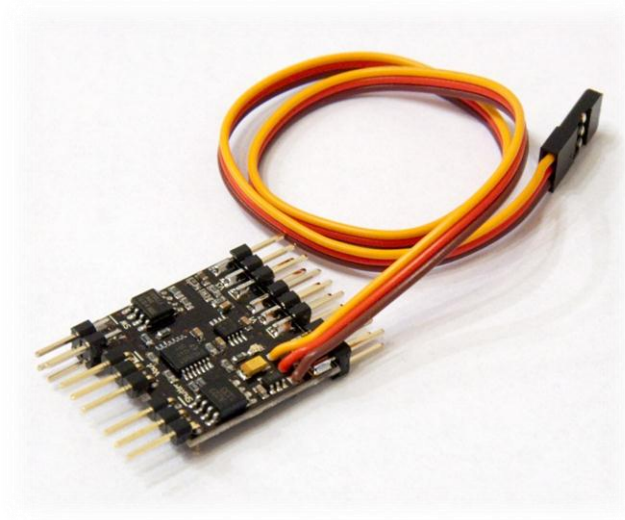


SmartFPV

RC Camera Control v2.0

User Guide
(RCCC v2)



6/9/2013
Rev. C

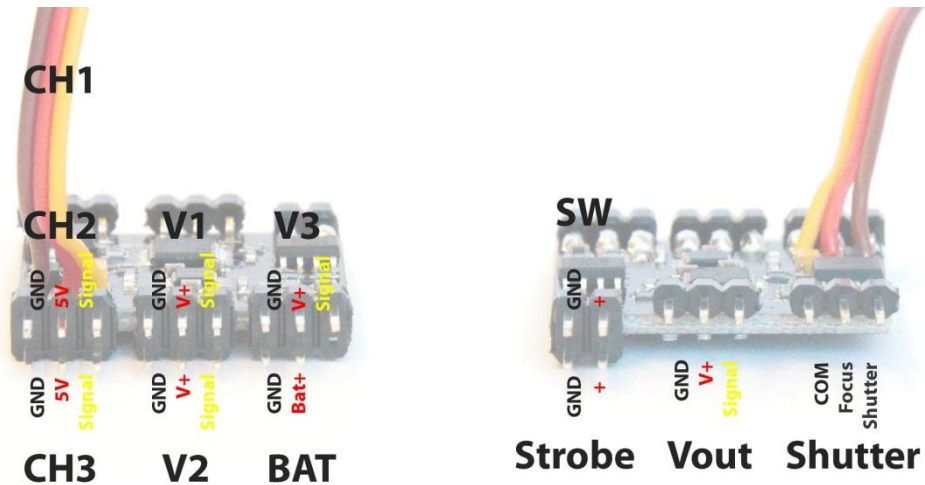
INTRODUCTION

SmartFPV RC Camera Control board (RCCC) is multifunctional RC control board designed for Aerial Photography or First Person Video flying. RCCC version 2 adds even more functions and has some improvements.

Features:

- Video switch
 - 3 input video switching
 - Regular 3 pin servo connector style headers with middle pins interconnected for power distribution
- Two LED switch outputs
 - Headlight output
 - Strobe output
- Camera shutter release control
 - DSLR and GoPro modes
 - Switched or standalone shutter timer with programmable time interval
- LiPo battery low voltage indication
- Channel mirroring (when sum PPM used)
- Sum PPM or 3 PWM input from RC receiver (Video source, LED switch, Shutter)

CONNECTIONS



CH1	RC channel 1 (PWM or sum PPM)	SW	Switch headlight output
CH2	RC channel 2	Strobe	Switch strobe output
CH3	RC channel 3	Vout	Video output
V1	Video in 1	Shutter	Shutter connector
V2	Video in 2		
V3	Video in 3		
BAT	Battery connector		

CAUTION!

- There is **NO reverse polarity protection** and it is physically possible to connect connectors reversed! Please be careful with connections.
- **Isolate bard** from short circuits using heatshrink if placing near metallic elements!
- All connectors have **GND pin on left side** if facing connectors and board with components on top.

