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# MP-GCG1 Buffer Unit User Guide

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## Introduction

The MP-GCG1 Buffer circuit assembly provides an active buffer that provides additional power to the RC systems and Servos. This is especial necessary for power hungry digital servos that can cause voltage to drop below the minimum requirements of the RC system components that can lead to brownouts.

## Specifications

Dimensions (mm): 24.2 x 38.3 x 2.5

Weight of Circuit board alone: 2.7g

...with 25F Caps: 20.7g

...with 50F Caps: 40.7g

...with R Extension, add 0.7g

Input/Output Voltage: 2.5V-8.1V

The MP-GCG1 allows for two configurations:

### NC configuration (Capacitors)

- Uses high capacity 25F or 50F low ESR Ultra-capacitors.
- Usable with LV (< 6V) implementations.
- Voltage: Max 8.1V (HV compatible)
- Zero maintenance.
- Maintains voltage during hard 3D maneuvers.
- Absorb voltage spikes from servos.
- Adjustable low voltage cutoff to eliminate servo lockup due to brownout.
- Adjustable charging current allowing gradual loading of capacitors.
- Provide 10 to 25 seconds of emergency power to RC Systems and Servos in case of BEC failure. It will NOT power the main motor! The MP-GCG1 is designed to power the RC system long enough for an emergency autorotation.

### NL configuration (2S LiPo)

- Uses 2S LiPo battery (no included)
- Only usable with HV (> 6V) implementations
- Voltage: Max 8.1V (HV compatible)
- LiPo is charged during flight
- Battery should be occasionally be checked and balanced
- Maintains voltage during hard 3D maneuvers.
- Provides emergency power to RC Systems and Servos in case of BEC failure. It will NOT power the main motor. Amount of available emergency power depends on the LiPo used.
- Adjustable low voltage cutoff to eliminate servo lockup due to brownout.
- Adjustable charging current helps prevent LiPo overcharging.

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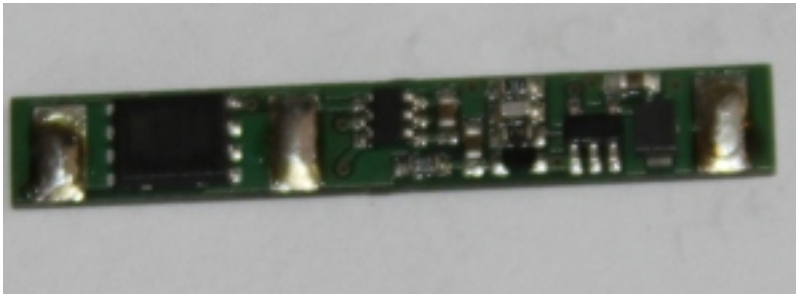
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## R Extension (optional)

The optional R extension allows the MP-GCG1 to be used with ESC/BEC's that are sensitive to voltage flowing "backwards" into the BEC. Some BEC's will be damaged if the voltage applied to the BEC power output is higher than the voltage it produces. Additionally, some ESC's will apply the voltage surplus from the BEC output to the motor, which will drain the buffer or battery more quickly providing less time for an autorotation.

The R Extension monitors the BEC output and MP-GCG1 output voltages. If the MP-GCG1 voltage level exceeds that of the BEC output, the "backwards" flow of voltage to the BEC is stopped until the BEC voltage is greater than the MP-GCG1 output. The circuit does this without the voltage loss that is typically seen with Schottky diodes (typically between 0.15V to 0.46V loss).

Please contact your ESC/BEC manufacture is you are uncertain if your ESC/BEC will be damaged if the voltage applied to the BEC is higher than the voltage the BEC generates.

