QUICK START GUIDE TO THE TRIUMPH-LS PLUS

December 10, 2025

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This ***Quick Start Guide to the TRIUMPH-LS Plus*** contains the basic information a user new to J-Field, the field software of TRIUMPH-LS Plus, needs to know to get started working quickly. When you receive a new or upgraded JAVAD GNSS receiver, you must activate it by installing the Options Authorization File (OAF) provided by JAVAD. The Triumph-LS includes a built-in tool for updating the OAF and enabling all licensed features. For detailed instructions on obtaining and installing the OAF, please refer to Appendix B: Updating the Options Authorization File (OAF).

It is important that new users to J-Field read and understand the information in this manual before attempting to use J-Field. **To obtain good results and RTK solutions, it is most critical to understand the RTK Verification and Validation process and settings.** More information and details are provided in the ***User's Guide to the TRIUMPH-LS Plus***. J-Field also contains its own overgrowing on-board manual with context sensitive help files get rid of all references to equipment various screens. Press the hardware button to learn more about each screen.

Be sure to check www.javad.com/jgnss/ and the user forum at http://support.javad.com frequently to stay current on all of the breaking news and innovative developments from JAVAD GNSS.

Central to J-Field are four key concepts, briefly introduced here and that are discussed more fully in their respective sections:

Project - A user-defined job identifier with its own database file and folders for storing data

Page - Each *Project* has 10 pages that can contain points and, lines and can be toggled on or off similar to CAD layers. Each *Page* has the option of having its own coordinate system.

ShapeTags - User-defined tags for points that can be assigned to create lines between points with like *ShapeTags*

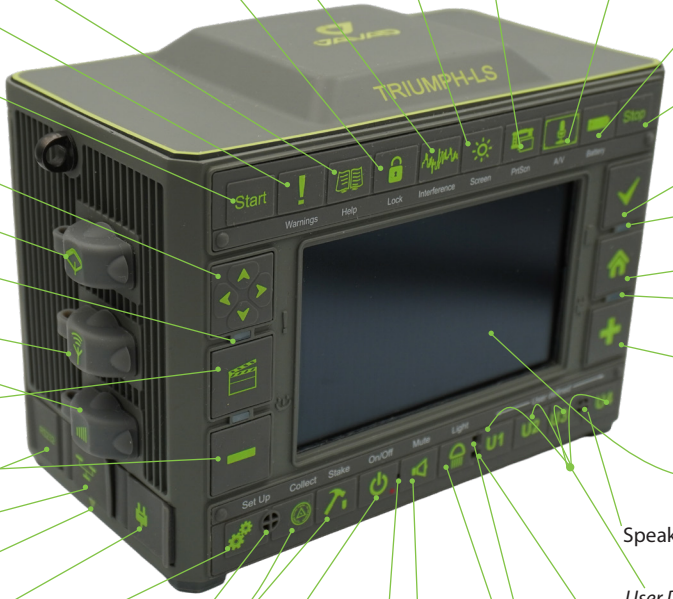
Codes - Each point has a *Code* field to store commonly used point descriptions. Once a Code has been created, it can be recalled from the *Codes Library* or from the *Favorite Codes* list.

(Help)

The Quick Help button offers contextual descriptions and help for the active screen.

Anatomy - Exterior of TRIUMPH-LS Plus

Top, Left and Front Faces



Warnings - Press when the warning LED is red to view warning messages

Help - learn more about the current screen

Lock - lock the screen to prevent accidental actions

Interference - Spectrum analyzer to check for interference in the GNSS bands

Screen - Cycle the screen to white or black backgrounds for better visibility in the sun

Print Screen - Capture a screenshot

A/V - Control sounds, volume and display brightness

Battery - status of the battery and internal temperatures

Start - Start the collection of a point

Stop - Stop the collection of a point

Navigation buttons

Check - Used to open or select the current item/box

External GNSS antenna port

Battery status LED

Warning LED / Battery LED (when off and charging)

Home - Press to return to the Home screen

External UHF antenna port

Charge Status LED

External Cellular port

Action - Open the *Stake* Action screen / Expand *White Box* buttons

Zoom In / Advance to the next page/ screen

Zoom Out / Advance to the previous page/screen

High resolution capacitance color touch screen

RS232 port

LAN port

Speaker

Slant height measurement point

User Defined Buttons - Customizable to invoke desired actions / functions

Charging port

Collect - Cycle through the collect screens

On/Off - Turn on the unit, hold down if the system is unresponsive

Mute - Mute the sound

Light sensor

Proximity sensor

Setup - Cycle between the *Setup* and *Advanced Setup* screens

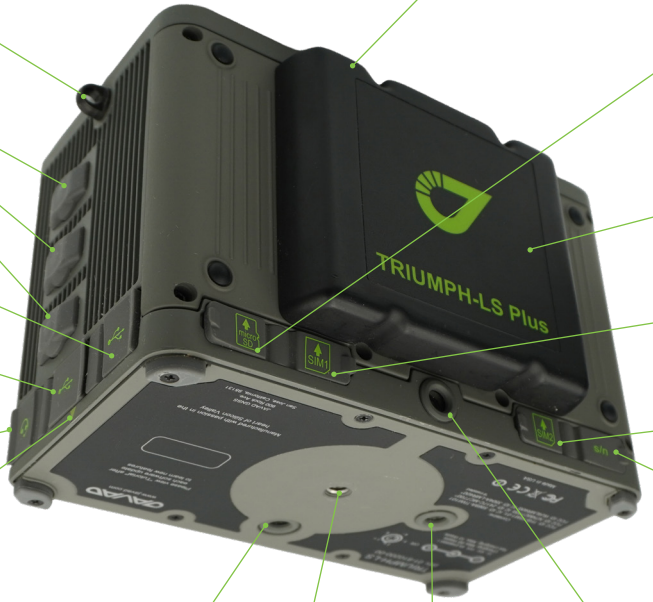
Stake - Cycle through the stake screens

Built in Microphone

Light - Turn on/off the flashlight

Anatomy - Exterior of TRIUMPH-LS Plus

Bottom, Right and Back Faces



Optional shoulder strap connection plug

Internal Radio Antenna

Micro SD card slot

Factory port covers

Micro USB Port - This is for connecting the Triumph-LS Plus to a computer. Use the provided cable.

WiFi / Bluetooth Antenna

USB Port - Use this port for connecting USB storage drives and dongles to the TRIUMPH-LS Plus. This is not for connecting the TRIUMPH-LS Plus to the computer.

SIM CARD Slot 1

SIM CARD Slot 2

Headset

Serial number of the TRIUMPH-LS Plus

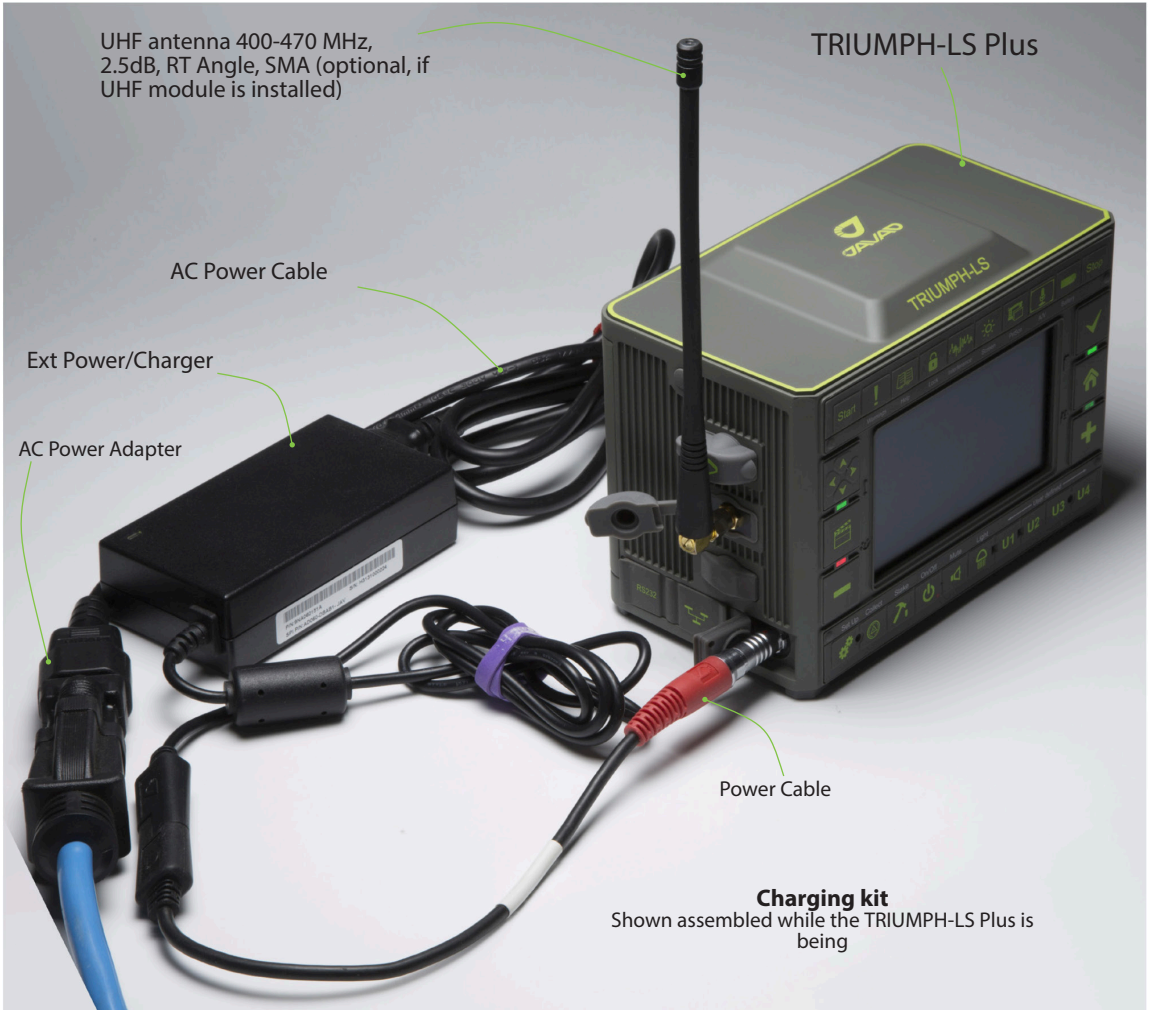
Slant height measurement point

Bottom Camera

1/4" x 20 threads

Flashlight

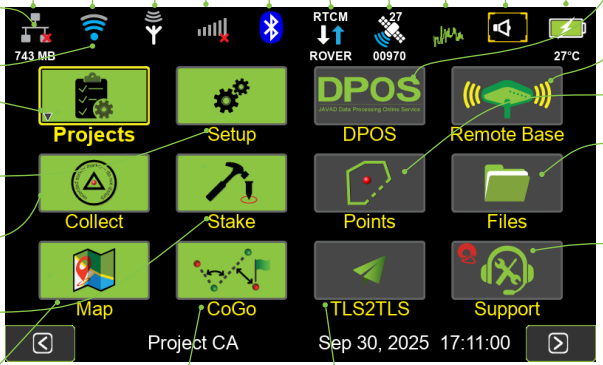
Front Camera



Charging kit
Shown assembled while the TRIUMPH-LS Plus is being

*All pictures and visual materials are provided for illustrative purposes only. Actual products, conditions, or outcomes may slightly vary from those depicted.

Screen Anatomy - Home Screen 1



GNSS Interference, the numeric value is the maximum magnitude of interference among all the GNSS bands

Satellites, number of tracked satellites are shown above the icon and the Receiver Name is shown below

Battery - The estimated hours : minutes of remain ing battery life is shown below

RTCM Rover – menu, used to configure and receive RTCM corrections over different communication channels.

DPOS – Used to post-process raw GNSS data and compute accurate base positions.

Click any icon in the top row to open its status screen

LAN WiFi UHF GSM BT

Volume

Remote Base lets an external GNSS receiver act as a base station and simultaneously transmit corrections through multiple services for rover use and post-processing.

Inactive connections are gray and active connections are blue

Points -List the project points and polylines

Projects section contains all projects stored on the device.

Files - Browse the file system, import and export files

Setup - Configure the setup profiles

Support - menu, used to request support and install updates.

Collect - Survey points

Updates available

Stake - Stake points and lines

Messages Available

Map - View, center, review, and edit collected points and map objects.

CoGo - Various CoGo Functions, DPOS and Camera Tools

TLS2TLS allows exchanging project-related data between receivers.

RAMS Connection Established

Screen Anatomy - Home Screen 2

My TL S- detailed information about the receiver

System - Receiver details and information, etc.

Language - Specify the language

Calendar - Manage survey projects by date

Data Exchange - Export / Import various data formats

Interference - Complete GNSS spectrum analyze

Coordinate Systems - lists all the system coordinate systems, not used to set the current coordinate system

Calibrate - Calibration for the level and compass

Calculator - Several different calculators are available

Locks - Prevent inadvertent screen interactions

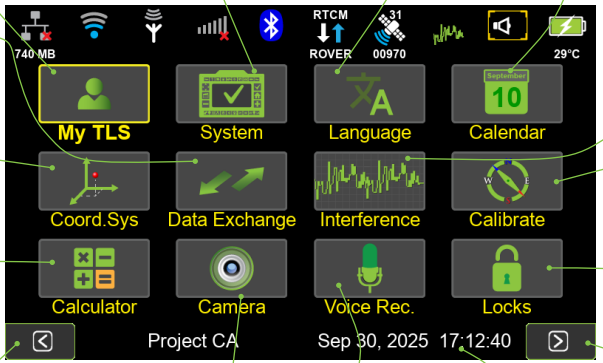
Previous Screen - Advance to the Home Screen 1

Camera - Capture photos with the front and bottom cameras

Voice Recorder - Record audio notes

Tap to open the *Timing screen*

Next Screen - Advance to the Home Screen 1



Charging the Batteries

The TRIUMPH-LS Plus comes from the factory with the batteries charged and ready to use so you can begin exploring its interface and familiarizing yourself right away while reading this manual.

Lithium Ion batteries should not and cannot be charged when their temperature is above 40° C (104° F). They charge faster when they are cool. Therefore, it's best that you turn off the unit when charging. Charging the unit when it's on will cause it to charge more slowly (up to 40° C) due to its increased temperature.

Some of the cables and their connectors used in charging the equipment may not be familiar to you. ODU style connectors are superior for a broad range of industrial power, communications and data applications that demand a precisionengineered, secure and robust solution.

When charging your receiver, be sure to line up the red dots on the connector and the charing port on the LS. Note that the four LEDs have different meanings when the LS is on from their meanings when the unit is being charged. When the unit is on, you'll want to pay attention to the upper left LED as it alerts you of an immediate issue.

Anytime the TRIUMPH-LS Plus displays this LED as red, press the warnings key to learn more and take any necessary corrective measures.

Help & Support

J-Field contains its own ever-growing on-board manual with context sensitive help files for various screens. Press the hardware ***Help*** button to learn more about each screen. Contact information of the Live Technical Support team members are listed in Support>Live Technical Support. You are also encouraged to submit your feedback and questions to the user's forum located at http://support.javad.com.

Turning on The TRIUMPH-LS Plus

Powering the TRIUMPH-LS Plus on is pretty straightforward with the underlying operating system Linux, loading first and then J-Field subsequently booting up.

There are occasions when the system might freeze. Should you experience this, simply depress the power key and hold it down until the unit powers off, about 10 seconds. Any data collected up to that point will be saved.

Calibration

The TRIUMPH-LS Plus is an advanced scientific surveying instrument. It is highly sensitive to its environment and includes a built-in magnetometer and 3-axis accelerometer.

For the visual stakeout features and the *Ahead/Back* and *Right/Left White Boxes* in the *Stake Action* screen to work correctly, the electronic compass readings need to be accurate. It is recommended to check the compass calibration before beginning work at a new location. To check the calibration, rotate the TRIUMPH-LS Plus 360° and observe the compass readings in the *Collect* or *Stake Action* screen. There should be no twitching, quick jumps, or reversals of the displayed bearing or azimuth, just as a real compass would perform. If this is not the case, the compass needs to be recalibrated or it may not be in a suitable environment for its use. Follow the instructions on the screen to calibrate the compass. When calibrating the compass, choose an area removed from overhead power lines, parked automobiles and other ferrous materials which cause magnetic disturbance. The electronic compass works in areas that are electromagnetically uniform.

The ***Level*** calibration typically only needs to be preformed once. Follow the instructions on the screen to calibrate the level.

The level sensors are sensitive to the internal temperatures of the TRIUMPH-LS Plus. To fine tune the level calibration, a ***Level Offset*** calibration needs to be preformed. It is located in the *Action Setup* menu. It is necessary to reperform this calibration as the internal temperature of the TRIUMPH-LS Plus changes. If the *Correct For Tilts* option is enabled and the most accurate positions are desired, it is essential to monitor the *Level Offset* calibration and recalibrate when necessary.

The ***Camera*** needs to be calibrated if you intend to use the camera's *Visual Angle* or *Camera Offset Survey* tools. This only needs to be done once.

Updates

Keeping your TRIUMPH-LS Plus up to date is nearly effortless; however, you do need to ensure that you have Internet access in order to download the firmware and software updates.

The TRIUMPH-LS Plus will automatically detect nearby WiFi networks. To see the detected networks, as well as their respective signal strength, tap on the *WiFi* icon in the top row of icons on the Home screen and then at the bottom of that screen tap on Network. Select the desired access point, tap on Connect, enter the case sensitive password, if any, and the connection should be established. Once connected to a WiFi network it will be remembered and added to the Favorites and the connection to it will become automatic when it is detected.

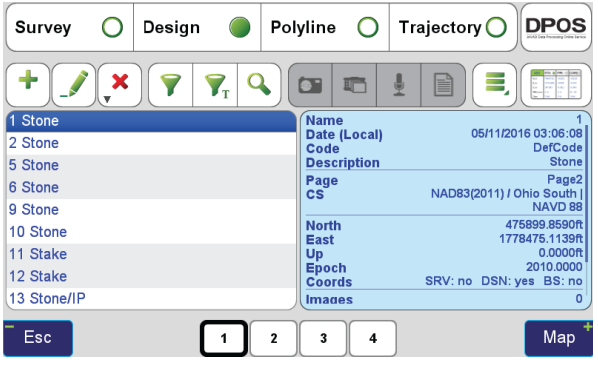
If you do not have WiFi or, for some reason, are unable to connect to it, but do have a wired local area network, you can connect the TRIUMPH-LS Plus to your network using a cable connected to the LAN port and your network interface card or router. A wireless network can also be used if you have an installed SIM card data plan with sufficient data.

Once connected to the Internet, J-Field will automatically check for updates. The Support button will be displayed

with the update symbol (cloud and down arrow) and a sound will be played periodically when a new update is available.

Points

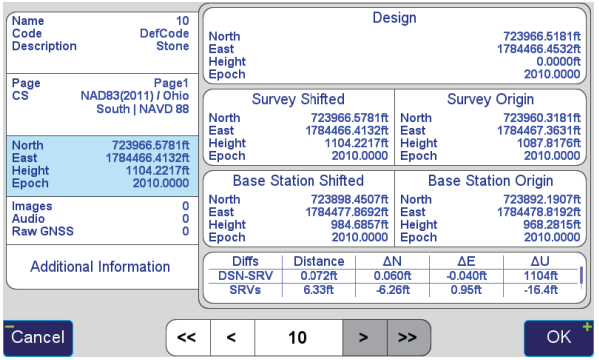
Tap on this icon to review points, alignments, trajectories in J-Field.



Points Screen Displaying Design Points

Each point record can have up to five types of coordinates that are displayed in the *Edit Points* screen:

- ***Design Coordinates*** - Imported and manually entered coordinates are populated into this field and stored in the *Project's* database file with their native coordinate system as was selected when they were imported.
- ***Survey Coordinates*** - These are coordinates determined from GNSS observation. All surveyed points are stored with *Survey Coordinates* with WGS84 (ITRF 2008) coordinates.
- ***Base Station Coordinates*** - When a point is surveyed with RTK corrections, the base station coordinate is saved.
- ***Survey Shifted Coordinates*** - When a point's base station coordinates have been adjusted or shifted, the shifted survey coordinates are displayed along with the unadjusted survey coordinates (*Survey Origin*).
- ***Base Station Shifted Coordinates*** - When a point's base station coordinates have been adjusted or shifted, the shifted base station coordinates are displayed along with the unadjusted base station coordinates (*Base Station Origin*).



Edit Point Screen Displaying a Point with Each Type of Coordinate

In addition to these coordinate types, all post-processed DPOS and Real-Time Shifted coordinates are also stored in the database. These will be discussed more in the DPOS section of this manual.

Screen Anatomy - Points Screen

Object Type - The radio button selects which type of object is displayed in the list: Survey Points , Design Points, Polylines (and lines) or Trajectories.

Add - The add button allows new points to be added; with the Survey option selected you will be taken to the Stake Action screen.

Edit - The edit button opens the Edit Points screen (shown on the previous page) to allow the various parameters of the point to be modified.

Delete - The delete button deletes the selected object. A Long Click (tap and hold) on this button deletes all objects currently shown in the list, i.e. taking into account the general filter and name filter.

