



AEMP-14 + EMLID RTK GPS SYSTEM (ROVER & BASE STATION)

PUTTING IT ALL TOGETHER

BY LANDVISER LLC – HOUSTON, TX (2018)

EQUIPMENT PURCHASED

- AEMP-14 package:
 - ✓ AEMP-14 electromagnetic scanner (two pieces of transmitter and receiver in backpack)
 - ✓ Rigged Field Tablet (Android OS 4.4)
 - ✓ isystemXX.ini file specific to your AEMP unit is provided on USB and already loaded on your tablet in QZOND App



- Two RTK-GPS antenna units (interchangeable use as Rover or Base)
Complimentarily – tripod and rover pole setup

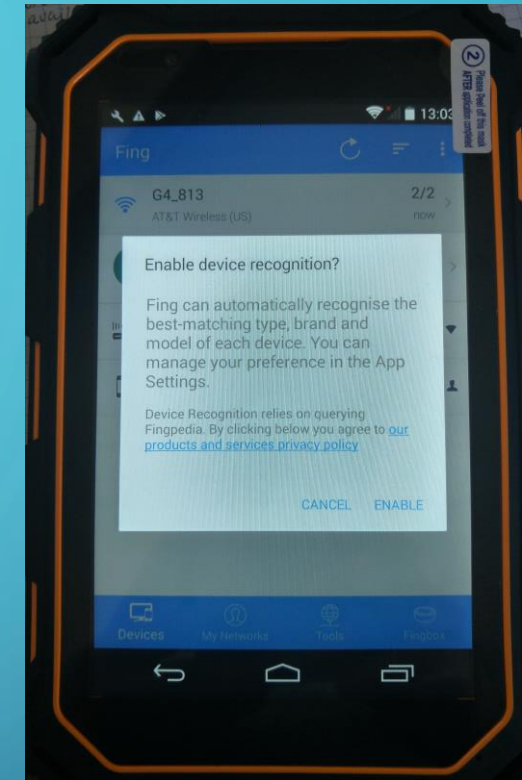
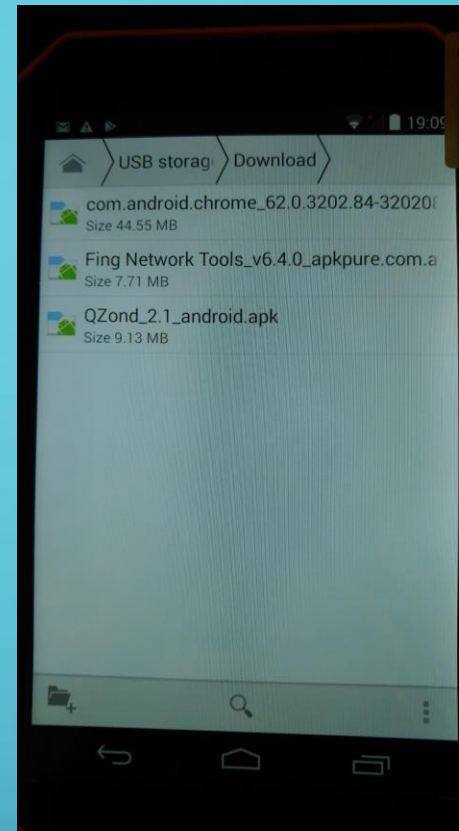


CLIENT'S STANDARD EQUIPMENT

- PC computer
- Router with working WiFi network connected to Internet
- Mobile phone (preferably Android) with FING installed
- If you received all the equipment as a set from us, go directly to slide 23 to start field work. This whole presentation is for your reference only if in the future you would like to pair equipment with different phone/tablet, carry out updates to RTK GPS units or some settings inadvertently were messed up.

PRELIMINARY STEPS

- Write down your WIFI network name, password and type (WPA2-PSK usually)
- Have Google browser (preferred) and FING apps installed on your cell phone



Download APKs and install on provided tablet (if you have purchased whole set from Landviser, all the apps would be already installed on the tablet):

QZOND: <https://drive.google.com/file/d/1OxBS0I5jxuOERdljfhSLdJasAeSEiqDc/view?usp=sharing>

Google Chrome: https://drive.google.com/open?id=1_aR5A8z6nihCn9PM4y-TY7A38OrRFdPe

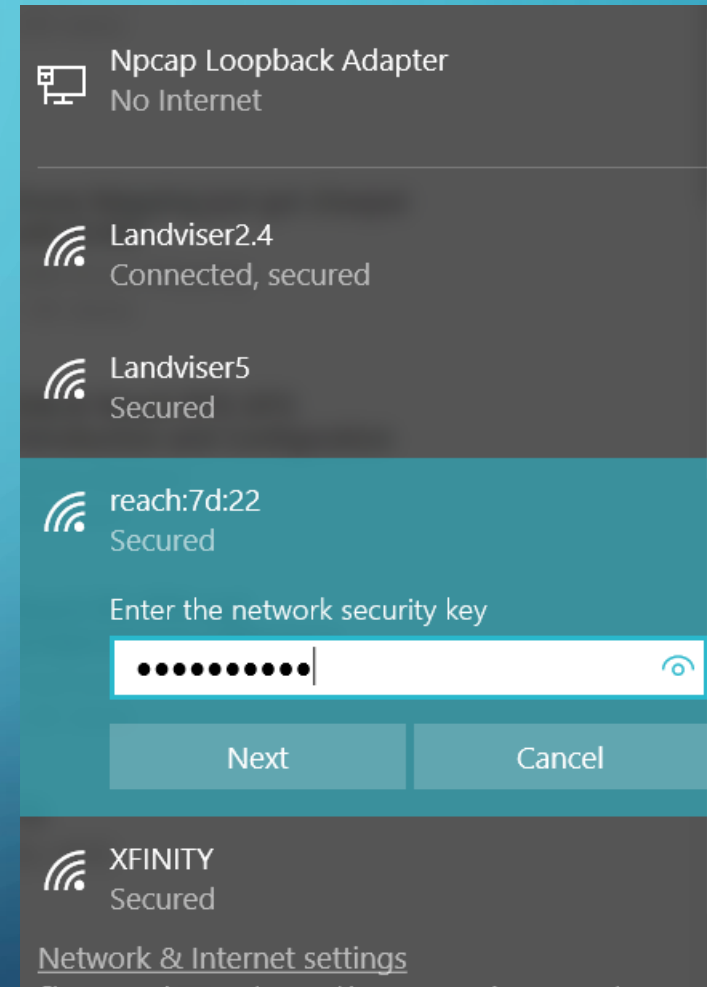
FING: <https://drive.google.com/open?id=13zsWAbzWyf-nADULF7R6AXCg9NUshBk4>

UPDATING RTK GPS

- Refer to the steps and video on web-page
<https://docs.emlid.com/reachrs/quickstart/#intro>
- I used laptop to connect to Home WiFi and update Reach + FING on Android phone (new version of iOS prohibit FING to show IPs) to detect IP addresses of Reach Base and Rover for software updates and pre-field work setup.

