



# **JAVAD ANDROID TOOLS FOR TRIUMPH-2**

## **Application notes**

**Version 1.0**

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# JAVAD ANDROID TOOLS FOR TRIUMPH-2

## 1. TRIUMPH-2 GNSS receiver

The TRIUMPH-2 receiver brings rugged, scalable, affordable, best-in-class GNSS performance to every application. TRIUMPH-2 is based on our TRIUMPH technology implemented in our TRIUMPH Chip.

TRIUMPH-2 GNSS receiver is precise surveying equipment with 216 channel L1+L2 GPS/GLONASS board, up to 2GB internal memory, integrated antenna and WiFi and Bluetooth communication and internal battery.



**Figure 1. TRIUMPH-2 receiver**

Using its internal Bluetooth and WiFi connection the receiver can access local GNSS Reference Station Network. In addition to post-processed DGPS capabilities, the TRIUMPH-2 utilizes external correction services for real-time DGPS mapping and navigation applications.

TRIUMPH-2 is fully equipped for post-processing survey. You can perform the survey tasks in several ways: using TriPad buttons on its cover or to use surveying software on iPhone/iPad or Android-based smart phones or use web-based software.

## 1.1. Setting up on tripod or pole

To start survey TRIUMPH-2 should be set up on a tripod or in a pole. The bottom 1/4-20" thread connector allows mounting TRIUMPH-2 on the monopode, install 1/4-20" to 5/8-11" adapter (included to the standard kit) to mount TRIUMPH-2 on the pole.



**Figure 2. TRIUMPH-2 with adapter attached**

There are two antenna IDs in the software - with and without the adapter. You don't have to sum the adapter height when computing vertical antenna height. ARP point for the receiver is located on the bottom of the adapter attached to the receiver. For slant height measure use the edge of the cover on the long side of the receiver marked with triangle. In this case doesn't matter which antenna is selected.

## 1.2. Post-processing survey

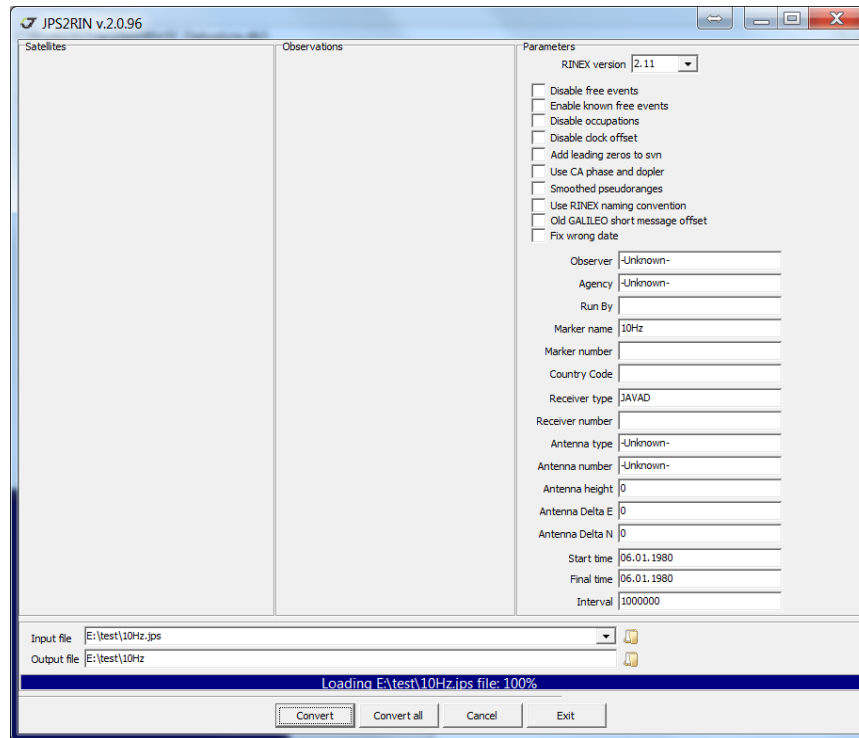
There are several different field techniques for GPS surveying using carrier frequency. These techniques could be used singly or in combination in some surveying projects. The mode used depends on accuracy needed, sky visibility in the project area, base line distance (distance between receivers) and other considerations such as mode of transportation, urgency of the project, etc. Following are the techniques that are commonly used now:

- Post-processing Static
- Post-processing Fast Static (Rapid Static)
- Post-processing Kinematic
- Post-processing Stop-and-Go
- Real Time Kinematic

OPUS server can process only Static and Rapid Static files. To process other types of post-processing surveys use JAVAD Justin software.

