

instruction manual for  
**Open LRS New Generation**



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# 1. Important warnings

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## **Some equipment is not 5 volt tolerant**

The radio modules on all 100mW models are not 5 volt tolerant. If you connect 5 volt power to the programming headers, you may damage the radio module.

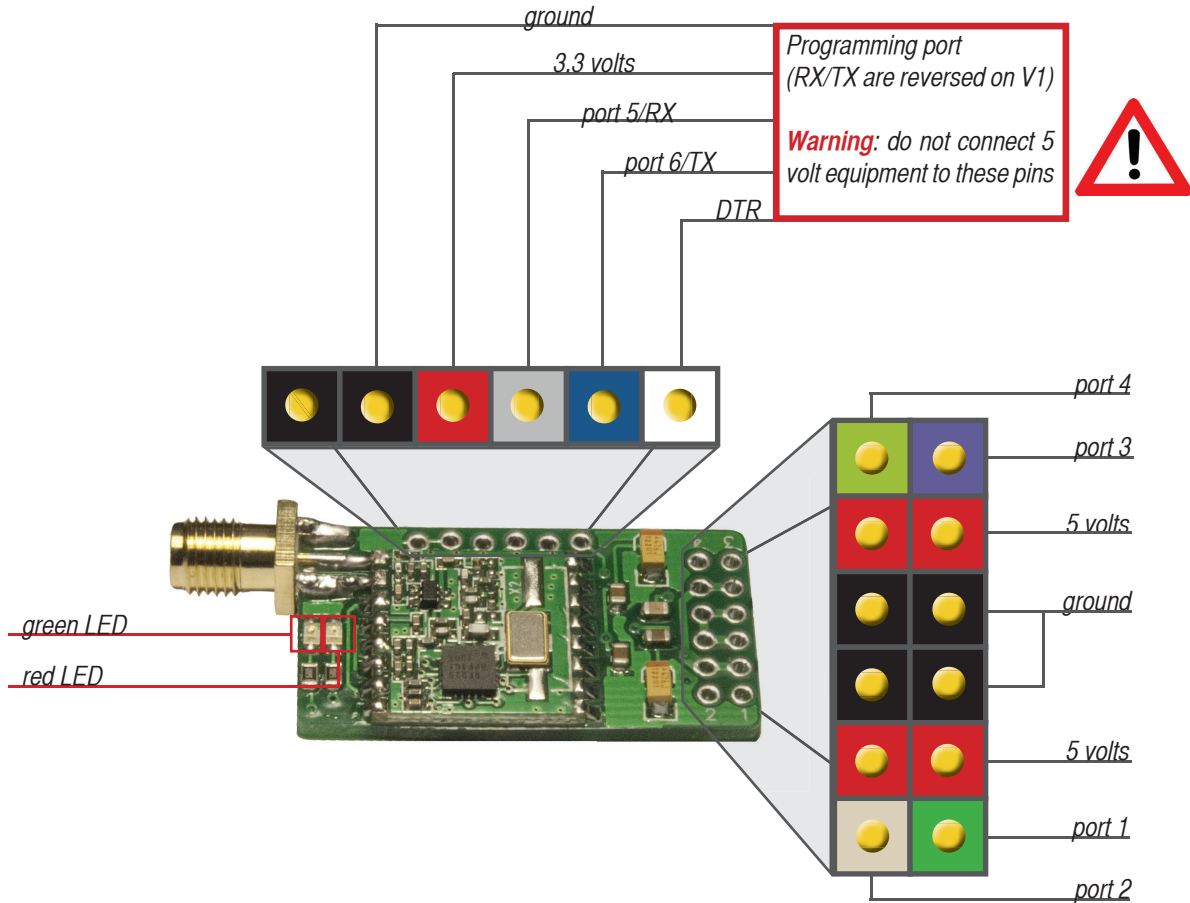
**Only connect a programming cable that provides 3.3 volt power.**

Fortunately, the other components on the receivers and transmitters are tolerant of 5 volts, and the radio module is replaceable if you damage it.

