# GNSS Logger Unit with RTKLIB

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# *GNSS Logger Unit with RTKLIB*


## Objective

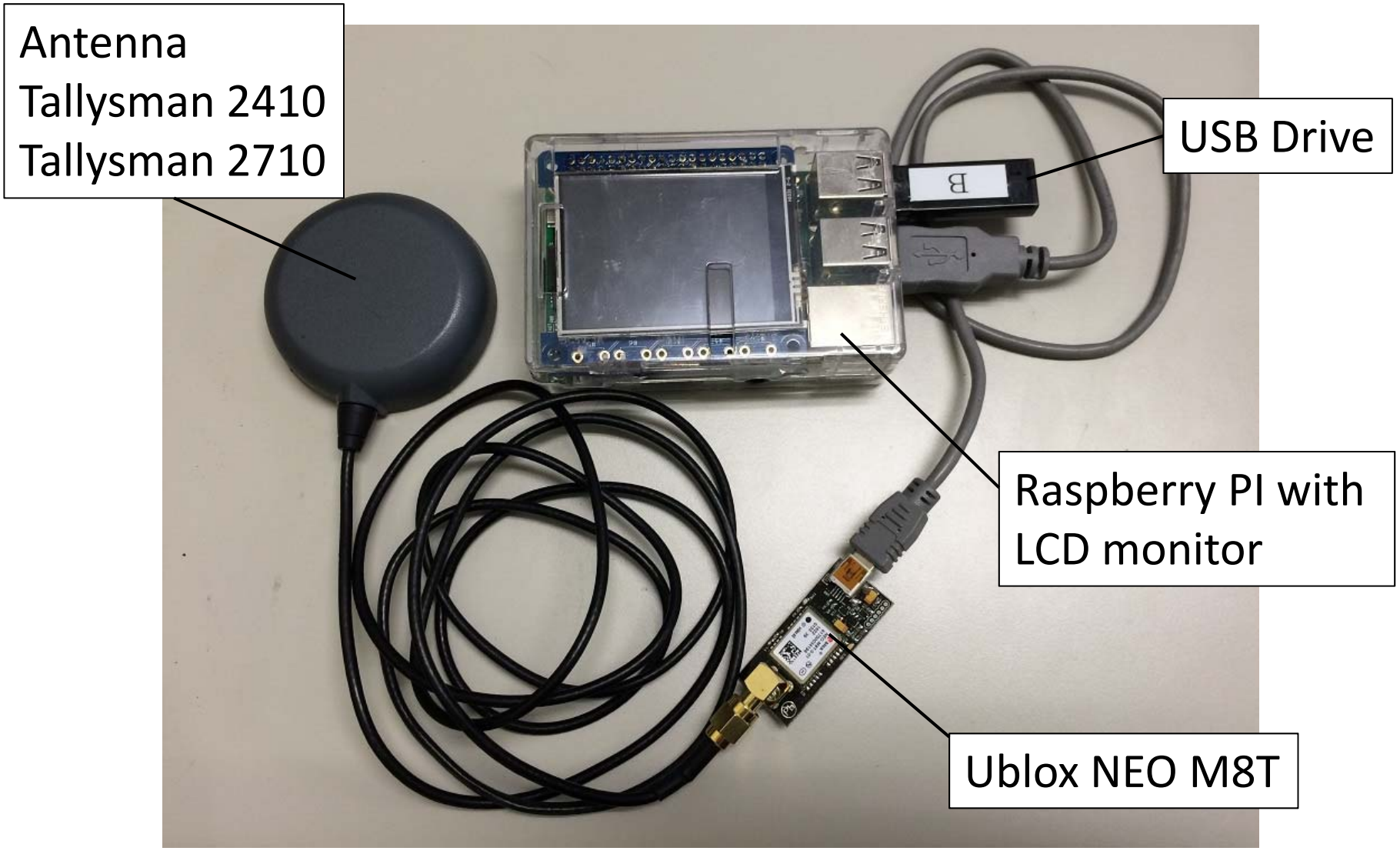
- To record GNSS RAW data directly from a receiver module for post processing
- Small footprint and easy to use
- Use RTKLIB as base software