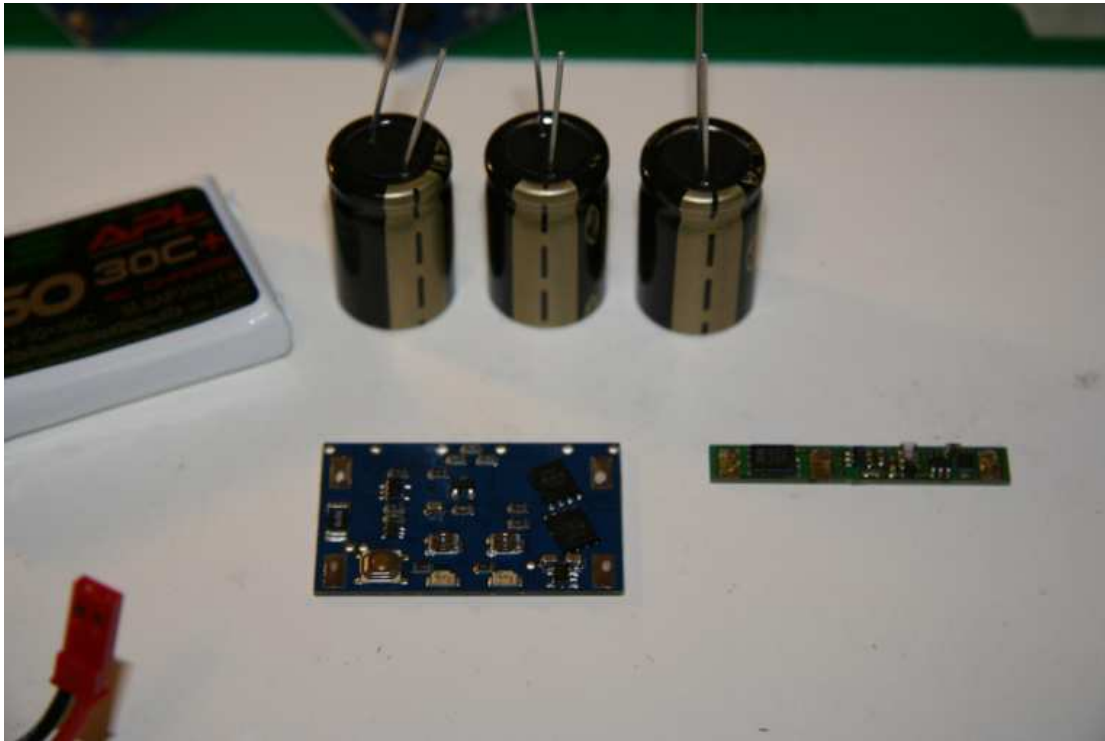


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## Assembly

The assembly instructions are separated into the NC and NL configurations. You should start by laying out the components in the work area. Assembly will require you to solder the capacitors or battery leads and the cable connecting to the RC System.



The assembly instructions are separated into specific sets for NC (Capacitor) and NL (LiPo) configurations. It is possible to assemble the unit for NC and then later switch to NL. Switching from NL to NC is not recommended due to the required removal of the balancing (See the *NL (LiPo) assembly instructions* section for more details).

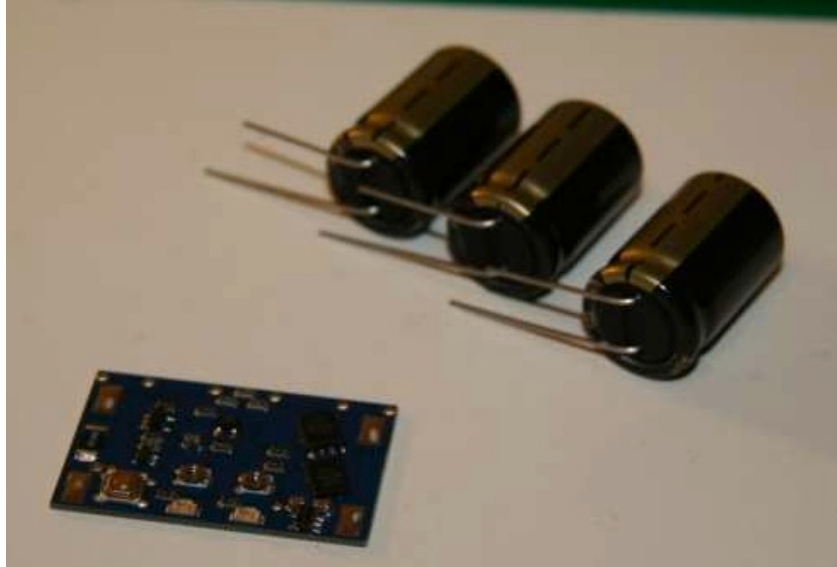
**For the chosen configuration it is important to also complete the setup and, if desired, the R extension assembly before heat shrinking the unit.**