## **Always attach an antenna**

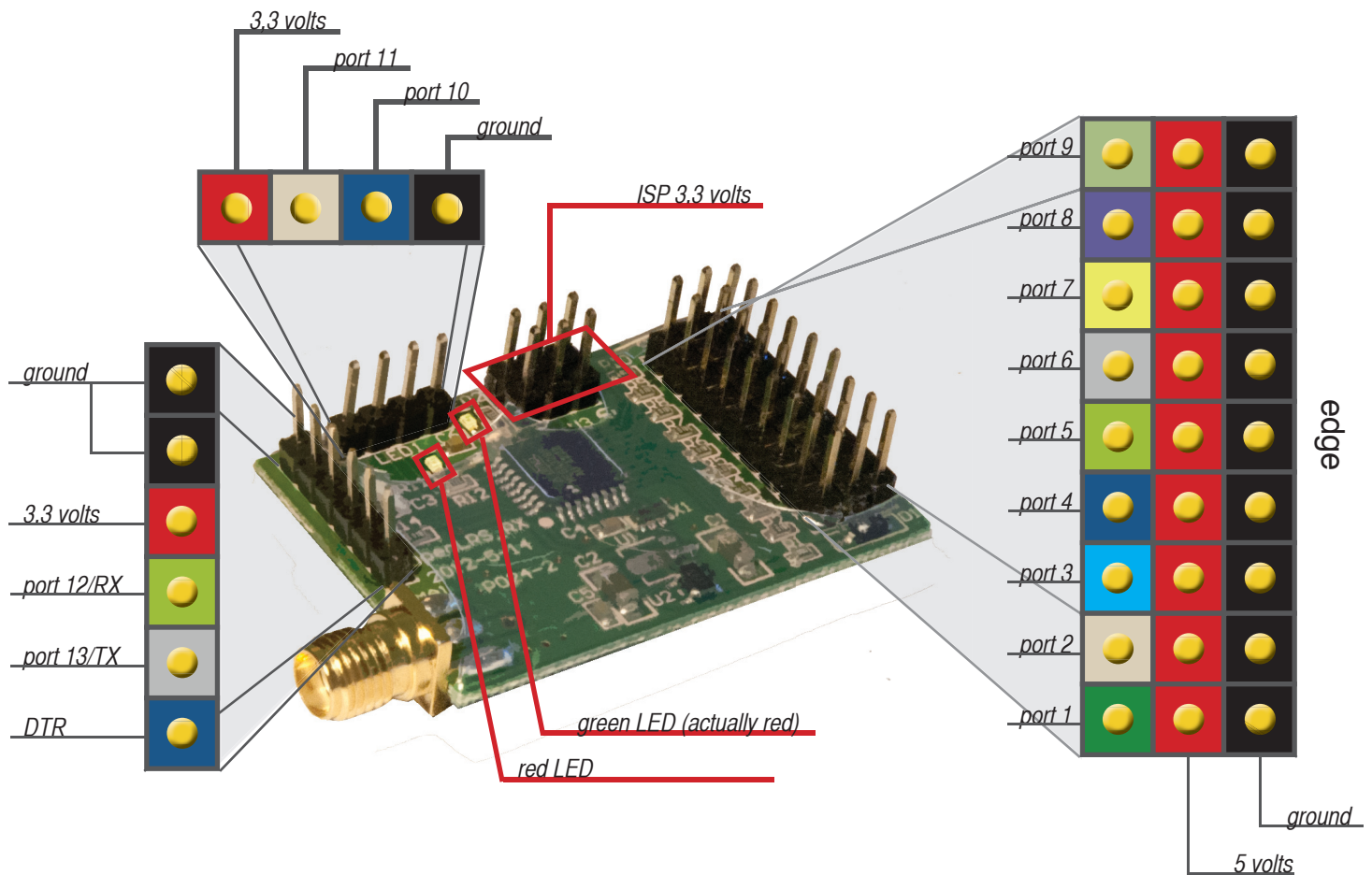
Never power on any receiver or transmitter for any reason without a suitable antenna attached. This includes when you are connecting it to a computer for software updates. All receivers are also capable of transmitting.

## 2.1 Hardware Overview : DTF UHF 4 Channel



| port | default   | alternate                             |
|------|-----------|---------------------------------------|
| 1    | channel 1 | PPM                                   |
| 2    | channel 2 | SDA/analogue 0                        |
| 3    | channel 3 | high-frequency RSSI/<br>analogue RSSI |
| 4    | channel 4 | SCL/analogue 1                        |
| 5    | RX        |                                       |
| 6    | TX        |                                       |

## 2.2 Hardware Overview : HobbyKing RX



| port | default             | alternate |
|------|---------------------|-----------|
| 1    | high-frequency RSSI |           |
| 2    | channel 1           |           |
| 3    | channel 2           |           |
| 4    | channel 3           |           |
| 5    | channel 4           |           |
| 6    | channel 5           | PPM       |
| 7    | channel 6           |           |
| 8    | channel 7           |           |
| 9    | channel 8           |           |
| 10   | analogue 0          | SDA       |
| 11   | analogue 1          | SCL       |
| 12   | RX                  |           |
| 13   | TX                  |           |

# 3.1 Instructions : Basic functions

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## **Binding**

Hold down the bind button while connecting power to the transmitter. Once the transmitter beeps once, release the bind button. The transmitter will begin to beep 5 times per second and the red LED will flash. The transmitter is now in bind mode, using the stored bind information.

