

- Twin receivers for best reception.
- Automatic antenna switching.
- Calibrated receivers for seamless switching between antennas.
- Dual, buffered AV outputs.
- Automatic or user configurable low battery alarm.
- Can be powered from 6-12V, 2S or 3S LiPo battery preferred.
- High bandwidth stereo-audio.
- Single button operation for channel selection.
- Visual indication of selected antenna.
- Twin female SMA antenna connectors.
- FM Audio/Video Modulation.
- -85dB typical sensitivity.
- 50 ohm antenna impedance.
- 1Vpp Video output level.
- 3V pp Audio output Level.
- Small, light weight, durable, anodized aluminum casing.
- Weight: 195-grams.
- Size : 82 x 105 x 26 mm.

Duo 2400 Diversity Receiver

Twin receivers for best reception

Conventional receivers have one big drawback, they only allow for a single antenna to be connected. If for some reason the reception fails there's no backup and you lose the signal. Not so with the Duo 2400 diversity receiver. With its twin receivers it allows you to hook up two antennas and the microcontroller inside will automatically switch to the receiver with the strongest signal, without any switching noise or a change in the image received.

With -85dB sensitivity per receiver the Duo 2400 is sensitive, very sensitive. Paired with two flat patch antennas it will give you many miles/kilometers of range. It is engineered from an FPV-er's perspective and hence has features to match. It'll warn you when the receiver battery runs low, or when switching antennas. The diversity receiver works best with either a 2S or 3S LiPo battery and the low voltage warning can be set accordingly, either automatically, or user configurable.

Equipped with two buffered AV outputs it allows you to connect your goggles, as well as your recording device, without the need for Y-cables or a signal splitter. Operating the Duo 2400 Diversity Receiver couldn't be simpler. After applying power it'll beep the number of LiPo cells it has detected and sets the low voltage warning to match. Selecting channels is a breeze; four channels according to the frequencies used by Airwave and another six as used by Lawmate are available with the press of a button.

ImmersionRC – Real Virtuality



Operating the Duo 2400 Diversity Receiver

Operating the receiver is simple, as a single push-button allows for switching channels as well as setting up user configurable settings. After applying power, and provided the 'auto' setting for the low voltage warning is selected, it'll beep the number of LiPo cells it has detected. So two beeps indicate a 2S LiPo and the low voltage warning is set to 6V, three beeps indicate a 3S LiPo and the low voltage warning is set to 9V.

The Duo 2400 Diversity Receiver has 10 channels it can tune to; four of these are reserved for Airwave audio/video transmitters and six for Lawmate audio/video transmitters. It'll cycle through these 10 channels with each press of the button. Airwave channels are indicated with a single beep, Lawmate channels with a double beep. When switching to Lawmate channels there'll be a long double beep for the first Lawmate channel, with subsequent channels having short double beeps. When switching to Airwave channels there'll be a long single beep, with subsequent channels having a short single beep. The last chosen channel is stored and will be tuned to at power up.

When the low voltage battery alarm is triggered the receiver will start to beep indicating you need to charge or change the battery. Furthermore it'll also beep when the input voltage is too low, less than 5V or too high, more than 13V. At voltages less than 5V it will not work reliably, at voltages over 13V it will run hot over a longer period of use, so this is not recommended. The power input is reverse polarity protected, however it is good practice to always check polarity prior to applying power. The Duo 2400 diversity receiver power connector is center pin positive, which seems to be the norm.

Programming the Duo 2400 Diversity Receiver

The Duo 2400 Diversity Receiver can be configured to store user selected configuration settings. The selected channel will always be stored so at power up it defaults to the last selected channel. Other settings that can be configured are:

- Low voltage alarm threshold
- Rx Switch Tick enable/disable
- Rx Switch Hysteresis

Programming these settings is accomplished by using the push button, with feedback from the internal beeper, in a manner similar to that used by most ESCs (Electronic Speed Controllers).