# *Complement of Logger*


- Raspberry Pi (B+, 2 and 3)
- Ublox M8T
- LCD Monitor
- USB cable
- Antenna
- USB Drive (Fat32)

# *Complement of Logger (2)*





# *How to build?*

# *How to build*



1. Raspberry Pi preparation
2. Receiver preparation
3. Software preparation

# *Raspberry Pi preparation*



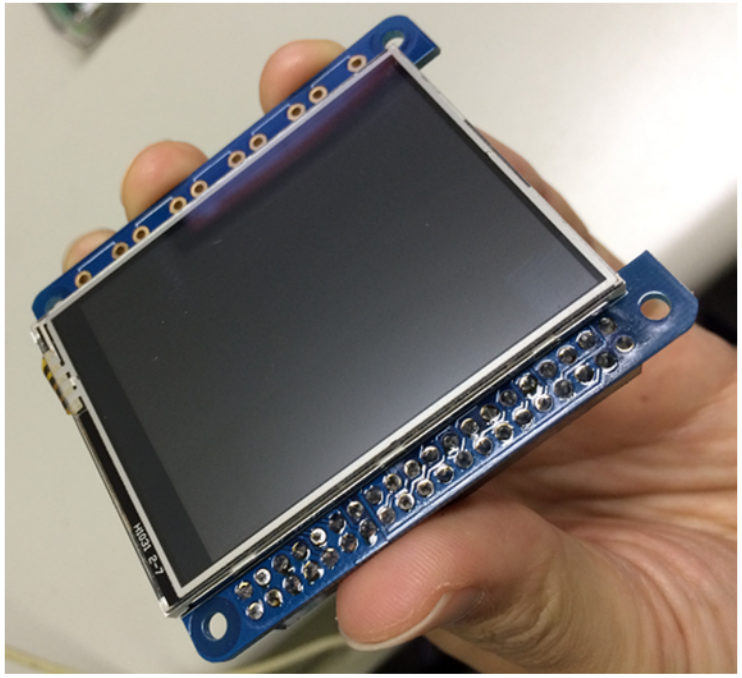
- You can install a Raspberry Pi board on any case.
- On this project we used a clear case from Amazon.com

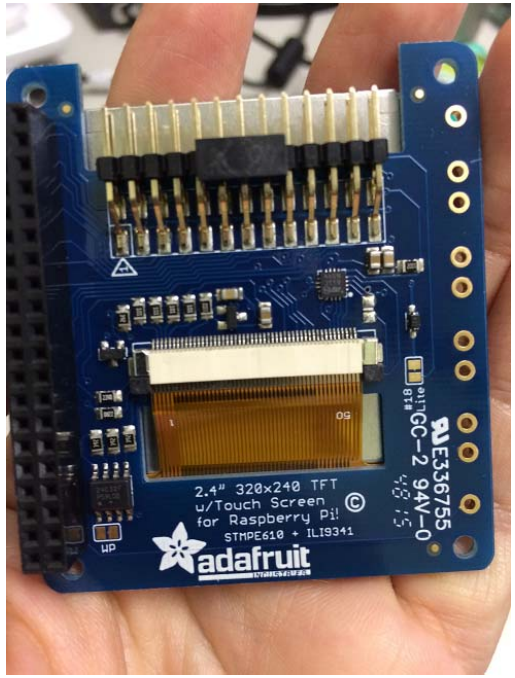
Case for Raspberry Pi 3 Model B/ Raspberry Pi 2 Model B/ Pi Model B+
*https://www.amazon.co.jp/dp/B01CDUM3D6/ref=pe_492632_227730602_TE_item*
Price at 790Yen/case

