

# Introduction to ULRS

*Notice: all content is extracted from <http://www.itluxembourg.lu/site/> for your use only.*

*The subject is gathered here in order to help you use the ULRS system. Use at your own risk, no warranty is implied herein.*

*Join us at <http://www.rcgroups.com/forums/showthread.php?t=2037442>*

This project provides drone and FPV flyers with a long range 1 watt bi-directional link for RC and telemetry. Use it to replace your other telemetry or LRS systems by a single system having many advantages:

## Performance

With 1W or power, the Ultimate LRS provides full telemetry and RC control up to 40 km. Check the [user provided content page](#) to see many flight videos.

Notice that 40 km is not the limit of the system, but the further a user has flown with it, limited by his plane's battery range. The system is capable to go to 100 km with good antennas and a sufficient altitude to keep a direct line of sight (earth's curvature).

## Unbeatable price

The Ultimate LRS is based on two [Hobbyking OrangeRX 1W TX modules](#) (or a 1W module + [a 100mW module](#)).

These 1W modules are available for \$28.95 each, a total of \$57.90 for a complete system, notice that the firmware is completely free.

## Complete documentation

The project provides a complete documentation on this site, including clear installation instructions, links to user videos and content, complete spectrum analysis, proposed mods etc.

## Active community

A very active user community has grown [in this rcgroups forum](#). Feel free to join the community and propose your ideas and suggestions, or get answers to your questions.

Users have made new 3D printed cases, new antennas designs and videos, click [here](#) to see some user provided videos and other ULRS related creations.

## Simplicity

The Ultimate LRS is complex inside and simple outside : no technical settings to guess, it's just plug and play.

## How do I start ?

Well, you're exactly in the right place :

- First, gather material described below, mainly the OrangeRX modules and an FTDI cable
- Then install the firmware as explained below

That's it, now take your favourite plane or quad and send your flight videos !

## Material

APM :

- Original APM from [one of these retailers](#) or the [HobbyKing clone](#). You can of course use another flight controller such as a Pixhawk.



- [Neo 6S GPS](#) or other GPS compatible with APM



- [Micro USB cable](#) (not mini USB)



- [Hobbyking OrangeRX TX 1W](#) (2 x): Remarks :
  - OrangeRX is the brand name, which contain both RX and TX modules
  - Every module (TX or RX) contains a similar transceiver chip, which can do both TX and RX.
  - There are no “1W RX”, so we will be using two “OrangeRX 1W TX” to make a complete bidirectional 1W link.
  - There are different modules types, [check this page to choose the right module](#).

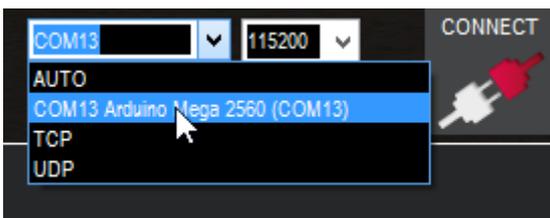


- FTDI cable : [here are some](#)