## 1.3. OPUS Processing

OPUS is on-line server that can process your raw-data file and compute precise coordinate in national system. To process the data using OPUS you can convert raw jps files to Rinex o-files. Use for this the jps2rin converter (Figure 3). It produces Rinex O and N files from a JPS file .



**Figure 3. JPS2RIN Converter**

To start use OPUS follow the link <http://www.ngs.noaa.gov/OPUS/> using any browser, select the Rinex O-file, set antenna ID, enter your contact e-mail and click *Send data* (Figure 4).

## JAVAD Android Tools for Triumph-2

### TRIUMPH-2 GNSS receiver

**OPUS: Online Positioning User Service**  
National Geodetic Survey

NGS Home | About NGS | Data & Imagery | Tools | Surveys | Science & Education

**OPUS Menu**  
Upload  
about OPUS  
projects  
shared solutions  
contact OPUS

**OPUS upgraded to v.2.3**  
option > **PROJECTS** is operational, option > **SHARE** replaces PUBLISH, & misc. bugs fixed. Enjoy, and **please report any issues**.

**Upload your data file.**  
Solve your GPS position & tie it to the National Spatial Reference System. **What is OPUS?** **FAQs**

Choose File | SanJose1H.rinex.140  
\* **data file** of dual-frequency GPS observations. **sample**

JAV\_TRIUMPH-1R NONE Integrated GPS L1/L2/L2C/L5, GLONASS L1/ **antenna** - choosing wrong may degrade your accuracy.

1.250 meters above your mark.  
**antenna height** of your antenna's reference point.

\* **email address** - your solution will be sent here.

Options to **customize** your solution.

Upload to Rapid-Static for data 15 min. - 2 hrs. | Upload to Static for data 2 hrs. - 48 hrs.

\* required fields  
We may use your data for internal evaluations of OPUS use, accuracy, or related research.

**Figure 4. OPUS web site**

Note that OPUS can handle files the next day only because ephemerides and observations from base station should be collected. Otherwise the warning appears.



## 2. Android software

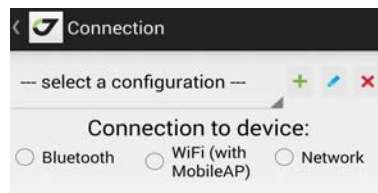
### 2.1. Purpose

JAVAD Android Tools is a set of applications designed to connect to JAVAD GNSS receivers, process the data collection for post-processing (Statis, Trajectory, Stop&Go), setup RTK Base and Rover and process the RTK surveying.

### 2.2. Connection to TRIUMPH-2

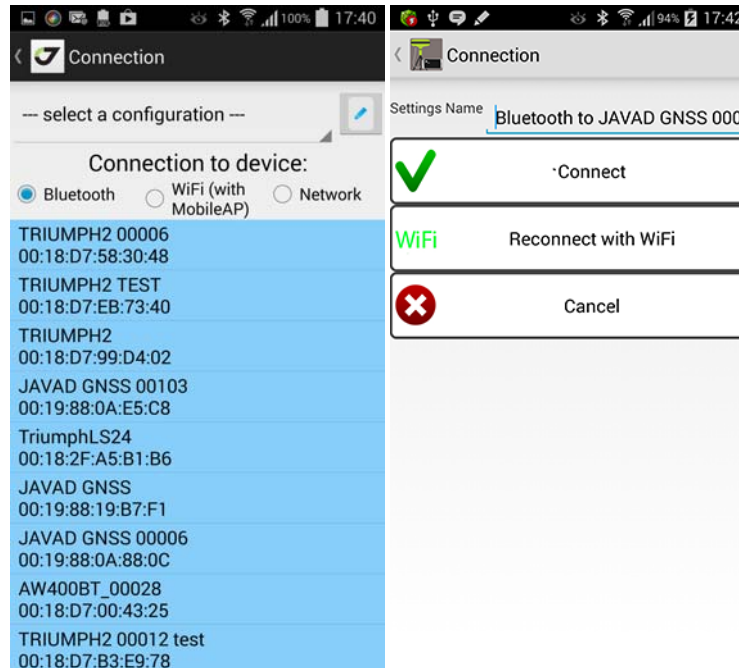
Run JAVAD Post.Proc for Android application (available at Google Play) and select the preferred connection type on the first page. Android-based devices can be connected to TRIUMPH-2 using (Figure 5):

- Bluetooth direct connection;
- WiFi (mobile access point)
- Ethernet (remote connection).



