

# **Rlink 16-chan UHF long range radio system**

## **Quick Start Guide v1.1**

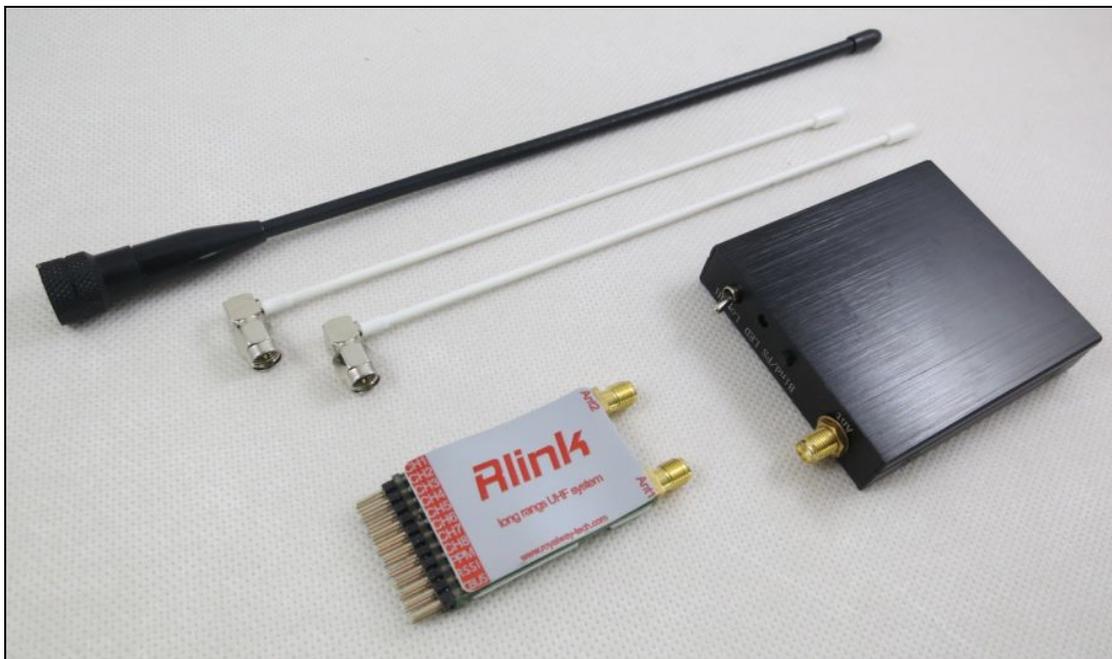
**Revision: 2013.12.16**

**for hardware v1.0 and firmware v1.1.0 or above**

Thank you for purchasing this RoyalWay-tech product. Please conform to the manual strictly to set up the Rlink to your aircraft.

Rlink is a highly expandable system, our engineers will keep improving and extending new functions, you can download the latest manual and firmware from our official site: [www.royalway-tech.com](http://www.royalway-tech.com)

Due to unforeseen changes or product upgrades, the information contained in this manual is subject to change without notice.



## Features:

- The first UHF solution support 16-chan perfectly, proven with Taranis X9D and Jeti DC16.
- Based on the latest RF solution, super high sensitivity as  $-115\text{dBm}$ .
- Proven robust super fast frequency hopping algorithm, combined with Unique ID for every module (RAFHSS), ensure the excellent interference-immunity capacity.
- Support nearly all radios in the market from 2 channels to 18 channels if there is a trainer port included.
- Low and high power mode switchable(400mw and 800mw)
- Failsafe set in the Tx side by simply pressing one button.
- Support both 2-axis and 3-axis head-tracker directly, and randomly mapping the tracking channel among the 16 channels.
- Support 2 PPM source input separately and randomly mapping
- Support 1 Tx to multiple Rxs and multiple Txs to 1 Rx.
- Frequency band configurable among 410-510Mhz(default 431-441Mhz).
- MicroUSB port included for configuration and firmware update, no need extra flash tools, no need any driver installed, support all OS systems,super easy to use.
- EXT port for extension, support Futaba Sbus and Spektrum/JR Satellite port and plan to support Joystick control, etc.
- Dual-direction communication is ready.
- Rich audio warnings for low voltage, wrong PPM connection or input, power switch, failsafe setting, binding, etc.
- Custom brushed metal case, well shielded and good heat dissipation, the lightest weight(64g only) make it easy to set up to your radio and won' t affect the COG.
- Diversity receiver with dual LED indicators, greatly improve performance.
- CPM output in separated channel in the Rx side.
- RSSI output(analog buffered) in separated channel in the Rx side.
- Can-bus interface included in the Rx side for extension.
- Custom antennas with low VSWR for best performance.
- Different receivers to choose for different applications
- Fully tested with Futaba, Spektrum/JR, Turnigy/Flysky/imax 9x2, Frsky Taranis, Jeti, TDF, walkera, etc..