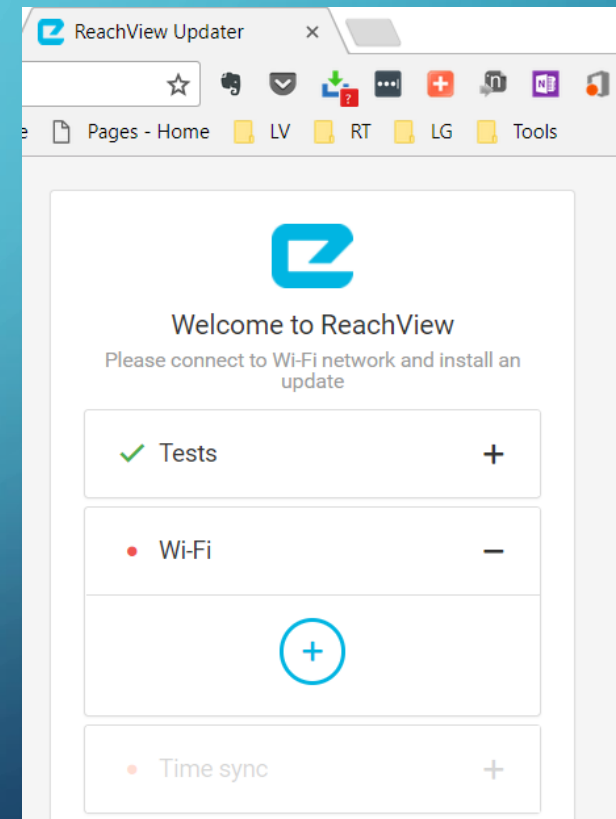
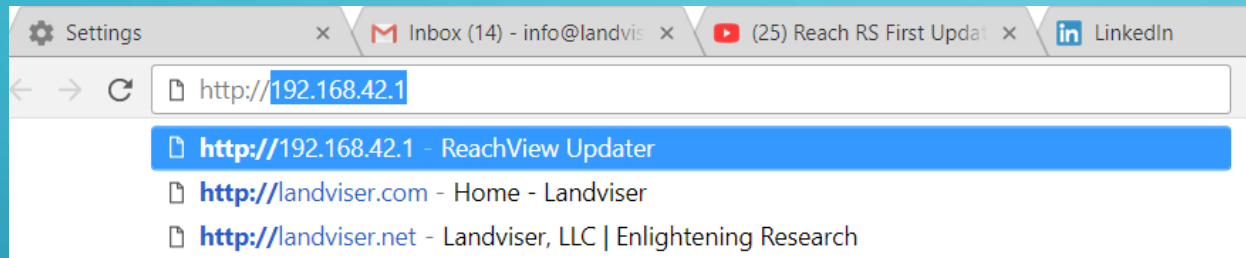
UPDATE STEPS (USUALLY DONE INSIDE)

1. Turn on one Reach unit and connect to it
(see new device available in WiFi section
in the righthand corner of your PC
 - Password “emlidreach”



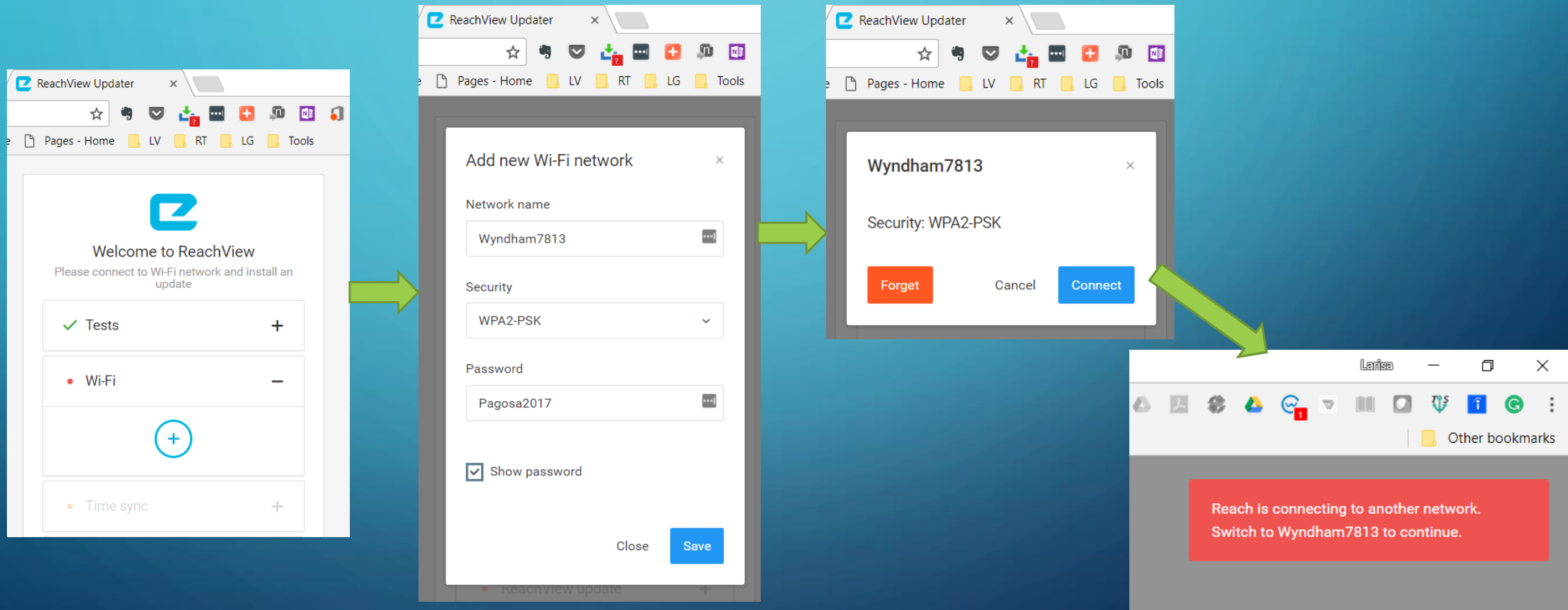
UPDATE STEPS (USUALLY DONE INSIDE)