Esc - Escape to the previous screen

Filter - Filter button (see next page)

Type Filter - Type Filter button (see the following pages)

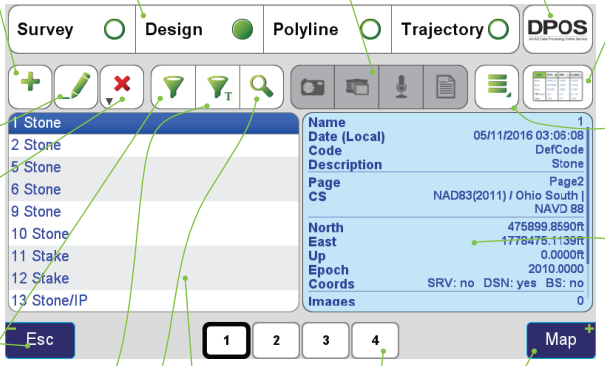
Name Filter - Name Filter button (see the following pages)

List - Point Codes and Descriptions can be displayed beside the Point Name. Formating options are found in Additional Actions>-Settings>Columns>Name. Options also exist here to display icons when the point is "Shifted" and when it has "JPS" GNSS data. The "Type Filters" column option will display Solution Type, Process Type and Base Type abbreviations beside the point names.

DPOS - The DPOS button opens the DPOS screen that allows raw GNSS data to be submitted to the JAVAD Data Processing Service. Base station data can be processed with CORS data to obtain real geodetic positions and rover data can be processed with both the base station data and CORS data.

Photo, Screenshots, Audio & Notes - These buttons are active when a point has photos, screenshots, audio or notes associated with it. Tapping these buttons will preview the associated file.

Processed Point Info - This button opens the Processed Point Info screen. Here post-processed coordinates from DPOS can be compared to RTK coordinates and the desired coordinate can be selected for every point.



Additional Actions - Various additional actions are available from this menu (see following the pages).

Point Information Panel - Information about the selected point is displayed here. Alternative templates for this panel are available by choosing Additional Actions>Settings>Info. The Default template is currently shown. Tapping this panel opens the Base-Rover Statistics screen.

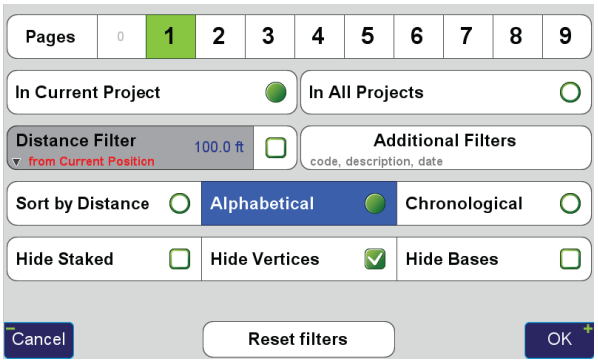
Map - Opens the map with the currently selected point highlighted in the map

Page Numbers - Chages which page of the list to view

Point Filters

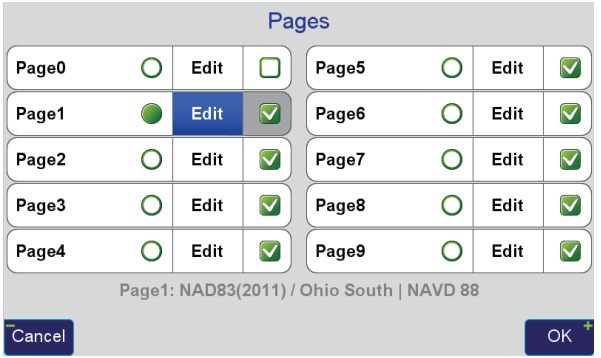
Points are displayed in the coordinate system of the *Current Page* in the CoGo functions and in the map. All new *Survey Points* and points created with the CoGo functions are created in the *Current Page*.

The *Current Page* can be selected by tapping  (*Filter Button*) to open the *Filter* screen. The First row displays buttons for each of the 10 pages. The *Current Page* is highlighted green while visible pages are shown with bold numbers and hidden pages are shown with small gray numbers. Tap a page button to toggle it between visible and hidden. Objects in hidden pages are not display in the list of objects or on the map.



Filter Screen - *Current Page* is 1, Page 0 is hidden

The ***Pages*** screen can be open by tapping *Pages*. It displays the page names and allows it to be edited along with the coordinate system and color.

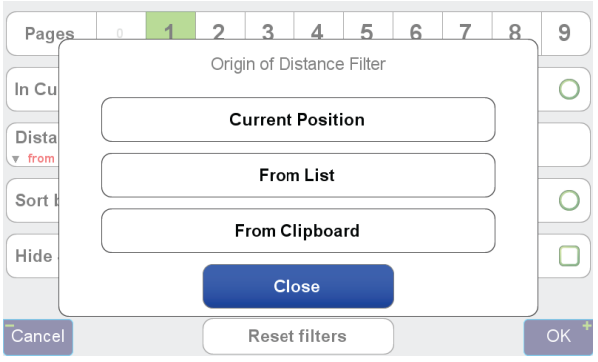


Pages Screen - *Current Page* is 1, Page 0 is hidden

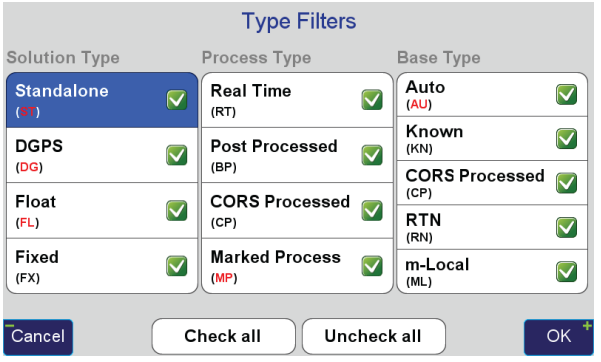
The *Current Page* is set with the toggle on the left while the visibility of *Pages* are controlled with the check box options on the right.

The ***In All Projects*** toggle will display points from all projects. This is usually not recommended as it will slow J-Field down if many points exist.

Points can be sorted in the displayed points list by ***Distance***, ***Alphabetical*** or ***Chronological***. Notice the down arrow in the corner of the *Distance Filter* button. Holding this button down will initiate a *Long Click* and present additional options for the *Distance Filter*.



Origin of Distance Filter Options



Type Filters Screen

Hide Staked hides points that have already been staked. A point is considered staked after it has been staked with a surveyed coordinate accepted for it.

Hide Vertices hides points created from imported lines from being displayed in the point's list. J-Field defines lines as connections between points so every line must have points at its vertices. For this setting to be applied the *Hide Line Vertices* option must be checked in the *Common Settings* screen when AutoCAD, DGN or Shapefiles are imported.

The  (*Type Filter*) opens the *Type Filters* screen. It allows points to be filter by *Solution Type*, *Processing Type* and *Base Type*.

The  (*Name Filter*) button enables/disables the name filter. When it is on, four additional fields are shown to the right: one text field and three switches captioned  ,  and  . Enter the search text in the text field and specify which switches are active (activated switches have a light blue background while deactivated switches are white):

 looks for names which begin from the search string;

 looks for names which contain the search string in the middle, but do not begin or end with it;

 looks for names which end with the search string.

Activating more than one switch combines the results:

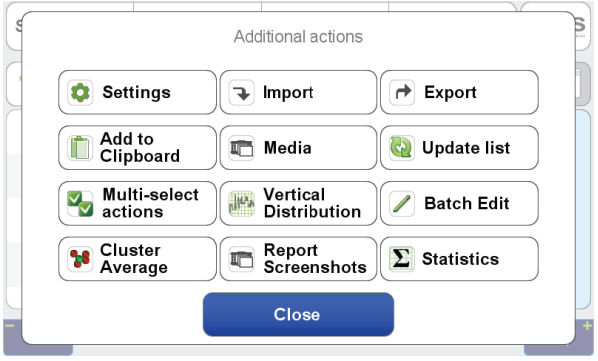
activate [... and ... searches for names which either begin with the search string or contain it in the middle.

To search for a range of numbers use the format of *number1..number2*. This format matches names which contain numbers in range between *number1* and *number2* (in the position defined by switches). E.g. if you enter *3..9* (assuming all switches are on), it will match names *3*, *Stake04a*, *Pt9*, but not names *14* or *Point19a*.

The (*Additional Actions*) icon contains a list various options, settings and functions related to the *Points* screen. More information about the items contained in this menu can be found in each of the actions' Help screen. Of particular interest are *Settings* and *Cluster Average*.

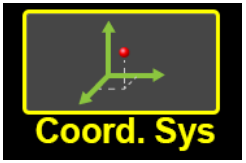
Settings has options to allow the *Point Name, Code* and *Description* to all be displayed in the left panel of the *Point* screen rather than just displaying the *Point Name*.

Cluster Average finds groups of points in a cluster and creates an averaged point from the group.



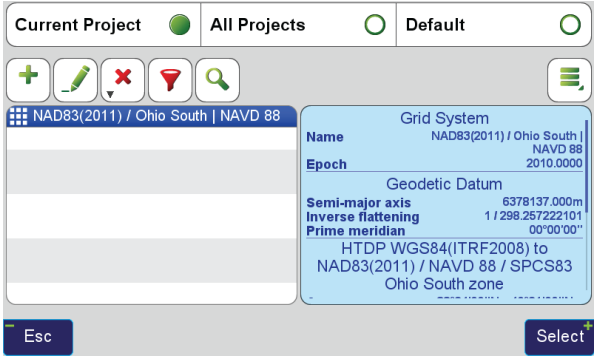
Additional Actions screen

The information panel (the right blue panel) may contain more text than fits in its view. If this is the case, tap and drag the panel to scroll its contents.



Coordinate Systems

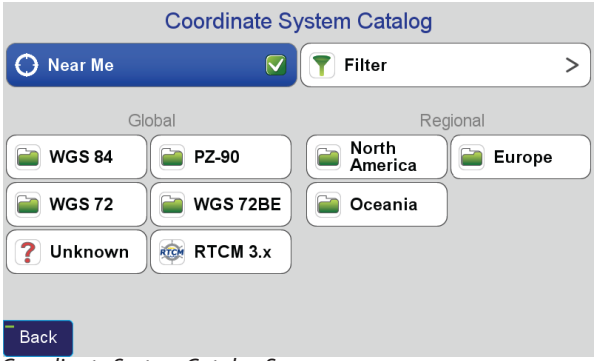
The *Coordinate Systems* screen allows you to quickly access and create new coordinate systems based on the predefined systems with just a tap on this icon. It is important to note that this screen does not set the current coordinate system for the *Project*. To change a *Project's* coordinate system choose *Project>Edit Current Project>Project Coordinate System* in the *Stake* and *Collect Prepare* screens. Each page in the *Project* can then also have separate coordinate systems, set from the *Page* and *Coordinate System* boxes in these screens.



Coordinate System Screen

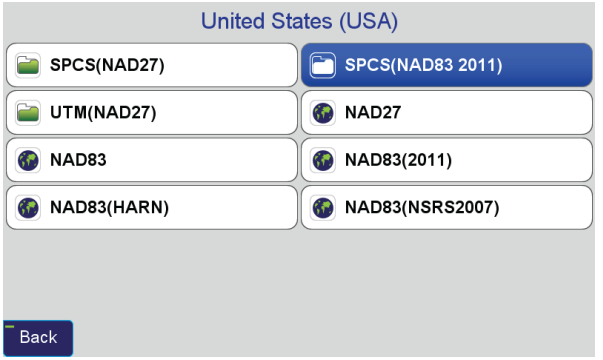
Adding a State Plane Coordinate System

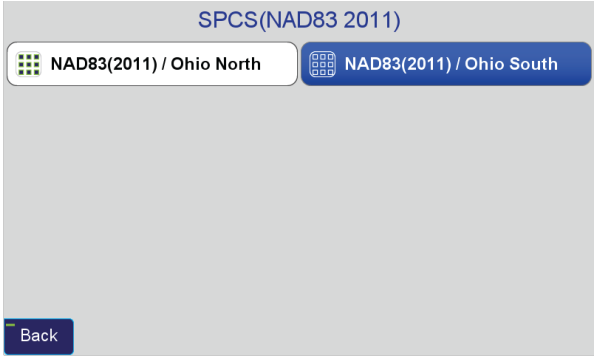
To add a new coordinate system that is currently not listed in the *Coordinate System* screen when the *All Project* button is selected at the top of the screen, tap the  (*Add*) button to open the *Coordinate System Catalog*.



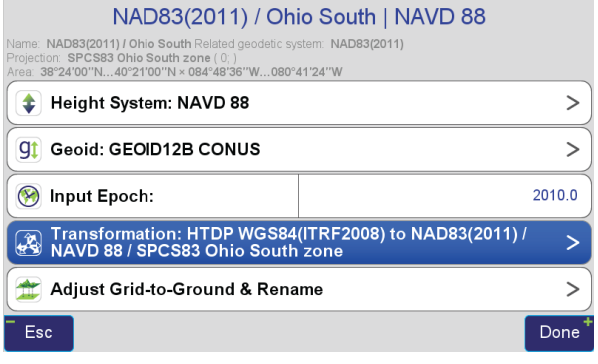
Coordinate System Catalog Screen

When selecting a Regional system for your project from the vast catalog, filter the choices to just those relative to your geographic location by checking the ***Near Me*** box. Select your Region, Country and type of coordinate system:





Select the appropriate *Height System*, *Geoid*, *Input Epoch* and *Transformation*. A typical coordinate system configurations for a US State Place Coordinate System is shown:

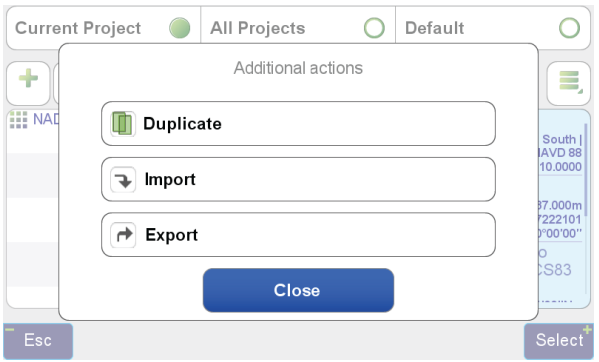


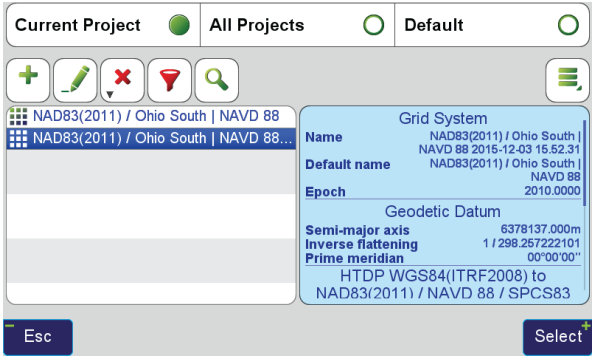
For all surveying in the US, it is strongly recommended that NAD83(2011) with Epoch 2010 be selected for all survey work as this is the current supported realization supported by NGS. The Geoid model should be "GEOID18 (CONUS)" and HTDP transformations should be used for compatibility with DPOS.

It is important to remember that GNSS distances measured in State Place Coordinate Systems may not match measured ground distances exactly and typically need to be scaled to ground. For this reason you may wish to create an adjusted grid-to-ground coordinate system. Alternatively, the CoGo functions in J-Field have the ability to display and input ground distances while still working in an unmodified State Place Coordinate Systems (see the CoGo chapter of this manual for more information).

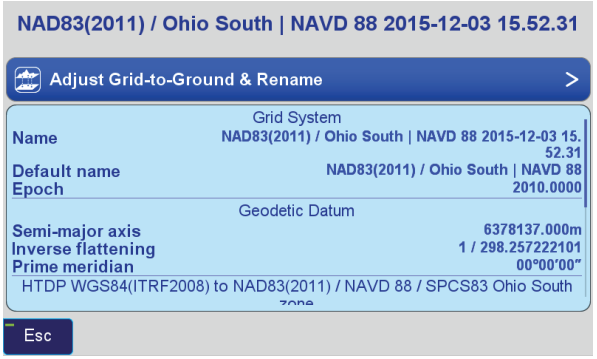
Creating an Adjusted Grid-To-Ground Coordinate System

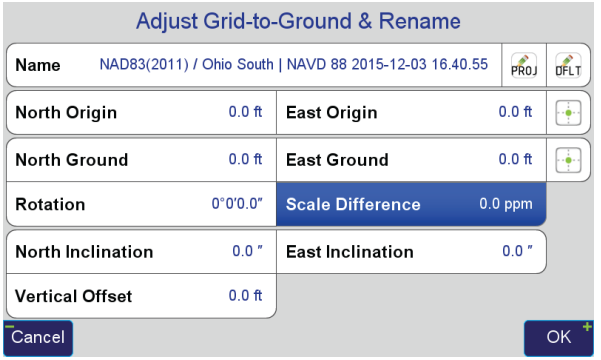
With your state plane coordinate system selected in the *Coordinate System* screen click the *Additional Actions* button  and tap ***Duplicate*** to create a copy of this coordinate system. The duplicated system will be created with the date appended to the end of its name:





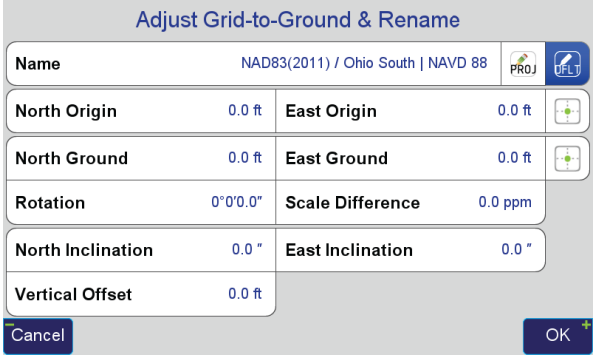
Now highlight the duplicated system and tap the icon  edit and choose ***Adjust Grid-to-Ground & Rename***:



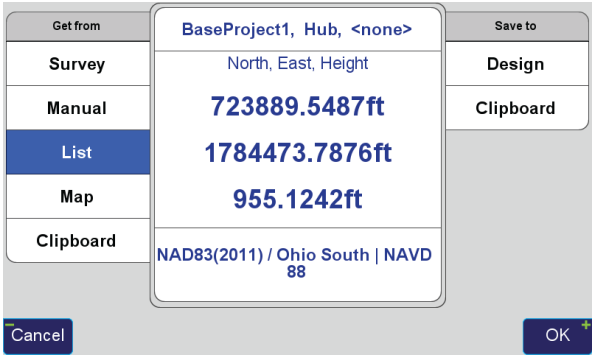


Adjust Grid-to-Ground & Rename Screen

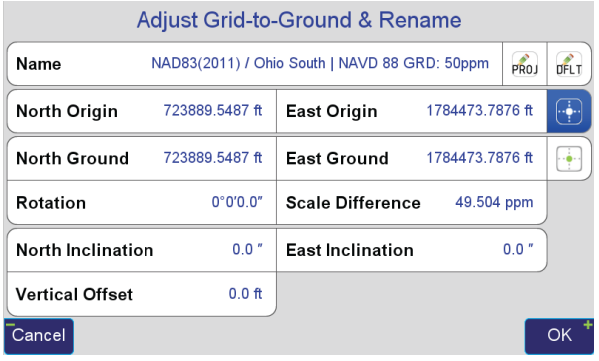
Tap the ***Default*** button  to change the coordinate system name to the default name:



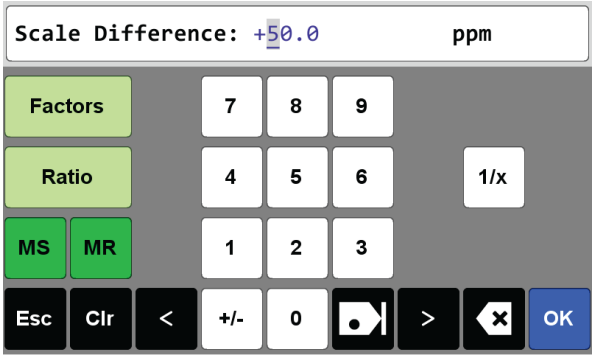
Tap the position icon  beside East Origin to set origin point in the grid system for the transformation. Here the base station coordinate is chosen from the points List:



By default the ground origin point will be populated with the same coordinate and the ***Scale Difference*** is populated with the grid-to-ground scale factor calculated from that point. The scale factor rounded to the nearest part-per-million (ppm) is automatically appended to the coordinate system name:



You may also wish to round the scale difference to the nearest ppm by tapping its button and entering that value. In this screen options exist to enter a new factor as a Ratio or Ppm:

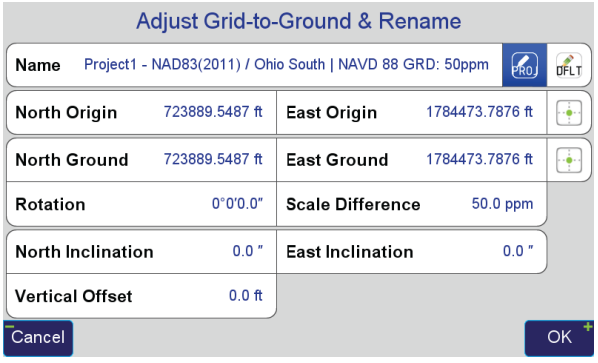


The *Factors* button will allow you to use the CoGo Scale Factor function to calculate a new scale factor if desired.