**Figure 5. Connection**

If **Bluetooth connection** is selected, the application starts searching for available devices. Select TRIUMPH-2 in the blue list (Figure 6).



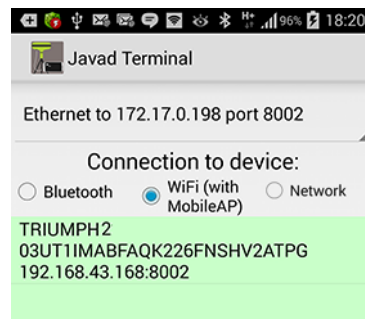
**Figure 6. Bluetooth connection to TRIUMPH-2**

BluetoothPIN-code will be required. After the pairing TRIUMPH-2 will be always in this list (till manual disconnection) without new search.

If **WiFi connection** is selected, configure your Android device as Mobile Access Point (aka HotSpot).

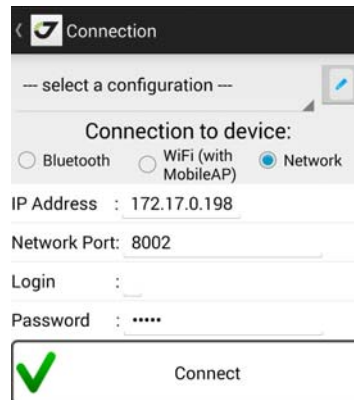
**Note:** This procedure may differ depending on device.

Connect to TRIUMPH-2 initially using Bluetooth and then tap Reconnect to WiFi button. Select WiFi (with MobileAP) radio button in Connection and your device will try to find TRIUMPH-2 connected via WiFi. After that you can connect to TRIUMPH-2 by selecting it from the green list (Figure 7). Login and password to access TRIUMPH-2 will be required.



**Figure 7. WiFi connection**

**Ethernet connection** requests manual IP address, port, and login/password setup. Tap *Connect*. (Figure 8) You can save all settings to profile. Next time you need to select the profile from list of profiles.



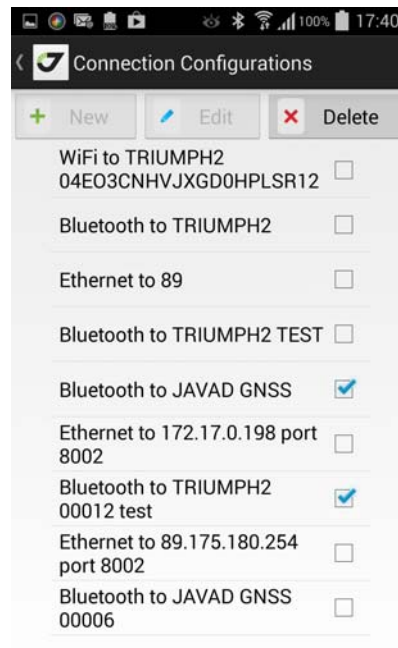
**Figure 8. Ethernet connection**

**Note:** Each connection will be stored as a connection profile. List of connection profiles are in the top of the connection screen. Select the needed profile to start connection.

## 2.3. Connection Configurations

Every time you select/setup connection with receiver it is stored as a connection configuration. You don't have to type all the values of wait till device will be found. Select the configuration from the drop-down menu and the connection will be initiated.

You can manage the connection configuration list with *Edit* button. Connection configuration screen appears (Figure 9). The redundant connections can be renamed or deleted.



**Figure 9. Connection configurations**

## 2.4. Main Screen

Application main screen (Figure 10) includes several icons you can use to start corresponding action. T



**Figure 10. Main screen**

- *Survey* – configure receiver to do post-processing survey and RTK survey;
- *RTK Base* – configure and start RTK base;
- *Pair Modem* – pair external HPTxxxBT modem with Bluetooth (it works only if the modem is not paired yet);
- *File Manager* – handle receiver files;
- *JPS2Rinex* – convert JPS files to Rinex;

- *Terminal* – send low level commands to receiver and read answers.