2. Open Chrome browser on PC and type in IP <http://192.168.42.1> – it will load ReachView/Updater App



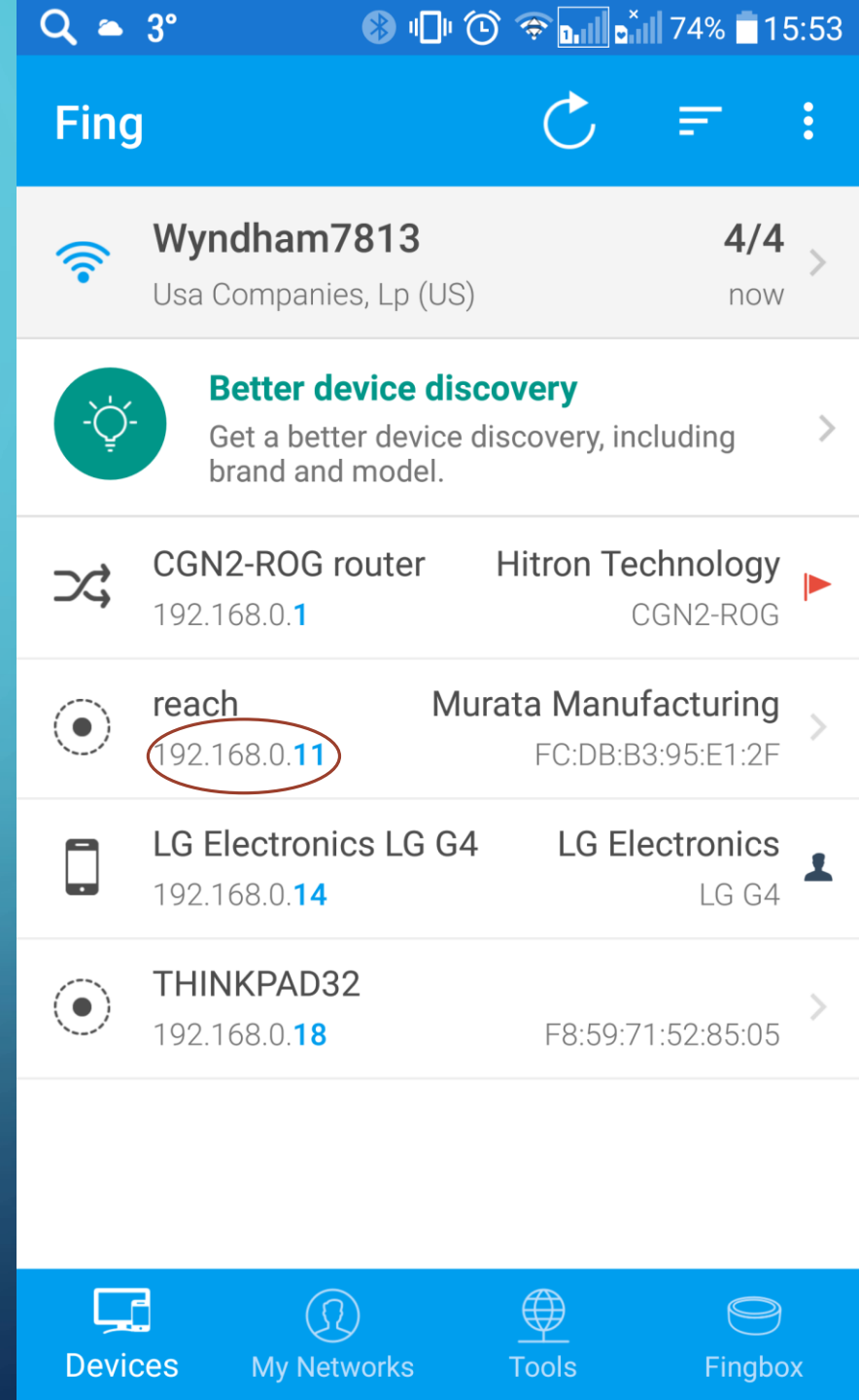
UPDATE STEPS (USUALLY DONE INSIDE)

3. Go to WiFi setup tab in ReachView App and type in your WiFi network credentials to add and connect to the WiFi with internet access



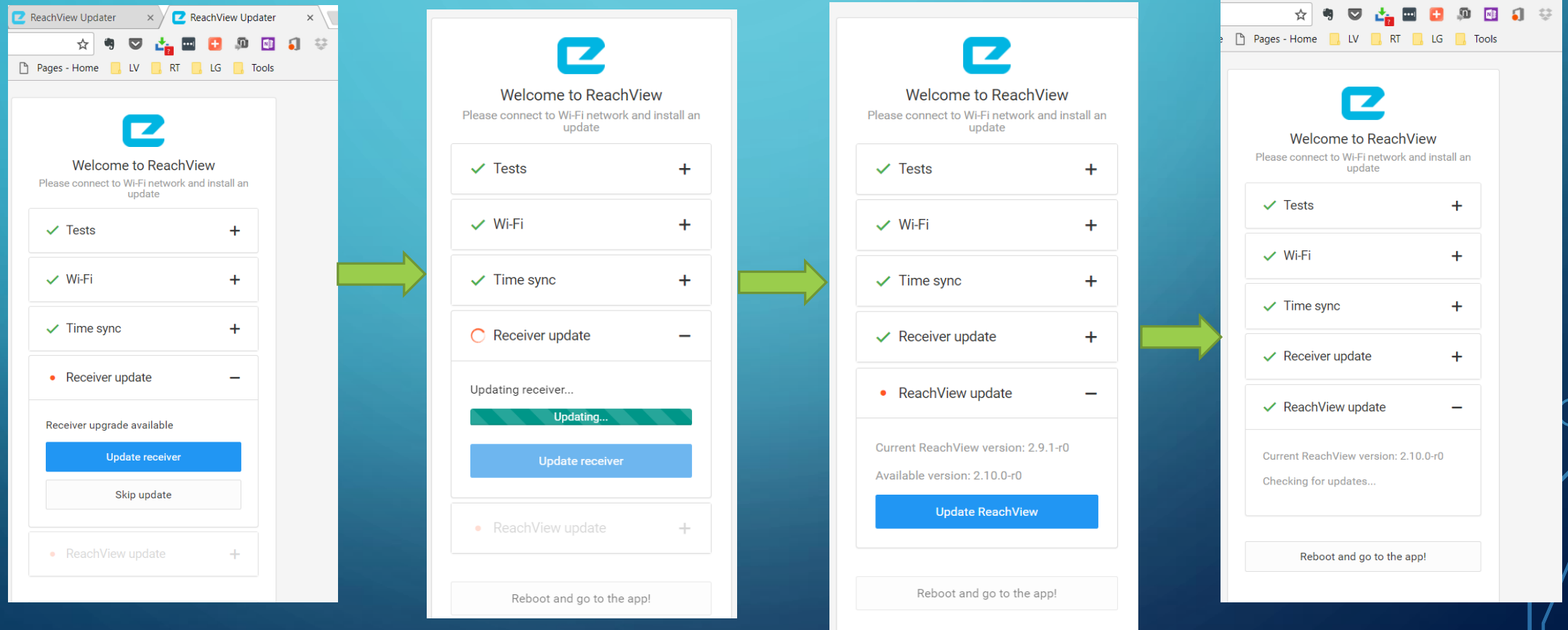
UPDATE STEPS (USUALLY DONE INSIDE)

4. On you phone (make sure it is connected to the same Home WiFi) load FING and see new device (reach /Generic/Murata manufacturer) and write down it's IP address



UPDATE STEPS (USUALLY DONE INSIDE)

5. On PC open another tab in the browser and type IP for Reach assigned to it by your WiFi router (every unit would get assigned different IPs which would be stable in the same network).