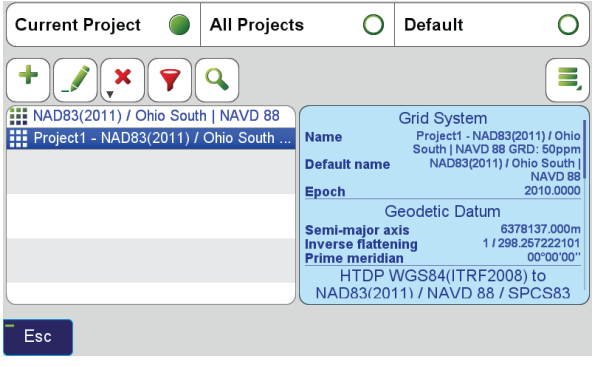
These settings will create an adjusted state plane coordinate system scaled around the base station and the base station coordinate will not change. This is useful for projects that have ground distances as would be measured with a total station and state plane coordinate system bearings since the rotation is set to 0. The coordinates will be very close to the real state plane system so that orthographic imagery and state plane referenced contours or elevation models can be loaded into your CAD drawings. You should be cautious when giving these coordinates to others as they may confuse them for real state plane coordinates. To solve this problem you may wish to subtract 100,000 from the *North* and *East Ground* coordinate values to create a (100,000 100,000) offset from the real state plane system. This can be done by tapping the *North Ground* and *East Ground* boxes.

Tap the PROJ button to add the current project's name to

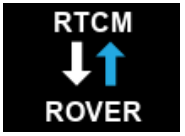
the beginning of the coordinate system name:



Press *OK* and then *Apply* to create this coordinate system:

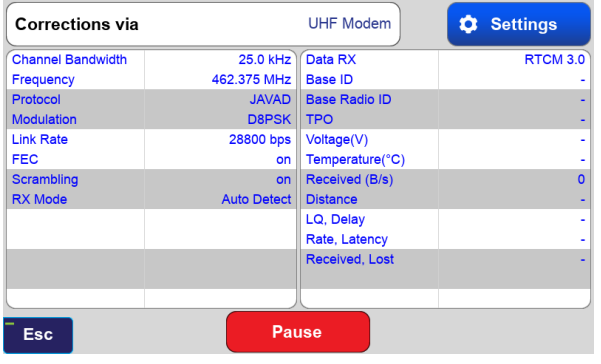


You can now use this coordinate system as the *Project Coordinate System* or just for some *Pages* if you choose.

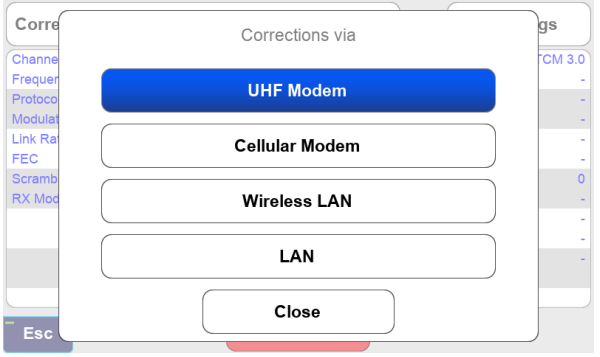


Statusbar-Rover-Corrections

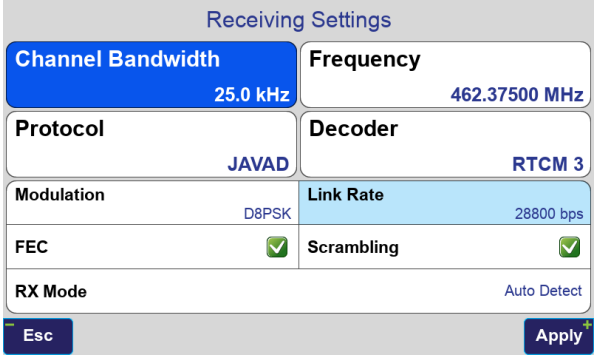
Here you can set up a channel to receive corrections.



Using ***Corrections via*** select one of correction transports: UHF/SSP, Cellular, WiFi, LAN.



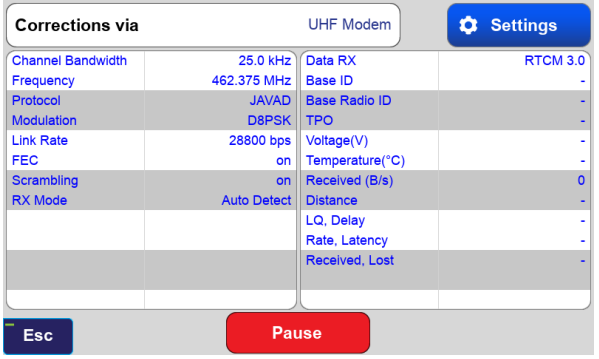
Then you can set up the channel using the ***Settings*** button if it was not done before.



On the ***left panel*** of the screen, you can see the selected channel parameters.

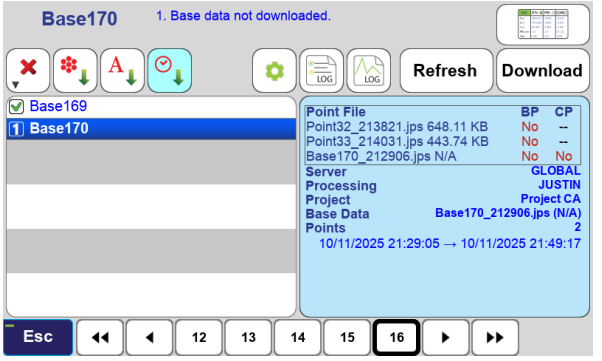
On the ***right panel*** – status of the channel.

Using ***Pause/Resume*** button you can pause/resume getting of corrections.



DATA PROCESSING ONLINE SERVICE

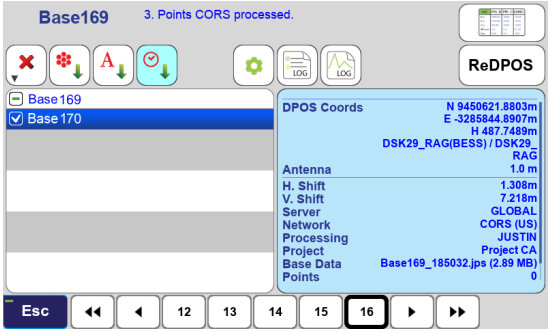
Here you can select a Raw GNSS data file and send it to our ***DPOS*** for post-processing and calculating the accurate position using the US NGS CORS stations, or in regions that such services exist.



If the file is from an ***RTK base station***, the new calculated base coordinates will be compared with the actual base coordinates used in RTK, and the corrections will be applied to all rover points if you allow "***Adjust***".

The "***Undo***" button removes the adjustment.

NGS CORS data usually are available up to few hours after the actual record time.

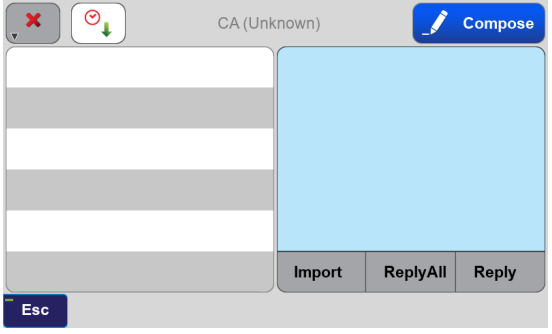


NGS CORS data usually are available up to few hours after the actual record time.

TLS2TLS

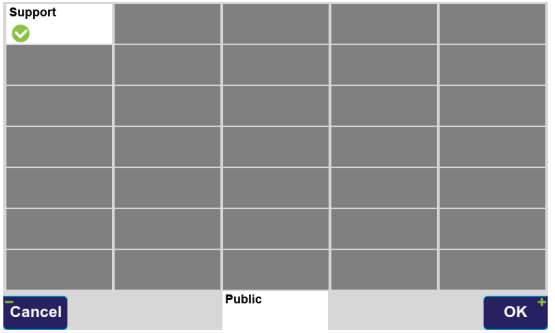
TLS2TLS allows ***exchanging*** project-related data between receivers.

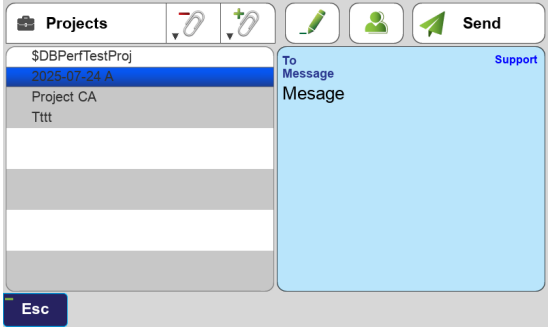
So you can send files or projects to other units identified by their serial number or receive and import such data if someone sent it to you.



You can consider this service like an email box where recipients are the units.

Every new message is stored temporarily on the server and available for 2 weeks.





Files and Data Exchange

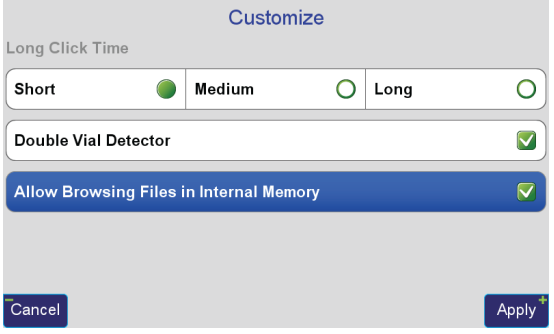
Data transfers between the TRIUMPH-LS Plus and your PC are facilitated through using either a USB cabled connection, a USB flash drive, a cloud drive or a network drive. Using a cloud drive or USB flash drive are the simplest and recommended methods to transfer data between your PC and J-Field.

Database Structure and Customize Screen

Each J-Field *Project* has a "data.db" file stored in its project folder found in "Internal Memory\ VS Data\Maps". All the points and lines for a project are stored in this file. By default, the Internal Memory is hidden. To allow it to be visible in J-Field you can enable this option from ***System>Customize***.

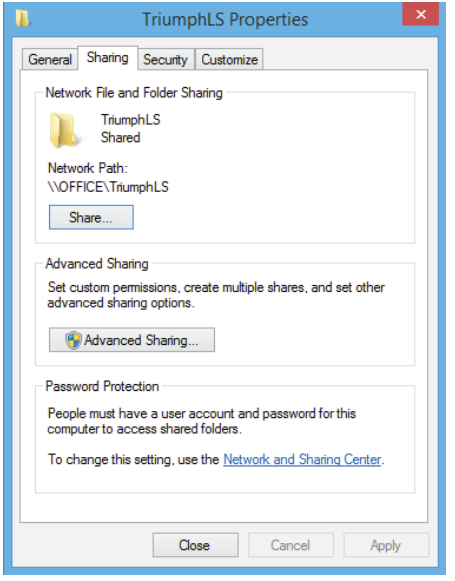
The ***Long Click Time*** setting in the *Customize* screen controls how long a button must be held down to register as a *Long Click*. Some button in J-Field preform two actions with the second action being initiated with a *Long Click*. Buttons with these second actions typically display a small down arrow in their bottom left corner.

Check the ***Double Vial Detector*** option if you are using the Javad rover rod with a double leveling vial. This allows the downward facing camera to detect both vials.



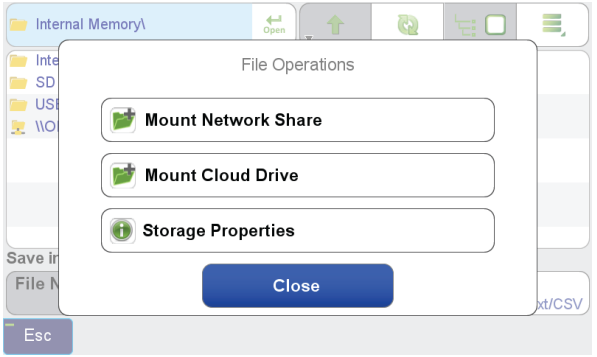
Mounting a Shared Network Folder

Mounting a shared network folder allows files to be transfered to and from J-Field while it is connected to a local network. First a folder from a PC connected to the same local network as the TRIUMPH-LS Plus needs to be created.

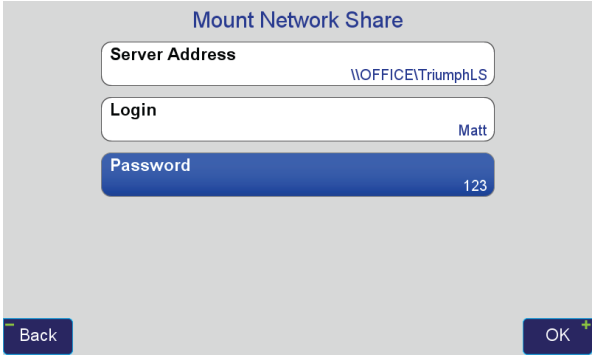


Here the folder TriumphLS was created on the Desktop. Right clicked on it, selected Properties and then enabled Sharing in the Sharing tab.

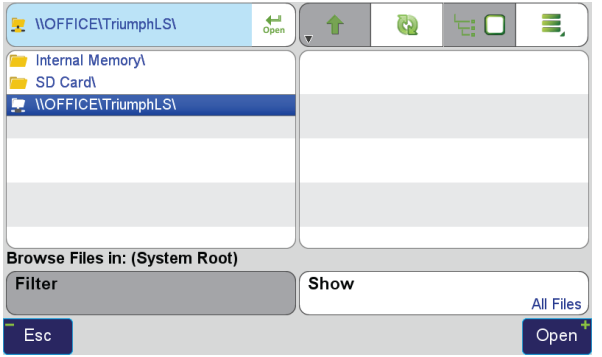
Then in the Browse Files screen, choose Mount Network Share from the File Operations menu when you are in the System Root directory.



Then enter the network path as shown above along with your Windows account name and password.



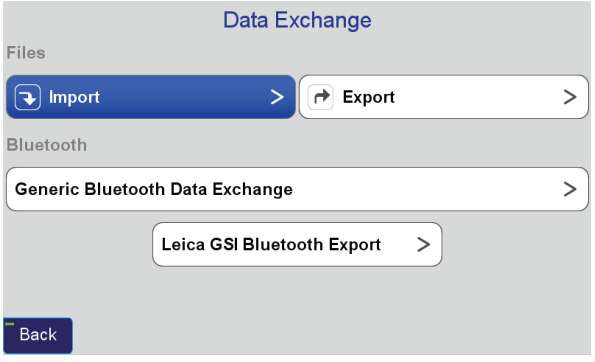
Press OK and you should now see this folder shared in the Root Directory where it can be used to import and export files.



Note that if an error message is received while trying to read the network shared folder, it may be necessary to reboot the TRIUMPH-LS Plus to resolve this. This is a known issue with the Windows operating system in the TRIUMPH-LS Plus.

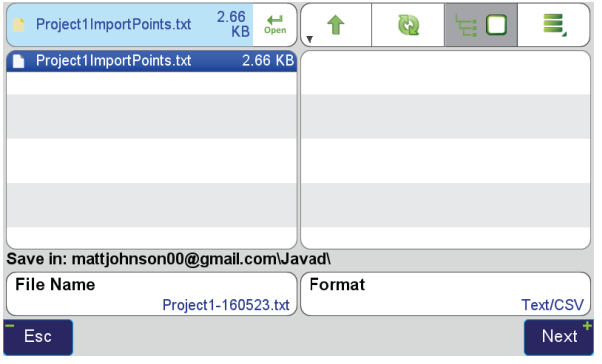
Importing Points From a Text File

To import points from a text file open the ***Data Exchange*** screen from the *Home Screen 2* or from *Files>Data Exchange*.



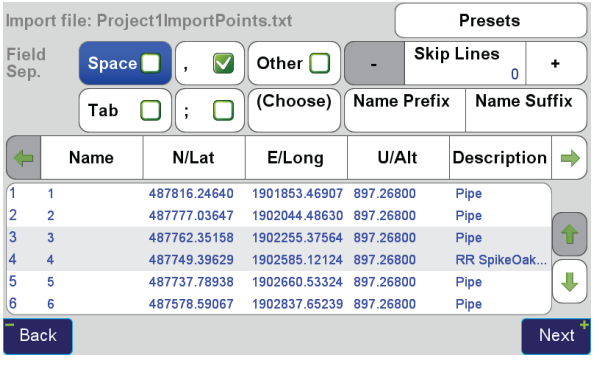
Data Exchange Screen

Navigate to the location where your file is located using the  to go up a directory and *Open* to open a folder. Then select and highlight the text file to open and choose Open. (Notice the down arrow in the corner of the *Navigate Up* button. Holding this button down will initiate a *Long Click* and navigate to the system Root directory.)

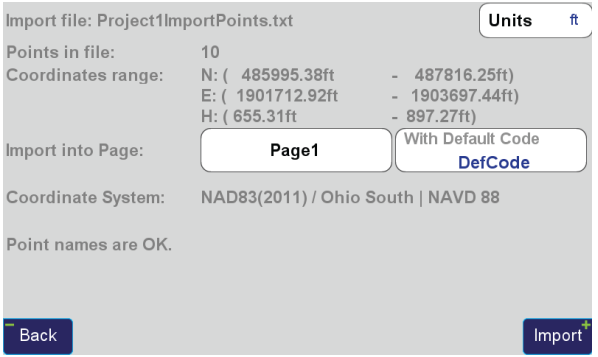


Open File Screen - Filtered to show only text files

If your text file is configured with the standard format of "PointName, N, E, H, Description" you should configure the import settings as shown below if they are not presently configured this way. The preview should display if the format is being interpreted correctly.



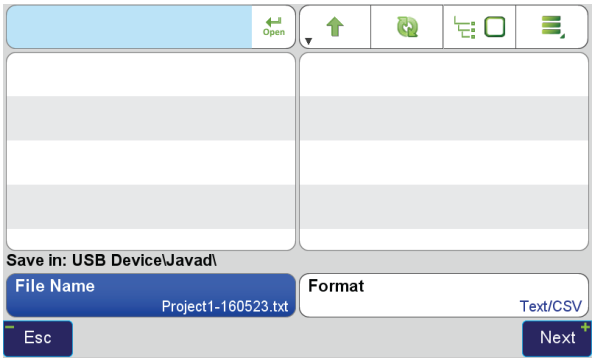
If the preview is correct, press *Next*.



A summary screen will be displayed. The points will be imported into the selected *Page* and be imported to the coordinate system of that *Page*. Tap *Import* to finish importing the points.

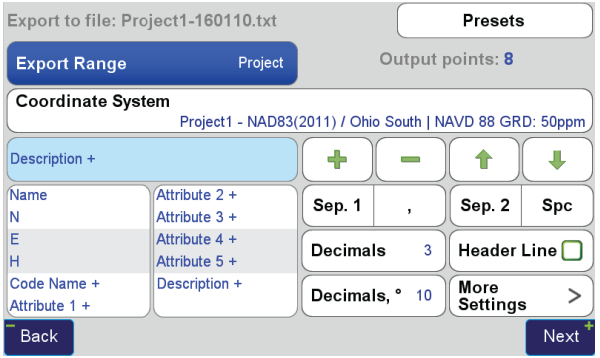
Exporting Points To a Text File

To export points to a text file open the Data Exchange screen and choose the *Export* option. Choose the format of the file type you wish to export with the box in the lower right corner, in this case ***Text/CSV.*** Navigate to folder you wish to save the file. Click the ***Next*** button to proceed or enter a new file name if desired. If you desire to change the default filename of the file to be created, you may do so by clicking on the filename box displayed to the right of *Save File in This Folder.*



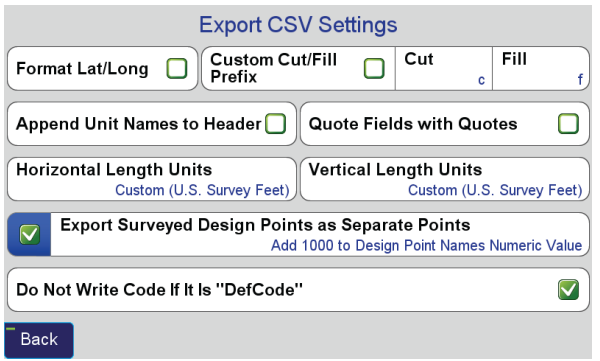
Save File Screen - Set to save a txt file in the USB drive

The *Export Formatting* screen will be displayed. It should have the default configuration to export a "PointName, N, E, H, Description" file with the description field being a merged field J-Field's *Code*, *Attributes* and *Description* fields. These fields are merged together with the use of *Sep. 2* (Separator 2) set to be a space. By default, fields are separated with *Sep. 1*, typically set to be a comma. Highlighting a field from the box on the left side of the screen and tapping *Sep. 2* will add a plus sign after the field name to indicate that it will be separated with *Sep. 2*.



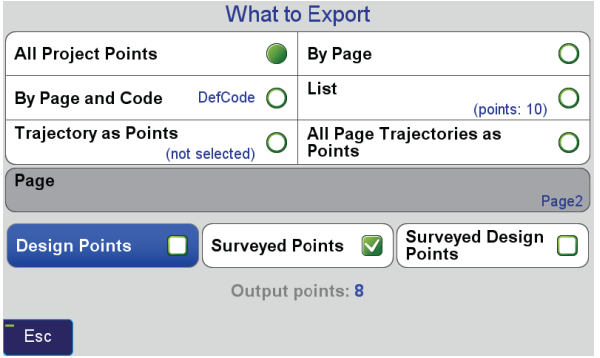
Export Formatting Screen with Default Formatting Shown

The plus and minus buttons are used to add and remove fields while the up and down arrows will change the order of fields. *Presets* allows configurations to be saved and recalled. Options are displayed to set the number of *Decimals* exported and whether to export a *Header Line*. *More Settings* opens the *Export CSV Settings* screen where options exist to specify how to format cut and fill values and *Surveyed Design Points*.