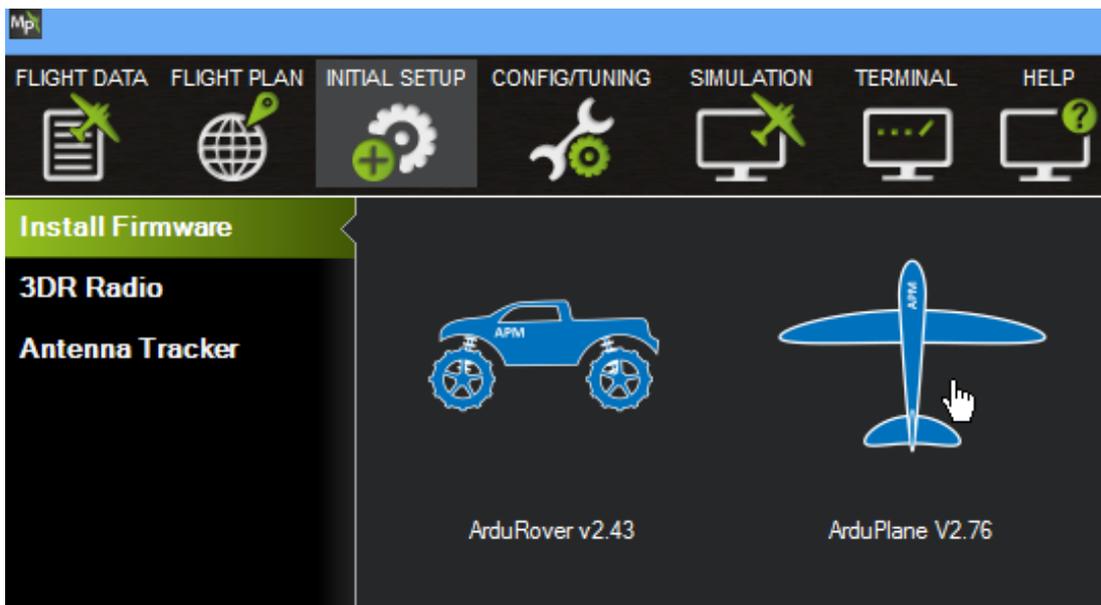


## Mission Planner set-up

- Connect your APM via micro USB cable.
- Install Mission Planner from [here](#).
- Select the APM COM port and connect at **115200 bauds**



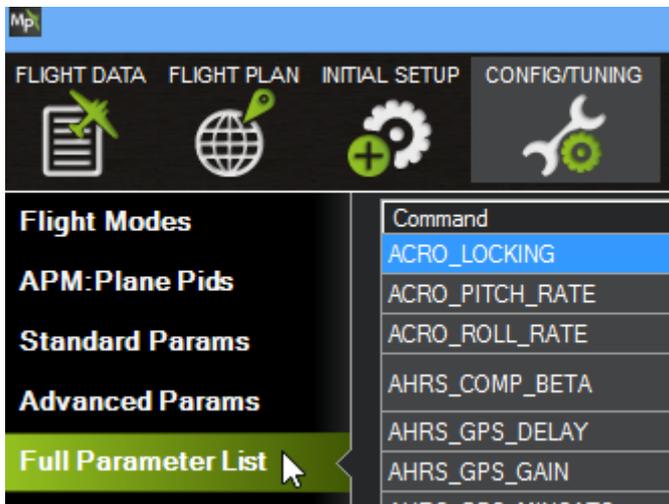
- If not already done, install APM firmware.

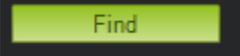


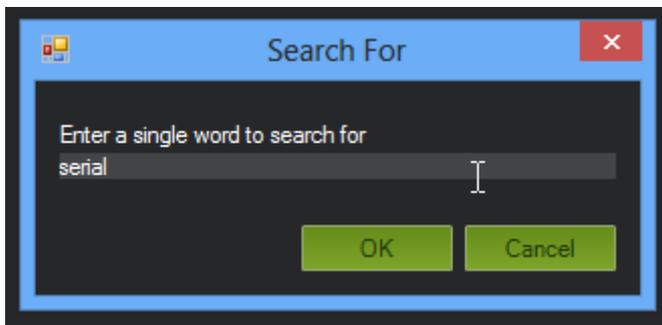
- Connect.



- Go to full parameter list.



- Click Find 
- Search for 'serial'.



- Change **SERIAL1\_BAUD** to 19 (for **19200 bauds** telemetry)
  - (Pixhawk users, please check [this page](#))
  - Notice that SERIAL1 = UART0, SERIAL2 = UART1, etc
- Write params 
- Configure your radio.
- Configure your flight modes (for example use a 3-way switch, and choose manual, FBWA and RTL modes)