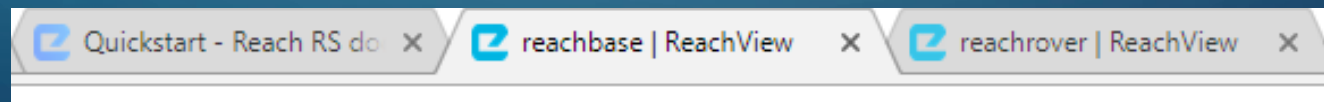


At the end click “reboot and go to the app!”. Wait a few minutes.

CONNECTING BASE/ROVER PAIR OVER LORA (INSIDE => OUTSIDE)

The following steps can be done on laptop or directly on the tablet you would be using with AEMP-14 in the field.

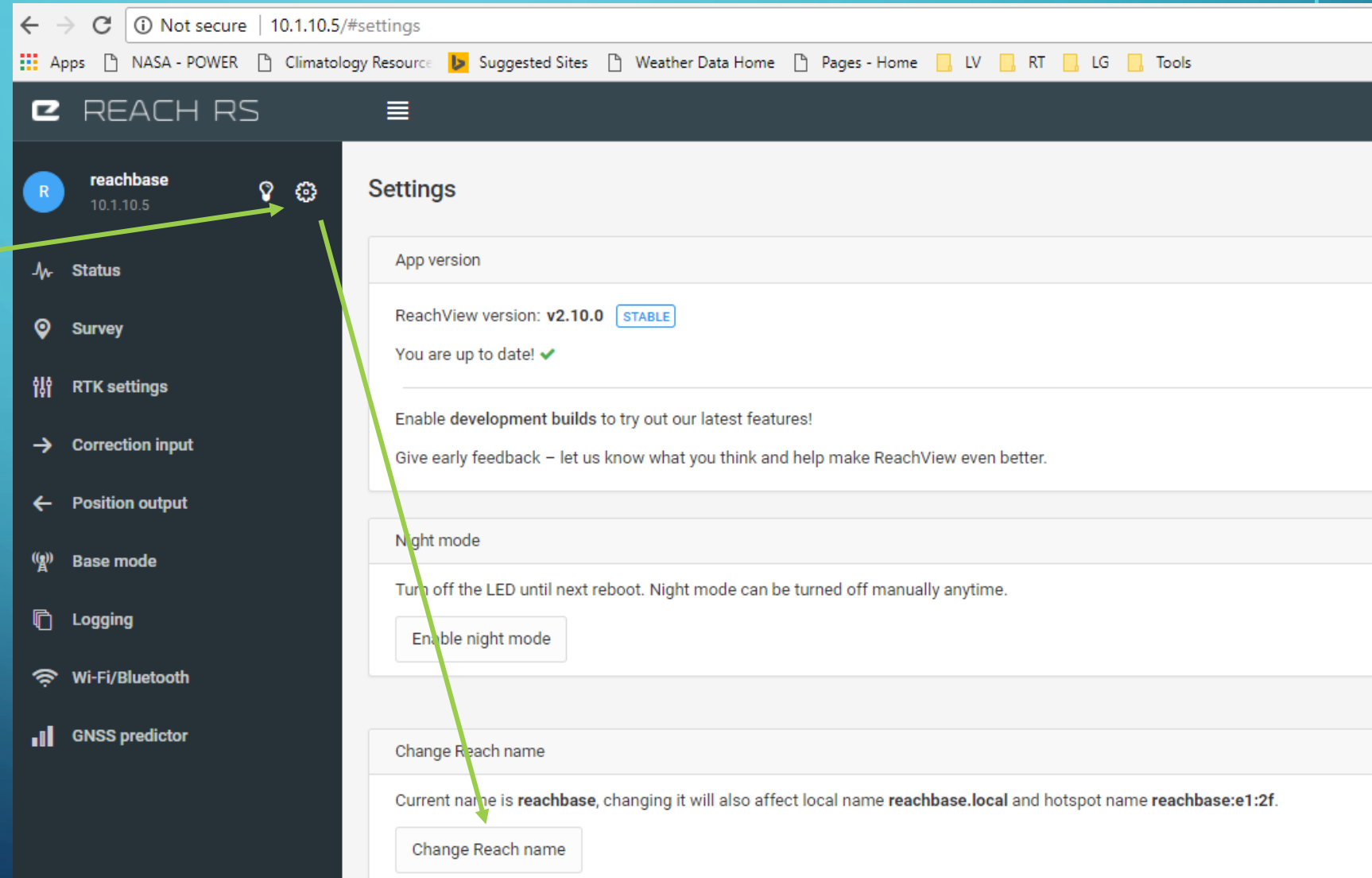
- Now pick a unit as rover, and another as base (mark them with stickers base and rover).
- Turn the units on and navigate to their assigned IPs in Chrome Browser. You can have all of the units on your network simultaneously as each IP would be different.



SETTING A BASE RTK-GPS UNIT ON LORA PROTOCOL

- Refer to this section of website <https://docs.emlid.com/reachrs/quickstart/#setting-up-base-station>

1. Go to IP address of the base station and navigate to settings Wheel.
2. Change Unit Name as discussed above.



SETTING A BASE RTK-GPS UNIT ON LORA PROTOCOL

- Refer to this section of website <https://docs.emlid.com/reachrs/quickstart/#setting-up-base-station>

Go to IP address of the base station and navigate to **Base mode** section.

Select LoRa tab and set frequency between 862 MHz and 1020 Mhz and set output power. In USA recommended frequency is 915-920 MHz

Using LoRa modulation it is possible to hit up to 19km in line of sight or a few km in urban areas with just 20 dBm power output.