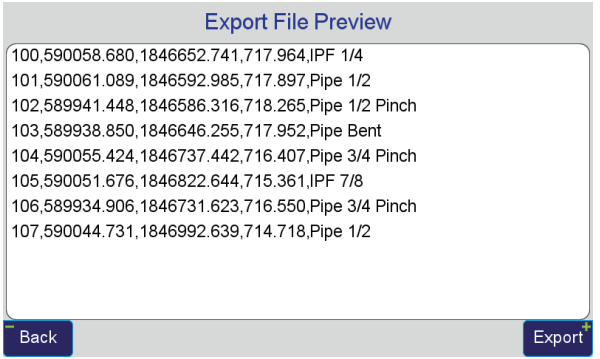
Export CSV Settings Screen

Use Export Range to choose which points to export.



What to Export Screen

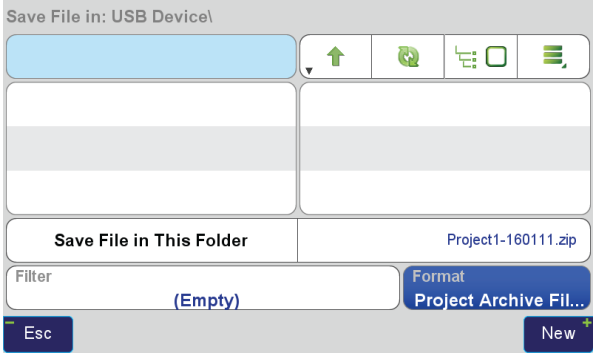
After the settings and points to export have been selected, tap *Next* to preview the formatting and points before pressing *Export* to create the file.



Export File Preview Screen

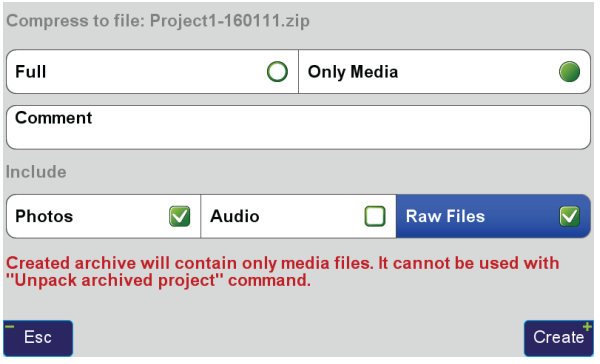
Exporting Photos, Screenshots, GNSS Data and Project Archives

To export media files that include photos, screenshots, audio files and raw GNSS data files choose the ***Project Archive File (ZIP)*** format option in the *Save File* screen. A full *Project Archive* can also be exported with this option. A Project Archive contains all the files necessary to restore the project if it becomes corrupt or deleted. It can also be used to copy the project to a different TRIUMPH-LS Plus.



Save File Screen - Set to save a Project Archive file in the USB drive

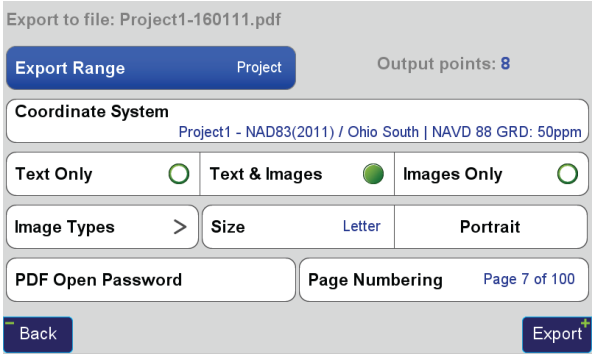
After tapping ***Save File in This Folder*** or the ***New*** button you will be presented with options to specify what type of files to export in the *Export Project Archive* screen. Use the ***Full*** option to create a backup that can be restored. The ***Only Media*** option will export only the filetypes chosen. Press *Create* to export the files which will all be contained in a zip file.



Export Project Archive Screen - Set to export only photos (screenshots included) and raw GNSS files

Exporting A Project Report

A report of the Project can be exported in HTML or PDF format by choosing ***HTML*** or ***PDF*** format in the *Save File* screen. The report will contain the selected points with all the details and statistics about that point. The ***Text & Images*** will be included if this option is checked. A number of options exist to format the PDF or HTML report:



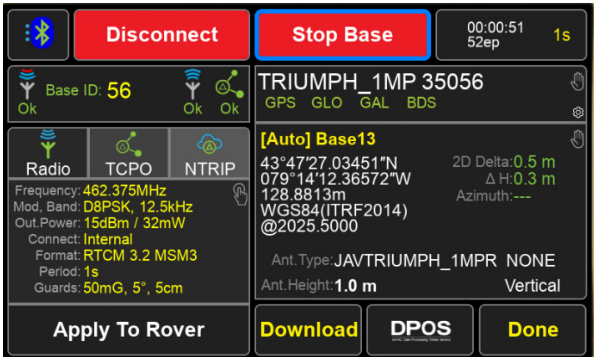
Setup

J-Field's settings are divided into 3 profile groups: the *General Group*, *Action Group* and *Favorite ShapeTags and Codes*. These groups exist so that different settings groups can quickly and easily be saved and recalled.

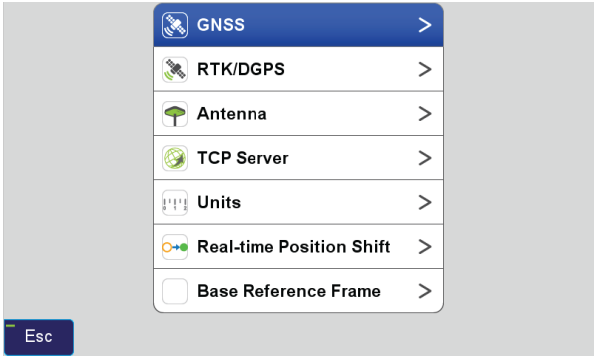
The ***General Group*** profile stores the settings for RTK corrections, i.e. the configurations for UHF radios or connection parameters to a RTN. The ***Advanced Settings*** are also stored in the *General Group* and are found as an option in the first setup screen of the *General Group*, they include the settings for the displayed units. Tap *Edit>Advanced* to access them.

The (*Set Up*) will quickly open the *Setup* screen; pressing it twice opens the *Advanced Settings* Screen.

As an example, to configure a new RTN setup you would tap ***Create*** to create a new *General Group* profile and then follow the screen prompts to enter the communication parameters and settings. See *Appendix A: Creating a RTN Profile* for detailed instructions on setting up a RTN. **Copy As** creates a copy of the existing profile but prompts you to enter a new name for the new profile.

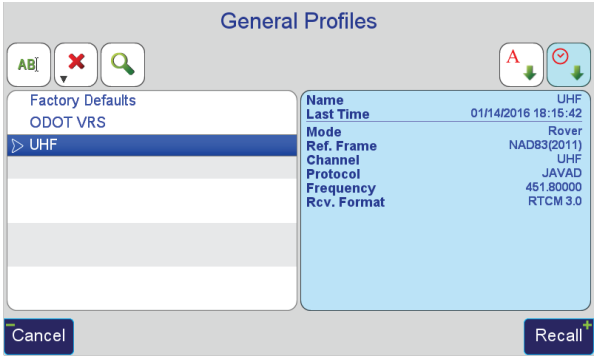


Setup Screen



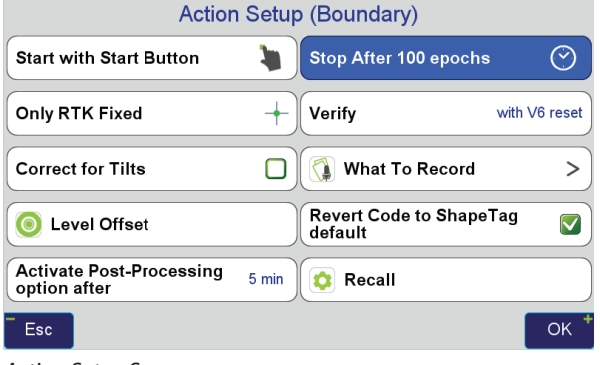
Advanced Settings Screen

Tapping the ***Recall / Manage*** button will open a list of profiles shown on the left side of the ***Profiles*** screen. Details of that profile are displayed in the information panel (the blue box on the right side of the screen). Across the top from left to right are buttons to ***Rename***, ***Delete***, ***Search***, ***Sort Alphabetically***, ***Sort by Date***.



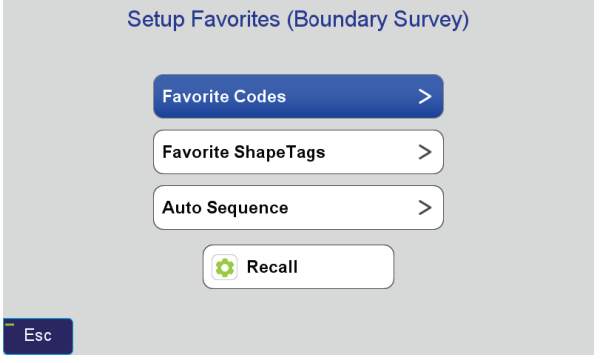
General Group Profiles Screen

The ***Action Group*** profile contains the collection settings. These include the RTK Verification and Validation settings and how many epochs to collect. These settings are discussed in the Collect section of this manual. The configuration of the *Stake* and *Collect Action* screens' *User Defined* (whitebox) *Buttons* are stored in the *Action Group* profile as well as the U1-U4 hardware button options.



Action Setup Screen

The ***Favorite ShapeTags & Codes*** profile stores different list of favorite *ShapesTags* and *Codes*.

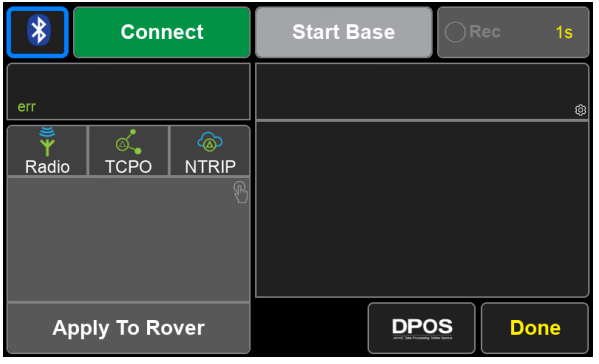


Setup Favorite ShapeTags & Codes Screen

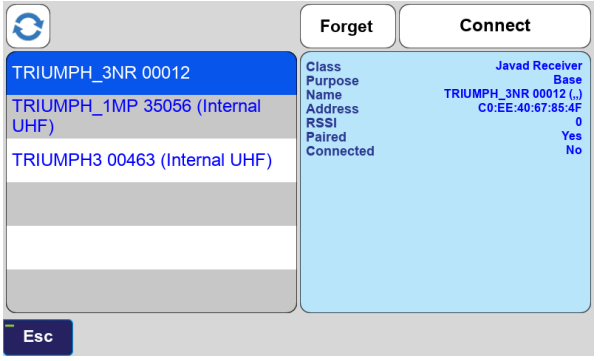
REMOTE BASE

Here you can set up an ***External GNSS receiver*** to transmit correction ***simultaneously*** via different services: ***Radio, TCPO, NTRIP***, and become a Base.

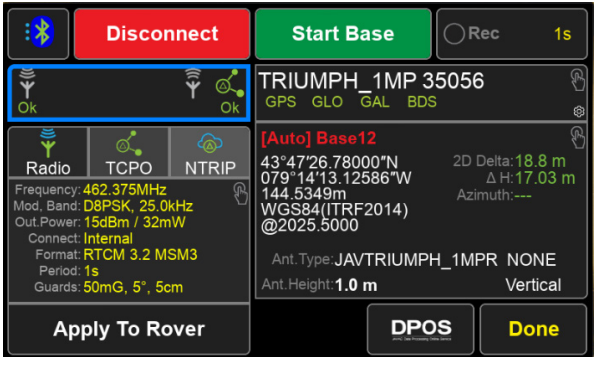
Click on the top left button to select the type of connection: ***Bluetooth*** or ***TCP***. Click the ***Connect*** button. In the case of Bluetooth connection, select the base unit from the list detected by Bluetooth and connect to it.
If base is already transmitting data, you will see the ***Stop Base***, otherwise the ***Start Base*** button.



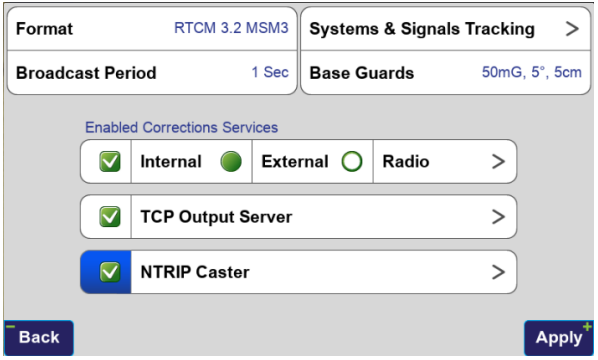
To see the parameters of a particular correction service click on the corresponding icon: ***Radio***, ***TCPO***, or ***NTRIP***. If the list of parameters is grey-out, it means that the service is not enabled on the services setup screen.
You can ***enable and set up*** the correction services if click on the list of the Base parameters.

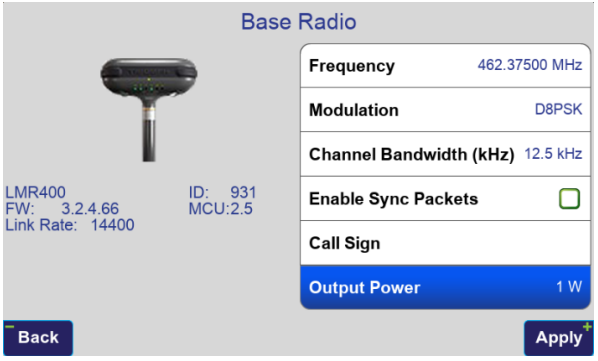


If the Base is transmitting, make sure that your rover communication parameters match with those of the Base, otherwise, while the Base is already transmitting corrections, you cannot receive them. In such a case you can use the ***Apply To Rover*** button to copy from Base. The option is especially helpful if the base is already transmitting corrections.

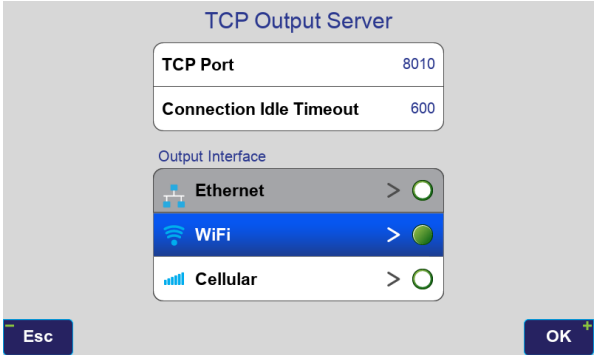


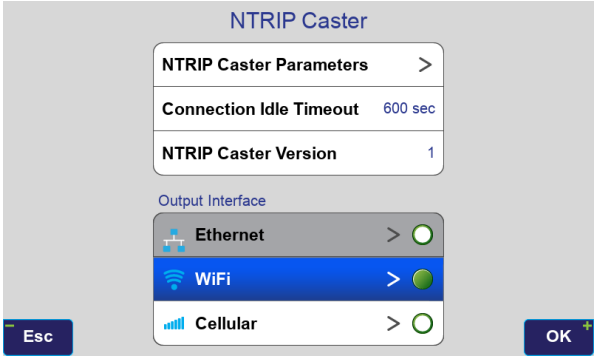
Base information is shown on the right side of the screen. Click this area to establish the ***base position and its antenna height***. Distance between the base position (as programmed in the base) and its instantaneous standalone position (computed every second and has the accuracy of a few meters) is shown as the "***2D Delta***" value.
This value helps to make sure that you have not mistakenly selected a base position that is far from its actual position. If this value is more than 10 meters it is shown in red to alert you.





Check the tracked GNSS systems on the ***Rover/Base*** area. If needed, you can set up tracked systems and signals using the "***System & Signals Tracking***" screen. Click the Rover/Base area and find the link to the screen.

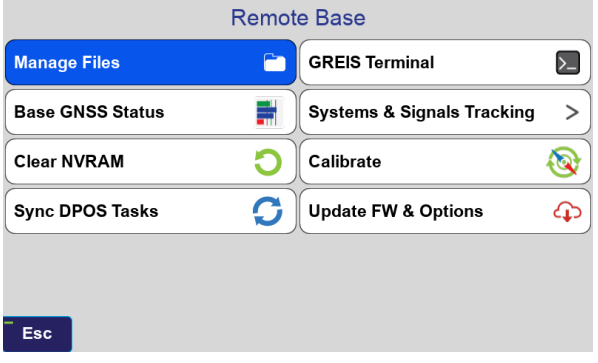


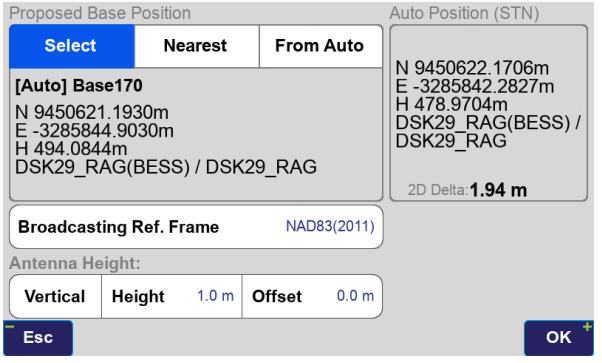


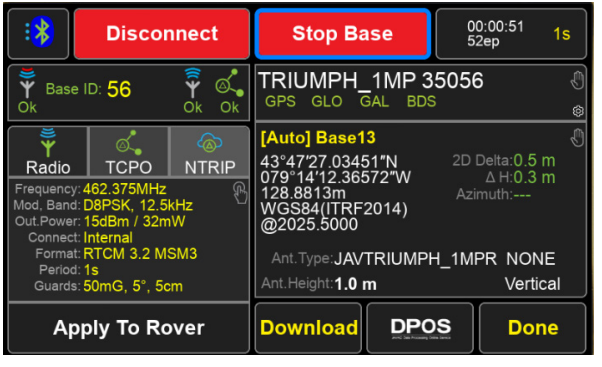
When all OK, click ***Start Base*** and follow the confirmation box. New base coordinates will be saved and raw GNSS data will be recorded in the base.

Click the ***Rover/Base*** area to view, download, and delete raw GNSS files stored in the base unit. Also, using the "***Sync DPOS Tasks***" you can automatically find overlapped files on the Base receiver, download them, create corresponding Base points and create appropriate DPOS tasks.

DPOS allows to calculate the accurate position of the Base and apply corrections to all RTK points collected with that Base.

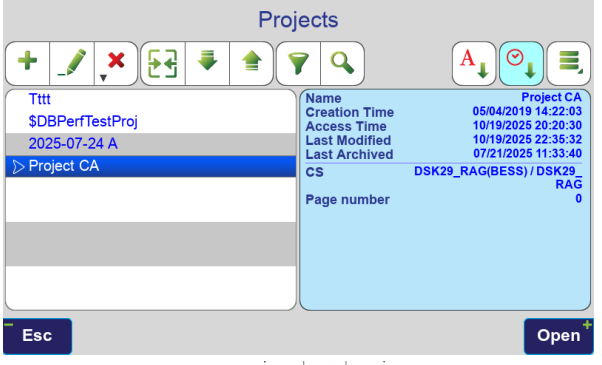






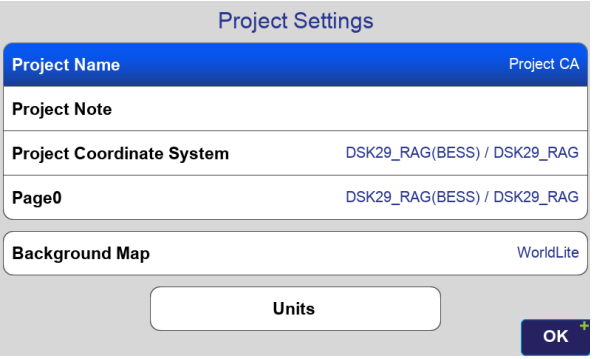
EXPLORER-PROJECTS

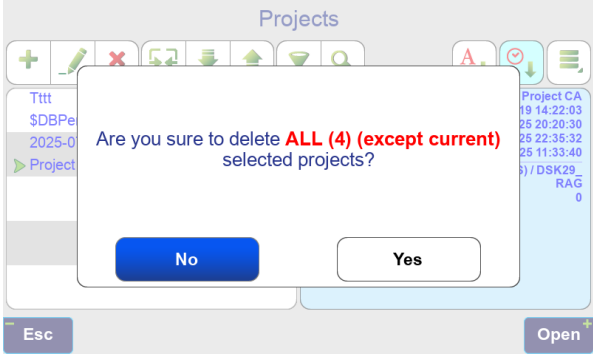
This screen manages ***Projects***



New, Edit, Delete buttons 

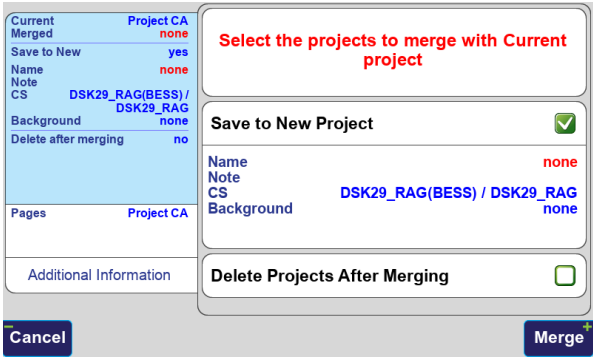
- ***New*** - this button opens the Project Settings screen to create a new Project.
- ***Edit*** - this button opens the Project Settings screen for editing the current Project and the Rename Project keyboard for inactive projects.
- ***Delete*** - this button deletes the selected projects. A Long Click (tap and hold, marked with "black arrow") on this button deletes all projects ***currently shown*** in the list, i.e. taking into account the different filters.