## Hardware setup

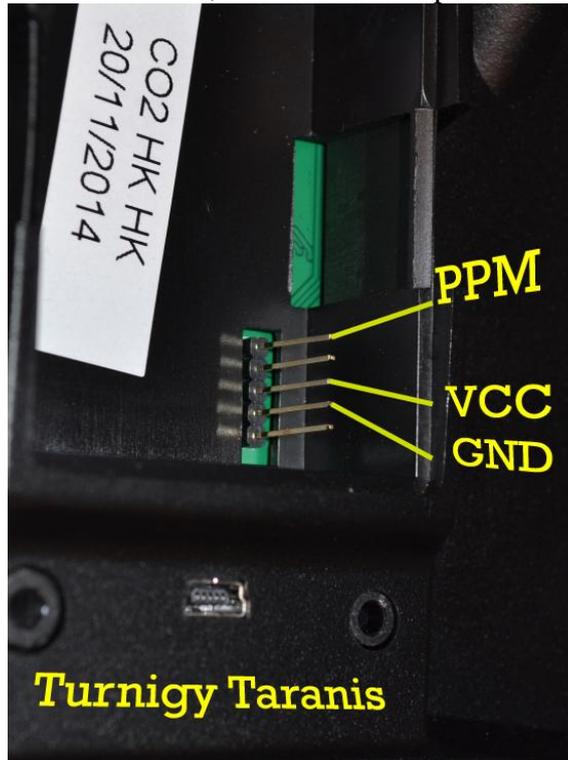
- On both modules, drill a hole to access the serial port :



- For the RX : follow the appropriate connection diagram :
  - [Click here for the connection diagram page](#)
  - Pixhawk users please check [this page](#)
- For the TX : simply plug into the transmitter, and connect an USB / FTDI cable:



- For information, here are the TX pins used:



- [Print your labels](#)

## Firmware setup

- [Download and run the ULRS updater](#), which will download the latest firmware and flash it on your TX and RX. If necessary have a look at [this page](#) to see how to connect a FTDI adapter.
- **You're done !** Double-check the list to be sure you didn't forget anything

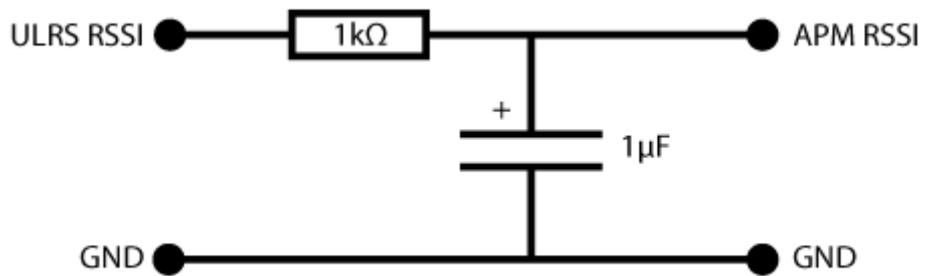
## Additional information

- Have a look at the [FAQ](#)
- Remember the custom firmware is made only for [Hobbyking OrangeRX 1W](#) or [100mW modules](#), not for other boards.
- Notice no binding is needed, it just works out of the box.
- LEDs meaning is the same on RX and on TX : one led means "receiving packet", the other led means "sending packet". For example if the TX is connected but not the RX, it will only light up one led ("sending packet").

- RSSI is available on this pin on both ground and plane 1W modules (ground and plane):



- To connect RSSI to APM or an OSD, use a RC filter (NB : a value of 10k rather than 1k works better, I'll update this diagram) :



- For the 100mW RX, the RSSI is on the first channel (closest to PCB edge)

- You can use a long cable to connect the TX to the computer. For example if you have the computer in the car, and want to run a few steps TX in hand to launch the plane. Two options :
  1. Connect a [5 meters USB cable to the computer](#), and have the FTDI adapter near the TX. (5 meter is the USB standard limit, else you'll have to insert an USB hub before going another 5 meters)
  2. or you have the FTDI adapter on the computer, and have a long serial cable. I've used 20 meters cable without issues.
- **IMPORTANT : disconnect the USB cable from APM when using telemetry** (when it's connected, APM will default to 115200 bauds and we're using the same port for telemetry)
- Remember that the Mission Planner communicates at 115200 bauds with the OrangeRX TX module.