# *Raspberry Pi preparation*



- LCD Screen for displaying a log information, we used Adafruit 2.4” 320x240 TFT
- Soldering a 40 female pin with LCD board to connect to Raspberry Pi






https://www.amazon.co.jp/dp/B019IBEMK0
Price at 5527yen/unit

http://www.marutsu.co.jp/pc/i/574345/
Price at 4350yen + tax

# *Raspberry Pi preparation*



- Connect LCD board to Raspberry Pi board by 40 GPIO Pin

# *Receiver preparation*



- Check the firmware of M8T, update to the new version (Current 3.01, support Galileo satellite)
- In this project, we used 4 GNSS satellites, GPS, QZSS, Beidou and Galileo

UBLOX NEO-M8T TIME & RAW receiver board with SMA (RTK ready)
*http://www.csgshop.com/product.php?id_product=205* Price at 74.99USD/Unit

# *Receiver preparation*



- The settings in receiver depend on what kind of data you want to output and record
- In this project, we used those settings below

  - NMEA and RAW output via USB
  - GPS, Galileo, QZSS and Beidou
  - 5Hz data output

# *Software preparation*



- Pre OS configuration
- RTKLIB software installation
- CLI mode configuration
- LCD monitor setup
- USB drive configuration
- Auto-start script configuration
- Trigger OS shutdown by USB

# *Software preparation*



## Pre Operating System configuration

- Expand a disk file system
  - Open Menu → Preferences → Raspberry Pi Configuration
  - Select “Expand Filesystem” then restart the system

# *Software preparation*



## RTKLIB software installation

- Download RTKLIB software from GITHUB (Branch: master, Version 2.4.2)
- Unzip and go to “RTKLIB-Master¥app” directory
- Execute this command below

```
sudo chmod 755 makeall.sh
```

- Then execute this command and wait until its completed

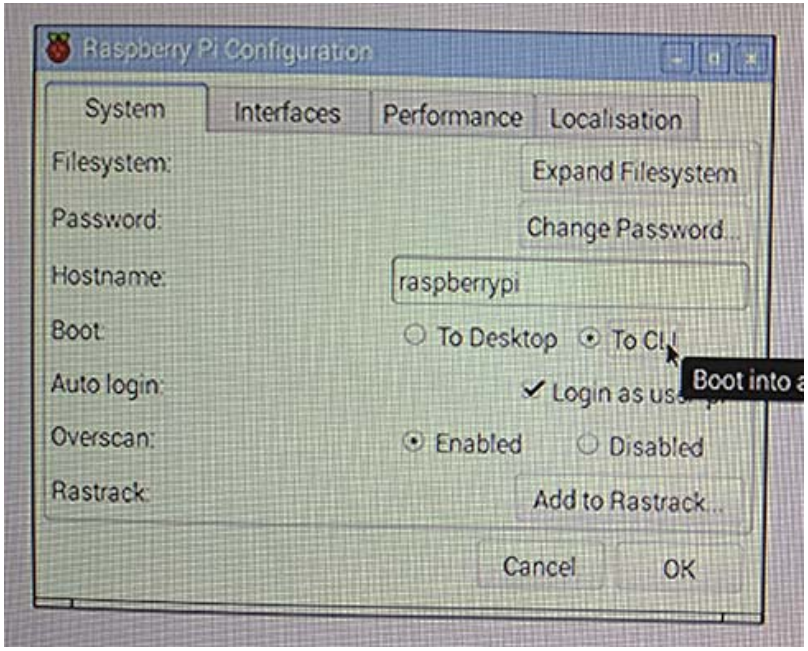
```
sudo ./makeall.sh
```

# *Software preparation*



## CLI mode configuration

- Open Menu → Preferences → Raspberry Pi Configuration
- From the “System” tab, you can simply click the radio button of “To CLI”, to change the boot preference
- Then reboot the system



# *Software preparation*



## LCD Monitor Setup

- At terminal console, install an LCD kernel by type those commands below

```
$curl -SLs https://apt.adafruit.com/add-pin | sudo bash
$sudo apt-get install raspberrypi-bootloader
$sudo apt-get install adafruit-pitft-helper
```