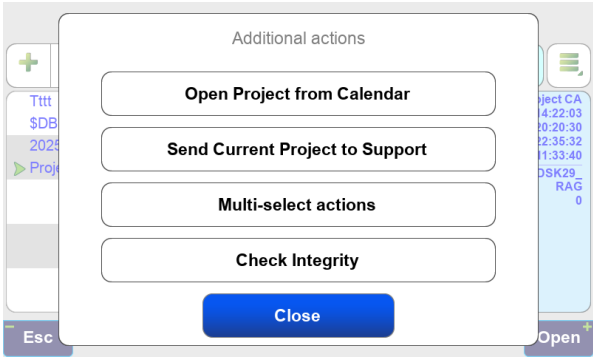




Merge, Import, Export buttons 

- **Merge** - this button opens the Merge Projects screen to merge the specified projects.
- ***Import*** - this button allows to import the selected project from a zip-archive.
- ***Export*** - this button opens the Archive Projects screen to export one or more projects to a zip-archive.





Projects Filter, name Filter buttons 

- ***Projects Filter*** - this button opens the Projects Filters screen. It allows projects to be filter by different parameters.
- ***Name Filter*** - this button enables/ disables the name filter. See the Help for the Points screen for a detailed description.

Sorting buttons

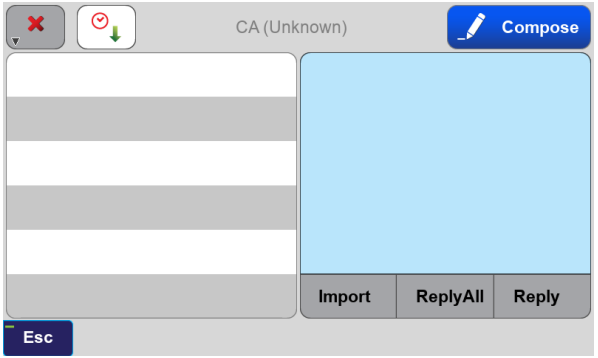
-  - alphabetical sorting. Green arrow down - sort in descending order, arrow up - in ascending order. The blue color of the button means that the current sort is used.
-  - sorting projects by creation date.

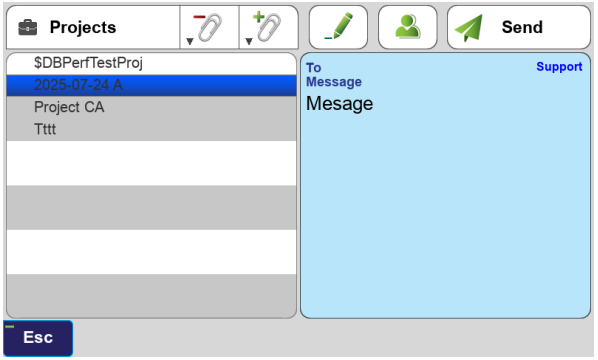
Projects List

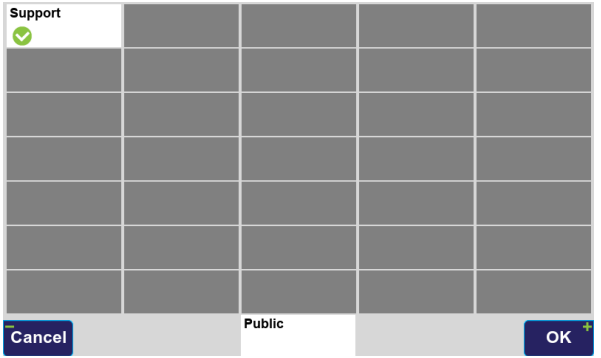
 - the arrow to the left of the project name means that this is the current project.

SUPPORT-MESSAGES

TLSTLS allows exchanging project-related data between receivers. So you can send files or projects to other units identified by their serial number or receive and import such data if someone sent it to you.
You can consider this service like an email box where recipients are the units. Every new message is stored temporarily on the server and available for 2 weeks.



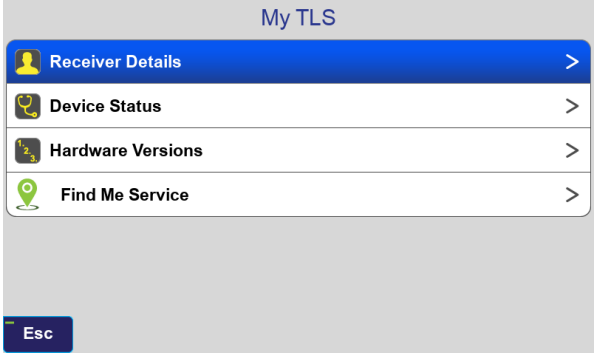




MY TLS

The ***MyTLS*** menu provides detailed information about the receiver, its hardware components, operational status, and optional tracking services. It consists of four main sections:

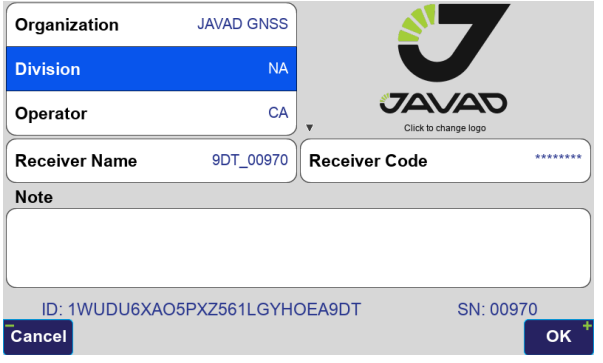
- Receiver Details;
- Device Status;
- Hardware Versions;
- Find Me Service.



The ***Receiver Details*** screen displays key identification parameters of the receiver:

- Organization, Division, and Operator fields;
- Receiver Name and Receiver Code;
- An optional Note field for user comments;
- The device ID and Serial Number (SN);
- The receiver logo, which can be changed if needed.

This information helps users correctly identify the device, manage multiple receivers, and organize units within an organization.



The ***Device Status*** screen provides a real-time health overview of the receiver's internal modules.

Each module is shown with a status indicator and the corresponding measured values.

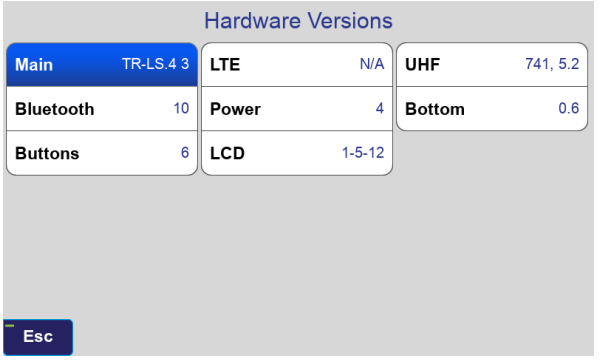
Typical parameters include:

- Internal and external antenna voltages and currents
- UHF and GSM module statuses
- ASIC supply levels
- Temperature and power status
- Communication module flags (GSM_EN, SIM2_EN, PCOM_ON, etc.)

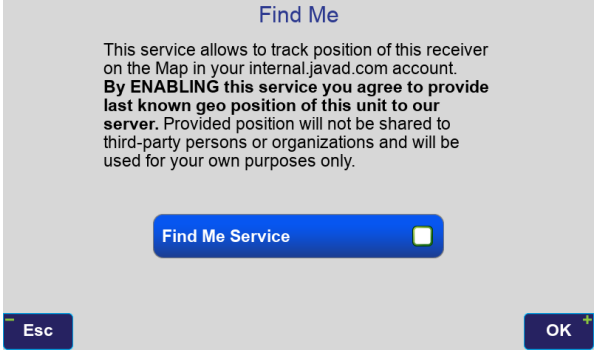
Hardware Versions displays the hardware revision numbers of all major components inside the receiver:

- Main board
- Bluetooth module
- Buttons board
- LTE module
- Power board
- LCD module
- UHF module
- Bottom board

These version numbers help service teams identify hardware configurations, verify compatibility, and determine required firmware or repair procedures.



The ***Find Me feature*** allows the user to track the last known geographic position of the receiver through the internal. javad.com account.



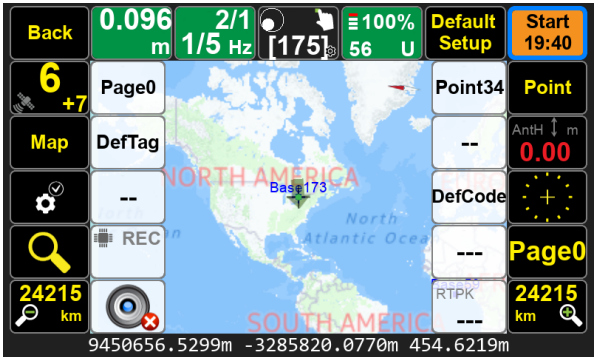
COLLECT-GNSS

The ***Collect*** action is used to collect and store RTK ***Points, Lines, Curves, Trajectories***, and GNSS static data.

The screen consists of a map and a number of buttons with information and assigned actions activated on a single click and also on a long push.

All white buttons are ***customizable***. Also, many black buttons are customizable too. To ***assign an action*** to a white button push and hold the button. The same way works for some black buttons which don't have an assigned long push action. Otherwise, long push the "***Back***" button and you will see the red border around the customizable black buttons. In this mode, you can customize a button with a single click on it. To turn off the mode push and hold the "Back" button again.

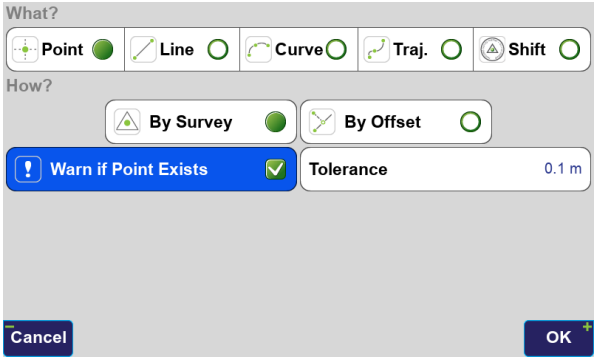
You can ***hide all white buttons*** by a long push on the top central button. Push and hold it to show white buttons again. Or you can hide/ show the button using the "Show Inner Buttons" checkbox on the "Action Setup" screen called by a single click on the button.



You can hide/show the background map if selected. For that, you have to assign the "***Show/Hide Background Map***" action (placed in the "Screen controls,..." group) to a hardware button (see Setup -> UI - Assign Actions to Hardware Buttons).

For ***better screen visibility*** you can switch between the Office/Field themes using the "Screen" HW button on the top.

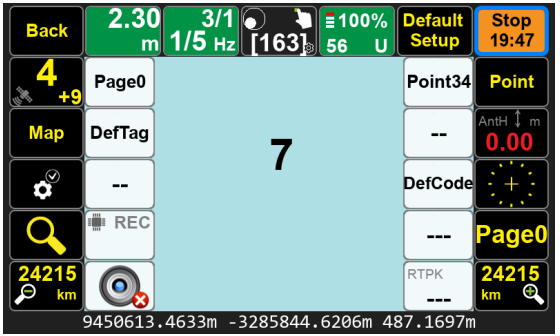
Using the button under the "Start" button you can select what kind of object to collect: ***Point, Line, Curve*** or ***Trajectory***. ***Shift*** - is the special task to set up Real-Time Shift feature using the Collect screen.



Push the "***Start***" button to begin data collection.

SHAPE

Here you can select what kind of object to collect. ***Point, Line, Curve*** or ***Trajectory.***

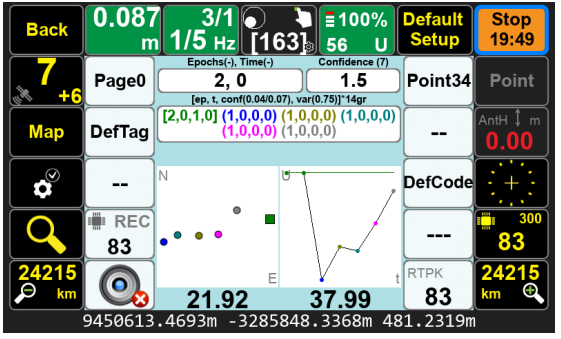


Shift - is the special mode to set up ***Real-Time Shift*** feature using the Collect screen.

Real-Time Position Shift, allows real-time corrections to be applied to receive base station corrections. A base station can be started with an autonomous position and then corrected by surveying a point with known coordinates. The known point could be a point previously surveyed with a base station set up in a different location. This feature is useful for several scenarios:

- You need to move or "leapfrog" your base station to extend the radio range into a new area.
- Your original base station point has been lost.
- You wish to save time by starting the base station with it mounted to the top of your vehicle. Setting the base and radio up on the top of the vehicle by mounting it a roof rack or using a magnet mount saves time by eliminating the need to set up tripods and can help protect the base station from disturbances or theft in undesirable locations. For the best performance, the base station should be mounted in a near-level position so that phase center variations and antenna offsets are correctly applied. If you are parked on a sloped surface, a swivel mount can be used to level the receiver on the top of your vehicle.

Your vehicle should be parked on solid ground where it will not move or sink.

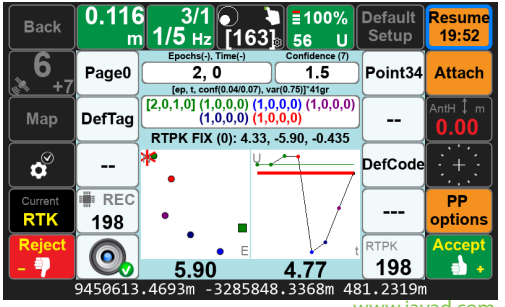


In this ***Shift*** mode select the Known Point and then press Start from the Collect screen to collect a point so that the offset can be calculated.

After it has been calculated you will be prompted to apply the shift.

You can manually check the Apply Shift and the shift will be applied to all the RTK surveyed points found in the current project collected from this base station. This shift will continue to be applied to all the points surveyed from this base station.

Undo Shift - will remove the shift for all the RTK surveyed points found in the current project collected from this base station.

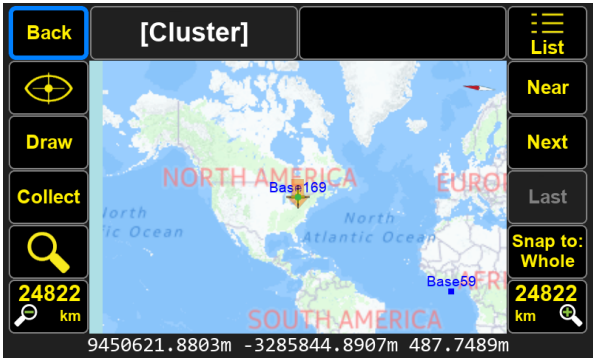


COLLECT-MORE

To **review** or **edit** a point that you have collected, **center it** on the map and then click to  go to the screen to review or edit the point that you have centered.

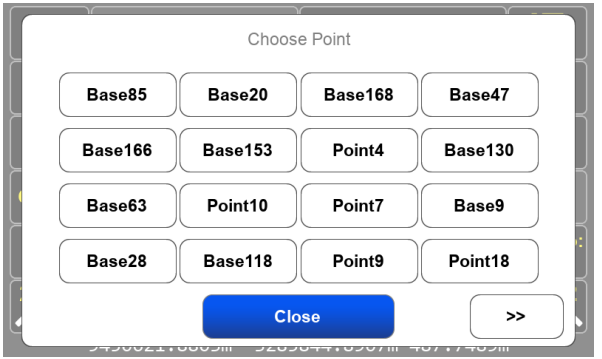
You can center a point with:

- Draw select/To Map;
- Near center the nearest point to the center (or to the current position, if available and shown);
- Next center the next nearest;
- Last center the last point collected.

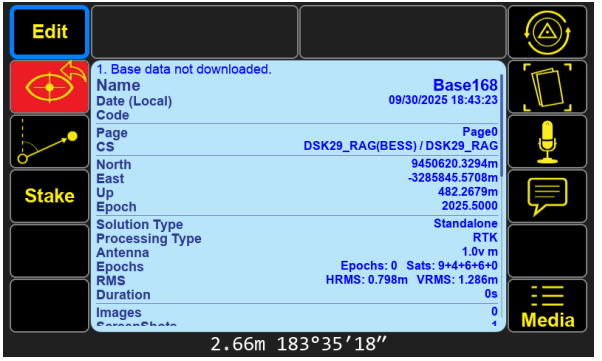


Point Name and its **Description** are shown on top of the screen. If you don't see such items, it means you have not centered any point and the  icon will not be active.
The red "!", when appears, means that filter is in effect and you don't see all points of the current project.
On the bottom of the screen the coordinate of the **cursor** (center of the map) is shown.

When no object is selected you can add points.
When an object is selected the **Draw** button appears which guides you how to draw objects.



Click  to get back to the **Review** screen.
Click **BACK** to get to the Prepare screen.

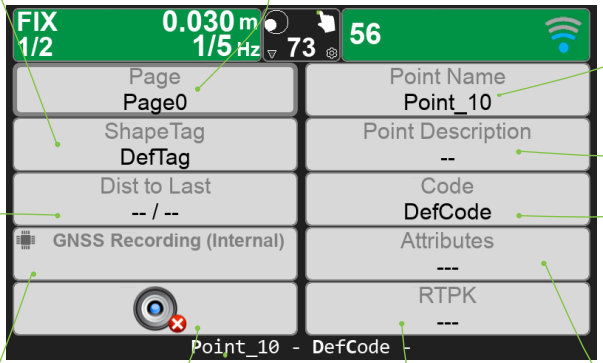


Screen Anatomy - Collect Prepare Screen

ShapeTags can be assigned to points during data collection to enable the automated drawing of lines between points with like ShapeTags. "DefTag" is the default ShapeTag and does not create lines between points.

The Page button displays the name of the current Page. Tap it to open the Pages screen and set the current Page, turn on or off Pages or edit a Page Name or coordinate system.

The Point Name button displays the name that will be assigned to the next surveyed point. After a point is surveyed it will increment to the next available name.



Use the Point Description field to store additional information about the point.

Dist to Last

The Code button displays the name of the Code that will be assigned to the next surveyed point. Tap it to choose a new Code from your list of Favorite Codes.

GNSS Recording (Internal)

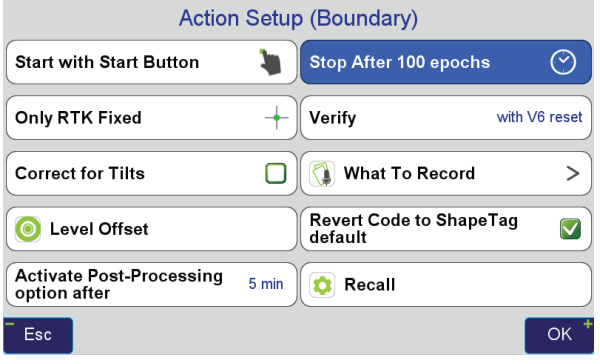
Camera Buttom

Real-Time Post-processed Kinematics (RTPK) enables parallel, near-real-time post-processing of RTK data to verify measurement results and generate a self-validated solution. In the event of an RTK connection loss, RTPK provides a fast and reliable alternative solution.

Up to five variable *Attributes* fields can be used be used to store additional information about a point with this box.

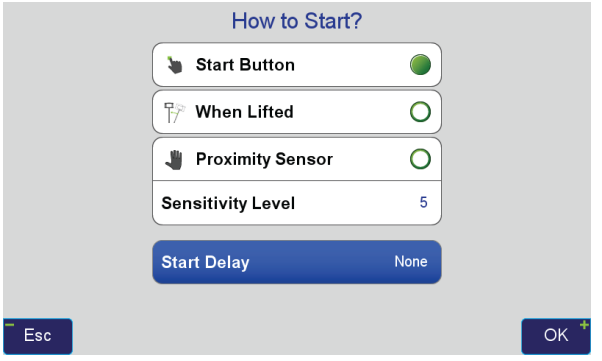
Action Profile Setup

The ***Action Setup*** screen can be opened by tapping the bottom middle button on the *Collect* and *Stake Prepare* screens. It contains all the settings related to the collection of points.

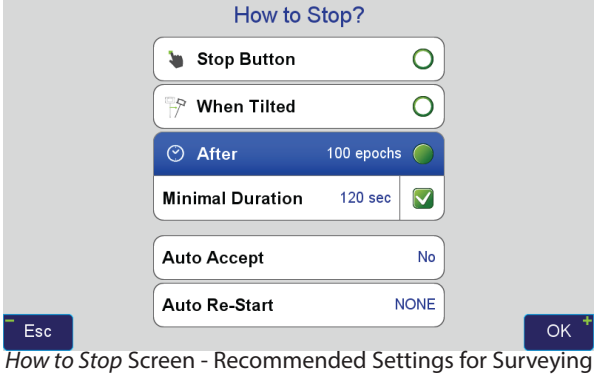


Action Setup Screen - Recommended Settings for Multipath Environments

There several different options to specify when data collection for points starts and ends, the most commonly used options being with the ***Start Button*** and after a specified number of epochs have been collected. Using a ***Start Delay*** may be useful if you need to collect a point where you cannot reach the TRIUMPH-LS Plus. You can press Start and then set the TRIUMPH-LS Plus up over the desired point. The starting of data collection will be delayed by the selected *Delay* period.



