

SOLUTION BULLETIN

VERSION 1.0

LAND SEISMIC CONFIGURATION AND OPERATION OF HD-GNSS UNDER TREE CANOPY

The Trimble R10 with HD-GNSS offers greatly improved performance when surveying under tree canopy. These new capabilities can be especially beneficial in stakeout surveys where the precision requirements are relatively relaxed, positioning must occur in real time, and production speed is important. To take advantage of this performance capability, the operator must configure the rover differently than in the past with non-HD-GNSS capable receivers. This guide details specific configuration parameters and procedures that have been determined to support the requirements of real time surveys in heavily-wooded prospects.

Trimble HD-GNSS technology is able to rapidly converge to a precise solution even in challenging environments. The HD-GNSS solution utilizes ambiguity-resolved carrier phase derived ranges and never enters a traditional ‘float’ stage. The convergence process is continuous without the polarizing shift in estimated precisions that accompanies the traditional transition from ‘float’ to ‘fixed’. The realistic precision estimates of the reported positions are a function of satellite geometry (PDOP) and the local signal environment (primarily multi-path). With HD-GNSS, these reported precision estimates are a complete and reliable indicator of positioning quality and a ‘fixed’ position label is irrelevant. In extremely high noise environments, HD-GNSS technology may not always achieve 2-3 cm level precisions. However, it can often rapidly obtain 10-30 cm level real time position precisions in environments where traditional RTK systems would never make the transition from ‘float’ to ‘fixed’.

One of the most significant operating procedure changes with HD-GNSS is the elimination of the value of “carrying in” an RTK solution. Before HD-GNSS, it was desirable to obtain a fixed solution in an area with a favorable sky view, and then move into a more-obstructed area to measure a location. With HD-GNSS there is no need to operate in this way. In fact, resetting satellite tracking while occupying the point to be measured in an obstructed environment will often lead to a faster convergence to the desired measurement precision.

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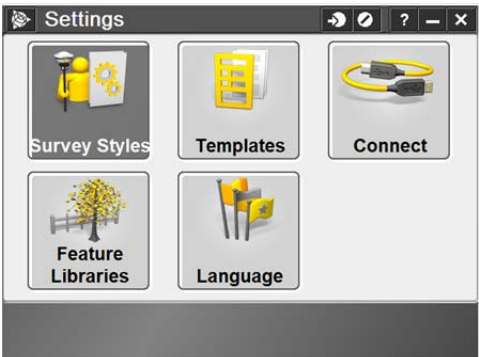
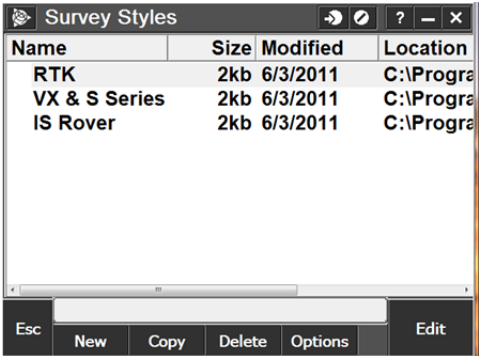
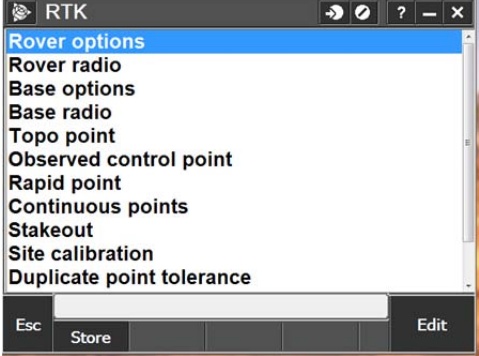
Survey Division, 10355 Westmoor Drive, Suite #100, Westminster, CO 80021, USA