There is the status bar on the top of the screen. There are 7 icons there (Figure 10):

- Solution type and accuracy. Color of the circle shows solution type;
- PDOP and its numerical value;
- Number of satellites and connection status;
- Radio link quality and delay time;
- Correction source status;
- Recording of raw data – the circle color shows remain receiver's memory. The numerical value is shown below. When recording is on the circle is flashing.
- Battery status.

## **2.5. Data collection**

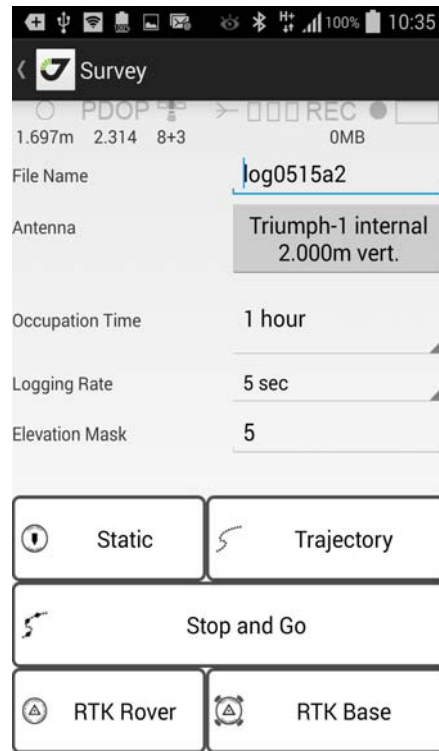
Data connection is performed in Survey screen. Set the following surveying parameters:

- Receiver file name;
- Antenna ID
- Antenna Height
- Occupation Time
- Logging Rate
- Elevation Mask

## JAVAD Android Tools for Triumph-2

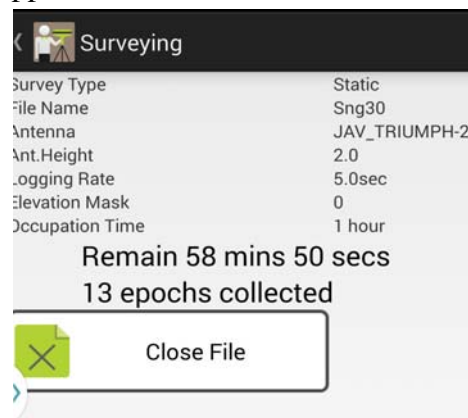
Android software

Tap *Static*, *Trajectory* or *Stop and Go* button to start the post-processing survey (Figure 11). Tap *RTK Rover* button to start RTK survey.



**Figure 11. Start Survey**

Surveying will start. Next screen appears with remain time and number of collected epochs (Figure 12).

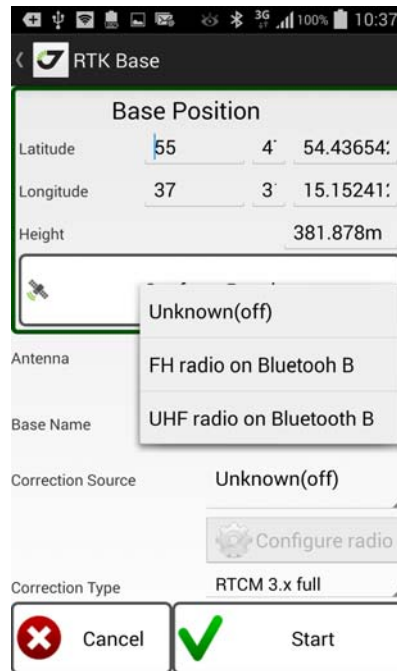


**Figure 12. Surveying in progress**

The screen will close automatically and return to the previous. Also you can tap *Close File* button at any time to stop the survey manually.

## 2.6. Start RTK Base

To configure and start your receiver as RTK base, select RTK Base icon. The following screen appears (Figure 13):



**Figure 13. RTK Base**

Here can be entered the base position, antenna height and correction type. Correction source for base can be either FH radio or UHF radio connected via Bluetooth for TRIUMPH-2 receiver. For TRIUMPH-1 receiver you can select among FH and UHF radio connected to Bluetooth (dev/blt/b), serial (dev/ser/b) or internal radio.