How to Start Screen



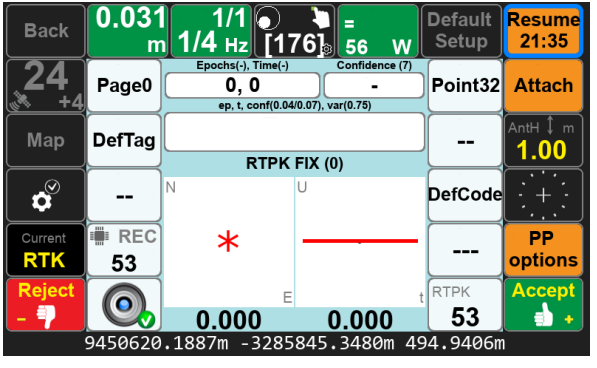
How to Stop Screen - Recommended Settings for Surveying Monuments in Multipath Environments with 5 Hz BEAST MODE Corrections

What To Record presents options to automatically capture raw GNSS data, camera images, voice recordings and screenshots. To process rover data with DPOS, GNSS data needs to be saved at 1 Hz.

Use ***Recall*** to quickly recall a saved Action Group profile.

This is useful for changing the collection settings for different environments and types of points that need to be collected.

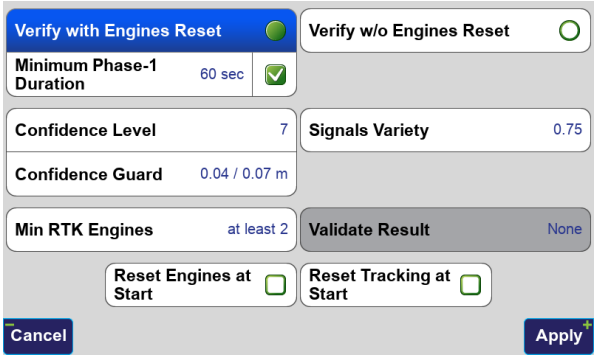
If ***Activate Post-Processing*** is enabled, raw GNSS data will always to be logged in the background when points are collected. If an RTK solution has not been accepted or rejected after the set period of time, a ***Save for PP*** option will be presented during point collection to save the GNSS data with the point for post-processing. Rover GNSS data can also be submitted to DPOS if it is recorded with the settings in What To Record.



Save for PP button displayed after a fixed solution was not able to be collected.

RTK Verification and Validation

It is very important that you read and understand the information about ***RTK Verification*** and ***Validation*** contained in this manual.



Verify Settings Screen - Recommended Settings for Multipath Environments

When located in difficult environments and under tree canopy, all GNSS receivers are prone to give bad fixed solutions that may appear to be acceptable if they are not verified. Existing methods to verify GNSS solutions include "dumping" the receiver, turning it upside down to cause the RTK engines to reset, and re-observing the point at a later time.

J-Field automates these processes with its built-in software features of *Verify* and *Validate*. ***Verify*** automatically resets the RTK engines after every fixed epoch is collected in ***Phase-1*** of its process. Epochs are placed into *Groups* or buckets during *Phase-1*. Once a *Group* has met the required ***Confidence Level*** and ***Minimum Phase-1 Duration*** (time between the first and last epoch in that group), *Phase-1* is complete.

The ***Confidence Guard (CG)*** determines the size of the *Group* or bucket. Each *Group* contains all the epochs located within a specified radius (the *CG* value) from its center and new *Groups* are created as necessary so that all epochs fall into at least one *Group*. Each *Group* has its own *Epoch Counter*, *Confidence Level* and *Elapsed Time*. A point may fall into more than one group. The groups are sorted from best to last by the sum of their *Time* and *Confidence* with the current best group being shown within [ ] and others within ( ). ***Show on the Screen*** specifies how many groups will be displayed on the plots on the screen. There is no limit to the number of groups that will be stored internally but only up to the best 6 will be displayed on the screen.

During ***Phase-2*** the engines are not reset and solutions which are located inside the *CG* of the selected *Group* are added to that *Group* for the remaining number of epochs that user has requested (***Epoch Number, EN***) in the ***How to Stop*** screen. Epochs which are outside the *CG* of the selected *Group* will be stored in a new (or previously created) group; the RTK engines are reset if the epoch falls outside a sphere with a radius twice that of the *CG*. If the number of epochs falling outside of the current group reaches 30% of epochs collected so far, the process will revert back to *Phase-1* and the *Confidence Level* of the current group will be reset to 0. Previously created groups will remain intact and once an existing or previously created group meets the *Phase-1* criteria, it will pass to *Phase-2*.

Validation is the final phase of the process. With this feature enabled the RTK engines will reset one final time at the end of the observation and collect 10 additional epochs. Allowing sufficient time between *Phase-1* and the final *Validation* step will guarantee a bad solution is not allowed to be accepted. From extensive testing in the

worst of multipath environments, a bad solution has yet to be accepted when *Verify* and *Validate* are enabled with *a* ***Minimum Duration*** *of* least 180 seconds. This will ensure that at least two separate fixed initiations are acquired at least 3 minutes apart. Having at least 2 fixed initiations in agreement and acquired at least 2 to 3 minutes apart has been found to be the critical requirement to ensure that bad fixed initiations are not accepted. In high multipath environments the Boundary Action Profile should be used to meet this requirement and guarantee a good initiation. You must let entire collection process complete.

Confidence Level and *Consistency Level* are counters; the *Confidence Level* of a group increments each time an epoch with a new RTK initiation (Fix) is collected. It increments by values of 1, 1.25, 1.5, 1.75, 2.0, or 2.5 for 1 to 4 fixed engines, respectively. The *Consistency Level* of a group increments with every epoch collected by values of 0, 0.1, 0.25, 0.5, 1.0, and 1.5 for 1 to 4 fixed engines. The set *Consistency Level* must be met before *Phase-2* is allowed to end.

If high accuracy is needed in areas of high multipath and areas with limited views of open sky (under full tree canopy and urban canyon environments), longer observations will improve accuracy. Repeated observation can also be performed later (1 hour or more is recommended) to improve accuracy. These repeated points can then be averaged together with the *Average* function found in *Cogo Tools* or with the *Cluster Averaging* function.

RTK Verification with Boundary Topo and Quick Topo Profiles

Key Parameters

1. Minimum Phase-1 Duration is used to set the minimum number of seconds that the RTK Verification process must remain in Phase-1. During this phase, the RTK engines are continuously reset; when an engine fixes it will collect 1 epoch and then reset. The longer the requirement for this setting and the longer the period between the first fixed solution and last fixed solution that agree, the more confidence is achieved that the fixed solution is correct. This is due to the decreasing likelihood of bad solutions agreeing as the satellite positions and geometry change with time.

2. Signal Variety is used to require all 4 RTK engines to be fixed at some point and be configured with different satellite signals. In this version of J-Field, Auto Setup Engines automatically configures the RTK engines to use 2 signals from each of the 4 satellite constellations (GPS, GLONASS, Galileo and BeiDou). Each engine is configured differently to maximize the Signal Variety that is achieved with all 4 RTK engines fixed. The minimum signal variety requirement is set to 1.6 in these profiles; this should be achieved if the base is providing corrections from all constellations and signals. If you are not receiving corrections with all constellations and signals, you will need to reduce this setting to a value that is 0.2 less than the value achieved with all 4 RTK engines fixed.

3. RTPK / RTK Must Agree is used to require the RTPK solution agree with the RTK solution. RTPK works by storing RTK corrections and then using a static post-processing engine to process the data after the data split interval is reached. When the data is split into multiple intervals, solutions from multiple intervals must be in agreement for a RTPK solution to be returned.

4. Min RTPK Verification Level is used to stop collection of a point before all the RTK verification requirements have been met. The RTPK Verification Level is the number of RTPK intervals that have solutions in agreement with each other. If the Min RTPK Verification Level is reached before all RTK verification requirements are met, point collection will be stopped. The Min RTPK Verification Level does not need to be met to automatically stop point collection when all the RTK Verification requirements have been met.

Profile Settings

Profile Name	Minimum Phase-1 Duration (seconds)	Signal Variety	RTPK / RTK Must Agree	RTPK Data Split Interval	Min RTPK Verification Level
Boundary	180	1.6	Yes	1 Minute	4
Topo	30	1.6	Yes	30 Seconds	4
Quick Topo	5	1.6	No	30 Seconds	4

Boundary Profile

The Boundary profile is intended to be used for both collecting and staking points for boundary survey work and in locations where there is significant multipath such as under tree canopy and in urban environments near buildings.

In open areas and areas with light multipath you may choose to stop the collection of a point early after the first RTPK solution is returned. The observation should only be stopped early if:

1. The RTK and RTPK solutions agree.
2. The RTK engines fix rapidly during the observation and only a single group is created (all RTK epochs agree).
3. The Signal Variety requirement is met, indicating all 4 RTK engines achieved fixed solutions.

To stop the collection of a point early, press the ***Stop*** button.

Conversely, if you are in an area where the RTK engines are struggling to fix and many groups that do not agree are created, it is advisable to either extend the Minimum Phase-1 Duration to 240 seconds and the Min RTPK Verification Level to 6. You could also collect a 2nd point and confirm agreement between the two points.

Topo Profile

The Topo profile is intended to be used for collecting and staking points for topo work when a lesser degree of verification is needed from the Boundary profile.

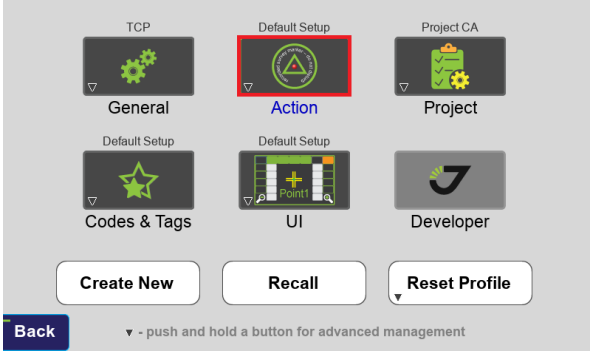
Quick Topo Profile

The Quick Topo profile is intended to be used for collecting and staking points for topo work when a lesser degree of verification is needed from the Topo profile and you are working in a mostly open area.

QUICKSETUP-VERIFY-RTPK SETTINGS

Real-Time Postprocessed Kinematics (RTPK) - computing coordinates in quasi-real-time based on the post-processing data. RTPK main features:

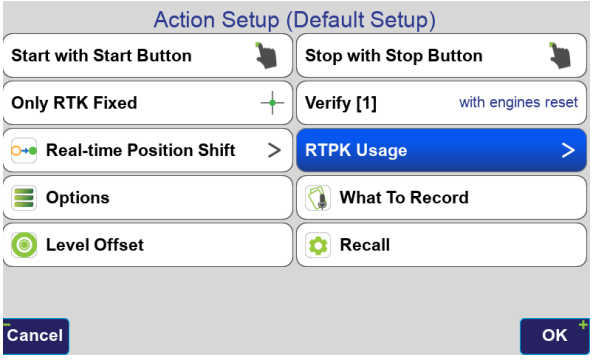
- data obtained in RTK mode is used;
- post-processing is performed by the GNSS receiver;
- a self-verified fixed solution is produced.



Enable RTPK usage, then select th***e RTPK environment category*** depending on your environment. "***RTPK/RTK Must Agree***" - will prevent Verify procedure from stopping until the required ***RTPK/ RTK Residuals*** will be met.

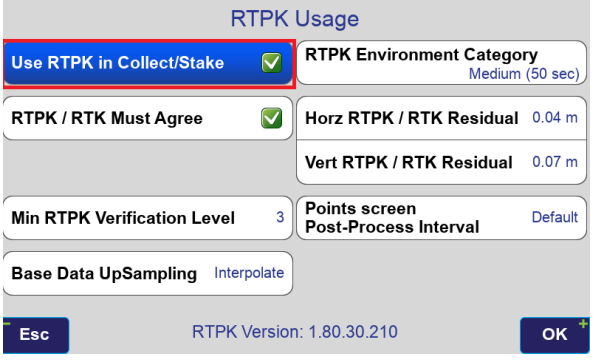
RTPK can be used for post-processing on the Points screen (look into the menu of the ***Points*** screen). This post-processing function has its own setting for data split interval - "***Points screen Post-Process Interval***". By default 120 sec interval will be used to split data for verification.

You can see the RTPK engine ***version*** on the bottom of the screen.

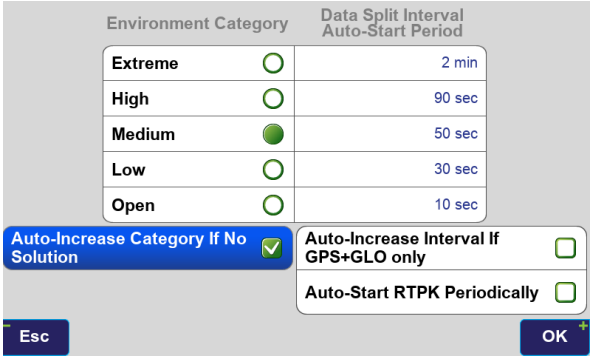


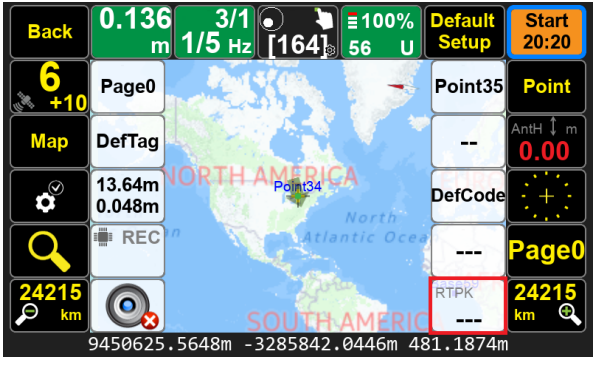
QUICKSETUP-VERIFY-RTPK-ENVIRONMENT

Select the required ***RTPK Data Split Interval*** depending on your environment. For convenience, there are 5 different ***environment categories***, and you can assign an individual interval to each category.
RTPK will split data using the setting for the internal RTPK verification procedure.

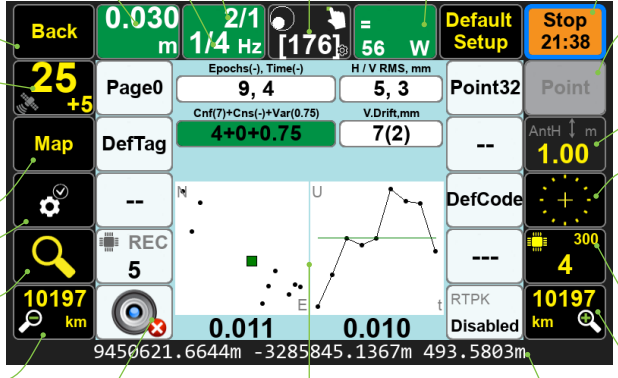


Auto-Start RTPK feature allows automating the Collect Verify procedure.





Screen Anatomy - Collect Action Screen



Number of engines fixed/number of engines required by user

The current RTK correction rate being received

Instantaneous RMS estimate of the current position solution

Returns to the previous screen

Shortcut to *Satellite Status* screen; displays the number of satellites being used + the number of additional satellites tracked but not used

Map

Shortcut to the Review screen

Cycle through *AutoZoom* and 1:1 *Zoom* modes

Zoom out

Shortcut to the *Action Setup* screen; the pitch (forward/back), roll (left/ right), and the azimuth or bearing the unit is facing are displayed. This box turns orange if the device is tilted more that 5 ° with *Correct for Tilts* off, or more than 30 ° degrees with *Correct for Tilts* enabled. When orange it prevents accepting of epochs in all modes except trajectory.

Shortcut to the applicable RTK corrections communications screen; Currently corrections are being received through WiFi with a 100% link quality and full signal strength (as displayed by the full bars of the signal strength icon)

Begin collecting a point; the current time is displayed on the 2nd line

Shortcut to Selection of the type of feature being located; Point, Line Curve, Trajectory or Shift; choose by Survey or by Offset

Antenna Height

D-SNR loss, displays the level (in dB) of the signal strength loss and interference in the L1 / L2 GPS and GLONASS bands. Values 0-3 are desirable, 3-6 are fair and above 6 are poor.

Center map on current location

Zoom in, the scale is displayed as the distance across the bottom of the screen (between the user defined boxes).

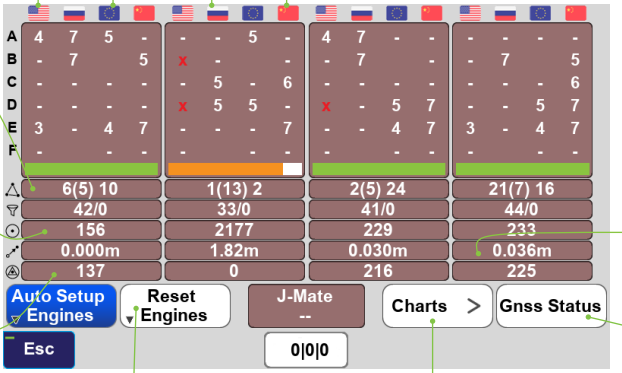
The map displaying point and lines contained in pages that are enabled. To expand the *User Defined Buttons* press the *Action* hardware button.

Tap once to preform the action associated with the User Defined Button (AKA White Box); long click (touch and hold) to remove or change the User Defined Button

Current location in current Page

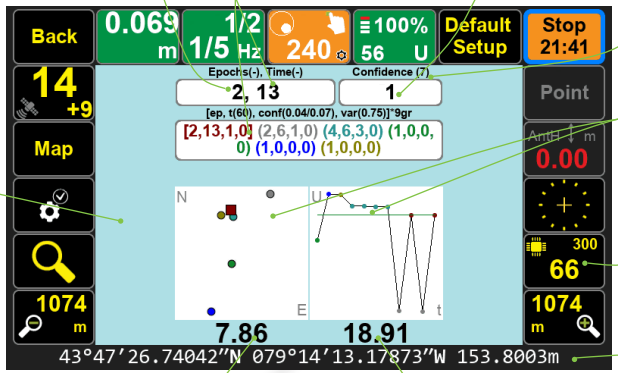
* Total number of SVs obsered by RTK Rover may be different from number of SVs observed by RTK Base

Screen Anatomy - RTK V4



Screen Anatomy - Collect Action Screen

ScreenshotafterPhase-1ofRTKVerificationisCompleted



* At the end of Verify sets values shown are the total RMS of all sets

Time: Duration is seconds between the first and last epoch collected

Current epoch count

Current best group in [ ]

Current other groups in ()

Current confidence level

Target confidence level

Horizontal (left) and vertical (right) plots of the collected epochs. Each *Group* has its own color. These plots currently have 2 *Groups*.

Verify Statistics
# of Phase-1 Restarts, # of Groups

# of Epochs outside the Confidence Guard during Phase-2

Activate Post-Processing - 66 epochs of raw data have been saved, 300 are required for the post-processing option

Coordinates of current position

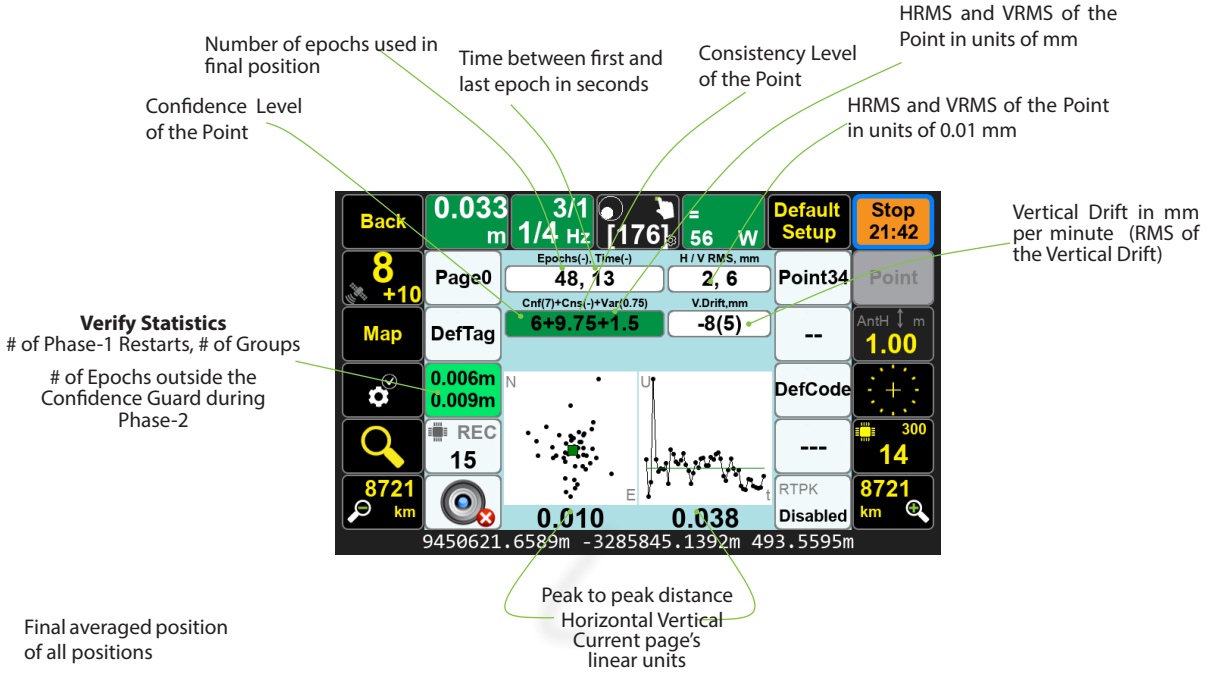
Scales of the plots
Horizontal Vertical

Example One: Phase-1 ONE

This point was collected under open-sky conditions

Screen Anatomy - Map Screen

ScreenshotafterPhase-2andValidationPhaseofRTKVerificationisCompleted



Example One: Phase-2

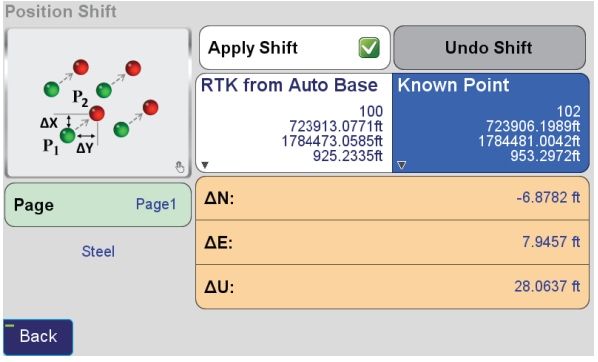
This point was collected under open-sky conditions

Real-Time Position Shift

Real-Time Position Shift, allows real-time corrections to be applied to receive base station corrections. A base station can be started with an autonomous position and then corrected by surveying a point with known coordinates. The known point could be a point previously surveyed with a base station setup in a different location. This feature is useful for several scenarios:

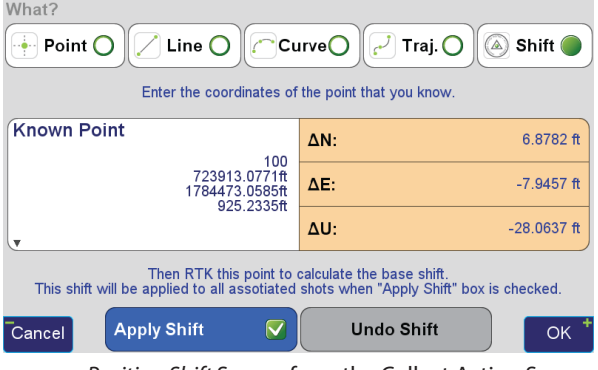
- You need to move or "leapfrog" your base station to extend the radio range into a new area.
- Your original base station point has been lost.
- You wish to save time by starting the base station with it mounted to the top of your vehicle. Setting the base station and radio up on the top of vehicle by mounting it a roof rack or using a magnet mount saves time by eliminating the need to setup tripods and can help protect the base station from disturbances or theft in undesirable locations. For the best performance, the base station should be mounted in a near level position so that phase center variations and antenna offsets are correctly applied. If you are parked on a sloped surface, a swivel mount can be used to level the receiver on the top of your vehicle. Your vehicle should be parked on solid ground where it will not move or sink.