Connect your receiver to power. After a moment, both the red and green LEDs should stay lit constantly and the transmitter will stop beeping. The receiver is now bound and all binding and transmitter information has been sent to the receiver. To bind additional receivers without restarting the transmitter, press the bind button momentarily and the transmitter will begin to beep again.

## ***Randomizing***

Hold down the bind button while connecting power to the transmitter. Continue holding down the bind button for about 5 seconds until the transmitter begins to beep slowly, then release the bind button. The transmitter will begin to beep 5 times per second and the red LED will flash. The transmitter is now in bind mode, and has randomized the binding data, making your transmitter's ID unique. Bind your receivers as normal. All receivers previously bound with this transmitter will have to be re-bound.

## **Setting failsafe**

Failsafe information is stored in the eeprom of each receiver. If failsafe information has not been set, the receiver's behaviour is to keep outputting the last information it received. To set failsafe controls to a specific position, turn on a bound transmitter and receiver pair, hold the controls in the failsafe position, and hold down the bind button until the transmitter beeps and the red LED flashes on both the receiver and transmitter. Failsafe information is now set. Always test failsafe operation BEFORE you need to rely on it.

## **LED information**

### ***Transmitter:***

The green LED will flash constantly under normal operation. The red LED will illuminate to indicate a loss of signal from the controller, a lost packet from the receiver (if telemetry is enabled), a problem with the radio, or when failsafe information is set.

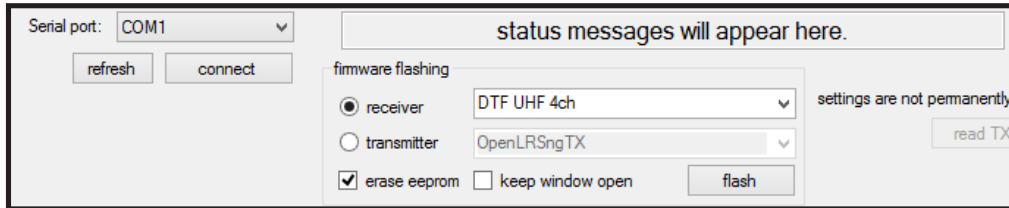
### ***Receiver:***

The green LED will flash constantly under normal operation. The red LED will illuminate to indicate a loss of signal from the transmitter, a problem with the radio, or when failsafe information is set.

## 3.2 Instructions : Flashing

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### **Flashing: Flytron TX&RX / HobbykingTX&RX / OpenLRSngTX / DTF UHF 4ch RX**



The screenshot shows the 'DTF UHF Companion' software interface. At the top left, 'Serial port:' is set to 'COM1' with a dropdown arrow. Below it are 'refresh' and 'connect' buttons. To the right is a large text box labeled 'status messages will appear here.'. In the center, under 'firmware flashing', there are two radio buttons: 'receiver' (selected) and 'transmitter'. Next to 'receiver' is a dropdown menu showing 'DTF UHF 4ch'. Next to 'transmitter' is a dropdown menu showing 'OpenLRSngTX'. Below these are two checkboxes: 'erase eeprom' (checked) and 'keep window open' (unchecked). To the right of these is a button labeled 'flash'. On the far right, there is a button labeled 'read TX' and a note that says 'settings are not permanently'.

Connect your USB-Serial adapter to the computer and ensure the drivers have installed. Driver installation is outside the scope of this manual. Find the COM-port associated with the USB-serial adapter.

Connect the USB-serial adapter to the device being flashed. Ensure you do not connect 5 volt equipment to a 3.3 volt device. Ensure a suitable antenna is attached, even when connecting a receiver. The pins you will need to connect are: GND, TX, RX and DTR. Connecting 3.3v is optional: you may also power the device being flashed through the battery it connected to normally - your controller's battery in the case of a transmitter, or the airplane/helicopter's battery in the case of a receiver.

Open DTF UHF Companion and select the COM-port from the Serial Port menu. If you plugged in your USB-serial adapter after starting DTF UHF Companion, click refresh to update the list of detected COM-ports. Don't click on Connect.