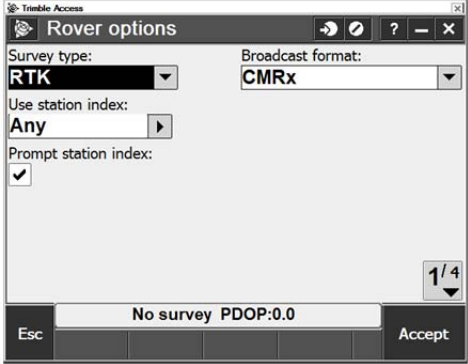
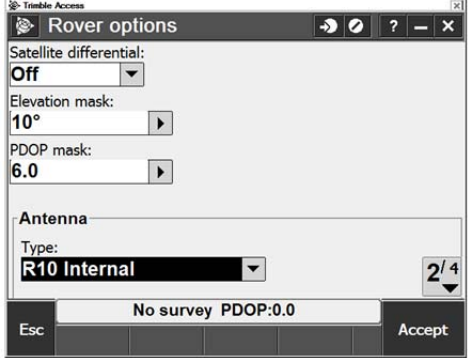
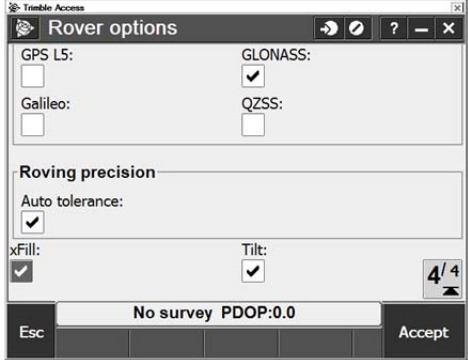
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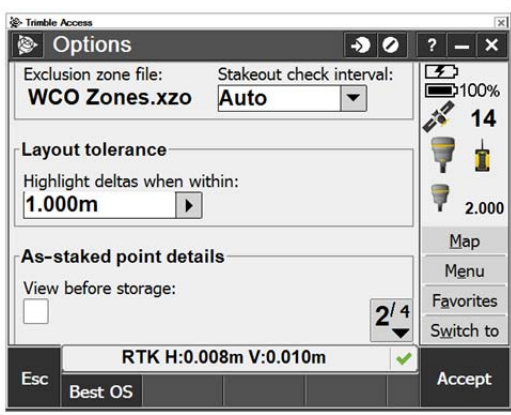
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Edit RTK Survey Style in Trimble Access