The screenshot displays the REACH RS web interface. On the left is a dark sidebar with a menu: Status, Survey, RTK settings, Correction input, Position output, **Base mode** (highlighted), Logging, Wi-Fi/Bluetooth, and GNSS predictor. The main content area is titled 'Base mode' and contains two sections. The 'Corrections output' section has a toggle switch set to 'ON' and five tabs: Serial, NTRIP, TCP, **LoRa** (selected), and BT. Under the LoRa tab, the 'Frequency' is set to 869.1 MHz, 'Output power' is a slider at 20 dBm, and 'Air data rate' is 18.23 kb/s. Informational text states: 'Corrections output format is RTCM3.' and 'LoRa frequency band: 862.0-1020.0 MHz'. The 'Base coordinates' section has a 'Coordinates input mode' dropdown set to 'Average single', a 'Coordinate accumulation time' slider at 2 min, and an 'Accumulating data...' progress bar at 33%. A note at the bottom says: 'Coordinates will be averaged every time you restart the device.' On the right, a 'RTCM3 messages' table lists various data types and their IDs.

RTCM3 messages	
1002	GPS L1 observations
1006	ARP station coordinates
1008	Antenna type
1010	GLONASS L1 observations
1019	GPS Ephemeris
1020	GLONASS Ephemeris
1097	GALILEO
1107	SBAS
1117	QZSS
1127	BeiDou

RECOMMENDED BASE SETTINGS IN USA

RTK settings:

- GNSS: GPS, GLONASS, GALILEO, SBAS
- Turn the rest off

Base mode (RTCM):

- LoRa frequency 915-920
- 1002 – 1 Hz
- 1006 – 0.1 Hz
- 1010 - 0.5 Hz
- 1097 – 1 Hz
- Turn the rest off

SETTING A ROVER RTK-GPS UNIT ON LORA PROTOCOL

- Refer to this section of website <https://docs.emlid.com/reachrs/quickstart/#setting-up-rover>

Go to settings and change the name to "reach-rover". Navigate to **Correction input** tab. Choose LoRa correction mode. Frequency and air rate settings must match what was configured on the base.

The screenshot shows the REACH RS web interface. On the left is a sidebar with a menu: 'reachrover 10.1.10.33' (with a gear icon), 'Status', 'Survey', 'RTK settings', 'Correction input' (highlighted in green), 'Position output', 'Base mode', 'Logging', 'Wi-Fi/Bluetooth', and 'GNSS predictor'. The main panel is titled 'Correction input' and features a 'Base correction' toggle switch set to 'ON'. Below this is a tabbed interface with 'Serial', 'NTRIP', 'TCP', 'LoRa' (selected and highlighted in green), and 'BT'. The 'LoRa' tab contains the following settings: 'Frequency' set to '869.1 MHz', 'Output power' set to '20 dBm' (via a slider), 'Air data rate' set to '18.23 kb/s', and 'Format' set to 'RTCM3'. An information note states 'LoRa frequency band: 862.0-1020.0 MHz'. There is an unchecked checkbox for 'Send NMEA GGA messages to the corrections provider (required for VRS)'. At the bottom, a status bar indicates 'Connected to localhost'.

Apply changes and you will see rover is connected to base.
The base now is sending corrections on rover via LoRa radio in RTCM 3 format

RECOMMENDED ROVER SETTINGS IN USA

RTK settings:

- GLONASS AR On
- GNSS: GPS, GLONASS, GALILEO, SBAS
- Turn the rest off

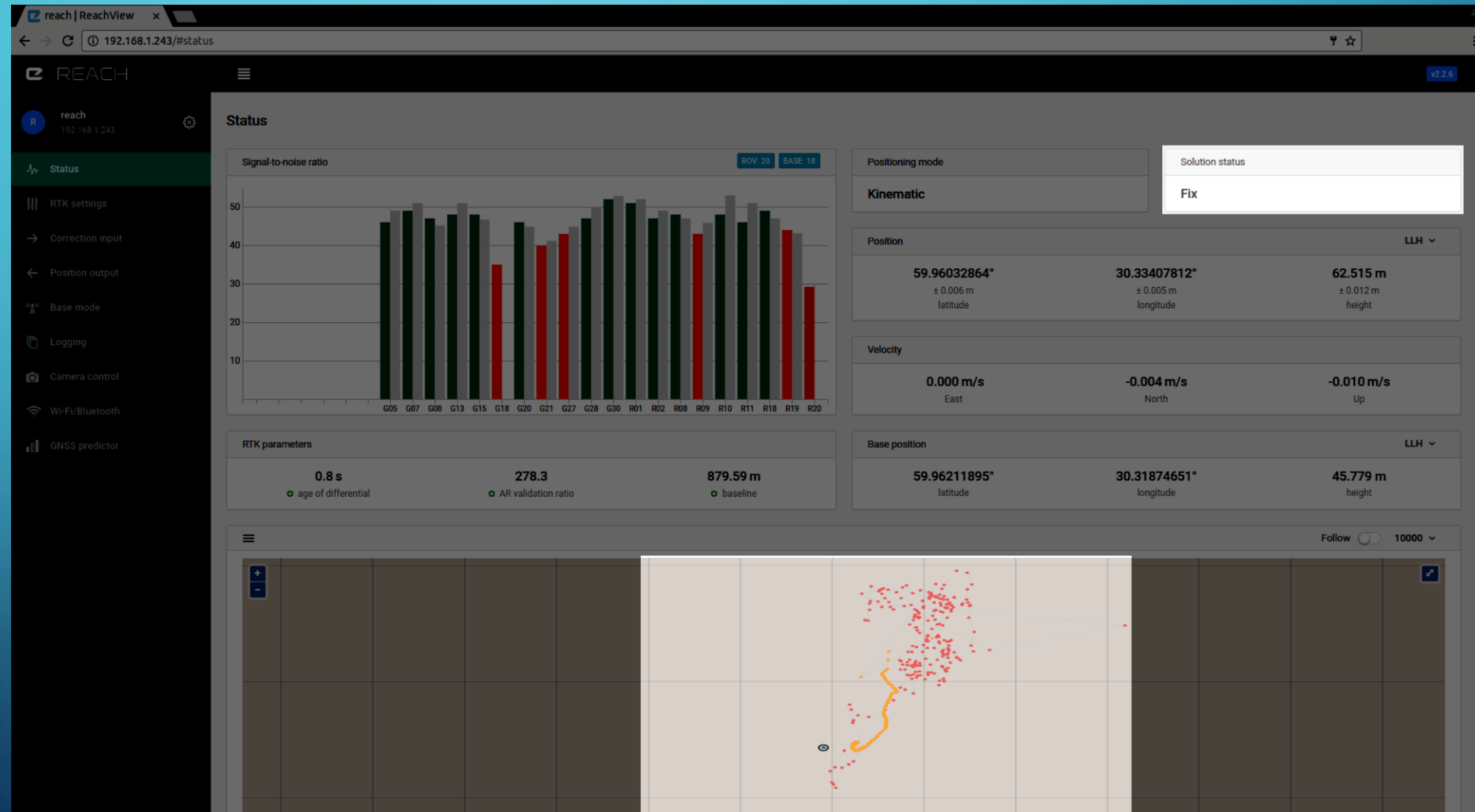
SUCCESS STATUS FOR RTK GPS LOCATION COLLECTION

- The successful setup would show red, green, and gray (base) columns for satellites.

