



FINEST SCALE LIGHTING TECHNIICS.

AURORA LCU *EVO₂*

LIGHT CONTROL UNIT



MANUAL




Exclusive Dealer



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Pay attention to notes and tips marked with a  before first operation of the lighting-system!

With the **AURORA LCU**  you purchased a high-quality and modern lighting system. We hope you enjoy lighting up your aircraft and ask you to read the following instructions carefully.

Technical Data

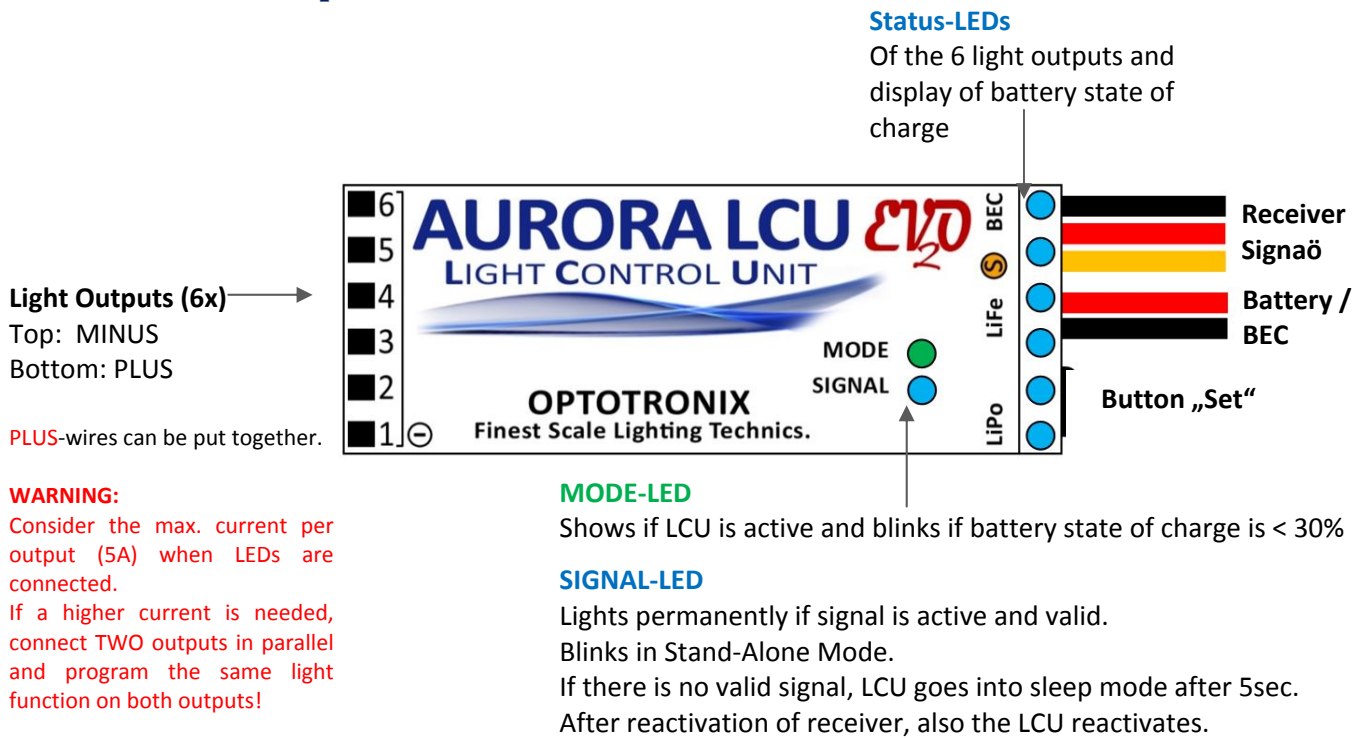
Dimension	48x16mm
Height	5,8mm
Weight	11g
Supply LCU	3,1V ... 13,0V (1s/2s/3s Lipo, 2s/3s LiFePO, NiMh, BEC)
Supply Current	max. 34mA
Standby Current	50µA (< 440mAh / Jahr) in Sleep Mode
Receiver Current	max. 8mA
Signal Input	galvanically isolated, with puls-booster
Outputs	6x Permanent / Flash / Beacon / Afterburner / Multi-Gun)
Output Power LCU	5A per Output (max. 12A total current / max. 18A Peak-current)
Stand-Alone Mode	Yes
Battery Protection	Yes
Battery State of Charge	Yes
Wake up via Receiver	Yes
FailSafe Lighting	Yes
Fully Programmable	on every Output: light function & activation-point; battery type (Lipo, LiFePO, NiMH, BEC)