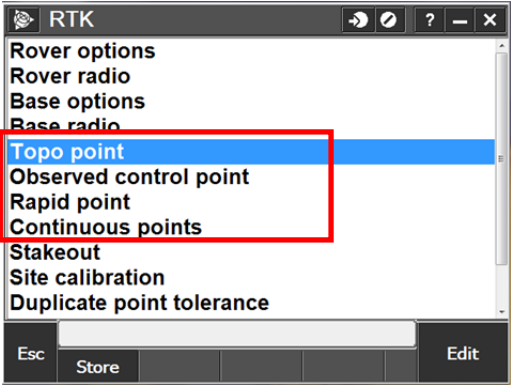
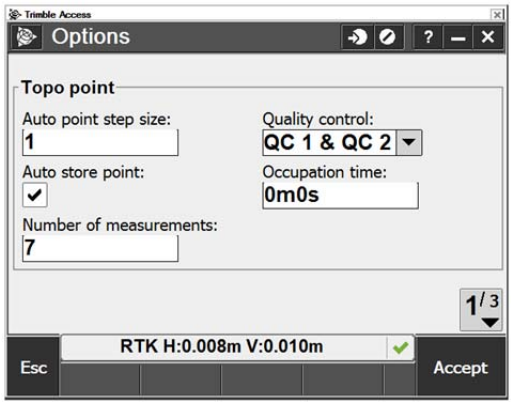
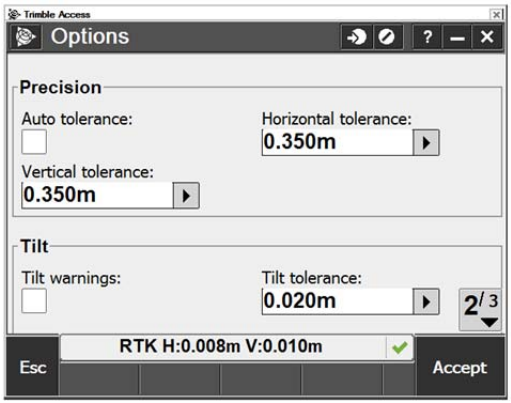
1	<p>To access the Survey styles menu:</p> <ul style="list-style-type: none"> - Tap Settings from the Trimble Access main menu 	 <p>The screenshot shows the Trimble Access application interface. At the top, it says 'Trimble Access' and '11:37'. Below that is a 'Training' section with icons for 'General Survey', 'Roads', and 'Tunnels'. At the bottom, there are icons for 'Mines', 'AccessSync', 'Settings', and 'GNSS Forecast'. The 'Settings' icon is highlighted.</p>																
2	<p>To access the Survey styles menu:</p> <ul style="list-style-type: none"> - Tap Survey Styles from the settings menu 	 <p>The screenshot shows the 'Settings' application window. It contains several menu items: 'Survey Styles', 'Templates', 'Connect', 'Feature Libraries', and 'Language'. The 'Survey Styles' icon is highlighted.</p>																
3	<p>To select RTK survey style:</p> <ul style="list-style-type: none"> - Tap RTK from the survey styles menu 	 <p>The screenshot shows the 'Survey Styles' application window displaying a list of survey styles. The 'RTK' style is selected and highlighted in blue.</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Size</th> <th>Modified</th> <th>Location</th> </tr> </thead> <tbody> <tr> <td>RTK</td> <td>2kb</td> <td>6/3/2011</td> <td>C:\Progra</td> </tr> <tr> <td>VX & S Series</td> <td>2kb</td> <td>6/3/2011</td> <td>C:\Progra</td> </tr> <tr> <td>IS Rover</td> <td>2kb</td> <td>6/3/2011</td> <td>C:\Progra</td> </tr> </tbody> </table>	Name	Size	Modified	Location	RTK	2kb	6/3/2011	C:\Progra	VX & S Series	2kb	6/3/2011	C:\Progra	IS Rover	2kb	6/3/2011	C:\Progra
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4	<p>To edit the operational settings of the RTK rover, tap Rover options.</p>	 <p>The screenshot shows the 'RTK' application window with the 'Rover options' menu open. The menu items are: 'Rover radio', 'Base options', 'Base radio', 'Topo point', 'Observed control point', 'Rapid point', 'Continuous points', 'Stakeout', 'Site calibration', and 'Duplicate point tolerance'. The 'Rover options' item is highlighted.</p>																

5	<p>On Page 1 of options:</p> <ul style="list-style-type: none"> - Set the Broadcast format to CMRx. 	
6	<p>On Page 2 of options:</p> <ul style="list-style-type: none"> - Set Satellite differential to your preference. - Set the Elevation mask to 10°. - Set the PDOP mask to 6.0. 	
7	<p>On Page 3 and 4 of options:</p> <ul style="list-style-type: none"> - Select GPS L2C tracking - Select GLONASS in the Tracking options. - Select Auto tolerance in the Roving precision. - Enable xFill and Tilt if desired. - Tap Accept. <p>Note: No additional under-canopy positioning accuracy or precision is provided by tracking GPS L5, Galileo, or QZSS at this time.</p>	
8	<p>Important: Be sure that the Base Options are configured to track the same GNSS signals.</p>	



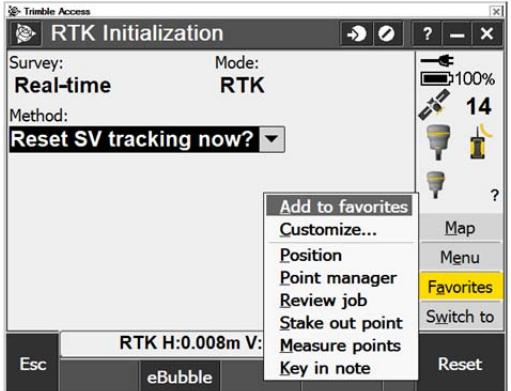
Edit Seismic Layout Tolerance in the Land Seismic Application