RC INPUTS

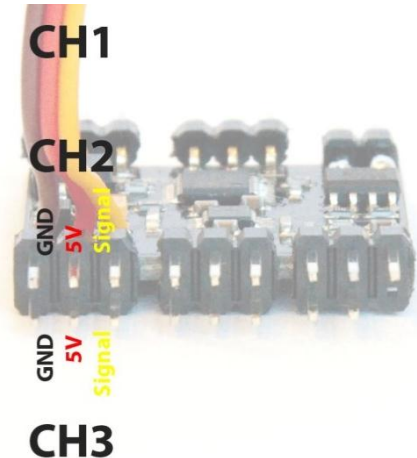
RCCC automatically detects type of RC signal regular PWM or sum PPM.

3 PWM inputs

To use device with regular servo outputs from RC receiver (PWM) connect RCCC to according channels of your RC receiver. Default functions of RCCC channels are:

- CH1** Video switch
- CH2** LED switch
- CH3** Shutter control

Function mapping to channels can be changed in Setup mode (see page 10).



PPM input

Connect your RC receiver sum PPM output to RCCC **CH1** connector.

RCCC can accept up to 16 PPM channels. Up to three of them will be used.

You can configure channel functions in Setup mode. Default channel function if RCCC is used with PPM:

- Video switch **CH7**
- LED switch **CH8**
- Shutter control **CH9**

Channel MIX

You can enable different channel mixes to use one channel for 2 functions. This will allow reducing RC system channels used and use them for different functions.

There are 2 types of mixes:

- 3 position mix
- 9 position mixes

In **3 Position MIX** one channel (CH1 in regular PWM mode or, Video control channel in sum PPM mode) using 3 position switch is used to control video switch and LED switch functions. 3 position switch must be set to middle position (1.5ms pulse). When switched to one of side positions and back, video switch source is changed. When switched to other side position and back, LED switch state changes. Video switch source and LED switch modes can be changed through all 3 states cyclic.

Video switch:	LED switch:
Video 1	LED's OFF
Video 2	Strobe ON
Video 3	Strobe and Headlight ON
Video 1	LED's OFF
...	...

In **9 position MIX** one channel is divided in 9 positions and used to control 2 functions of RCCC.

There are 3 MIX combinations available:

MIX	Function 1	Function 2
Video+LED	Video switch	LED switch
Video+Shutter	Video switch	Shutter control
Shutter+LED	Shutter control	LED switch

Channel used when MIX is activated is channel that is configured for Function #1 used in MIX.

Using mixes in RC transmitter you can combine by example two 3 position switches to 9 positions of one control channel:

Channel pulse	Function 1	Function 2
1.000ms	1	1
1.125ms	1	2
1.250ms	1	3
1.375ms	2	1
1.500ms	2	2
1.625ms	2	3
1.750ms	3	1
1.875ms	3	2
2.000ms	3	3

To set mixes on your RC transmitter you need to follow its user manual.

Channel mirroring

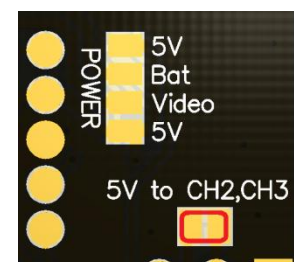
If you are using sum PPM signal to control RCCC, you can output any 2 channels from PPM stream to CH2 and CH3 connectors. Please see Setup mode how to configure.

This is useful to reduce cables to RC receiver if connecting camera pan/tilt servos.

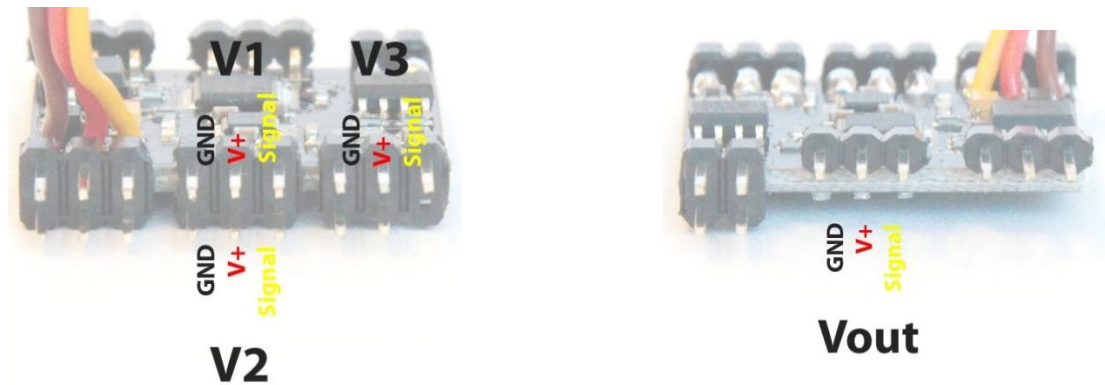
You can have cameras, video transmitter, RCCC and pan/tilt servos placed in some distance from RC receiver and use only one PPM cable from RC receiver and one cable from battery and have fully functional video system with minimum of cables used.