Use the *Configure* button to configure radio connected to the receiver. Bluetooth radio should be already paired and connected at the moment of configuration.

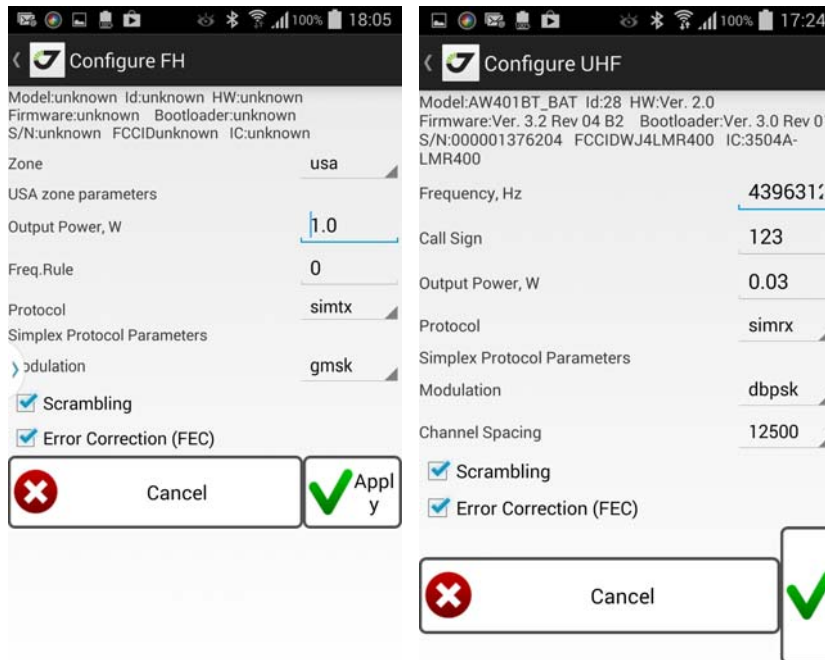
## Radio configuration

Select *FH radio on Bluetooth B* or *UHF radio on Bluetooth B* as Correction Source. Use *Configure FH* and *Configure UHF* buttons correspondingly to configure your FH or UHF radio.

For FH radio (Figure 14) set working zone (USA or Europe), radio output power, frequency rule (from 0 to 9). Also you can define parameters for “simtx” protocol:

- modulation;
- scrambling;

- error corrections.



**Figure 14. FH and UHF radio configurations**

For UHF radio (Figure 14) set frequency, Call Sign, output Power and set “simtx” protocol with its parameters:

- modulation
- channel spacing
- forward error corrections
- scrambling.

Tap *Apply* button to save the settings.

## 2.7. RTK Survey

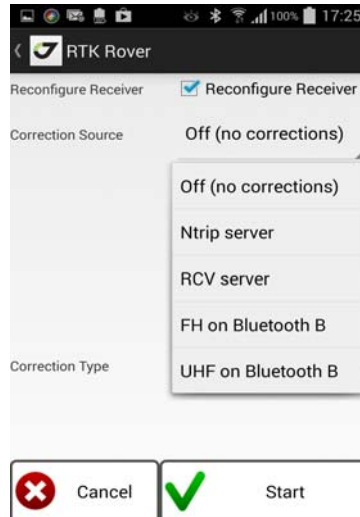
This approach involves using at least one stationary reference receiver and at least one moving receiver called a rover. RTK procedures do not require post processing of the data to obtain a position solution. A radio at the reference receiver broadcasts the position of the reference position to the roving receivers. This allows for real-time surveying in the field and allows the surveyor to check the quality of the measurements without having to process the data.

VRS networks (NTRIP network base stations) can be used to work with one rover receiver only. The rover receives correction from such services with 3G/Internet.

You can use external FH or UHF radio connected via Bluetooth to your device as correction source. Alternatively you can use your Android device as Mobile Access Point to provide Internet connection to your Triumph-2 device and use NTRIP or RCV server connection as correction source. In this case your receiver should be connected via WiFi.