Features

These are the features of the **AURORA LCU** :

- 6 outputs (Permanent / Flash / Beacon / Afterburner / Multi-Gun)
- **8 different flash sequences** @ 3 different, chose able points of time
- **4 beacon sequences** (imitation of Rotating Beacon) with different speed levels
- **Water-Airplane Landing Light / Helicopter Landing Light:**
Alternating lighting of two landing lights for water airplanes and helicopters
- **Multi-Gun Simulation:** 3 different, fully-random generated fire sequences for LED lighted machine gun dummies
- **Afterburner-Simulation:** 10 different, fully-random generated Afterburner-Effects
- Every Output fully programmable
 - Activation Point
 - Flash Sequence
 - Point of time
 - Automatic detection of switch direction
- Adaptive (learns behaviour of transceiver)
- All light functions are 100% true to original and easy and fast to program, there is no expensive programming via PC needed
- Permanent Lipo / LiFe battery guarding with battery-test function and safety shut-down
- Fully galvanically isolated from receiver circuit
- Signal-Input with Servo-Puls-Booster
- Stand-Alone Mode (e.g. for exhibition and showroom) at push of button

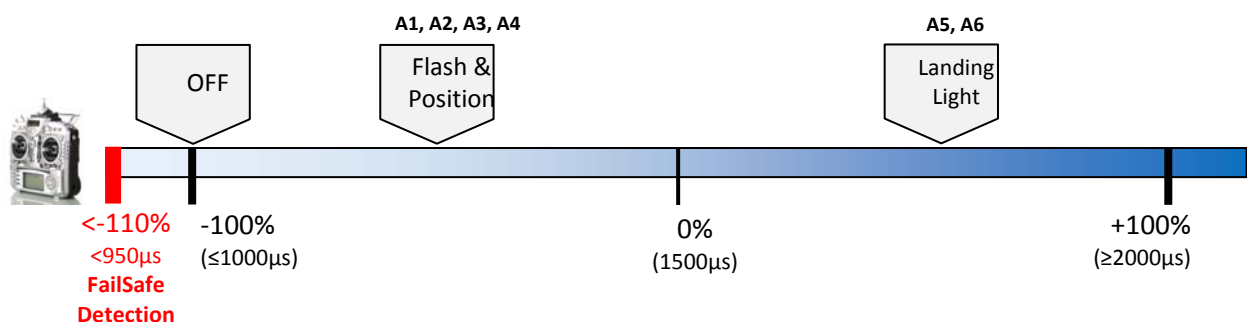
Interface and Operation



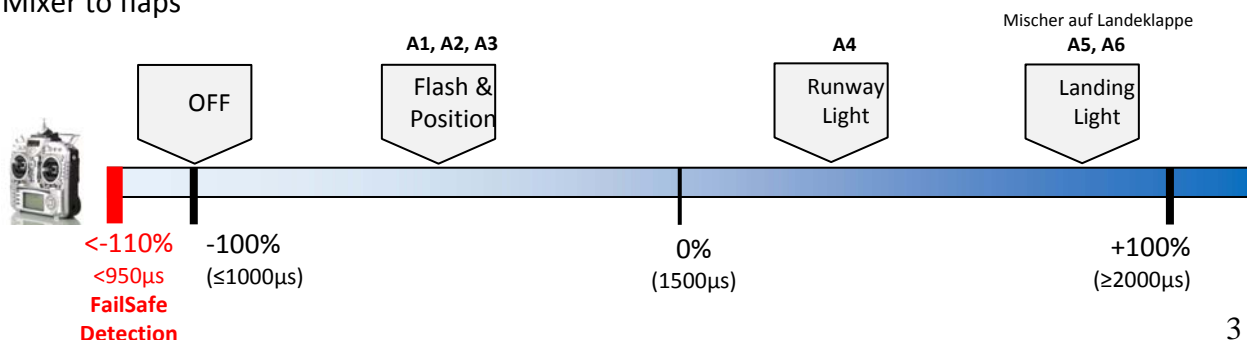
Functional Principle

The following figure shows how the **AURORA LCU** works. Light Function and Activation Point can be programmed for each light output. For controlling the light outputs by transceiver, use a triple switch or proportional slider on your transceiver. It is also possible to mix the light functions to e.g. flaps or gear is possible by programming the Activation Points accordingly. Here are two examples (the signal values in μs could vary by different transceiver manufacturers):

Most frequently used variant: 3point-Switch for OFF – Position & Flash – Landing Light



Landing Light & Runway Light: 3point-Switch for OFF – Position & Flash – Runway Light + Mixer to flaps



Connection of Supply and Receiver

The **AURORA LCU** **AV2D** is powered by 1s/2s/3s Lipo Batteries, 2s/3s LiFePO Batteries, 3-10s NiMh Batteries or with a BEC Voltage between 3,2V und 13,0V.