By default middle 5V pin of RCCC **CH1** cable is not connected to **CH2** and **CH3** connector middle pins to avoid short circuit.

In order to power servos connected to **CH2** and **CH3**, you need to solder together pads of solder jumper **shown in picture** under board.



VIDEO SWITCH



Connect video sources (video camera, photo camera ...) to video input connectors **V1-V3**.

Connect video transmitter to video output **Vout**.

You can use 3 state switch to switch between all 3 video sources or 2 state switch to select between 2 video sources.

Video source is selected based on video control channel value:

0% (1.0ms) **V1**

50% (1.5ms) **V3**

100% (2.0ms) **V2**

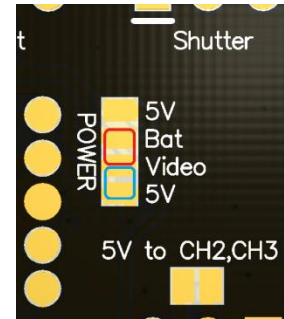
Video inputs and video output connector middle “power” pins are connected together so you can feed power for your video camera or video transmitter to one connector and have powered other connected video devices.

You can also choose to power cameras and/or video transmitter by soldering jumpers in bottom of board.

That will connect according power source to video connector “power” pins:

- **5V** – 5V from RC receiver
- **Bat** – voltage from battery connector

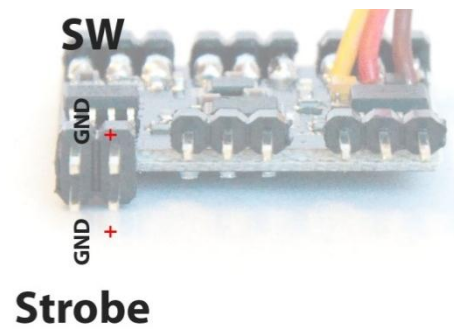
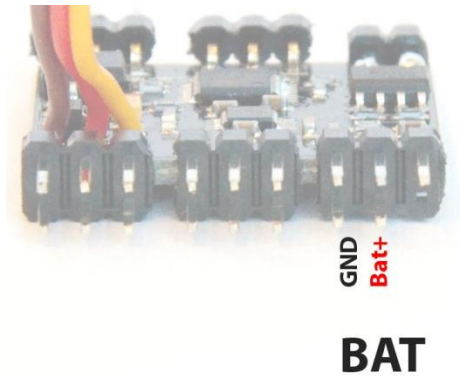
Please read video camera and video transmitter manuals to find voltage needed to power them.



WARNNG! Do not solder together both jumpers **5V** and **Bat** if battery connected to **Bat** connector.

If video cable 3 pin servo style connector middle pin is dedicated for audio, or it needs different voltage than other video devices connected to RCCC, then remove middle pin and leave only GND and video pins.

LED SWITCH



Connect battery to **Bat** connector. Connect headlight LEDs to switch output connector **Sw**. Connect strobe LEDs to **Strobe** connector.

WARNING! Use LEDs that are dedicated to voltage you are connecting to **Bat** connector.

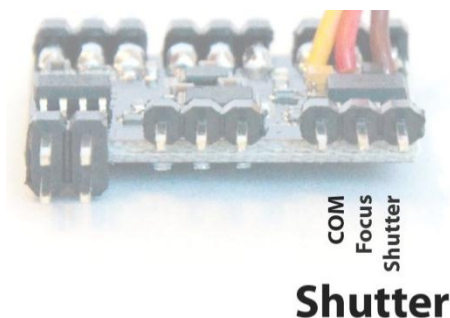
You can use 2 or 3 state switch to control switch output. Switch has 3 states depending on control channel value:

0%	(1.0ms)	Both switch outputs OFF
50%	(1.5ms)	Strobe output active (2 impulses every second) and headlight output OFF
100%	(2.0ms)	Strobe output active (2 impulses every second) and headlight output steady ON

Switch output has permanent connection of + pin from **Bat** connector + pin. Ground pin is switched. Switch can handle **2A** continuous current and 4A current for 10s.