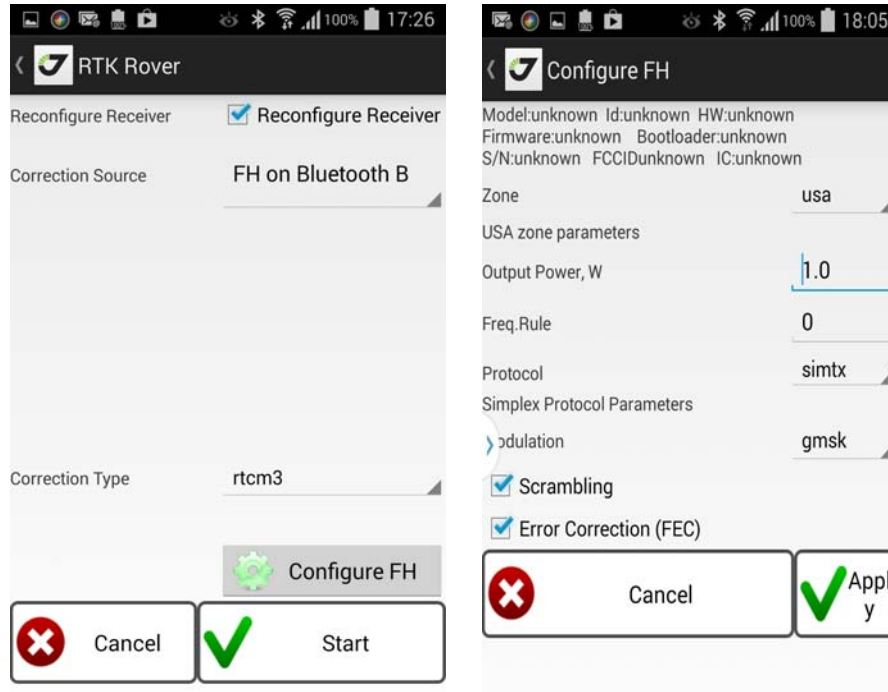


There is *Reconfigure receiver* check mark (Figure 15). If disabled your device will be not reconfigured. You don't have to configure it every time till correction setting changed. With your equipment you can do RTK survey. Tap *RTK Rover* button and RTK Rover screen appears (Figure 15):



**Figure 15. RTK Rover settings**

Select *FH on Bluetooth* or *UHF on Bluetooth*, then *Configure FH* or *Configure UHF* to configure the appropriate radio (Figure 16).



**Figure 16. FH radio configuration**

Select NTRIP or RCV server (see Figure 15) and set all its parameters. For NTRIP:

- IP Address or URL

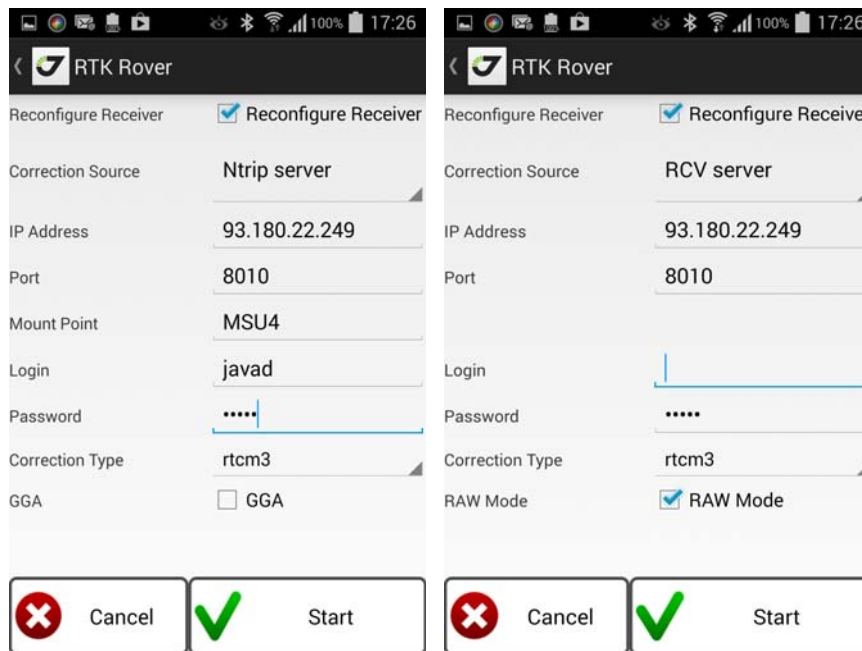
## JAVAD Android Tools for Triumph-2

Android software

- Network port;
- Mount point;
- Login;
- Password;

For RCV:

- IP Address or URL;
- Network port;
- Login (a,b,c,d,e or remain empty)
- Password;
- Raw mode.