The **PLUS** supply line ist **red**, the **MINUS** line is marked by a **black** line. The most efficient operation (Least power dissipation at resistors and lowest system weight) works with 1s cell Lipo.

Attention: 1s LiFePO batteries are not recommended for powering Power LEDs (1Watt / 3Watt) because the little lower battery voltage means a lower brightness of LEDs.



The used battery-type has to be programmed at first use of the **AURORA LCU** **AV2D** to offer a reliable deep-discharge-protection and battery-test function, see "Programming Mode". After programming, the used battery will be protected and the batteries condition can be checked with battery-test function of the **AURORA LCU** **AV2D**.



Do not connect other battery-technologies to the **AURORA LCU** **AV2D**.



The factory setting of the **AURORA LCU** **AV2D** is **BEC Supply**, that means the supply is **NOT** protected for low voltage!

If the programmed battery voltage becomes critical, the **AURORA LCU** **AV2D** shuts down after a fast flashing-sequence of the **green Info LED** (Error) and can only be restarted by reconnecting the battery



Folgende Hinweise sind für einen sicheren Betrieb zu beachten.

- All wires and components have to be installed in a proper way, with distance to hot and moving parts of the model.
- The **AURORA LCU** **AV2D** is not protected against high humidity and wetness.

Battery Recommendation

Following battery capacities are recommended for one hour operation of one LED on each of the six outputs. If LEDs are operated with flash sequences, capacity can be accordingly smaller.

LEDs connected to outputs	Rec. capacity for >1h operation
Standard LEDs (20-30mA)	180 mAh
Power LEDs (~60mA)	360 mAh
1Watt Emitter (350mA)	2100 mAh
3Watt Emitter (700mA)	4200 mAh

Connexion of Battery

The battery is connected at the two silicon wires (**red / black or black line**) with **JR plug**, see Labeling **Supply**.



Be sure to pay attention to proper polarity: **RED = PLUS**, **BLACK = MINUS**. The **AURORA LCU** **AV2D** is not protected against reverse polarity!

Connection of Receiver

For operation of the **AURORA LCU** $\Sigma V_2 D$ connect the patch cable (yellow – red – brown) to the signal input and to the receiver.