## Spectations:

### TX:

Size: 73\*65\*15mm

Weight: 64g

Working voltage: 7-16v

Current: 180ma@12v, low power mode

360ma@12v, high power mode

### RX:

Size: 45\*30\*6mm

Weight: 16g

Voltage: 4-6v

Current: 75ma@5v

## Assembly & Connection:

The Rlink can be set up to any radio with trainer port in the market (or with PPM signal output pin), the internal circuit can adjust all types of PPM signals (low and high, positive or negative etc) to the standard 3V3 PPM signal. A small module called Rlink-companion will be released soon as PPM encoder (super low latency) to connect your current radio receiver and Rlink Tx to make up a relay system without any change of your current radio system, at the meantime, avoid the interference between UHF tx and some video Rxs.

### Tx:



As above shows, the Tx module support 2 PPM signals input with 4-pin Molex connectors(the pins' definition are as above), the 2 PPM sources could be radio or head-tracker or any other PPM generator. The 2 PPM source could be merged into 1 PPM output with 16 channels at most.

- The RC port is the prior PPM input source, if you only plug one PPM signal to the Tx module, please connect to this port.
- The HT port is the second PPM source input, default to be the head-tracker port, could also be another radio' s PPM input.
- The 2 PPM input interfaces share the same pins' definition, can be powered at the same time, the Tx module will choose the higher voltage source automatically.

Please make sure the PPM signal is correct, make sure the Tx antenna is connected before power on, if the PPM signal input is not right, the Tx will beep and the LED will flash slowly to indicate the wrongly input. Please check the connection and your radio settings(some old radios with PCM module need to set the radio to PPM mode).



Please check the appendix for more information

**Rx:**



The Rlink rx is more or less the same as normal 2.4G receivers, but the diversity antennas are connected with SMA connectors, recommend to set up as "V" shape in your aircraft, and make sure the antennas have no touch with any metal, carbon or any other conductive object. When the rx is connected with too many servos or the servos are too big and draw too much current, you need to use a separated UBEC to power the Rlink

rx to ensure the performance. The Rlink should be placed away from video tx, ESC and big amp cables, some bad shielded step-up modules and naked cameras emit wide band UHF noise, which should be kept distance also.

You can also choose our optional receiver antennas with extended cable to keep distance to avoid the unwanted interference.

When the Rlink rx is working normally, the blue or red LED will flash fast to indicate which antenna is chose(blue LED--Ant1, red LED--Ant2), the switch of the diversity antennas is very sensitive and fast, you can use the indicator functions to choose better antennas or adjust the setting angles of the antennas for best reception.

The CPPM output port can be used with any controller support PPM input(MFD autopilot, DJI Naza, YS-X4 etc).

The RSSI port output buffered analog RSSI signal(0-3.3v), the output can be configured to base on the digital RSSI or the right packet ratio, you can switch them by short press of the button on the rx during the first 10 seconds after power on.

## Bind:

- 1) Press the Bind button on the Rx and power on, the red and blue LED on the rx will flash alternately, which means the Rx enter the binding mode.
- 2) Press the Bind/FS button on the Tx and power on, the LED of the Tx will flash slowly at a rate of 2 times per second, which means the tx enter the binding mode, short press the Bind/FS button to transmit one time of binding information.
- 3) If the blue and red LED on the Rx flash simultaneously at a rate of 1 time per second which means the binding is done.
- 4) Cycle the power of the Tx module to check if the Rx is receiving signal and working properly.

## Failsafe setting:

Rlink support failsafe setting in all channels, and the setting is done on the Tx side, so you no need to stretch out your Rx from deep inside of your aircraft, also you can set the failsafe during the flight by simply press the Bind/FS button for 1 second. After 1 second of signal lost, the Rlink Rx will enter failsafe mode and output failsafe position for every channel.