WARNING! Please follow polarity!

CAMERA SHUTTER



DSLR mode
C – Common
F – Focus
S – Shutter

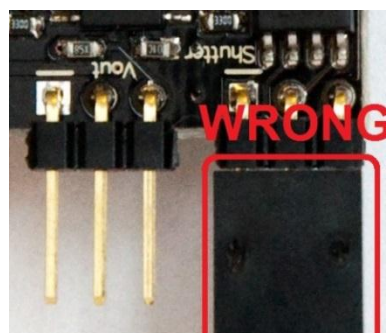
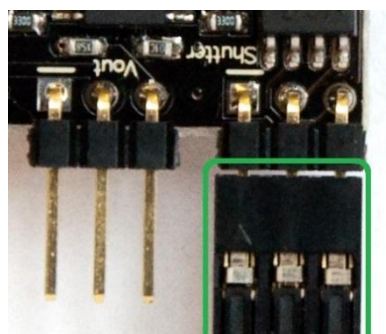
GoPro mode
C – Ground
F – Mode
S – Mode

Connect camera shutter cable to RCCC board. If you use original SmartFPV shutter cables then connect them so that connector contacts are seen if looking from top of the board like in picture.

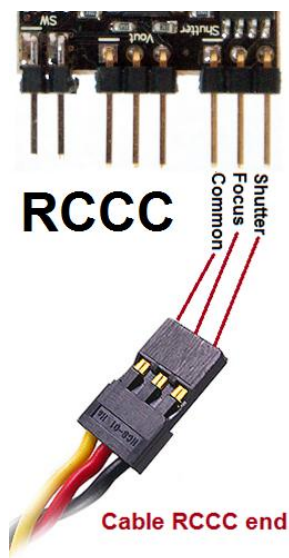
Use 3 state switch for Focus and Shutter control or 2 state switch for immediate Shutter control.

You can use RCCC shutter function with all C3 plug and 2.5mm plug Canon cameras, Nikon cameras, GoPro HERO and HERO2 (HERO3 not fully compatible) and other cameras.

Shutter control for DSLR cameras works just like regular shutter release button (Focus and Shutter). Shutter control for GoPro cameras just turns ON/OFF camera (see details in GoPro mode description).



You can also make your own cable for camera shutter.



Cable camera end



For GoPro connect:
pin 30 to Common
pin 12 to Focus



Some information about shutter connector pin outs:

<http://www.cameraaxe.com/wiki/index.php?title=CameraCables>

http://www.doc-diy.net/photo/remote_pinout/

GoPro mode

To enable **GoPro mode** you have to configure it in setup step 2.

Shutter control in GoPro mode turns ON and OFF GoPro camera. To start recording after power ON you have to put GoPro in One Button Mode (see GoPro user manual).

It is possible to change way you turn GoPro ON and OFF by enabling **GoPro toggle mode** in setup.

If **GoPro toggle mode is disabled** GoPro follows state of RC transmitter switch dedicated to shutter control. If switch is ON then GoPro will turn ON, if switch is OFF then GoPro will turn OFF.

If **GoPro toggle mode is enabled** then GoPro will change its power state each time when switch is changed from OFF to ON state. This is usable if you have momentary switch on your RC transmitter (like Trainer switch). Pushing switch will turn GoPro ON, pushing switch one more time will turn GoPro OFF.

DSLR shutter timer

It is possible to configure DSLR camera shutter to trigger camera with defined time period using configurable timer function. Shutter timer is not available for GoPro shutter function. Timer is configured in Setup mode and can be set to: 1s, 5s, 10s, 30s, 1min, 5min.

Shutter timer is configurable to start when switched by shutter switch on RC transmitter or to start automatic when RCCC powers ON and RC signal is detected (standalone timer). If timer is configured as standalone, you will have one free channel that will not be used for shutter function.

It is possible to manually trigger shutter while shutter timer is enabled. This is possible with 3 different shutter control channel values using 3 position switch.