Select whether you are flashing a Receiver or Transmitter. Note that some receivers can also be flashed with transmitter firmware, allowing them to be used as transmitters with some additional components.

Select whether or not to erase eeprom. It is always recommended to leave this enabled unless you know what you're doing.

Select whether or not to keep the flashing window open. It will close immediately upon completion if this option is unchecked and only display the result in the text box. Check this box if you want to see what's going on during flashing.

Click the flash button. If the flashing was unsuccessful, check to make sure the correct COM-port is selected, the pins have been connected properly (you may have to swap TX and RX, depending on your USB-serial adapter), the LEDs on the receiver are off for the duration of the flashing (indicating that the device is indeed being flashed), and that the device being flashed is being powered properly. Some 1-watt transmitters draw more power than a USB port can give; in this case the transmitter must be powered by a battery while flashing.

## 3.3 Instructions: Transmitter configuration

### Configuring: Flytron TX / Hobbyking TX / OpenLRsngTX

Connect the transmitter, USB-serial adapter, and power connection as before. The DTR pin is optional for configuration. Click on Connect. Now, put the transmitter in bind mode by holding down the bind button as power is connected. This can be done by holding down the button as you connect the USB-serial adapter with power, or by holding down the button and switching on your controller if you have disconnected the power from the USB-serial adapter. Once the transmitter is in bind mode, click “read TX settings” to connect to the transmitter and stop the beeping.

The screenshot shows a software interface for configuring a transmitter. At the top, it displays 'Serial port: COM18' with 'refresh' and 'disconnect' buttons. A status bar indicates 'read successful'. On the right, there are buttons for 'save and exit bind mode', 'read TX settings', and 'write TX settings', with a note: 'settings are not permanently saved until you click this button ~~~'. The 'firmware flashing' section includes radio buttons for 'receiver' (selected) and 'transmitter', dropdown menus for 'DTF UHF 4ch' and 'OpenLRsngTX', and checkboxes for 'erase eeprom' (checked) and 'keep window open'. A 'flash' button is also present. The 'TX settings' section includes 'RF power' (set to 7), 'telemetry' (checked), 'serial baudrate' (115200), 'data rate' (radio buttons for 4800, 9600, and 19200, with 19200 selected), 'base frequency (Hz)' (435000000), 'channel spacing (x10kHz)' (5), '# of hop channels (max 24)' (6), 'channel numbers (0-255)' (22,10,19,34,49,41), and 'bind code (hex)' (DEADFEED). The 'RC channel configuration' section has radio buttons for '4 channels + 4 switches', '8 channels' (selected), '8 channels + 4 switches', '12 channels', '12 channels + 4 switches', and '16 channels', with a note about refresh rates. It also shows 'calculated refresh rate (Hz)' (40Hz) and 'calculated packet interval (µs)' (25000ms). On the right, 'channel frequencies' are listed for Hop channels 0 through 5, with buttons for 'restore defaults' and 'randomize and write'.

#### **RF Power**

The output power setting of the transmitter.

#### **Telemetry**

Enable the telemetry link from the receiver. The transmitter will beep if the receiver experiences packet loss. Other features are available such as FrSky telemetry emulation and serial bridge.

#### **Bind code**

The randomly-generated ID of your transmitter. If this reads DEADFEED, you need to randomize the information on your transmitter. Valid characters are hexadecimal (0-9, A-F)



## 3.3 Instructions: Transmitter configuration (cont.)

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### **Data rate**

The rate that data is sent to the receiver. Lower numbers mean slightly improved range at the cost of servo refresh rate.

### **Base frequency**

The frequency that hop channels are referenced to.

### **Channel spacing**

The amount of frequency between each channel.

### **# of hop channels**

This will display the current number of hopping channels you have configured.

### **Channel numbers**

The channels that the radio will use to hop, and the order in which they are hopped. The first channel numbered 0 indicates the end of the hopping sequence.

### **Channel frequencies**

The actual frequency of all the hopping channels configured. Frequencies are calculated using this formula:

$$\text{Transmission frequency} = \text{base frequency} + (\text{hop channel} * \text{channel spacing} * 10\text{kHz})$$

As channel numbers can vary from 1 to 255, this gives a maximum bandwidth of 25MHz. Always check your local laws and be sure you are able to legally transmit the frequencies you have selected at the power you have selected.