- 1)Make sure the Tx and Rx module are binding successfully and working normally.
- 2)Move your sticks of radio to the failsafe position, hold and press the Bind/FS button for around 1 second and then release, the buzzer will beep to indicator the failsafe setting is done.
- 3)Power of your radio, and check if the failsafe setting is right.

## Definition of buzzer and LED indicators:

### Tx:

- 1) Top red LED flash fast, which means the Tx module is working and transmitting signal.
- 2) Top red LED flash fast, and the buzzer beep continuously, which means the failsafe signal is transmitting.
- 3) Top red LED flash slowly and the buzzer beep as "Di-Dong", which means the PPM signal input is wrong.
- 4) The Buzzer beep one time per second, which means the voltage is too low. You need to charge or change the battery
- 5) The bottom red LED light on, which means the USB connecting is done.

### Rx:

- 1) The blue and red LED flash alternately, which means the Rx enter the binding mode.
- 2) The blue and red LED flash synchronously, which means the the Rx is ready and waiting for the signal.

- 3) The blue or red LED flash fast, which means the the Rx is working and receiving signal.
- 4) The red LED near the USB is light on, which means the USB connecting is done.

## Configurations for Tx & Rx modules:

The Rlink Tx and Rx module can be easily configured for different applications, you don't need to install any software extra or any flash tool, what you need is only a MicroUSB cable(which is used normally with your smart phone) to connect to your computer, smart phone or pad with OTG function(no matter what OS, just if it can support U disk).

### Tx:

Switch the stick to Hi on the Tx and connect to computer, the Tx module will be identified as an U disk named CONFIG by your computer, open the disk and you will find a file named tx.cf, open the file with excel as below:

	A	B	C	D	E	F	G	H
1	Version	ID	Frequency Band	Mapping	Remote power switch	Channel maximum number	ID Slave	ID Slave Enable
2	Tx1.1.0	0	431	0	0	8	0	0
3			441	0				
4				0				
5				0				
6				0				
7				0				
8				0				
9				0				
10				0				
11				0				
12				0				
13				0				
14				0				
15				0				
16				0				
17				0				

**Version:** firmware version, it's invalid for any revision, determined only by the firmware.

**ID:** Unique 16-bit ID for every Tx module, this is pre-defined by factory, invalid for any revision, range:1-65535.

**Frequency Band:** The frequency hopping band, it was set among 431-441Mhz as above shows, you can adjust the band according to your local laws, mostly, the wider the band is, the higher anti-interference capacity, but it will also weaken the gain of the antenna. The minimum band width is 2Mhz, for example, you can set it to 433-435Mhz. The valid setting range is 410-510Mhz. **The setting of frequency band on Tx and Rx end should be the same, or they can't binded and work normally.**

**Remote power switch:** This is used to switch the Low and high power mode, when you place Rlink tx module away from you using an extension cable or use Rlink-companion(or other relay device), which makes you can't switch low and high power mode immediately, you can define a channel's stick on your radio to be the low and high power mode switch. For example, you can set channel 5(which maps to a 2-position switch on your radio) as your mode switch, the original switch on the Rlink Tx module will be invalid in this situation, when it set to be 0, default to be disabled.

**Channel maximum number:** The maximum channel number you want to transmit, range: 2-16 which means 2-16 channels. The more channel you use, the more data you need to transmit, and the lower sensitivity for the Rx end, normally, the 8-chan setting will be more sensitive than 16-chan by 1-2dBm. So please keep the channel number as small as possible for best performance. **This setting on Tx and rx end should be the same, or they will can't be binded and work normally.**

**Mapping:** The PPM signal input from the HT port, and the mapping in the merge PPM stream, if there is no PPM signal connected to this port, it's default to be 0. For example, if there is a 2-axis head-tracker was connected to the HT port, and output in channel 5 and channel 6, and the RC port was connected a 6-chan low-end radio, then we can merge the HT port and map then to channel 7 and channel 8, which is equally to a 8-chan high-end radio, the setting is as below:

	A	B	C	D	E	F
1	Version	ID	Frequency Band	Mapping	Remote power switch	Channel maximum number
2	Tx1.0.0	65532	431		0	0
3			441		0	
4					0	
5					0	
6					0	
7					7	
8					8	
9					0	
10					0	
11					0	
12					0	
13					0	
14					0	
15					0	
16					0	
17					0	