Channel values when shutter timer function is enabled:

0%	(1.0ms)	Shutter OFF
50%	(1.5ms)	Forced shutter
100%	(2.0ms)	Shutter timer ON

Please see Setup mode how to configure shutter timer function.

LOW BATTERY DETECTION

If enabled in setup device will automatically detect LiPo battery cell count on power up if battery is connected to **Bat** connector and flash blue LED and **LED switch headlight** output number of times equal to LiPo battery cell count detected. RCCC can measure LiPo batteries from 1S to 4S

During operation RCCC board monitors voltage of battery. If battery voltage falls below warning level **LED switch headlight** output will be toggled approximately once per second.

When voltage falls below critical level **LED switch headlight** output will be toggled rapidly.

You can see low battery warning from ground while you are flying.

Warning level is **3.5V** per cell and **critical warning** level is **3.33V** per cell. So for 3S LiPo battery that will be 10.5V and 10V

START USING DEVICE

RCCC is powered from **CH1** input that is connected to RC receiver.

You can use 6 volt BEC or ESC to power RCCC board.

When device is powered it starts waiting for valid control signal from RC receiver indicating this state by slowly flashing LED.

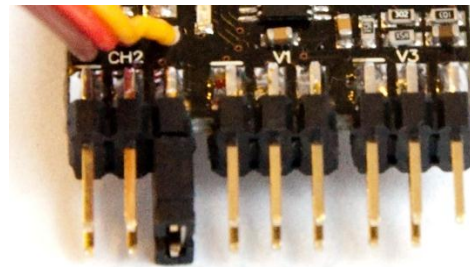
After valid signal from RC receiver is detected LED goes OFF.

If battery monitor is enabled blue LED together with LED switch headlight output flashes number of times according to LiPo cell count detected.

CONFIGURING DEVICE

To configure RCCC you have to enter Setup mode.

Setup mode can be enabled by connecting RCCC **CH1** to RC receiver, connecting **CH2** and **CH3** signal pins together using jumper and then powering on RCCC and RC transmitter. Setup mode is indicated with fast flashes after RCCC detects signal from RC receiver.



Before setup you must configure switches on RC transmitter for needed RCCC functions.

Setup mode is slightly different if using sum PPM or regular servo connection to RC receiver.

Regular PWM mode

Channel connected to RCCC's **CH1** is used as enable channel to enter submenus and change options.

Sum PPM

If using sum PPM to control RCCC Enable channel is used to enter submenus and change options. It is recommended to use one of RC transmitter sticks as Enable channel.

Enable channel is set after entering setup mode (fast flashes). You have to move 4 times stick on RC transmitter from one end to other until LED on RCCC board flashes one time.

After Enable channel is set, setup menu is entered.

Setup menu

Blue LED flashes long number of times according configuration menu item number. After flashes you have 4 seconds to enter configuration step by changing enable channel state.

If you wait 4 seconds then next menu item number is flashed ...

When entered submenu blue LED flashes fast number or times according submenu item number. After flashes you have 4 seconds to enable this option by changing enable channel state.

Setup menu structure

Menu item	Submenu item	Notes
1 Channel setup	1 Video CH	Toggle 4x in 4s, then 2s for OFF state (Disabled if not set)
	2 Switch CH	
	3 Shutter CH	
2 Shutter setup	1 GoPro mode	Exits submenu
	2 GoPro toggle mode	
	3 Regular DSLR mode	
	4 Timer OFF	Exits submenu
	5 Switched timer	
	6 Standalone timer	
	7 Timer 1s	Exits submenu
	8 5s	
	9 10s	
	10 30s	
	11 1min	
	12 5min	
3 Battery monitor	1 Low bat monitor OFF	Exits submenu
	2 Low bat monitor ON	Exits submenu
4 Mix setup	1 Mix OFF	Exits submenu
	2 Video+Switch 3pos MIX	
	3 Video+Switch 9pos MIX	
	4 Video+Shutter 9pos MIX	
	5 Shutter+Switch 9pos MIX	
5 Default Settings	1 Reset to default settings	Exits Setup
6 Mirror setup	1 Mirror CH2	Cycle 4x in 4s (Only if PPM used)
	2 Mirror CH3	

1 Channel setup

In this step you configure channels used to control functions of RCCC.