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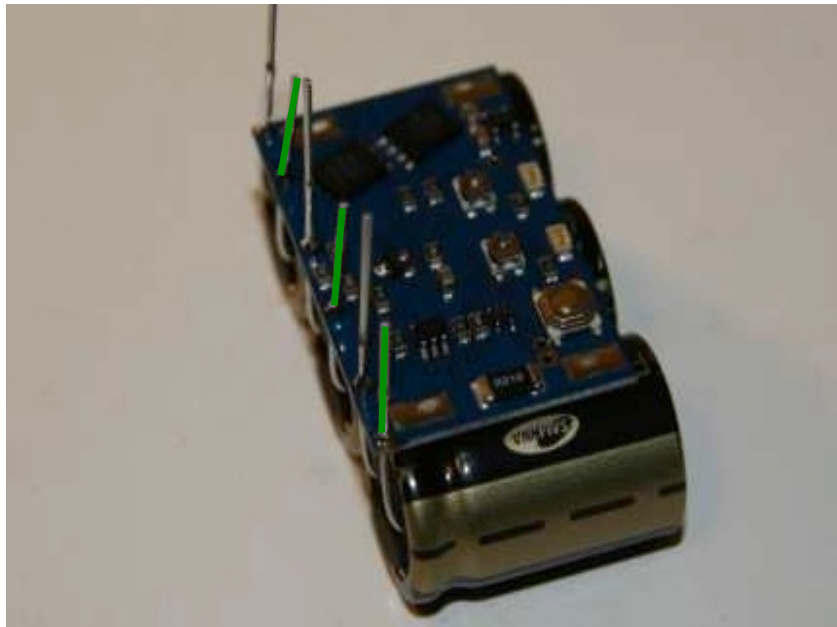
## NC (Capacitors) assembly instructions

1. Bend capacitor leads 90°



2. Insert capacitors into circuit board as in the picture below

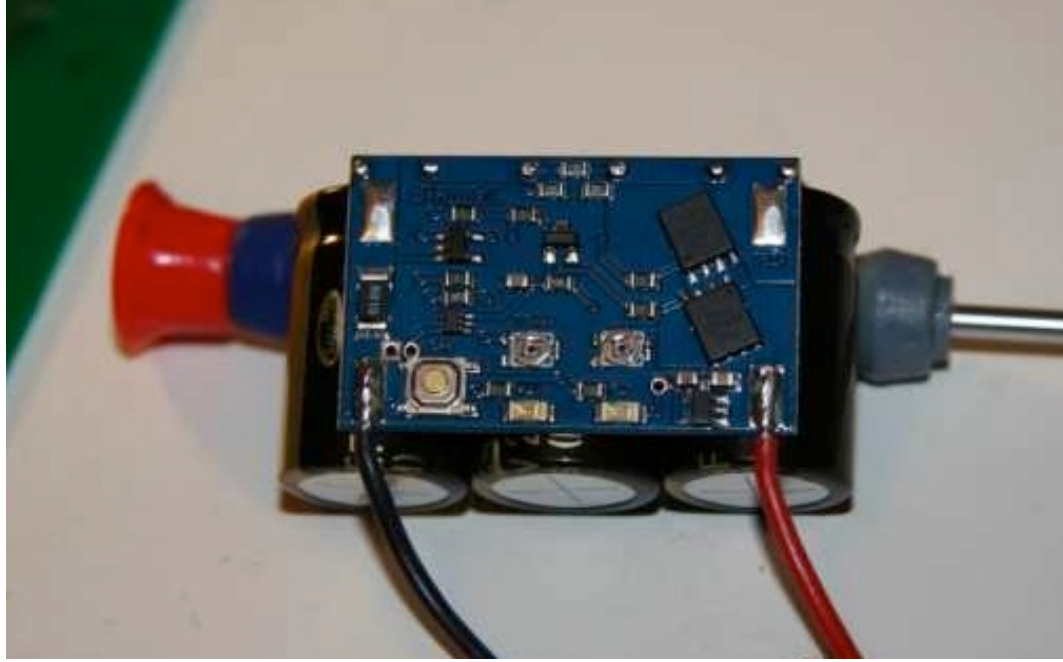
**Pay close attention to polarity! When holding the board with the leads at the top, the board facing you, the negative poles are to the left (marked in green below).**