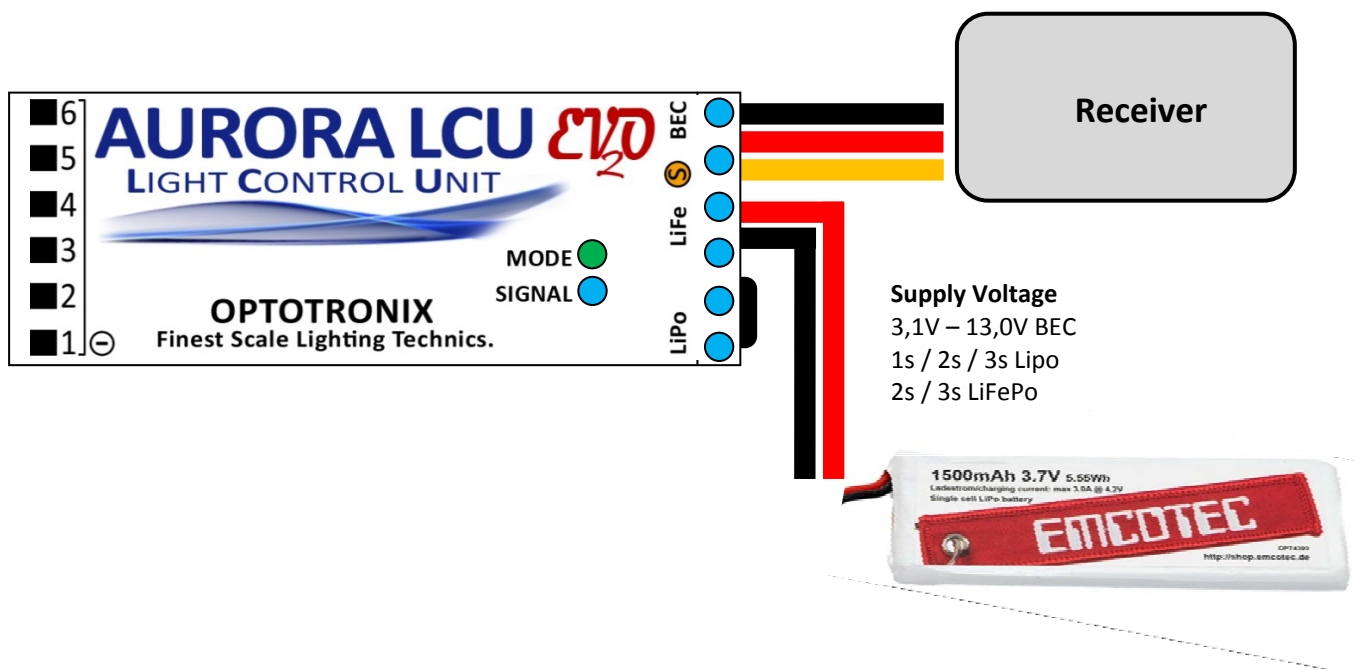
To become familiar with the operation of the **AURORA LCU** $\Sigma V_2 D$, you can also connect to a servo tester.

The signal input is electrically completely separated from the receiver, so negative reactions to the receiver are excluded.

If there is no signal (no receiver is connected or invalid signal / defective signalwire) the **blue Signal LED** is **NOT** lighting up.



If there is no valid signal for more than 5sec (receiver is deactivated), the **AURORA LCU** $\Sigma V_2 D$ also deactivates and stays in Sleep Mode. As soon a valid signal is present again, the **AURORA LCU** $\Sigma V_2 D$ wakes up.



FailSafe Emergency Lighting

A very important and useful function is the **indication of signal disruptions during the flight**, live at the sky. If the mode is in FailSafe Mode because of weak signal or signal disruptions, the **AURORA LCU** $\Sigma V_2 D$ starts a **Emergency-Lighting-Mode**. All outputs – even permanent light outputs - of the **AURORA LCU** $\Sigma V_2 D$ are flashing very fast. This indication will be active as long as the FailSafe phase is active, but at least 2sec!