When entered channel setup using regular servo channels (PWM) for control LED flashes fast for 30s. That gives you time to remove jumper and connect RC receiver to RCCC CH2 and CH3.

When entered channel setup blue LED blinks number of submenu according to function which channel is being configured. After these blinks you have 4 seconds to toggle 4 times switch on RC transmitter which will be used for this function. After toggling 4 times LED flashes and you have 2 seconds to leave switch in default state which is Video 1 for video switch, LED's OFF for LED switch and Shutter OFF for shutter function.

If you don't toggle switch 4 times during these 4 seconds, this function will be disabled.

2 Shutter setup

In this step shutter functions are configured. After LED blinks number of submenu item you have 4 seconds to change enable channel state which is RCCC's CH1 or preconfigured channel if sum PPM mode is used.

There are several submenu items after enabling which submenu is exited to main menu items because enabled options are not used with next items (GoPro mode and timer for example). Submenu is exited also if by example GoPro mode has been configured previously

and you don't enable regular DSLR mode (next functions are not used with GoPro shutter mode).

See page 7 for more information.

3 Battery monitor

In this step low battery monitoring function is enabled or disabled. See page 9 for more information.

4 Mix setup

In this step RC channel mix functions are configured. See page 3 for more information.

5 Default settings

In this step all settings are reset to default factory values:

Channel functions:

	Regular servo channels (PWM)	Sum PPM channels
Video switch	CH1	CH7
LED switch	CH2	CH8
Shutter control	CH3	CH9

DSLR shutter mode without timer

Battery monitoring disabled

Channel mixing disabled

PPM channel mirroring disabled

6 Mirror setup

In this step sum PPM channel mirroring is configured.

In each of mirror setup submenu items you have 4 seconds to cycle 4 times from one end to other (1ms-2ms pulse) channel on RC transmitter which will be mirrored to according output. After you cycle 4 times channel, LED blinks accepting channel for mirroring.

If you don't cycle channel 4 times during these 4 seconds, mirroring to according output will be disabled.

See page 4 for more information.

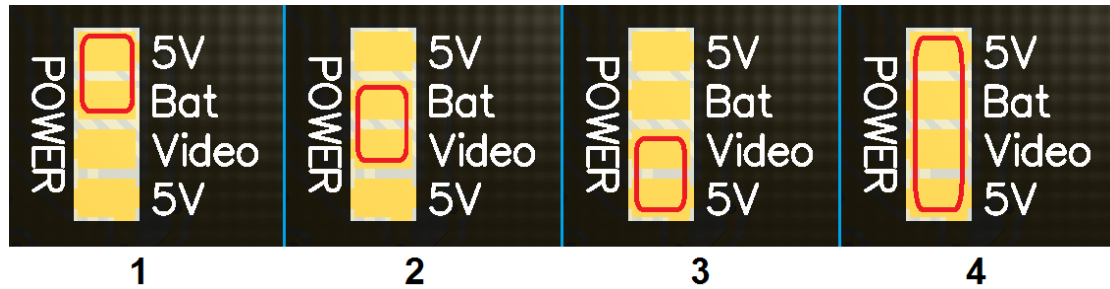
NOTE! Remember to remove jumper used to enter setup mode.

VOLTAGE SOLDER JUMPERS

Solder jumpers are located on bottom of device PCB. There are 4 pads located close to each other. They expose contact areas of 3 different voltage circuits:

- **5V** – 5-6 volts powering RCCC board from RC receiver.
- **Bat** – voltage connected to **Bat** connector
- **Video** – middle pins of video connectors used to power video camera or transmitter