If the RC port was connected a 8-chan radio, and the HT port was connected a 6-chan radio, and we only need the channel 1,2,4 to control the gimbals, and we need 11 channels in total, then we can set as below:

	A	B	C	D	E	F
1	Version	ID	Frequency Band	Mapping	Remote power switch	Channel maximum number
2	Tx1.0.0	65532	431		0	11
3			441			
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

**ID Slave:** default to be 0, the ID is the slave ID sent by the master Tx module.

**ID Slave enable:** default to be 0, which means the Tx module is in master mode, the Tx ID will work with the original ID; if set to be 1, which means the Tx mode is in slave mode, and the Tx will work with the Slave ID which sent by the master Tx, this function is used to bind multiple Txs to 1 Rx.

## RX:

Connect the RX to computer with the MicroUSB cable, the RX will be identified as a U disk named CONFIG, open the disk, and you will find a file named rx.cf, open it with excel as below:

	A	B	C	D	E
1	Version	ID	Frequency Band	Sequence	Channel maximum number
2	Rx1.0.0	65532	431	1	8
3			441	2	
4				3	
5				4	
6				5	
7				6	
8				7	
9				8	

**Version:** firmware version, it's invalid for any revision, determined only by the firmware.

**ID:** default to be 0, range 0-65535, the ID of binded TX module.

**Frequency Band:** The frequency hopping band, it was set among 431-441Mhz as above shows, you can adjust the band according to your local laws, mostly, the wider the band is, the higher anti-interference capacity, but it will also weaken the gain of the antenna. The minimum band width is 2Mhz, for example, you can set

it to 433-435Mhz. The valid setting range is 410-510Mhz. The setting of frequency band on Tx and Rx end should be the same, or they can't be binded and work normally.

**Channel maxim number:** the channel number of the binded Tx, it should be set the same as the TX module, or the Tx and Rx can't be binded, and can't working normally.

**Sequence:** this is used to set the sequence of the output channels of the RX, the setting will also take effect in the PPM stream output port.

Normally in the market, the first 4 channels of vary radios are different, for example:

1. JR radios and similar: 1(Throttle), 2(Aile), 3(Elev), 4(Rudd), 5(Gear), 6(Aux1)
2. Futaba, SD and similar: 1(Aile), 2(Elev), 3(Throttle), 4(Rudd), 5(Gear), 6(Aux1)
3. Walkera 2801/devo radio: 1(Elev), 2(Aile), 3(Throttle), 4(Rudd), 5(Gear), 6(Aux1)

And lots of controller(Naza, WKM, YS-X4, X6) may support PPM single cable input, but mostly, they only support futaba sequence, With the Rlink system, you can define all the radios to the same output sequence, for example, I want to change the JR radio to the Futaba radio sequence, we can set as below:

	A	B	C	D	E
1	Version	ID	Frequency Band	Sequence	Channel maximum number
2	Rx1.0.0	65532	431	2	8
3			441	3	
4				1	
5				4	
6				5	
7				6	
8				7	
9				8	

You can utilize this function for more applications.

When you need to use channels more than 8, you need to bind 2 RXs as a 16-chan(9-16chan) receiver. For example, when you need a 14-chan receiver, you can bind them to a 14-chan Tx and set the 2 Rxs as below:

	A	B	C	D	E
1	Version	ID	Frequency	Sequence	Channel maximum number
2	Rx1.1.0	0	431	1	14
3			441	2	
4				3	
5				4	
6				5	
7				6	
8				7	
9				8	

	A	B	C	D	E
1	Version	ID	Frequency	Sequence	Channel maximum number
2	Rx1.1.0	0	431	9	14
3			441	10	
4				11	
5				12	
6				13	
7				14	
8				0	
9				0	

## Firmware update:

Rlink is equipped with 32-bit high speed MCU and can-bus with infinitely extension capacity , we will keep improving and extending more functions through releasing new firmwares.

It's very easy to update the firmware.

### Update for TX module:

Move the power switch to Low mode, connect the TX module to your computer with the MicroUSB cable, the TX module will be identified as a U disk named bootloader, copy the new firmware(.bin) file to this vacant U disk, when the top red LED is on and then off, remove the USB cable, and cycle the power of the TX to complete the update.

### Update for RX module:

Press the button of the RX module, connect the Rx module to computer with the MicroUSB cable, the RX will be identified as a U disk named bootloader, copy the new firmware(.bin) file to this vacant U disk, when done, remove the USB cable and cycle the power of the RX to complete the update.