To use the Emergency-Lighting-Mode, the receiver has to be programmed to deliver a signal of < 950us, if a FailSafe is detected.



This function only can be used, if the used receiver supports a FailSafe function. Please check the receivers manual.

LED - Outputs

Pin assignment of Outputs

The **AURORA LCU $\Sigma V_2 D$** offers 6 light outputs in total, on each output **PLUS** and **MINUS**.

The supply voltage of the used battery / BEC is available at the output pins. Thereby you have a maximum of flexibility for designing the lighting system and choosing different LED types with different forward voltages. It is possible to use every LED type and every power type up to a voltage of 13V and a current of 5A per output. Important: Consider the max. current per output! If a higher current is needed, connect TWO outputs in parallel and program the same light function on both outputs!

The outputs have a common **PLUS** strip, that means that **PLUS** wires e.g. of the model wings can be put together.

The following Figure shows the output pin assignment:

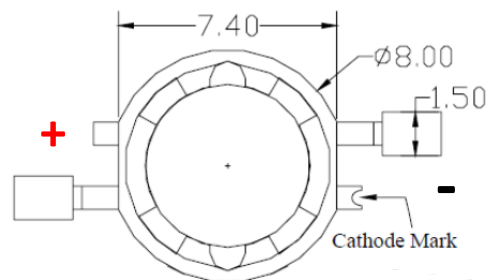
Outputs					
6	5	4	3	2	1
-	-	-	-	-	-
+	+	+	+	+	+

Common PLUS-strip!

Anschluss von LEDs

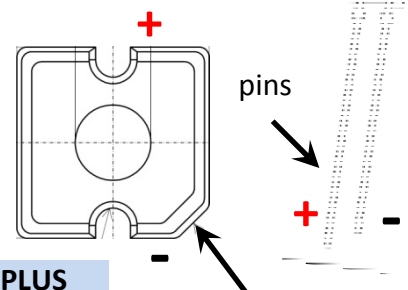
The **AURORA LCU $\Sigma V_2 D$** offers operation of all typical LEDs with a resistor in series. Every Output can be operated with up to 3A (5A in flashing mode). Multiple LEDs can be connected in **parallel**, in this case every LED needs its own resistor.

The right-hand chart shows the polarity of the SEOUL 1Watt / 3Watt power LEDs: Next to each pole is a small brass stub, which is scored on the minus side, but not on the plus side.



The classic 3mm / 5mm LED types mark the plus terminal with a longer pin.

The classic SuperFLux LEDs are marked with flattened corner which shows the minus terminals. There are four for increasing stability on printed circuit boards, so plus and minus are available twice but have to be connected only at one pin.



If multiple LEDs are connected to one output in parallel, the **PLUS** wires can be combined to one.

Because the **AURORA LCU $\Sigma V_2 D$** can provide high currents, the output connector is a female one, so that it is not possible to have a short circuit due to accidentally touching with metallic parts. LEDs are connected by using the connected pin rail. For more easy soldering, put the pin rail into the **AURORA LCU $\Sigma V_2 D$** during soldering process.

A very easy and comfortable solution is the **Light Plug 6** from Optotronix accessories.

If you like to have a separate connector for each output, use the **Light Connector Cables** from Optotronix accessories.



Multiple LEDs can be connected in parallel to one light output of the **AURORA LCU אורורה**. The output current of max 5A e.g. allows to connect 6 pieces of 3Watt-Power Landing Lights in parallel to one output.

Warning: the outputs are not protected against short-circuit. Be careful when installing LEDs.



Only connect LEDs to the **AURORA LCU אורורה**, if all outputs are finally programmed. So it is avoided, that LEDs that are configured for flash operation burn, because they are connected to an output, which still is programmed for permanent light.