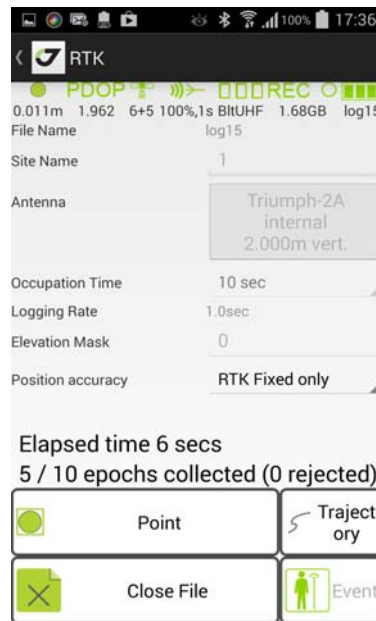
**Figure 17. NTRIP and RCV server settings**

Tap *Start* to continue.

At the next screen select the point or trajectory. Tapping *Point* button you will start point survey. Tapping *Point* button once more finishes the point survey. If the occupation time is set the survey will finish automatically after requested number of epochs reached. You can limit epochs with *Position accuracy* (Figure 18):

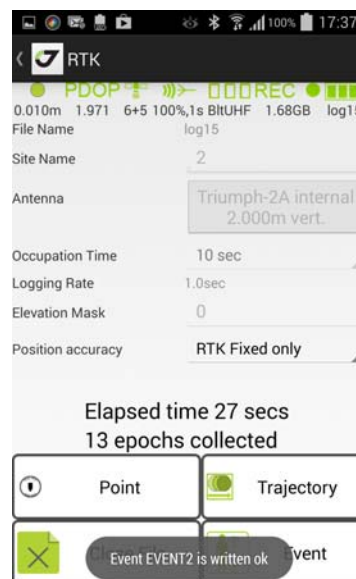
- All Epochs;
- DGPS, Float and Fix;

- RTK Fixed only.



**Figure 18. Point survey settings**

Tapping *Trajectory* button you will start the trajectory survey. If the point survey is currently in progress it will be finished. The same is with trajectory survey when point survey is selected. Tapping *Trajectory* button again finishes the survey. During trajectory survey you can use *Event* button to mark quickly an object without interruption of the trajectory surveying.



**Figure 19. Trajectory survey settings**

After the job is finished, the surveyed data will be on your Android device in folder javad/jobs/YYYYMMDD in points.txt file. The information about RTK bases will be stored in bases.txt file in the same folder.

Please note WGS84 coordinates are available for RTK surveying and for RTK base start only.

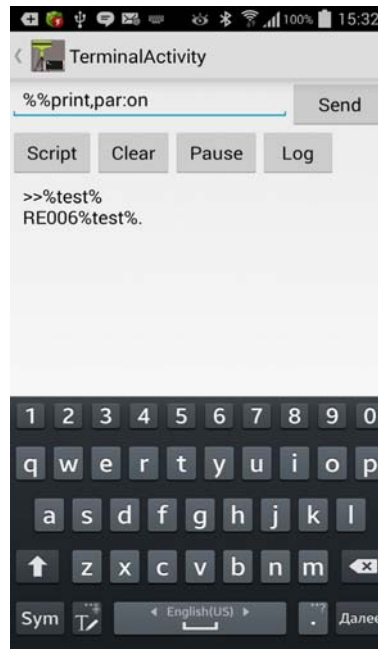


```
points.txt
ugol2,Fix,55.785107198679455,37.53799724644
354,170.32333074938506,,JAV_TRIUMPH-1R
NONE,1.52,2014-05-30 11:05:21,2014-05-30
11:05:31,1
ugol3,Fix,55.784499267927046,37.53777585245
726,168.8908388229087,,JAV_TRIUMPH-1R
NONE,2.0,2014-05-30 11:09:09,2014-05-30
11:09:19,1
ugol3.2c152,Fix,55.784499267927046,37.53777
585245726,168.8908388229087,,JAV_TRIUMPH-
1R NONE,1.52,2014-05-30 11:09:09,2014-05-30
11:09:19,1
ugol3.2c170,Fix,55.784499551476664,37.53777
002782074,168.88582570885774,,JAV_TRIUM
PH-1R NONE,1.7,2014-05-30
11:13:33,2014-05-30 11:13:44,1
p1.c170,Fix,55.784499551476664,37.537776002
782074,168.88582570885774,,JAV_TRIUMPH-1
R NONE,1.7,2014-05-30 11:13:33,2014-05-30
11:13:44,1
1,Std,55.79848371714153,37.520854180927294
,378.63896268892915,,JAV_TRIUMPH-1R
NONE,1.7,2014-05-30 13:34:42,2014-05-30
13:34:53,0
2,Std,55.79848371714153,37.520854180927294
,378.63896268892915,,JAV_TRIUMPH-1R
NONE,1.7,2014-05-30 13:34:42,2014-05-30
13:34:53,0
3,Std,55.79848371714153,37.520854180927294
,378.63896268892915,,JAV_TRIUMPH-1R
```