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3. Solder and remove excess wire
4. Solder power lead as shown



## NC (Capacitors) setup instructions

1. Charging current
  - a. The charging current is set by the left pot (Red in the picture below)
  - b. When using Capacitors, the charging current should be set to maximum (app. 0.7 Amp.).
  - c. **If you do not have a Multimeter simply set the left pot as the red line shows below (10 o'clock).**

2. Cutoff voltage

Here you have three options:

- a. Turn the right pot to the counter-clockwise stop. Use a variable power supply attached to the power leads to load the capacitors to the desired voltage. Remove power and slowly turn the right pot (green) clockwise until both LEDs are no longer lit.
- b. Turn the right pot to the counter-clockwise stop. Load the capacitors using the BEC. Remove from BEC and connect to a multimeter measuring voltage. The voltage will slowly drop (This may take quite some time) When you reach the desired cutoff

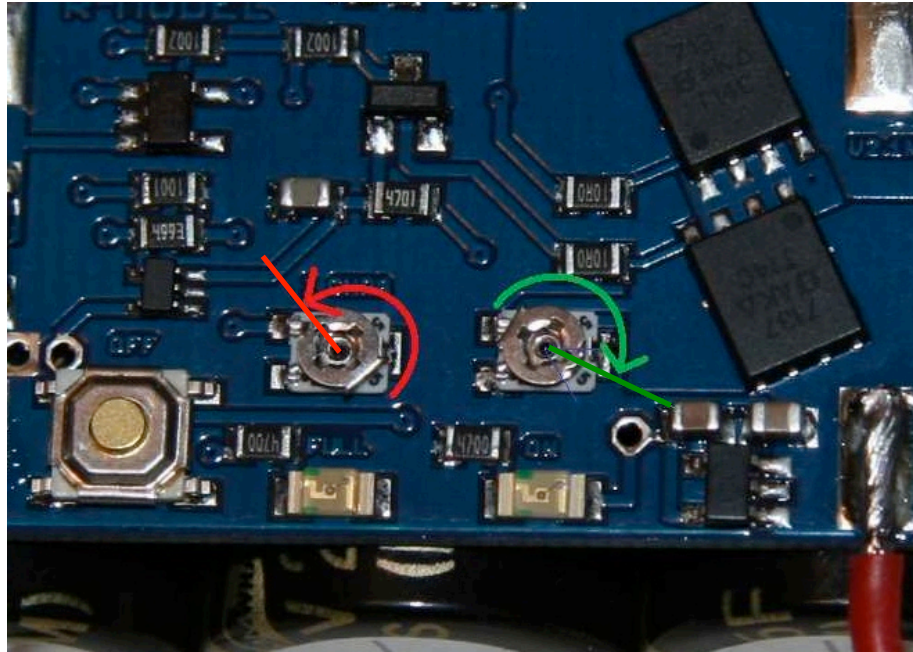


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voltage slowly turn the right pot (green) clockwise untill both LEDs are no longer lit.

- c. **If you do not have a Multimeter or variable power supply, simply set the left pot as the green line shows below (5 o'clock). This is roughly 3 volts.**



Now all you need to do is add some heat shrink and your done. 58mm diameter clear heat shrink is recommended.