Example of usage

Connection of Afterburner Rings

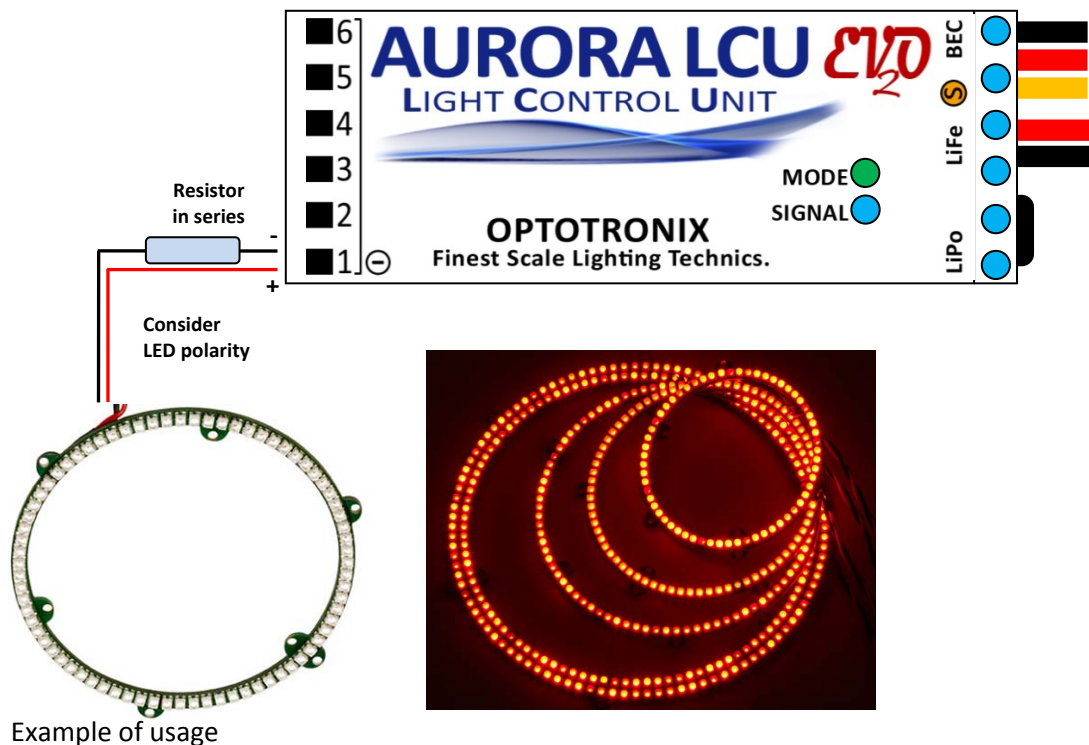
It is possible to connect voltage-controlled afterburner-rings to the **AURORA LCU** **AV2** for afterburner simulation in EDF or turbine models. It is also possible to connect self-made afterburner-rings or single LEDs to simulate an afterburner-effect as long as it is possible to drive (with a resistor) at a voltage of 3,2V – 13V.

Afterburner-rings with a maximum current of 3A can be connected to one output. Rings with a higher current are connected to two or more outputs in parallel. So the **AURORA LCU** **AV2** makes it possible to drive up to 6 small or 3 big afterburner rings simultaneously.