# *Software preparation*



## LCD Monitor Setup (2)

- Enable & Configure the LCD by this command

```
$sudo adafruit-pitft-helper -t 28r
```

- At the end of process, you will be prompted on whether you want the text console to appear on the LCD Screen
- Answer “Y” to continue

# *Software preparation*



## USB Drive Configuration

- Prepare a USB drive in FAT32 file format
- Create a mount point on Raspberry Pi by those commands below

```
$ sudo mkdir /media/usb
$ sudo chown -R pi:pi /media/usb
```

# *Software preparation*

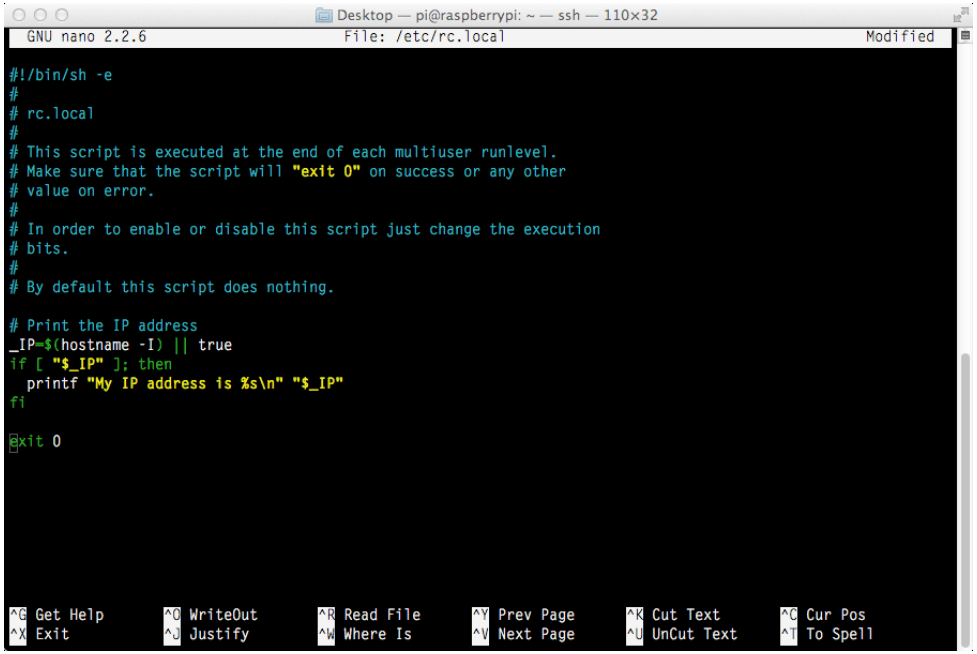


## Auto-start script configuration

This step will allow STR2STR to start automatically when system booted

- Edit “rc.local” by type this command below

$ sudo nano /etc/rc.local



# *Software preparation*



## Auto-start script configuration (2)

- After an initial comments (lines beginning with '#'), add those commands below.

```
sudo mount /dev/sda1 /media/usb -o uid=pi,gid=pi
cd /home/pi/RTKLIB-master/app/str2str/gcc/
sudo ./str2str -in serial://ttyACM0:57600#ubx >//media/usb/$(date +%Y%m%d-%H%M%S).ubx
```

- First command will mount USB drive
- Second command will change directory to /STR2STR
- Last command will start STR2STR and write an output to USB drive

# *Software preparation*



## Trigger OS shutdown by USB

- As the logger unit has no keyboard when operating outside.
- We add more script that can be trigger a shutdown process. By disconnect the receiver from Raspberry Pi.
- To protect an output file from EOF problem.