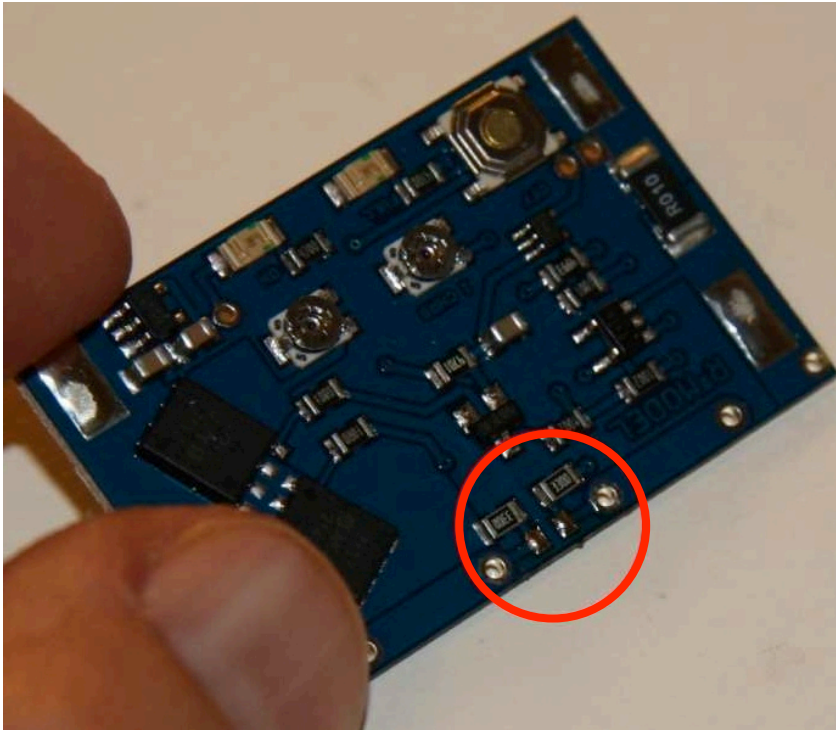
## NL (LiPo) assembly instructions

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1. Carefully **remove** the center balancing resistor using a soldering iron and a small amount of solder. Remove excess solder.



2. Remove the heat shrink from the battery.





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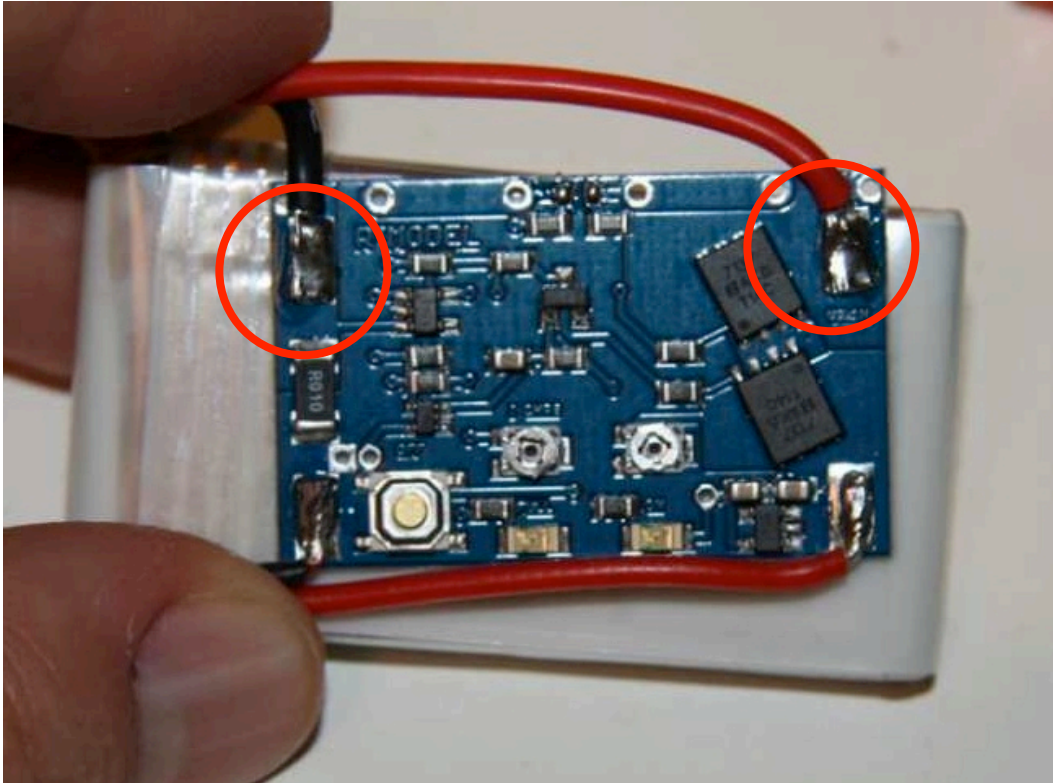
3. Solder power lead as shown