The *Real-time Position Shift* function can be accessed from the Advanced Setup menu (press the ***Set Up*** hardware button twice > ***Real-time Position Shift***). In this screen, select a point you have collected RTK coordinates from with an autonomous base station and then the known coordinates of this point. Check the *Apply Shift* and the shift will be applied to all the RTK surveyed points found in the current project collected from this base station. This shift will continue to be applied to all the points surveyed from this base station.



Position Shift Screen

Real-time Position Shift can also be accessed from the Collect Action screen by clicking the button below the Start button and changing the collection mode to Shift. In this mode select the *Known Point* and then press *Start* from the action screen to collect a point so that the offset can be calculated. After it has been calculated you will be prompted to apply the shift.



Position Shift Screen from the Collect Action Screen

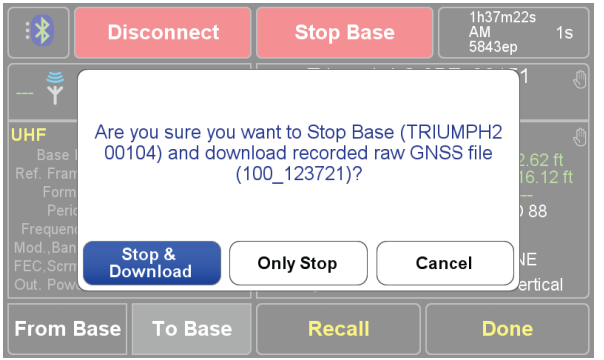
Hybrid RTK with DPOS

When a GNSS RTK base station is started by assuming an autonomous position, it is necessary and good practice to later adjust and correct the coordinates with a GNSS solution referenced from known coordinates. J-Field, has the ability to adjust the base station coordinates and associated RTK points surveyed with DPOS (Javad's Data Online Processing Service). Your raw GNSS base station data is sent to the DPOS server from J-Field to be processed with CORS (Continuously Operating Reference Station) data. DPOS then sends the adjusted coordinate back to J-Field and J-Field applies the adjustment to the base and rover coordinates.

Now with the introduction of ***Hybrid RTK*** in ***J-Field 2.0***, raw data files from the rover can also be post-processed with DPOS. Your local base station data can be used to post-process base to rover vectors; serving as an additional check for the RTK solutions and as method to obtain accurate solutions in areas where RTK corrections are lost. Rover points with raw GNSS files can also now be post-processed with CORS data.

Recording Raw GNSS Data

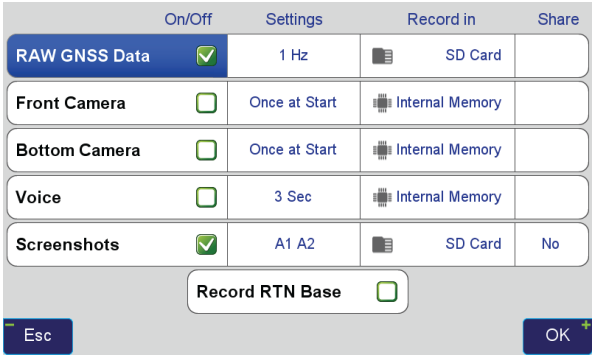
Base station data is automatically recorded when a base station is started with *Base/Rover Setup*. After done surveying connect to base in *Base/Rover Setup* and choose Stop Base. You will be prompted with several options. Choose ***Stop & Download*** so that the base data is downloaded into J-Field and can later be processed with DPOS.



Base/Rover Setup - Prompt to stop the base and download data

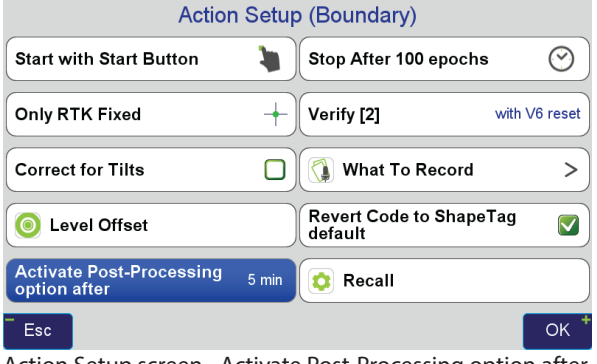
You will be prompted with several options. Choose ***Stop & Download*** so that the base data is downloaded into J-Field and can later be processed with DPOS.

Rover GNSS data is recorded with points when this option is enabled in the What To Record settings.

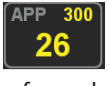


What To Record screen - Recording of GNSS Data enabled

Raw data for rover points can also be saved with the *Activate Post-Processing* option found in the *Action Setup* screen.

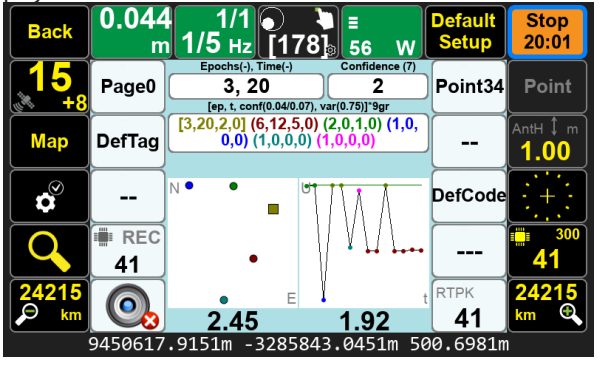


Action Setup screen - Activate Post-Processing option after 5 min

When this option is enabled, the 

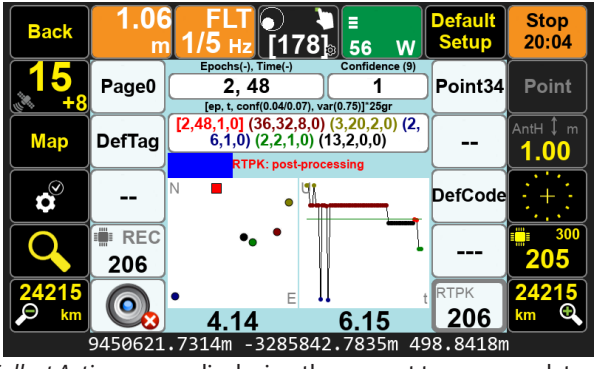
(APP) button will be display how many epochs of raw data have been recorded and how many are required in the Collect and Stake Action screens. Once the required number of epochs have been met the button changes to display 

. Then once Stop is tapped the PP Options button is displayed.



Collect Action screen displaying the *PP Options* button.

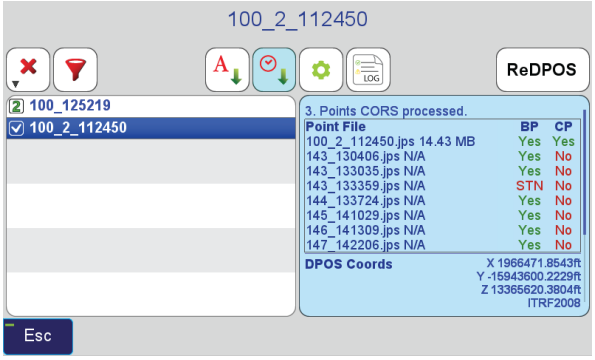
Tapping this button presents the options to save the raw data for post-processing.



Collect Action screen displaying the prompt to save raw data.

Processing Raw Data with DPOS

To post-process the data, open the *DPOS* tool found in the CoGo menu and select the base file you wish to process. It can also be open by tapping the *DPOS* button found in the Points screen.

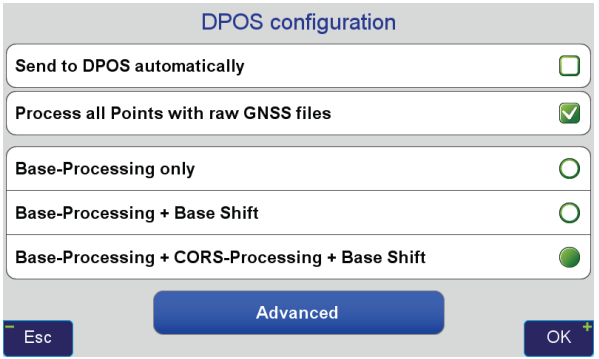


DPOS - The Filter is Applied to *Show Current Project Base Files Only*

With J-Field connected to the Internet, tap the button

to submit the raw data files for the selected base station session to DPOS. The blue information panel displays the status of the selected DPOS session.

The  (configuration) button contains various options for DPOS processing.



DPOS Configuration Screen

Send To DPOS automatically will submit GNSS raw data to DPOS automatically when an Internet connection is available.

Process all Points with raw GNSS files will submit all rover raw data files to DPOS for processing even if they have not been marked for post-processing.

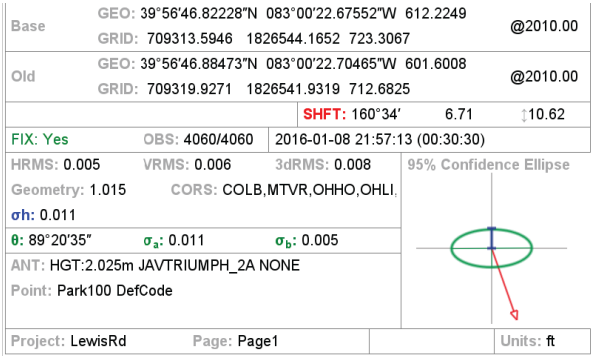
Three processing types exist to determine how to process the data:

- ***Base-Processing*** - base and rover raw GNSS data are uploaded to DPOS and base-rover vectors are then processed
- ***Base Shift*** - base station data is processed with CORS data; the base station coordinate and survey points collected from the base station session will be automatically adjusted
- ***CORS-Processing*** - rover points with raw GNSS files are processed with CORS data (including your base data if this option is enabled in the Advanced settings)

Note that as of J-Field 2.01.523, design points are not adjusted but this feature is planned for the future. All CoGo functions except *Average* create resultant points with design coordinates.

Reviewing DPOS Results

The *Base Rover Statistics* screen can opened by tapping the blue information panel. An acceptable solution should have a Fixed solution, a 3dRMS of less that 3 cm (0.10') and make use of multiple stations; if this is not the case, the data can be reprocessed again at a later time by pressing the ***ReDPOS*** button.



Base Rover Statistics Screen

Full DPOS results can be reviewed in the *Processed-Point Info* screen by tapping  found in the *Point* screen.

The detailed use of *Processed-Point Info* screen is explained on the following two pages.

Screen Anatomy - Processed Point Info Screen

Example of a Screenshot for a Base Point

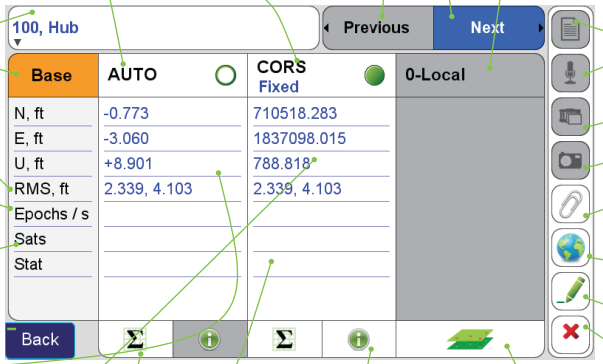
Point Name - The name of the current point being reviewed, this box can be formated to also display the Code and Description with a long click (notice the arrow in the bottom left corner)

Use *Previous* and *Next* to cycle through the list of surveyed points

The current (radio button is selecting this column) coordinate type for the base and associated rover points is *KNOWN* (base station was started from a known coordinate). If the base station was started from an autonomous position this would be labeled *AUTO*.

M-Local - The *Multiple Local* coordinate/residuals are displayed in this column. *M-Local* coordinates shift the associated surveyed points with the same base station session to known coordinates. (This point does not currently have *M-Local* coordinates.)

The post-processed *CORS* solution for the base station (currently not selected as the current coordinate)



Indicates this is a Base point

Horizontal and Vertical RMS

Number of Epochs / Duration (time between first and last epoch in seconds)

Number of GPS + GLONASS satellites

Note, Audio, Screenshots and *Photos*- Tapping these button will display the point's *Note, Audio, Screenshots* or *Photos*. These buttons will only be active when the point has these attachments.

Attach - Use this button to attach new media to the point

Map - View this point on the map

Edit - Open the Edit Point screen

Delete - Delete this point

The current coordinates; the coordinates in the selected column will be used throughout J-Field as the current coordinates. These are the coordinates that will be displayed in map, points list, exports, etc.

Residuals from the current coordinate

Number of stations used in this CORS solution

Add M-Local - Use this button to add the current displayed point as a M-Local point. Once tapped, you be prompted to select or enter a coordinate. The translation from the displayed point (100 in this example) to the enter coordinate will be calculated. Multiple pairs of points can be added in *M-Local* to calculate a best fit translation; hence the term *Multiple Local* (*0-Local* has 0 pairs of points, *1-Local* has 1 pair, *2-Local* has 2, etc.). Select the *M-Local* coordinate (radio button set to this column) for any point to then apply this translation to the selected point and all other associated points with the base station session.

Base Rover Statistics - View the *Base Rover Statics* screen for the solution shown in this column.

Info - The info button opens a text report for the post-processed solution shown in this column.

Screen Anatomy - Processed Point Info Screen

ExampleScreenshotsforaRoverPoint

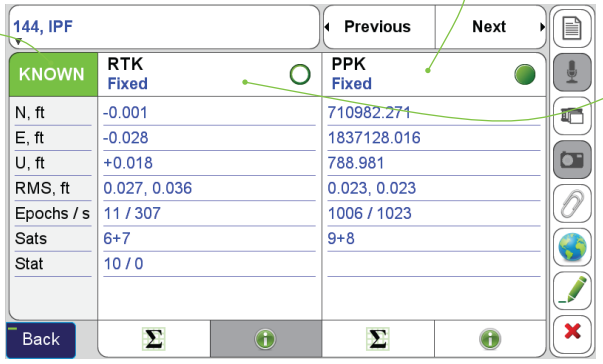
Base Type - This box is painted green when the current coordinate has the base reference from this type of coordinate. *KNOWN* indicates that the base was started from a known position. If the base station was started from an autonomous position this would be labeled *AUTO*. Tap this button to view the *ABS* coordinates (absolute coordinates, shown in the bottom screenshot).

Base Type - This box is painted red when the current coordinate down not have the base reference from this type of coordinate. *ABS* (absolute) coordinates indicate that the base station coordinates are reference from a *CORS* adjusted solution or from local control points when the *M-Local* coordinate is chosen. Tap this button to view the *AUTO/KNOWN* referenced coordinates.

RTK Solution with *BCP (Base CORS Processed)* Solution

Base-Rover Post-Processed with *BCP (Base CORS Processed)* Solution

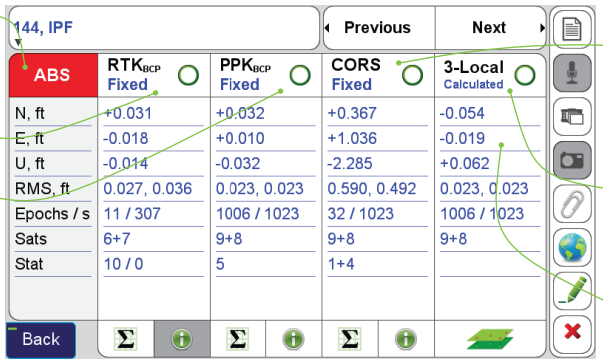
Base-Rover Post-Processed Solution with *KNOWN* Base (current coordinate in this screenshot)



RTK Solution with *KNOWN* Base, tap this box to set the current coordinate to this coordinate. You will be prompted with several options:

Yes, For All - This option select this coordinate type for all points with associated with this base station session.

Yes, For All (Auto RTK/PPK) - This option will use an algorithm to automatically select the best RTK or post-processed coordinate for all points with associated with this base station session.



CORS Post-Processed Solution

M-Local Solution - 3 pairs of coordinates used in this example. This solution is always M-Local base-RTK rover solution.

Tap this column to view the setup properties of the calculated *M-Local* for this point

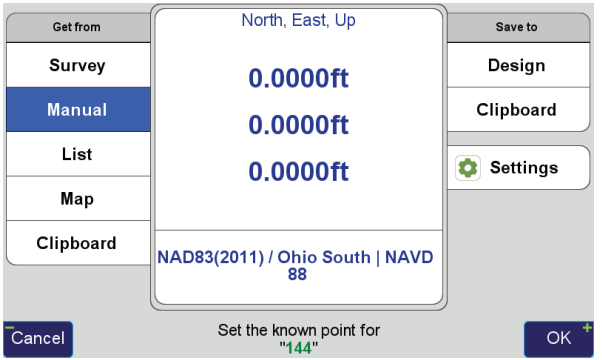
M-Local

M-Local coordinates shift the associated surveyed points with the same base station session to known coordinates. Some possible uses for *M-Local include:*

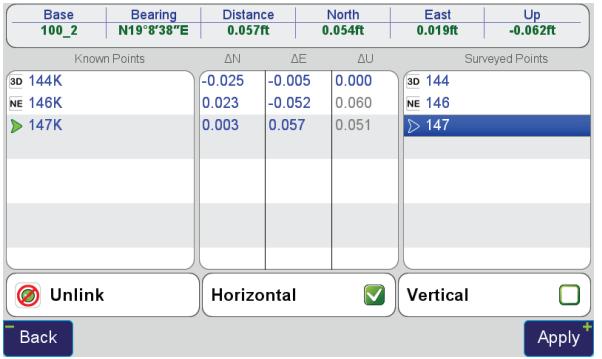
- Adjusting an autonomous base station to local control points
- Adjusting an autonomous base station to a postprocessed derived position such as OPUS
- Shifting base and rover coordinates to the averaged coordinate of multiple DPOS base station sessions

Adjusting an autonomous base station to local control points

Use the  button found in the *Processed Point Info* screen (see previous two pages) to add the current displayed point as a *M-Local* point. Once tapped, you be prompted to select or enter a coordinate. The translation from the displayed point (144 in this example) to the selected coordinate will be calculated. Multiple pairs of points can be added in *M-Local* to calculate a best fit translation; hence the term Multiple Local (0-Local has 0 pairs of points, 1-Local has 1 pair, 2-Local has 2, etc.).

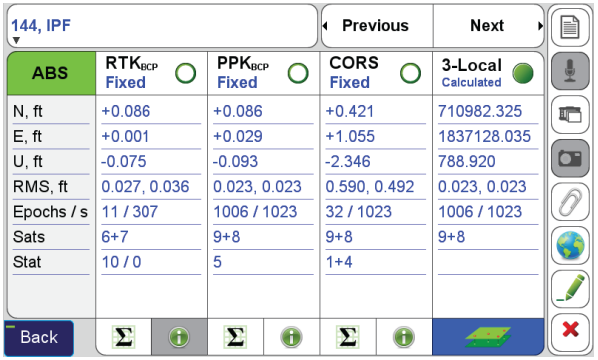


Add M-Local Point Screen - Prompted to select the known coordinate for point 144



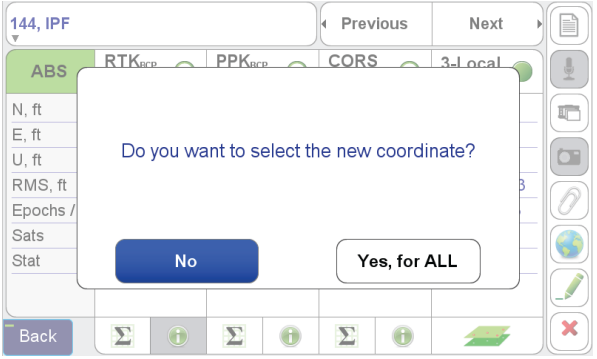
M-Local Screen - 3 pairs of points shown

The *M-Local* Screen displays the translation along the top row of the screen. Pairs of points can be used Horizontally, Vertically or only as check points. The residuals for each pair of points are shown in the middle of the screen. Be sure to press Apply to save the added points to M-Local and apply the adjustment to the associated base and rover coordinates.