**Figure 20. Pnts.txt file**

## 2.8. Additional configuration

You can configure your receiver with GREIS command using Terminal screen. There you can type commands manually, run scripts and log interaction with receiver to files.



**Figure 21. Terminal**

## 2.9. Downloading raw data from TRIUMPH-2

The raw data can be downloaded from TRIUMPH-2 with *File Manager*. There are two buttons: *Delete* and *Download*. Check the needed file(s) and tap *Download*, to download it from receiver to your Android

device, or tap *Delete* to delete the file(s). Refresh button updates the file list. To specify the path to the folder to store the files, tap “...” button (Figure 22):

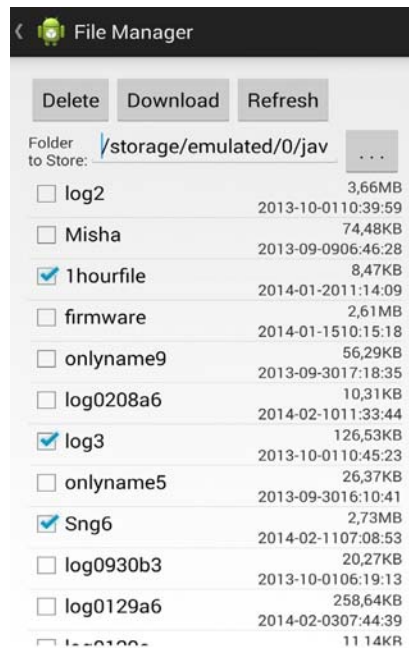


Figure 22. File Manager

## 2.10. Sending files to OPUS

You can use standard Internet browser in your device to sent \*.jps files to OPUS. RINEX files can be send for processing as well. To convert the \*.jps file to RINEX, select it, set required parameters of conversion and tap *Convert* button (Figure 23). RINEX file(s) will be stored in the same folder as initial \*.jps file(s).

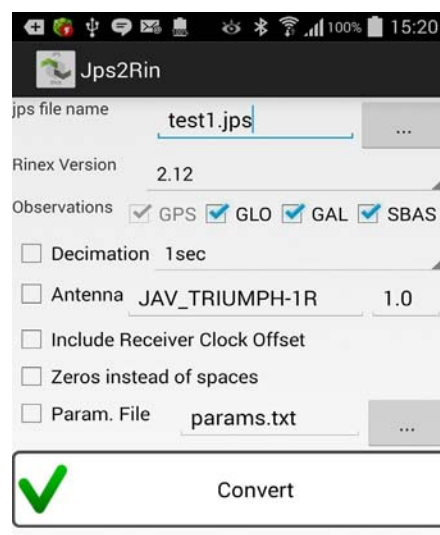


Figure 23. JPS2RIN converter

## 2.11. OPUS Processing

For working with NGS OPUS server you can use standard web-browser on your Android device. Follow the on-screen instructions to upload your data file to the system. Select the antenna, specify antenna height. The solution will be sent to specified e-mail address (Figure 24).



**Figure 24. OPUS web site**

## 2.12. Export data to desktop

To export data to desktop, connect your Android device to your PC and copy the files. Alternatively you can use cloudbased solutions like DropBox, OneDrive or e-mail.



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