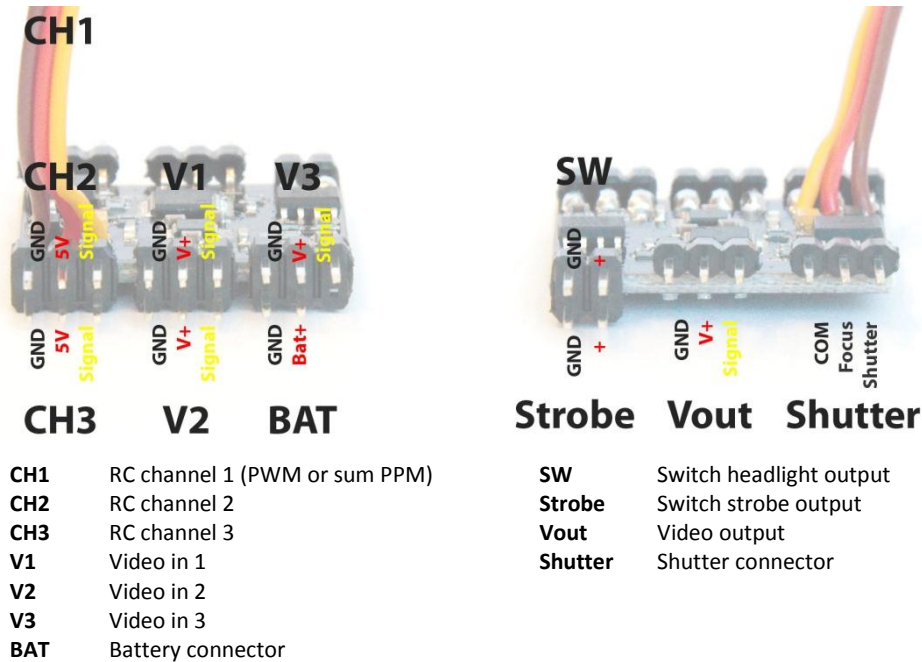
You can solder neighbor pads to have different voltage connections:



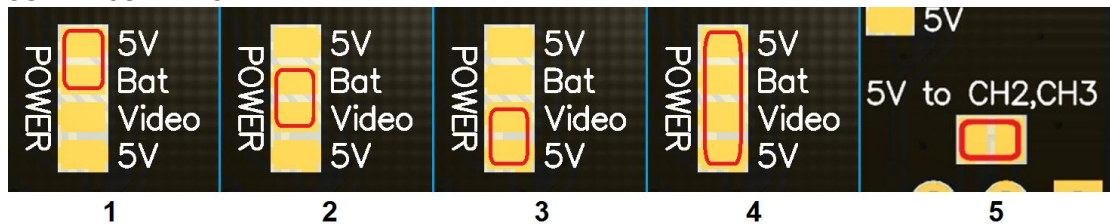
1. **5V** power **Switch** output for 5V LEDs.
*Don't connect battery to **Bat** connector!*
*Don't short circuit **Bat** connector!*
2. **Battery** power **Video** connectors and **Switch** output.
3. **5V** powers **Video** connectors. **Battery** powers **Switch** output.
*Don't connect power to **Video** connectors!*
4. **5V** powers **Video** connectors and **Switch** output.
*Don't connect battery to **Bat** connector!*
*Don't short circuit **Bat** connector!*

WARNING! Do not solder together both jumpers **5V** and **Bat** if battery connected to **Bat** connector.

RCCC v2.0 QUICK GUIDE



SOLDER JUMPERS



1. **5V** power **Switch** output for 5V LEDs.
*Don't connect battery to **Bat** connector!*
*Don't short circuit **Bat** connector!*
2. **Battery** power **Video** connectors and **Switch** output.
3. **5V** powers **Video** connectors. **Battery** powers **Switch** output.
*Don't connect power to **Video** connectors!*
4. **5V** powers **Video** connectors and **Switch** output.
*Don't connect battery to **Bat** connector!*
*Don't short circuit **Bat** connector!*
5. **CH2** and **CH3** powers RCCC board.

WARNING!
Do not solder together both jumpers **5V** and **Bat** if battery connected to **Bat** connector.

SETUP MENU

Menu item	Submenu item
1 Channel setup	1 Video CH
	2 Switch CH
	3 Shutter CH
2 Shutter setup	1 GoPro mode
	2 GoPro toggle mode
	3 Regular DSLR mode
	4 Timer OFF
	5 Switched timer
	6 Standalone timer
	7 Timer 1s
	8 5s
	9 10s
	10 30s
	11 1min
	12 5min

3 Battery monitor	1 Low bat monitor OFF
	2 Low bat monitor ON
4 Mix setup	1 Mix OFF
	2 Video+Switch 3pos MIX
	3 Video+Switch 9pos MIX
	4 Video+Shutter 9pos MIX
	5 Shutter+Switch 9pos MIX
5 Default Settings	1 Reset to default settings
6 Mirror setup	1 Mirror CH2
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