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4. Solder battery wires as shown



## NL (LiPo) setup instructions

**Setting the charging current and cutoff voltage will require a multimeter.**

1. Charging current
  - a. The charging current is set by the left pot (Red in the picture below)
  - b. The charging current should be set to the maximum charging C rating (maximum 2C) for the LiPo being used i.e. For a 350mAh 4C charge rated LiPo you would set the charging current to 700mA.
2. Cutoff voltage
  - a. When using a LiPo, the cutoff voltage must be set to the minimum voltage that the LiPo can safely provide. This is 6V for a 2S Lipo.
  - b. Turn the right pot to the counter-clockwise stop. Use a variable power supply attached (or a LiPo that is discharged to 6V) to the power leads to load the capacitors to the desired voltage. Remove power and slowly turn the right pot (green) clockwise until both LEDs are no longer lit.

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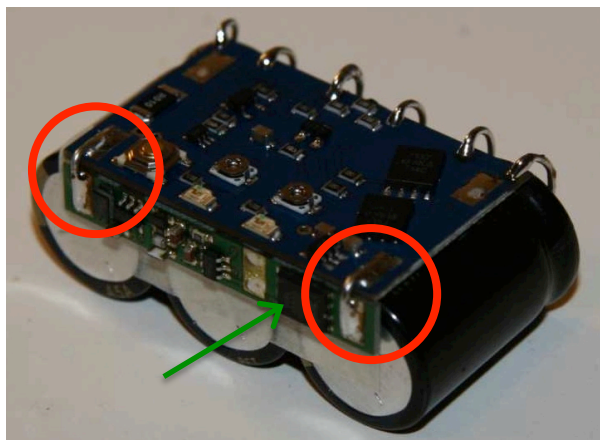
Now all you need to do is add some heat shrink and your done. 58mm diameter clear heat shrink is recommended. **Do not forget to reapply the label from the battery!**



## R Extension assembly instructions (optional)

The optional R extension allows the MP-GCG1 to be used with ESC/BEC's that are sensitive to power flowing "backwards" into the BEC. It monitors the BEC output and MP-GCG1 output voltages. If the MP-GCG1 voltage level exceeds the BEC output, the "backwards" flow of voltage to the BEC is stopped until the BEC voltage is greater than the MP-GCG1 output. The circuit does this without the voltage loss that is typically seen with Schottky diodes (typically between 0.15V to 0.46V loss).

1. The extension can be soldered directly to the main MP-GCG1 board as depicted below (biggest chip should be on the right side, see green arrow). **When installing, ensure the extension is properly isolated from the capacitor cans.**