# *Software preparation*



## Trigger OS shutdown by USB (2)

1. At terminal console, get an information about USB device via "lsusb"
   - ***The third field labelled ID is the vendor and model id separated by a colon***

2. Create a file in /etc/udev/rules.d
   - ***The file must end in .rules and all files in this directory are processed lexicographically. Such as 00-XXX.rules***

# *Software preparation*



## Trigger OS shutdown by USB (3)

3. Edit the created file as below

```
ACTION=="remove", ENV{ID_VENDOR_ID}=="XXXX",
ENV{ID_MODEL_ID}=="XXXX", RUN+="/sbin/shutdown -h
now"Create a file in /etc/udev/rules.d
```

4. Run this command below to take effect.

```
udevadm control --reload-rules
```

5. System is now ready to use as Logger unit.

# *How to use?*

# *How to use?*



1. Prepare and Start system
2. Shutdown system
3. Access the record file

# *Prepare and Start system*



- Plug Ublox Neo-M8T receiver unit (via USB) and USB drive to logger unit

# *Prepare and Start system*

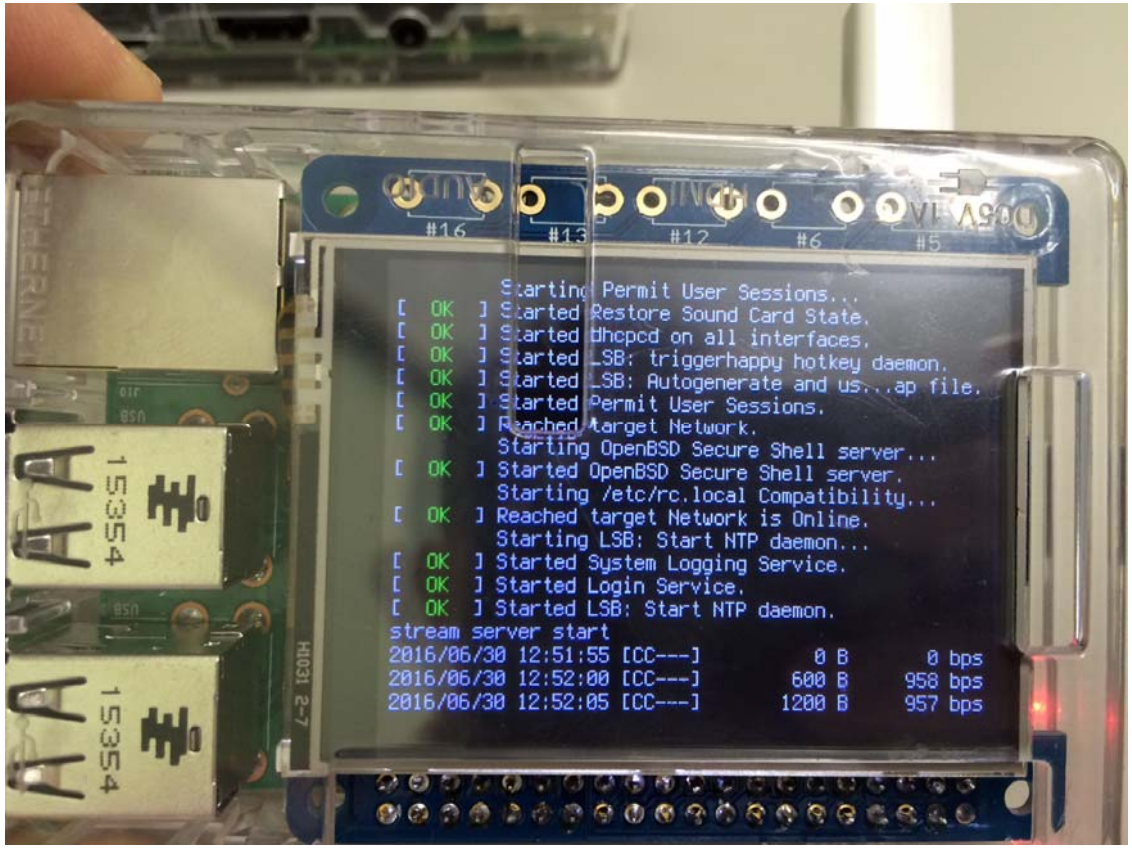


- Plug a micro USB power cable to logger unit

# *Prepare and Start system*



- Logger system will start automatically as picture below.