Positioning Mode:
Kinematic

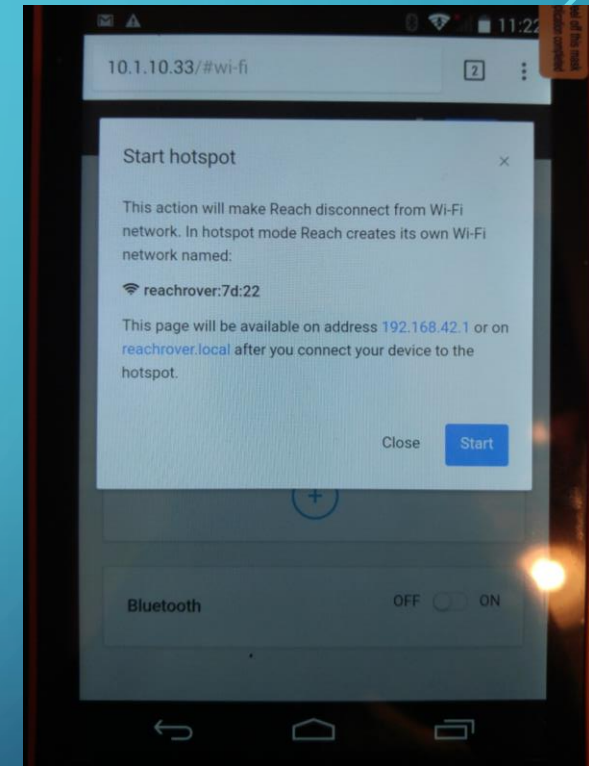
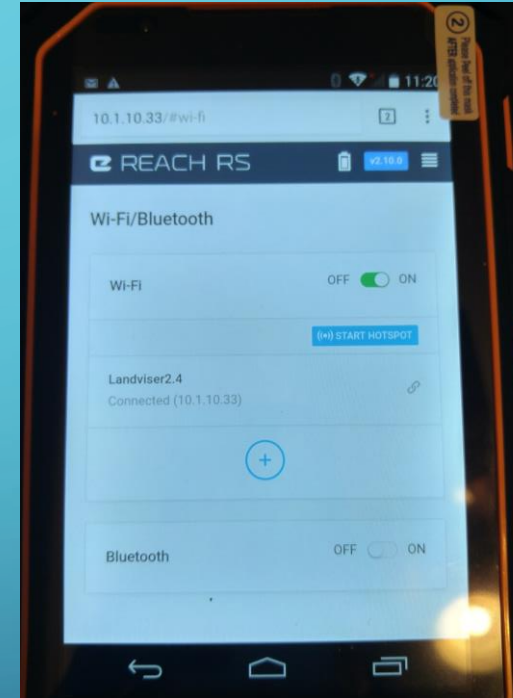
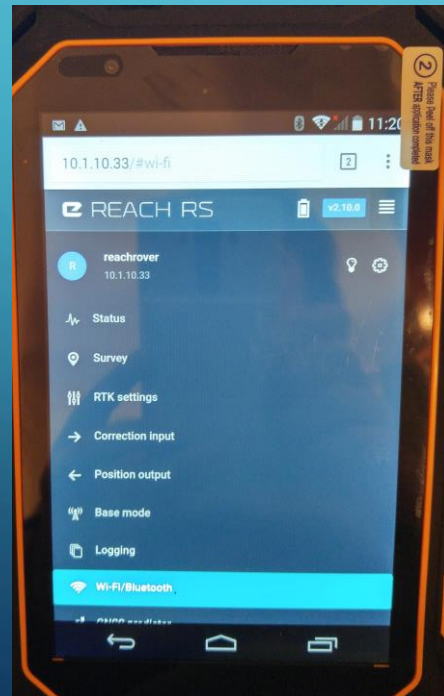
Solution Status:
Fix

You would also see
coordinates and
accuracy.



PREPARING ROVER TO WORK WITH QZOND

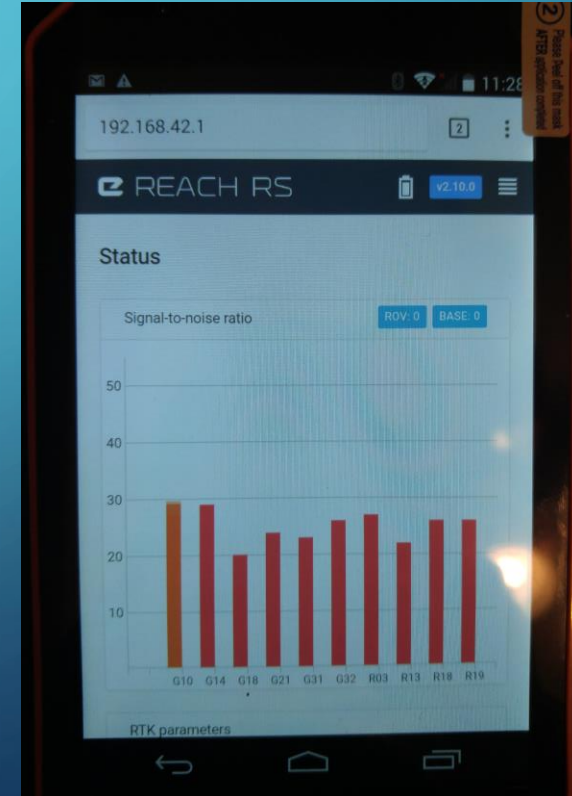
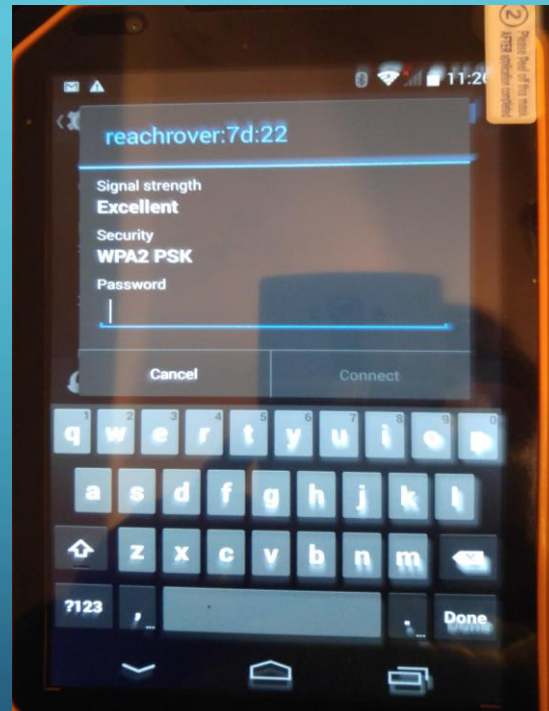
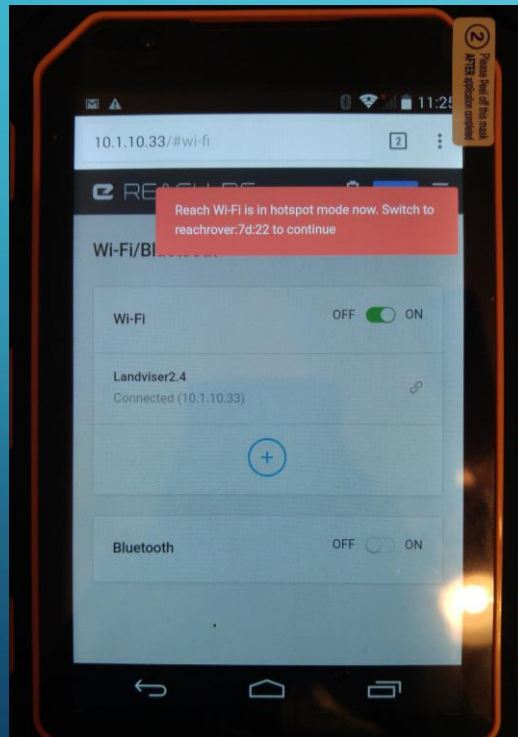
- Turn on Rover GPS unit.
- Make sure tablet is connected to the same network you used to update Rover
- Using Tablet Chrome browser connect to IP of the Rover like <http://10.1.10.33>
- In WiFi/Bluetooth tab press (o)START HOTSPOT and follow the steps