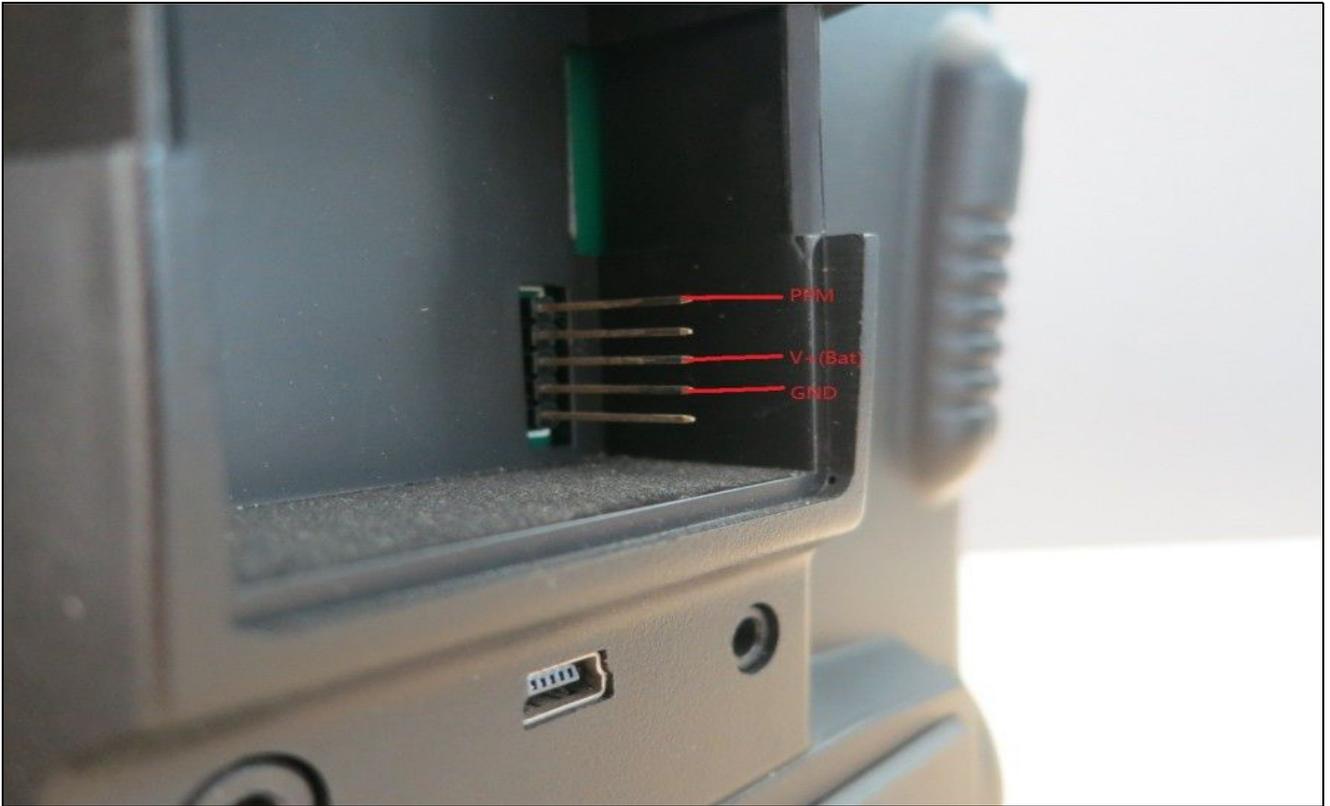
## Appendix: The definitions of common radios in the market

Normally we can get PPM signal from trainer port, but some old radios with removable RF module can output PPM signal from the RF pins also. For example:

Futaba, TDF:



JR, Flysky, Turnigy, Imax, Tarinis。



We have shielded cables custom for common radios in the market:

Plug and play cable for Futaba radios with square trainer port:



Plug and play cable for Turnigy/Imax/Flysky 9x2, 9XR, frsky Taranis, JR 3801, 9x2 and similar:



Plug and play cable for JR/Spektrum or other radios with DSC trainer port:

(You need to offer power extra through the red(+) and black(-)wires)



You can get definitions of the trainer port for more radios here: [http://www.mftech.de/buchsen\\_en.htm](http://www.mftech.de/buchsen_en.htm)