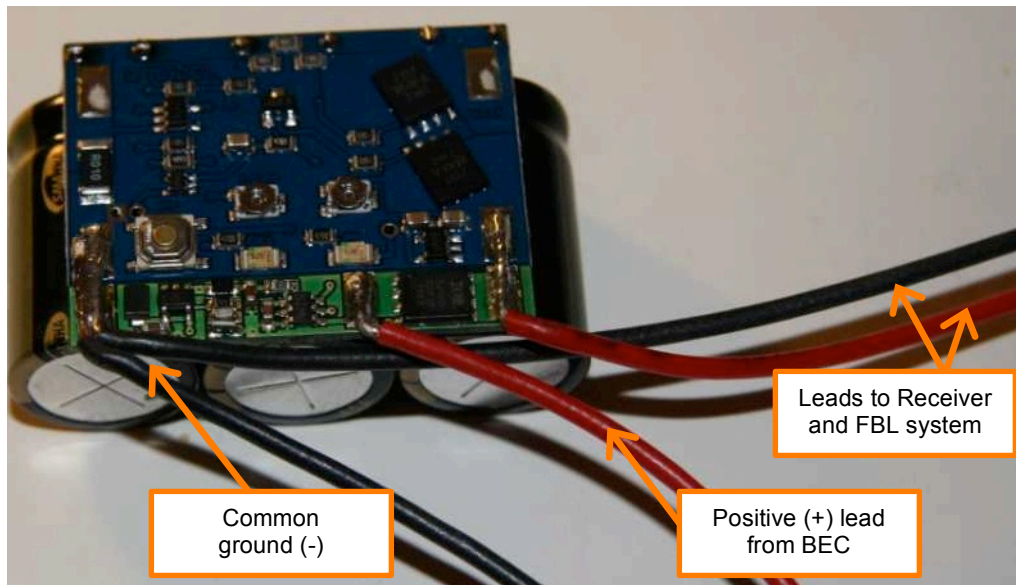


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2. Solder cables as shown below. The ground (-) from both the BEC and MP-GCG1 output are now common and must be soldered to the left most solder point. The positive (+) lead from the BEC is soldered to the middle solder point. The positive lead (+) to the RC systems is soldered to the right solder point.



3. The unit should now be setup as described in the NC or NL setup instructions.

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## Operating Instructions

When power is supplied by the BEC, the MP-GCG1 unit is automatically armed. The red LED lights when the BEC is supplying voltage to the unit.

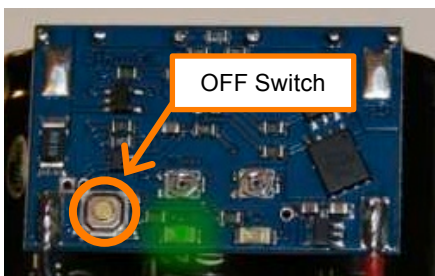


The unit automatically begins charging the capacitors (NC) or LiPo (NL). ). When the charge reaches 85% the green LED lights.



You are now ready to fly. Bare in mind that the high capacity capacitors charge logarithmically and it may take up an additional minute before the capacitors reach maximum charge.

After your flight, unplug the main battery and the red LED will no longer be lit. You will notice that the green LED is still on and the RC system will still be powered. It may take up to a minute for the system to fully discharge. Pressing the “OFF” button will turn the power to the RC systems off and allow the capacitor charge to be stored.





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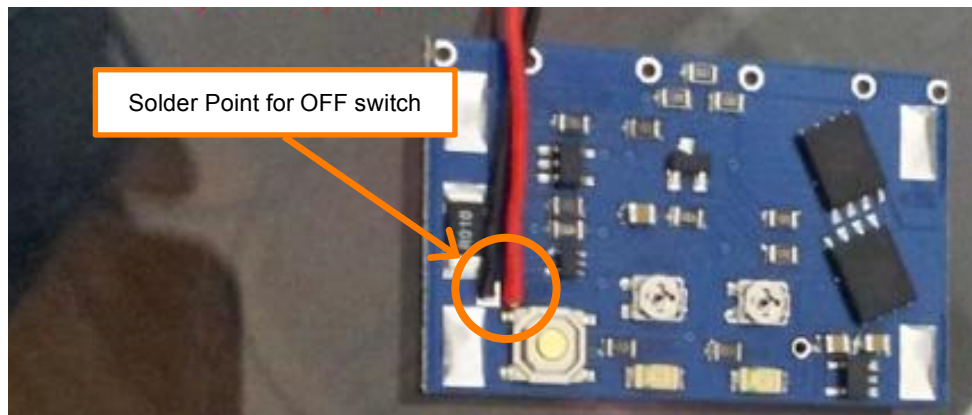
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## Adding external switches