This step would be not necessary if you are in the field away from network you used to setup/update rover and base. If Reach cannot connect to known network it would start in Hotspot (broadcast its own network) automatically. When Reach in Hotspot mode all the lights are solid red/blue/green. When Reach is connected to WiFi router, the blue light is blinking.

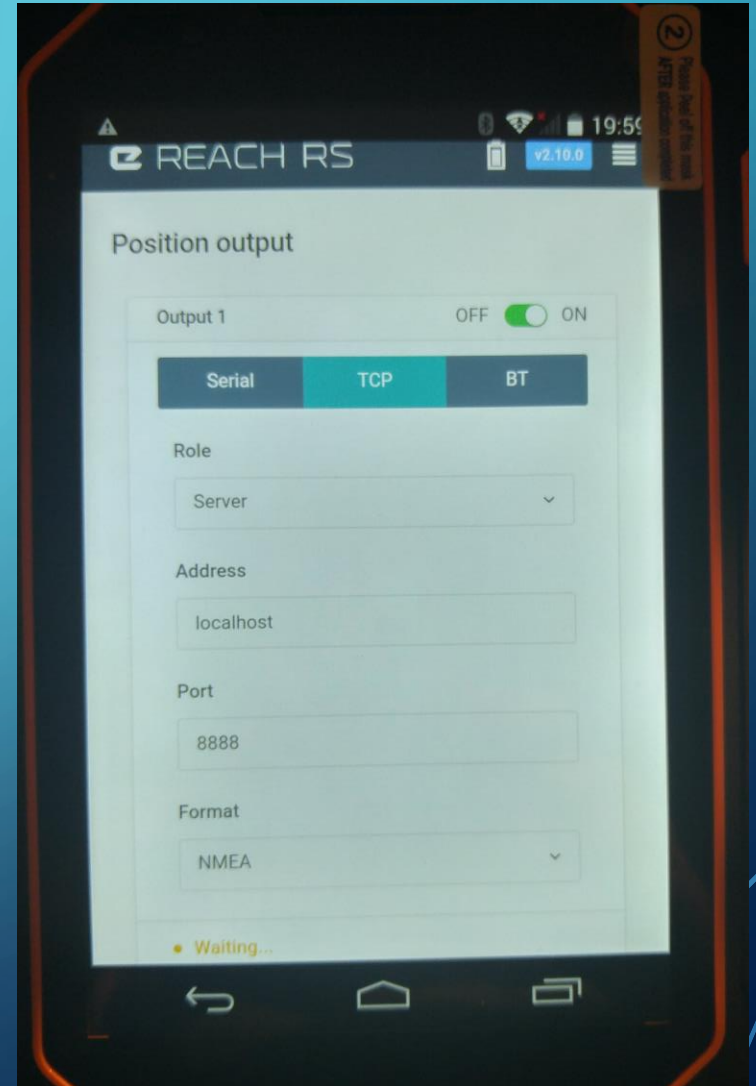
ROVER IN HOT SPOT MODE FOR DATA COLLECTION

- Go to settings/WiFi and connect to Reach network like reachrover:7d:22
- Type password “emlidreach”
- In Chrome browser type IP <http://192.168.42.1> to return to Reach View app.



SETTING POSITION OUTPUT FOR QZOND

- Go to Position Output Tab in Reach View app and set TCP protocol as shown on the photo:
- Role: Server
- Port: 8888
- Format: NMEA