1	To access the Land Seismic Application: <ul style="list-style-type: none">- Tap Land Seismic from the Trimble Access main menu	 The screenshot shows the Trimble Access main menu. At the top, it says 'Trimble Access' and '11:55'. Below that, there are several icons: 'Land Seismic' (a yellow and black layered block), 'General Survey' (a globe), 'Settings' (a wrench and screwdriver), 'AccessSync' (two yellow arrows), 'GNSS Forecast' (a black antenna), 'Internet Setup' (a yellow arrow and globe), and 'Files' (a yellow folder). The 'Land Seismic' icon is highlighted.
2	To access the Options menu: <ul style="list-style-type: none">- Tap Options from the main menu.- Set the Layout tolerance value.- Tap the Accept button.	 The screenshot shows the 'Options' menu in Trimble Access. It has a title bar 'Options' and a status bar at the bottom. The main content includes: 'Exclusion zone file: WCO Zones.xzo', 'Stakeout check interval: Auto', 'Layout tolerance' section with 'Highlight deltas when within: 1.000m', 'As-staked point details' section with 'View before storage: <input type="checkbox"/> ', and a status bar showing 'RTK H:0.008m V:0.010m'. At the bottom, there are buttons for 'Esc', 'Best OS', and 'Accept'. On the right side, there are icons for battery (100%), signal strength (14), and a '2/4' indicator.

RTK Observation settings for stakeout under canopy

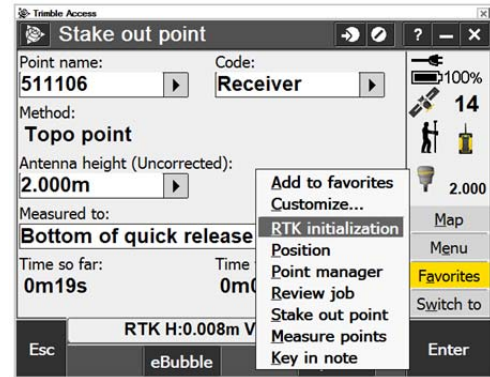
<p>1</p>	<p>There are four configured methods of measuring and storing a point in an RTK Survey; all are defined in the survey style and can be changed if required during the survey, using Options when in the Measure point's screen.</p> <p>Edits made in the survey style become the default for each new job after the survey style has been saved (stored), but are not applied to any open jobs unless they are ended then restarted.</p> <ul style="list-style-type: none"> - Tap Topo point. 	 <p>The screenshot shows the RTK menu with the following options: Rover options, Rover radio, Base options, Base radio, Topo point (highlighted in blue and enclosed in a red box), Observed control point, Rapid point, Continuous points, Stakeout, Site calibration, and Duplicate point tolerance. At the bottom, there are buttons for Esc, Store, and Edit.</p>
<p>2</p>	<p>On page one of options:</p> <ul style="list-style-type: none"> - Enable Auto store point. - Set the Number of measurements to 7. - Set Quality control to QC 1 & QC 2. - Set Occupation time to 0m0s. <p>Note: The number of measurements setting of 7 is a good compromise between a short occupation time and collecting enough measurements. A value of 10 is the maximum and going beyond 10 adds no value.</p>	 <p>The screenshot shows the Options screen, page 1. It includes the following settings: Topo point, Auto point step size: 1, Quality control: QC 1 & QC 2, Auto store point: checked, Occupation time: 0m0s, and Number of measurements: 7. At the bottom, it shows RTK H:0.008m V:0.010m and buttons for Esc and Accept.</p>
<p>3</p>	<p>On page two of options:</p> <ul style="list-style-type: none"> - Deselect Auto tolerance. - Set the Horizontal and Vertical tolerance values to client-specified values. - Tap Accept. <p>Note: Appropriate values for seismic stakeout demonstrations meeting common industry requirements are H: 35cm V: 35cm.</p>	 <p>The screenshot shows the Options screen, page 2. It includes the following settings: Precision, Auto tolerance: unchecked, Horizontal tolerance: 0.350m, Vertical tolerance: 0.350m, Tilt, Tilt warnings: unchecked, and Tilt tolerance: 0.020m. At the bottom, it shows RTK H:0.008m V:0.010m and buttons for Esc and Accept.</p>