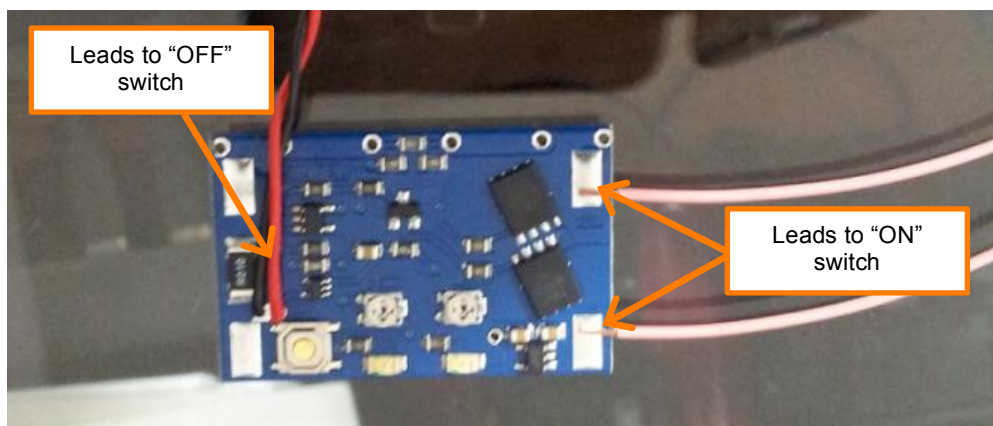
The MP-GCG1 supports adding external switches for turning the unit on and off. Normally the unit switches on automatically then power is applied from the BEC. If the unit is mounted inside a fuselage of inaccessible area, it may be advantageous to mount an external “OFF” switch. When using the NL configuration, you may wish to install an “ON” switch to allow the unit to provide power to the RC receiver and FBL units from the LiPo. This allows FBL or receiver configuration without having to connect the main battery.

**You may only use separate momentary normal open (NO) push-button switches for the “ON” and “OFF” functions.**

1. The external “OFF” switch is soldered to the board on the special solder points as depicted below:



2. The external “ON” switch is installed between the positive (+) LiPo and positive (+) output solder points as depicted below:





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## Notices

Design and Development: ©Marcellinus Pfeifer

Germany Sales and distribution: [www.microHELIS.de](http://www.microHELIS.de)

WEEE -Reg.-Nr. DE 81028642

**This is an electronics kit. No guarantees or replacements can be provided.  
Use at your own risk.**

## Links

### German Dealer:

[MP-GCG12 Buffer Unit \(Board only\)](http://www.microhelis.de/afsshop/artikeldet.php?proid=3673)

<http://www.microhelis.de/afsshop/artikeldet.php?proid=3673>

[MP-GCG12 Buffer Unit with 25F Ultra-Capacitors](http://www.microhelis.de/afsshop/artikeldet.php?proid=3686)

<http://www.microhelis.de/afsshop/artikeldet.php?proid=3686>

[MP-GCG12 Buffer Unit with 50F Ultra-Capacitors](http://www.microhelis.de/afsshop/artikeldet.php?proid=4265)

<http://www.microhelis.de/afsshop/artikeldet.php?proid=4265>

[MPF-R-GC R Extension](http://www.microhelis.de/afsshop/artikeldet.php?proid=3831)

<http://www.microhelis.de/afsshop/artikeldet.php?proid=3831>

[Single 25F Ultra-Capacitor](http://www.microhelis.de/afsshop/artikeldet.php?proid=3678)

<http://www.microhelis.de/afsshop/artikeldet.php?proid=3678>

[Single 50F Ultra-Capacitor](http://www.microhelis.de/afsshop/artikeldet.php?proid=4220)

<http://www.microhelis.de/afsshop/artikeldet.php?proid=4220>

## Forums

[RC-Heli.de \(German only\)](http://www.rc-heli.de/board/showthread.php?t=159622)

<http://www.rc-heli.de/board/showthread.php?t=159622>