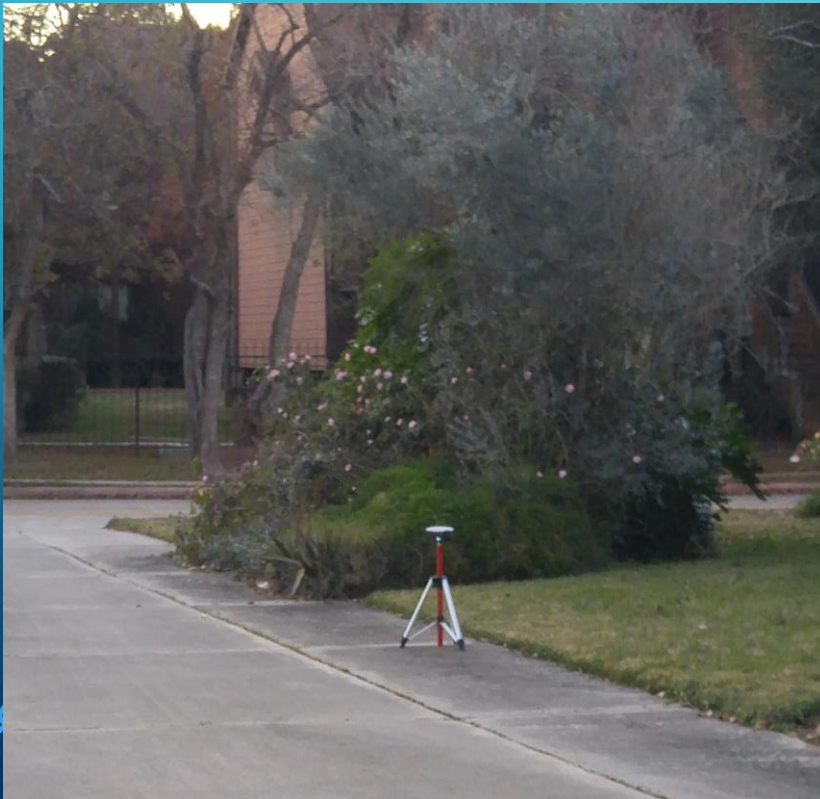
FIELD WORK WITH ALREADY SET UP EQUIPMENT SET

- If you received all the equipment from Landviser, LLC all previous steps up to this point are done for you.
- To start field work and collect EM data you need to follow directions in last three slides!

TIME TO GO OUTSIDE!!!

Make sure you screw on **black LoRa antenna** to all units.

- Set up Base unit on tripod in the middle of study area with clear view of the sky.
- Put Rover GPS unit in backpack for convenience (one person measurements in continuous mode) or put it on the pole (two people or measurements in single mode).
- Turn everything, wait a couple of minutes, connect to Rover's WiFi and see Rover Status on <http://192.168.42.1> . It should show red (rover) and grey (base) satellite bars.



QZOND WITH NETWORK GPS (RTK ROVER)

- Make sure you have Bluetooth turned on and paired with your EMS (AEMP-14) unit.
- Open QZOND application. In Equipment section select the EMS/Nemfis probe and correct .INI file through the series of questions.

Can not identify this probe. Is that EMS/NEMFIS?

No Yes

When correct unit shows, click **Accept**.

EMS92-14/09/2017

Accept

Bluetooth pairing request

EMS92-14/09/2017

Enter PIN to pair the device.

e.g. 0000 or 1234

☐ Use QWERTY keyboard

CANCEL PAIR

1 2 3

4 5 6

7 8 9

0 Done

Bluetooth

OFF ON

G4
Visible while on this screen

PAIRED DEVICES

ActivBuds S-250

Charge 2

TOYOTA Sienna

AVAILABLE DEVICES

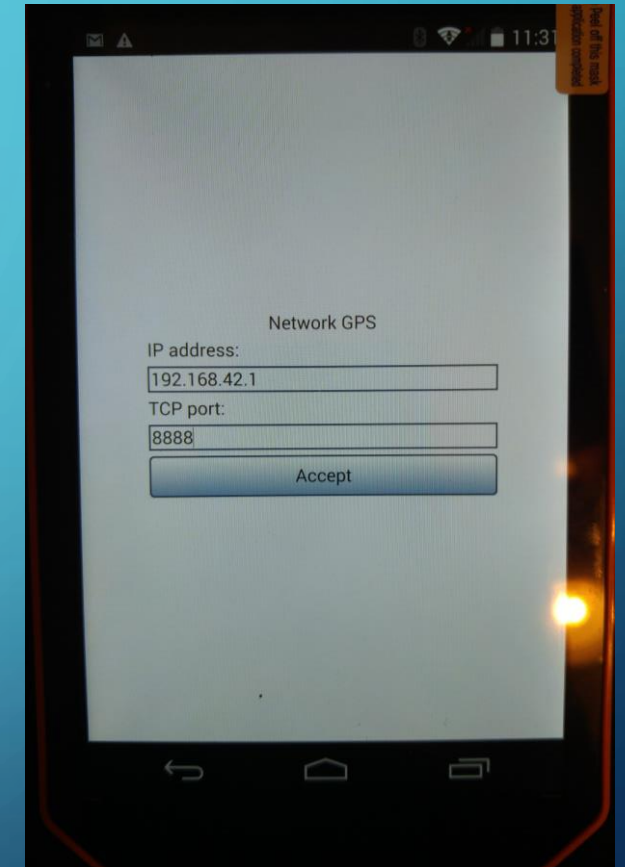
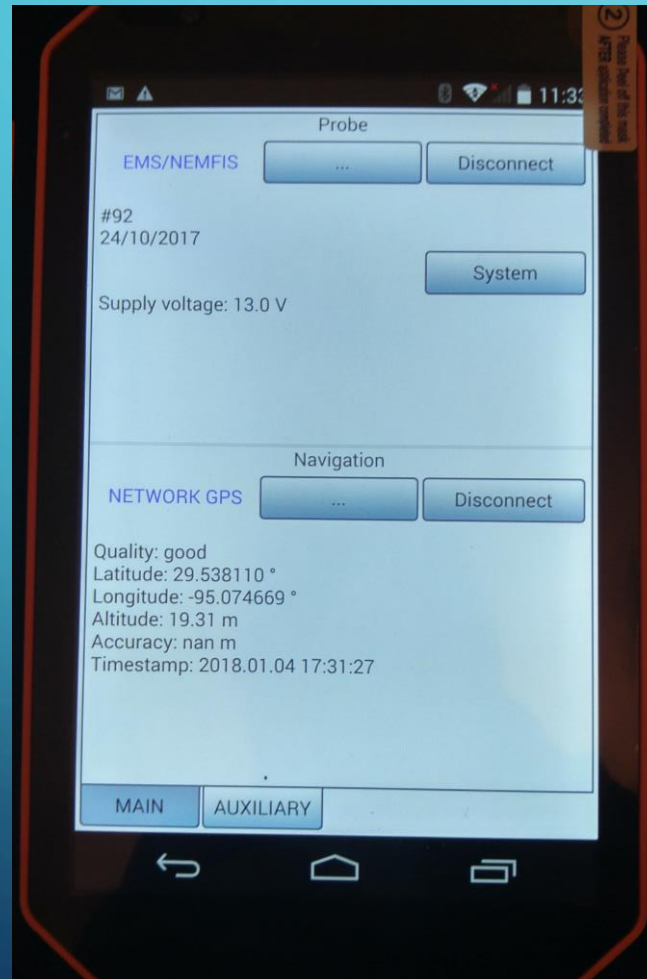
EMS92-14/09/2017

AYE-AS9-GZ9-XP

SEARCH

QZOND WITH NETWORK GPS (RTK ROVER)

- In Navigation select Network GPS and type IP address 192.168.42.1 and TCP port 8888
- If all went well, you will see output in QZOND similar to one below.



- Follow the directions in AEMP-14 manual to start field survey.