J-Target <input type="checkbox"/>	Distance (e... 4.946 m	Tolerance 10 %	MOTOR
Scan H Step 3'0"0.0"	H Limit (+/-) 20.0	Scan V Step 1'0"0.0"	V Limit (+/-) 5.0
	Rover Pole Hgt 1.23 m	GNSS on J-Mate <input checked="" type="checkbox"/>	
EDM timeout 1000	Pointer <input type="checkbox"/>	Keep Fixed Height <input type="checkbox"/>	Repeat Never
Stop on Error <input checked="" type="checkbox"/>	Pause None	Report <input type="checkbox"/>	Screenshot <input checked="" type="checkbox"/>
Advanced >		RECALL	
Show Inner Buttons <input type="checkbox"/>	Reset Buttons To Default		
Esc	OK		

Backsight with Auto SunSeek

Click a button and after a few seconds Backsight will be calibrated with the Sun AUTOMATICALLY. Don't forget the Sun filter.



Light Weight, Low Cost

**Costs ½ , Weighs ½
and works much better
than conventional total stations
and RTK systems.**

Complete RTK Base & Rover.

Complete optical system.

Complete controller and software.

Free updates.

Robotic & Scanner...

...all under \$40K

And it all fits in a small carrying bag.