Processed Point Info Screen - The M-Local coordinate is the current coordinate, 3 pairs of points exist in this *M-Local* setup

If the *M-Local* coordinate is not currently selected (radio button set to its column), select it for any point from this base station session to apply its translation to the selected point and all other associated points with the base station session.



Processed Point Info Screen - Prompt to apply the M-Local coordinates to all the associated base and rover coordinates

Adjusting an autonomous base station to a postprocessed derived position such as OPUS

View the base point in the *Processed Point Info* screen and press the  button. Then choose *Manual* and enter the OPUS coordinates. After pressing OK you will be prompted to enter a point name for the newly entered coordinates. Once satisfied with the results in the *M-Local* screen hit Apply to save and apply the adjustment.

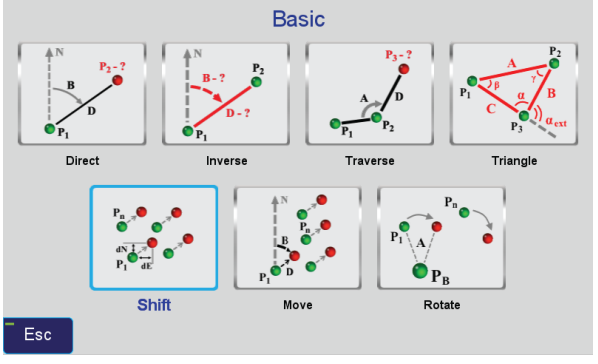
Alternatively, you could create a new design point with the known coordinates of the base station prior to entering the *M-Local* screen by tapping the  (Add) button found in the design side of *Points* list and entering the coordinates for the new point.

Shifting base and rover coordinates to the averaged coordinate of multiple DPOS base station sessions

First average the base station coordinates from multiple base sessions using the *CoGo Average* function. Next view each base station point and use the  button to setup the translations to the averaged coordinate for each base station point.

CoGo

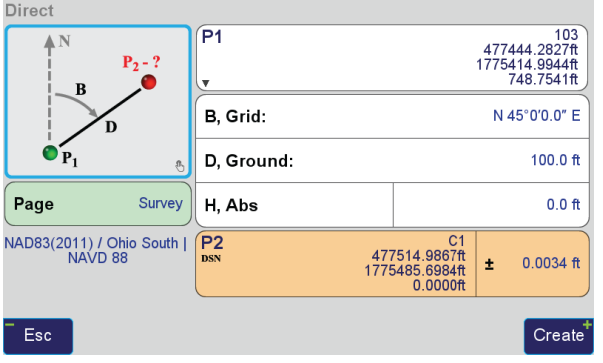
Most CoGo (Coordinate Geometry) functions in J-Field are rather self-explanatory after viewing their diagrams. *CoGo Direct*, *Inverse*, *Shift* and *Rotate* are found in the *Basic* group of CoGo functions that will be explained here.



CoGo Basic Functions

In all CoGo function diagrams, labels shown in black are inputs and labels shown in red are the resultant calculations. Input points are displayed in green and red points are resultant points created from the function.

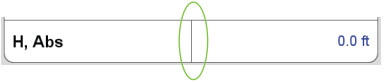
Direct



CoGo Direct

Direct calculates the coordinate of a new point (***P*** $_2$) given the coordinate of a known point (***P*** $_1$), bearing (***B***) and distance (***D***) from ***P*** $_1$.

Notice the vertical line in the white box shown between ***H,Abs*** and the input "0.0 ft":



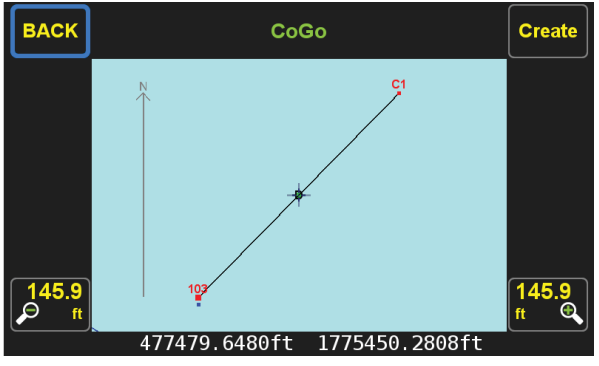
Clicking on the left side of this white box with ***H, Abs*** will toggle it to the other options of ***H, Slope*** and ***ΔH***

Clicking on the right side of this box will allow for the entry of the value. This functionally is similar in all CoGo menus when you see a white box separated with a vertical line in the middle.

The resultant point is shown in the orange box. Clicking on this box will allow you to edit the Name, Description and

Code of this point.

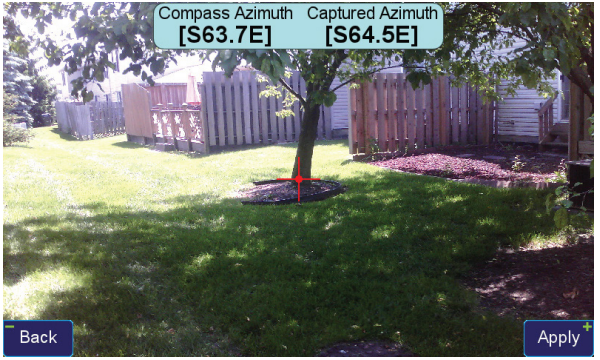
Once all the inputs have been entered you may tap the diagram to preview the results in the map. If satisfied, tap Create to create the resultant points.



Preview Screen of *Cogo Direct*

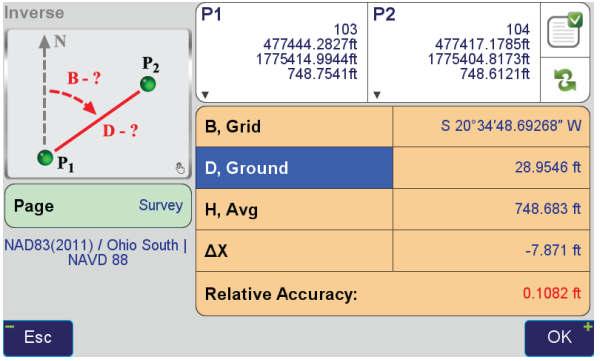
The *CoGo Direct* function can be used to calculate and store an offset point by using the internal compass and camera to determine the offset bearing. To determine the bearing to an object using the compass tap the Set by Compass button in the bearing entry screen. Align the cross-hair at the desired object and press the check hardware button to capture the azimuth and then tap *Apply*. Determine the offset distance to the desired object with a tape measure or laser distance meter. It is important to check and confirm the compass calibration is working properly before using this feature; recalibrate the compass when necessary. Occasionally, the camera screen may go blank or cause a crash of the system when using this feature or other features of J-Field that use the camera. This is a known problem with the current camera driver. If this happens, reboot the unit.

Hold the On/Off button down to power off the system if becomes unresponsive. The accuracy of this offset method is limited by the accuracy of the compass (typically +/- 2 degrees). To determine a much more accurate position from offsets, use the *CoGo Resection* function.



Set By Compass Screen - Determining the Position of a Tree

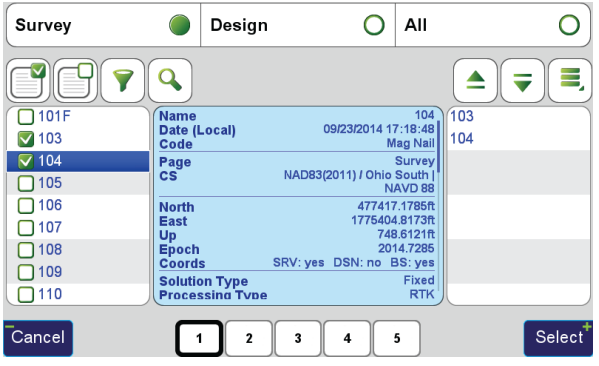
Inverse



CoGo Inverse - Ground distance is displayed, tap the **D** button to cycle through the other distance type

Inverse calculates the bearing (***B***) and distance (***D***) of a line between two known points (***P*** $_1$ & ***P*** $_2$).

The (multi-select) button can be used as a quicker method to select both ***P*** $_1$ & ***P*** $_2$ from the point's list.

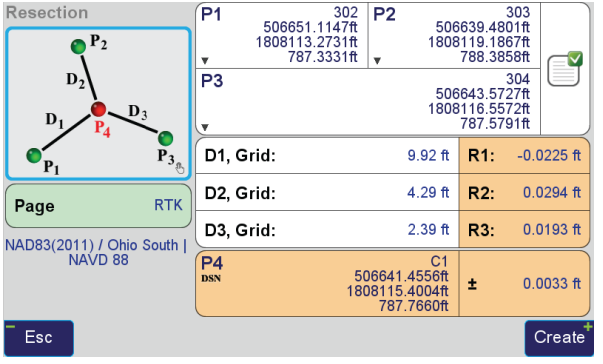


Multi-Select Screen - Selecting Points 103 and 104

P $_1$ & ***P*** $_2$ can also be entered directly from the keyboard by typing in the point names. To use this option, long click the ***P*** $_1$ & ***P*** $_2$ boxes (notice the small arrows in the bottom left corner of these boxes).

Press to switch the coordinates of ***P*** $_1$ & ***P*** $_2$. Clicking on the right side of output boxes such as ***B***, Grid copies the value of the box into the selected clipboard box.

Resection

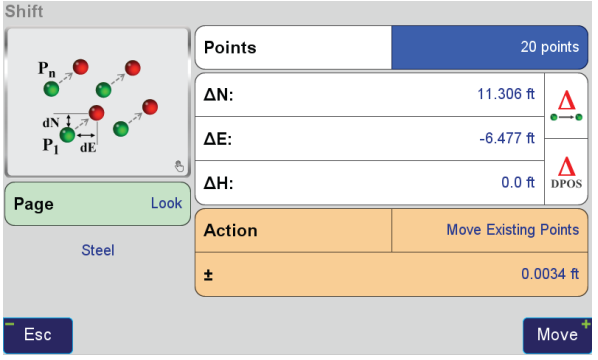


CoGo Resection

CoGo Resection is found in the *CoGo Intersections* menu and can be used to accurately locate an object that is difficult or impossible to survey directly by surveying 3 points around that object and measuring the 3 corresponding offset distances to it.

In the example shown above, an iron pin at the base of a tree was located by surveying 3 points around the tree. The offset distances of 9.92, 4.29 and 2.39 feet were measure with a tape measure. The small residuals indicate a good solution (R1, R2 & R3 are all less than 0.03').

Shift

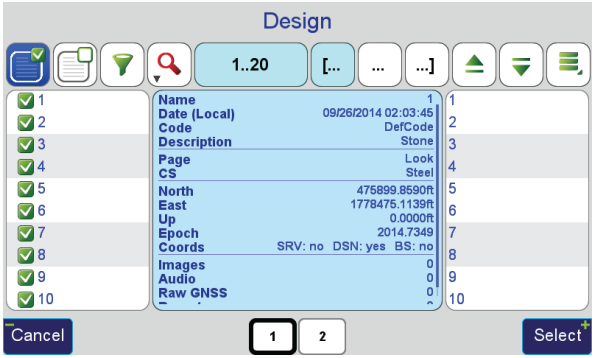


CoGo Shift

CoGo Shift and *Rotate* are useful for shifting and rotating design points to desired geodetic surveyed locations.

Upon opening the *Shift*, *Move* or *Rotate* functions you will be prompted two options: to *Create New Points* or *Move Existing Points*. The *Create New Points* would need to be chosen if the desire is to shift surveyed points. Surveyed coordinates are blocked as options to be shifted is the *Move Existing Points* option is selected. The *Create New Points* would typically only be desirable and applicable to use if some object needs to be physically relocated in the field and the new location needs to be calculated. To adjust surveyed coordinates from an autonomous base, *Real-Time Position Shift*, *DPOS* or *M-Shift* should be used.

The *Multi-Select* screen is used to select the points to be shifted. To select individual points in this screen, use the  (*Check Hardware*) button for easier selection of individual points.



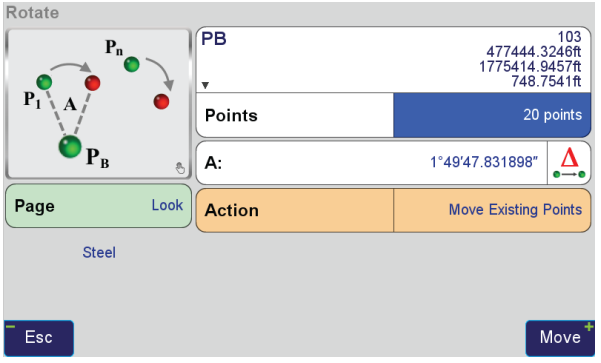
Multi-Select Screen - Selecting points 1 through 20, notice the filter used to filter the list to points 1 through 20, the select all button then is used to select all points

The  (*Delta*) button can be used to calculate the delta between two points, from the first selected point to the second selected point.

The  (*Delta DPOS*) button is used to recall the *DPOS* shift from a base station session. Use this feature to shift design points. (Automatic shifting of design points created from CoGo functions is planned to be implemented in a future version of J-Field.)

Tap the *Move* button once ready to shift the selected points.

Rotate



CoGo Rotate

CoGo Rotate is very similar to *CoGo Shift*. Here the Δ (*Delta*) button calculates the angle between the first selected points to the second selected point with the selected ***PB*** coordinate as the vertex.

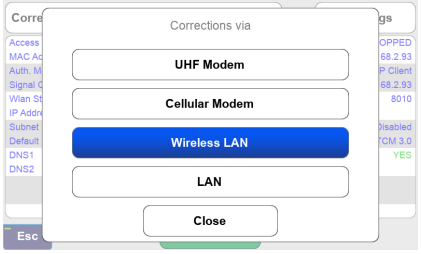
Appendix A: Creating a RTN Profile

Step 1

Click RTCM ROVER icon

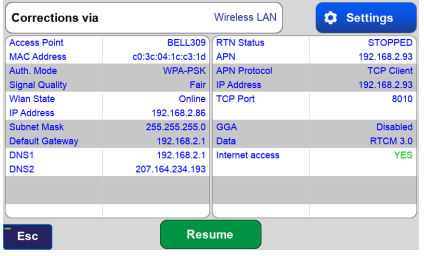
Step 2

Select correction channel



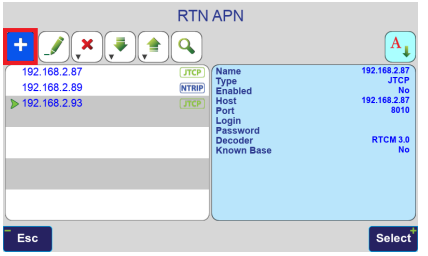
Step 3

Click Settings



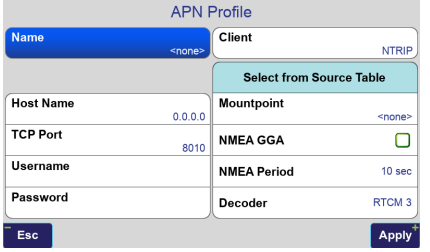
Step 4

Click plus for new RTN



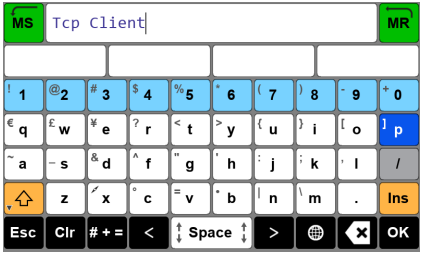
Step 5

Tap the Name



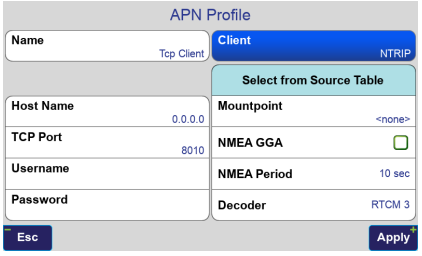
Step 6

Specify the name



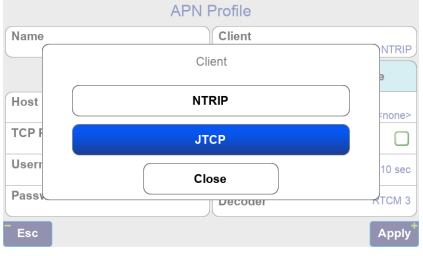
Step 7

Tap Client



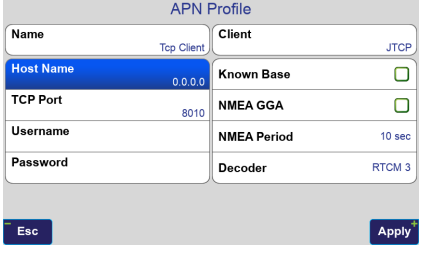
Step 8

Select JTCP



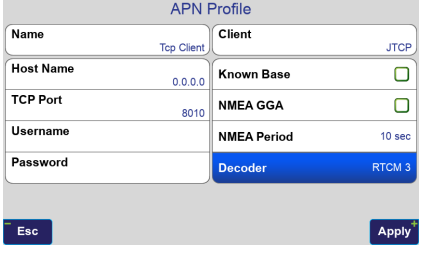
Step 9

Set Host Name, TCP Port, Username, Password



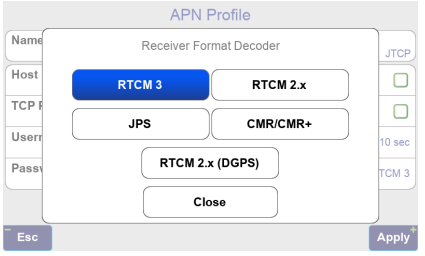
Step 10

Tap Decoder



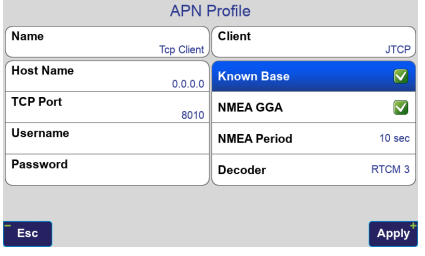
Step 11

Select the Receiver Format



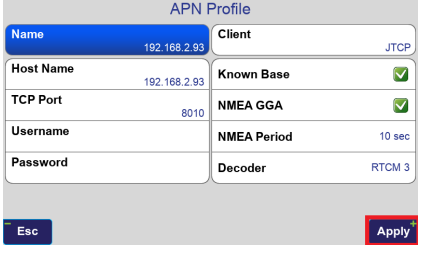
Step 12

Select NMEA GGA, Known Base if neccesary



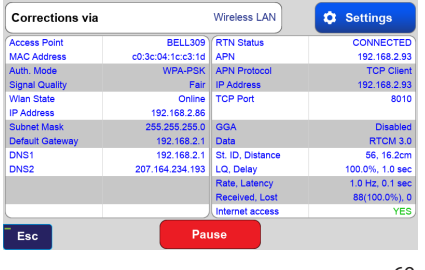
Step 13

Tap-Apply



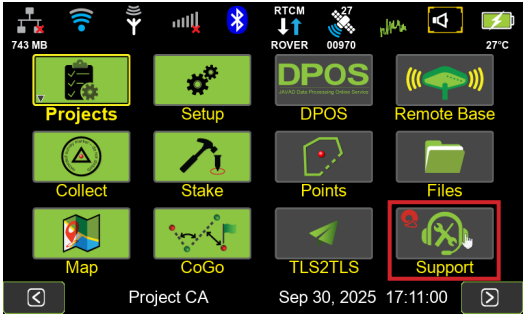
Step 14

Check connection status

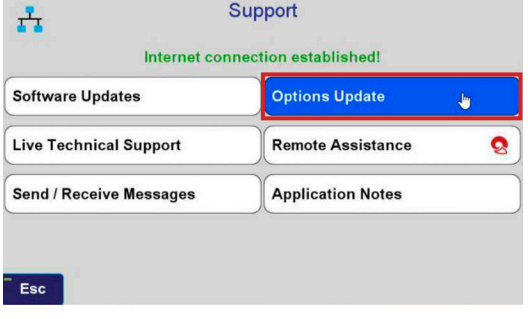


Appendix B: Updating the Options Authorization File (OAF)

To Update the TRIUMPH-LS Option Authorization File (OAF), click Support from the Home screen:

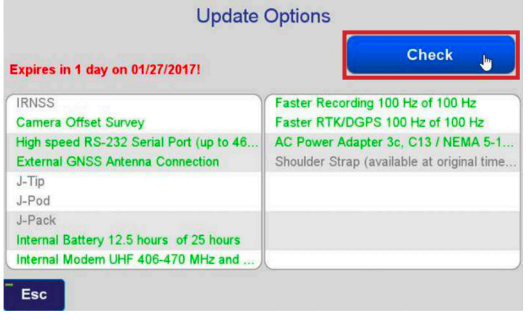


Click Options Update



If a temporary OAF is installed, the expiration date will be displayed.

Click Check to check for a new OAF is available on the server:



If a new OAF is available, click Update. The TRIUMPH-LS will install the new OAF and reboot.

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