### **RC channel configuration**

Select the number of channels that will be sent to the receiver. This is also the number of channels that will appear on the receiver's PPM output. Additional channels sent to the transmitter will be ignored. Example: if the transmitter is set to 8 channels, and you controller is set to 12 channels, only the first 8 channels will be sent to the receiver. The "Switch" channels are channels with very low resolution - only 4 positions; however they take 1/5th of the time to transmit, increasing the number of useful channels for a certain refresh rate.

## 3.3 Instructions: Transmitter configuration (cont.)

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### ***Restore defaults***

This will load the default settings into the transmitter. It's a good idea to also randomize values after you do this.

### ***Randomize and write***

This will randomize the bind code and hop channels, without changing any other settings or the total number of hop channels. This performs the same function as randomizing while binding (the 2nd bind mode).

### ***Save and exit bind mode***

No settings are permanently saved until you click this button. Once you do, the transmitter will exit to bind mode so you can bind your receivers.

## 3.4 Instructions: Receiver configuration

### Configuring: Flytron RX / Hobbyking RX / DTF UHF 4ch RX

Configuration is done wirelessly: it is not necessary to connect receivers to your computer to configure them. First, enter the transmitter configuration menu as shown above, and keep your transmitter connected to your computer. Click the Connect to RX button, then connect the receiver to power. You can just plug in your airplane or helicopter,Äôs battery as normal. There is a 10-second window to power up the receiver.

RX settings

Connect to RX

save and return to Tx menu

save settings

restore defaults

Connected: DTF UHF 4ch

failsafe delay 10 x 0.1s

always bind on startup ☒  
(disable this and you will have to jumper ports 1 and 2 to re-enter this menu or bind)

minimum PPM sync time: 3000 µs

stop pwm on failsafe ☐

inject RSSI on servo channel: Disable

stop ppm on failsafe ☐

limit PPM out to 8 channels ☐

beacon

frequency 0 interval (s) 10  
0 = disable beacon  
f# = FRS channel 1-7 (example: f1)  
p# = PMR channel 1-8 (example: p1)  
the time between beacon signals

deadtime (s) 30  
the time after failsafe before beacon is activated

Channel Output

Port 1 1

Port 2 2

Port 3 3

Port 4 4

Port 5 RXD

Port 6 TXD

Port 7

Port 8

Port 9

Port 10

Port 11

Port 12

Port 13

#### ***failsafe delay***

The amount of time after the last packet is received before the receiver will load failsafe values. This can be used to “fly through failsafes” and can be adjusted to your liking. This value is in 1/10ths of a second.

#### ***Stop PWM on failsafe***

Completely stop PWM outputs on failsafe.

#### ***Stop PPM on failsafe***

Completely stop PPM outputs on failsafe.

#### ***minimum PPM sync time***

The minimum time between PPM frames. Some devices that accept PPM are picky about this.

#### ***limit PPM out to 8 channels***

Some devices that accept PPM are also picky about the number of PPM channels that are in a PPM frame.

## 3.4 Instructions: Receiver configuration (cont.)

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This is used to only output the first 8 channels in the PPM stream regardless of the number of channels sent to the receiver.

### ***inject RSSI on servo channel***

RSSI information can be indicated using a servo in front of a camera, and some OSDs take RSSI information in the form of a servo pulse. Choose a channel here and the RSSI information will override that channel in the PPM stream and on that channel's output pin.

### ***Channel Output***

Select the output for each port in this menu.

### ***Always bind on startup***

If this option is enabled, the receiver will listen for binding or configuration information for a moment every time it is connected to power. This will allow you to bind the receiver and configure it simply by applying power. If this option is disabled, you will have to connect ports 3 and 4 together with a jumper and then apply power in order to enter bind mode or configure the RX.

### ***Beacon***

If this option is enabled a tone is transmitted on the selected frequency that can be picked up using a common FRS, PMR or amateur radio walkie-talkie to aid finding a lost airplane or helicopter. Three tones are sent of descending transmit power and tone to help you zero in on its location. The beacon is sent after failsafe has been activated.

### ***Save settings***

Immediately sends information to the RX and writes the information in eeprom.

### ***Restore defaults***

Restores the default settings and writes them to eeprom.

### ***Save and return to TX menu***

Saves the RX settings to eeprom and returns to the TX menu. You may now disconnect the RX from power.

## 3.5 Instructions: Spectrum analyzer

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To enter spectrum analyzer mode, connect ports 1 and 2 on a receiver with a jumper and apply power to the receiver. Use USB-serial adapter to connect the receiver to your computer. Open the spectrum analyzer software, choose your COM port, and connect.