(In case of system cannot start or boot to terminal prompt, please check that receiver and USB drive are plug to the system correctly or not, then reboot the system again)

# *Shutdown system*

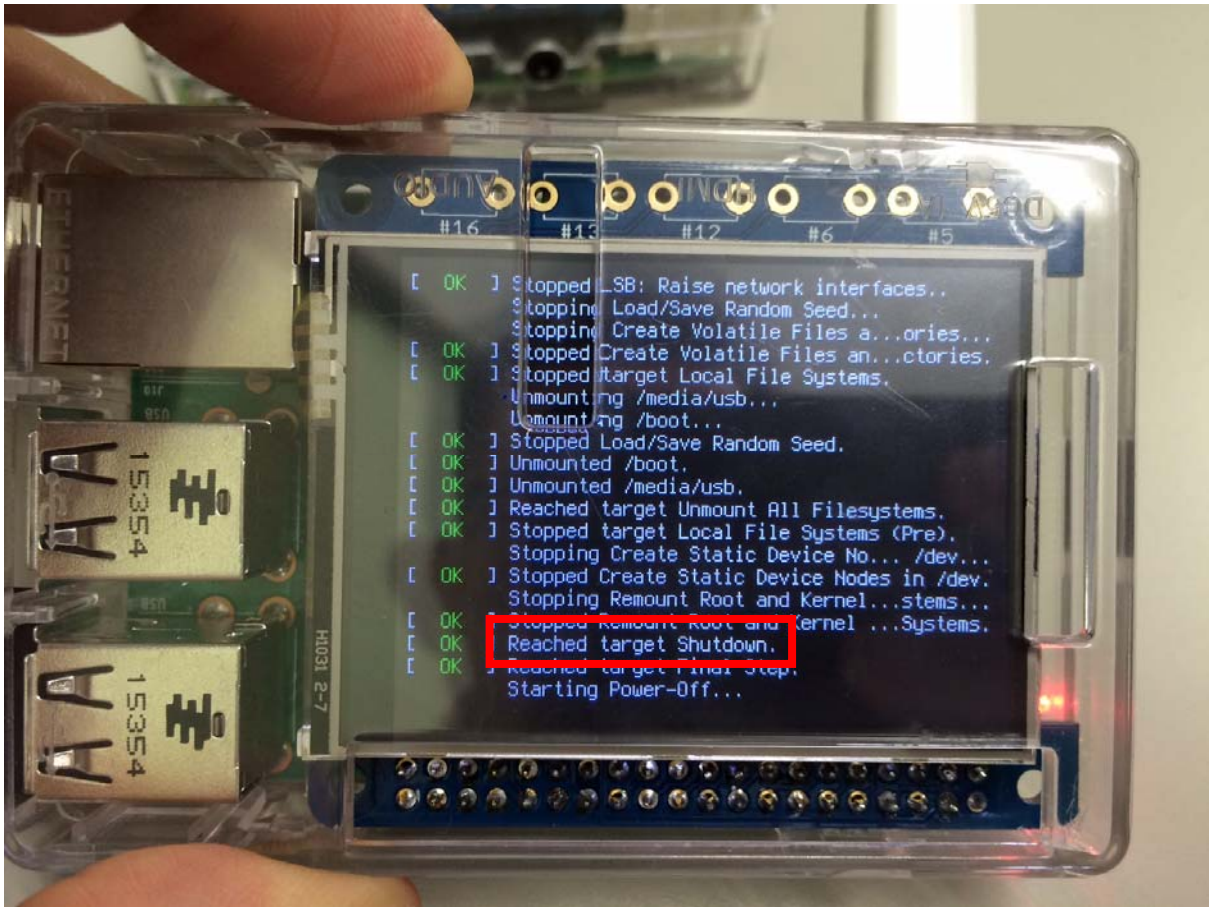


- When you done an experiment, please unplug the Ublox Neo-M8T from logger unit and system will start to shutdown automatically