To enter the programming menu, hold down the push button for 5 seconds or longer. Once the programming menu has been activated, the receiver will start cycling through the menu options, in the order listed.

To change one of the items, wait for it to be ‘played’, and immediately after, press the button.

The receiver will then ‘play’ the current value, as a number of beeps, and will then start from the first option, and play each option until the last. Selecting an option is simply done by waiting for it to be played and pressing the button briefly.

For example to change the Rx Switch Tick setting:

Button pressed for > 5 seconds

Dash Dot Dot Dot	- third menu item –	<u>press button briefly to enter setting</u>
Dot Dot	-	<u>current setting</u>
Dot	- first available option -	Tick Off <u>press button briefly</u>

At this point the Rx Switch Tick setting has been changed to ‘Tick Off’. The module will now continue with the next item in the menu, and continue to the end of the list. Once the end of the list is reached, the receiver will automatically exit the programming mode signaled by two short beeps.

Beep Codes

Beep Code	Menu	Menu Choices
- .	Low Batt Volts	1 – Auto (for 2S or 3S LiPo)* 2 – 6v 3 – 7v 4 – 8v 5 – 9v 6 – 10v 7 – 11v 8 – 12v <i>Default: 6V for 2S, 9V for 3S</i>
- . .	Low Batt 100mV	1 – 0.0v 10 – 0.9v <i>Default: 0.5v (for threshold of 9.5v) (Ignored in Auto mode)</i>
- . . .	Rx Switch Tick	1 – Tick Off 2 – Tick On *
-	Hysteresis	# beeps * 5dB <i>Default: 1 = 5dB</i>

Note that * indicates the default value .

Rx-change Ticks

When the diversity receiver's microcontroller switches receivers, it issues an audible 'tick'. A useful confidence-building feature when using the receiver, but if you feel the ticking becomes annoying you have the option of turning it off.

Low Battery Volts

Low Battery 100mV

These two options can be combined to set the threshold at which the low-voltage alarm sounds. In Auto mode (the default), the receiver will sense the attached battery voltage, and will set the alarm voltage accordingly (6V for 2S and 9V for 3S LiPo). This mode is designed only for use with LiPo batteries. For use with NiCD, NiMH, or other batteries, set the alarm voltage manually, for example:

9.2v	set LowBattVolts to 5 (9v), and LowBatt100mV to 3 (0.2v)
10.0v	set LowBattVolts to 6 (10v), and LowBatt100mV to 1 (0.0v)

When powering the receiver from LiPo batteries, it is important to note that the discharge curve is fairly flat, and drops off quickly near the end. Setting a threshold of around 3.0/cell is relatively safe. It is however highly recommended to perform a 'dry-run' after setting the voltage warning threshold to make sure the low battery warning is set up correctly.

If upon connection of a battery pack the receiver beeps continuously then the low battery warning is set higher than the voltage from the battery pack, so reset accordingly or charge the battery pack.

Note that regardless of the low battery alarm settings, a fixed alarm will occur when an input voltage smaller than 5V or larger than 13V is detected. This safeguards the receiver from being used with input voltages with which the correct operation cannot be guaranteed.

Safety Note: Even though this alarm will provide some protection against loss of video signal during an FPV flight, it is highly recommended to fully charge all battery packs used before each and every flight.

Hysteresis

The hysteresis control is used to prevent unnecessary receiver switching when the difference between their signal-strengths is minimal, for example when flying close by. The default value should be reasonable in most applications.

Antenna Selection

The diversity receiver can be used with standard 2.4GHz antennas, equipped with a male SMA connector. The idea behind the use of two antennas is to prevent nulls due to multipath interference. A combination of antennas can be used for optimal signal reception. Two small 8dBi flat patch antennas provide a good compromise for most, but two different antennas can also be used to fill in any nulls, for example a low gain 3dBi and a high gain 11dBi omni-directional antenna.