Make RTK Initialization a Favorite menu item

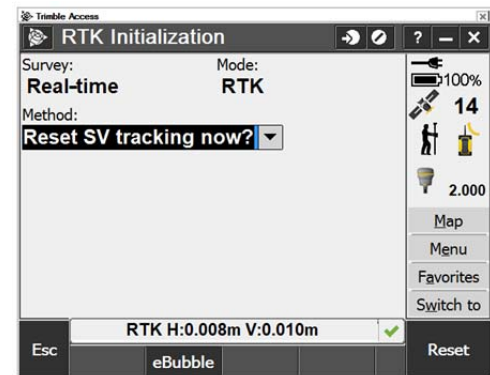
<p>1</p>	<ul style="list-style-type: none"> - From the main menu, tap General Survey. 	 <p>The screenshot shows the main menu of the Trimble Access application. The title bar reads 'Trimble Access' and the time is 5:02. There are several menu items: 'Land Seismic', 'General Survey' (which is highlighted with a yellow border), 'Settings', 'AccessSync', 'GNSS Forecast', 'Internet Setup', and 'Files'.</p>
<p>2</p>	<ul style="list-style-type: none"> - Tap the Measure menu item. 	 <p>The screenshot shows the 'Job: Office' screen. The title bar reads 'Job: Office'. There are several menu items: 'Jobs', 'Key in', 'Cogo', 'Measure' (highlighted with a yellow border), 'Stakeout', and 'Instrument'. On the right side, there is a battery status indicator (100%), a signal strength indicator (14), and a 'Map' icon. At the bottom, there is a status bar showing 'RTK H:0.008m V:0.010m' and 'Enter'.</p>
<p>3</p>	<ul style="list-style-type: none"> - Select the RTK Initialization menu item. - Select the Favorites menu item at the lower right. - Select Add to favorites. 	 <p>The screenshot shows the 'RTK Initialization' screen. The title bar reads 'RTK Initialization'. The 'Survey:' field is set to 'Real-time' and the 'Mode:' field is set to 'RTK'. The 'Method:' field is set to 'Reset SV tracking now?'. A context menu is open over the 'Reset SV tracking now?' field, with 'Add to favorites' selected. Other menu items include 'Customize...', 'Position', 'Point manager', 'Review job', 'Stake out point', 'Measure points', and 'Key in note'. On the right side, there is a battery status indicator (100%), a signal strength indicator (14), and a 'Map' icon. At the bottom, there is a status bar showing 'RTK H:0.008m V:' and 'eBubble'.</p>

Operating Procedures

1. Using the Trimble Access Land Seismic Application, navigate to the target point.
2. When the system indicates that the current position meets the layout tolerance, plant your evidence (stake or pinflag).
3. Position the GNSS antenna to survey the marked location and press 'Measure'. Do not wait for the tolerances to meet the desired levels before you press 'Measure'. Initiating the measuring process invokes the static filter which can improve multipath modeling and enable you to obtain the desired precisions in less time.
4. While keeping the antenna still at the measurement location, observe the reported precisions. These precisions should systematically decrease toward the desired value. **Avoid force storing a point.** Allow the measurement counter to reach the threshold and let the system auto-store the point.
 - a. If there's no significant improvement in precisions after one minute, reset SV tracking with the RTK Initialization action. This is already preprogrammed as a Favorite menu item and can be accessed without exiting current screen. The wait time before resetting satellite tracking may be shortened based on user experience in the tracking environment.
 - b. Select Favorites – RTK Initialization



- c. Press the Reset button at the lower right of the screen. A reset acknowledgement message window will be displayed temporarily.



Still do not force store the point measurement.

If, after resetting satellite tracking, auto store does not occur in an acceptable period of time, the point may not be measurable with RTK methods with the available satellite geometry.

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