# *Shutdown system*



- The last state of shutdown system is “Reached target Shutdown”, then you can remove power cable



# *Access the record file*

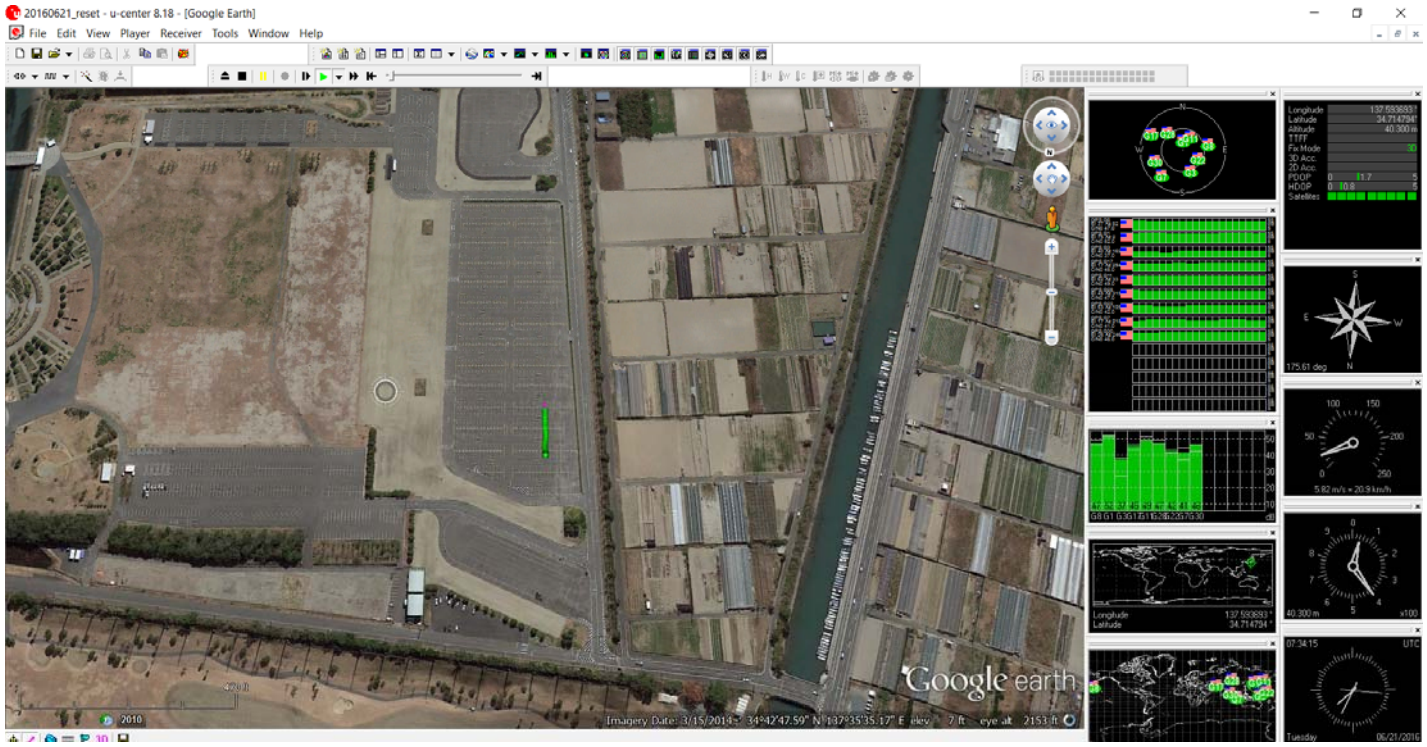


- When you shutdown the logger unit, record file will available in the USB drive.

- Filename will be written by the time of Raspberry PI system, you need to check the actual time again in RAW data (GPST)

# *Access the record file*






- Recorded file UBX can be review from u-center application provided by Ublox.
- From here, you can briefly review data and position in map view

# *Contact point*

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