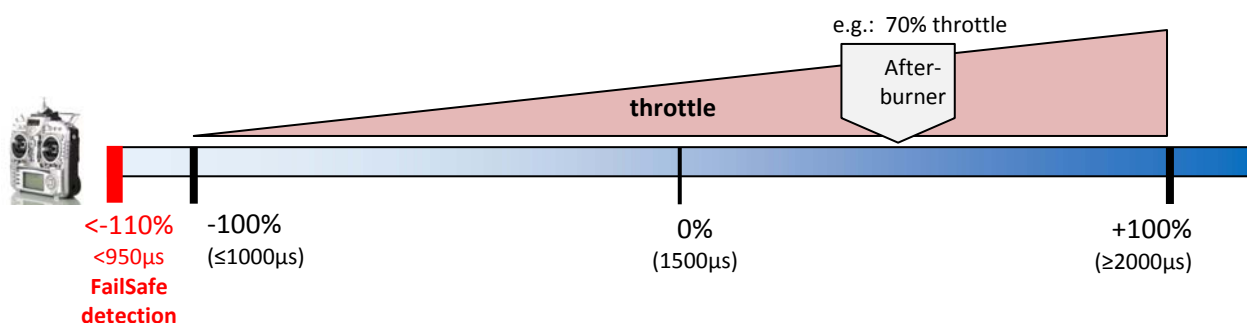
The **AURORA LCU** **AV2** offers 10 different and true to original afterburner effects. A very special feature by Optotronix is the afterburner random generator, which generates a very realistic flame effect. In contrast to low cost lighting electronics, there is no loop of the same flame effect all the time. Instead, no second of the flame effect looks like another.



Attention: The **AURORA LCU** **AV2** only can be used in **scale-lighting-mode** (positions lights, flashes, beacon) **OR** in **afterburner-mode**, because you control the afterburner effect by speed-channel but the scale-mode by a additional switching-channel. If you like to realize both, you have to install two modules.



How Afterburner Simulation works: Throttle activates the afterburner at the desired point of time, e.g. at 70% throttle

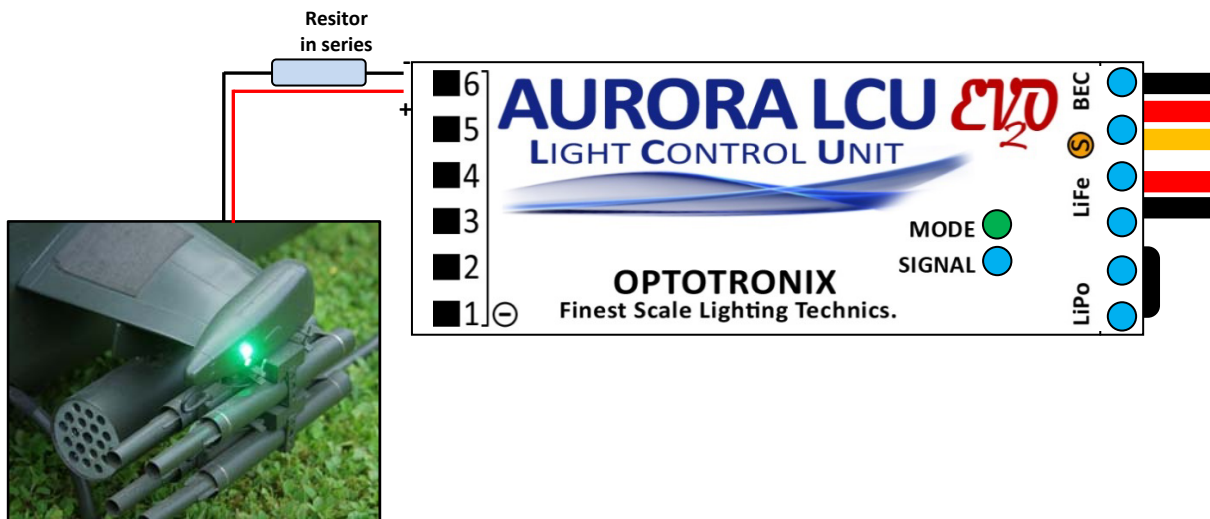


Connection of Multi-Gun LEDs

The **AURORA LCU** *EV2* now offers also the simulation of machine gun effects by using LEDs, this feature is used especially for lighting up weapon dummies of military models. The **Multi-Gun Light Effect** is fully random generated and looks very realistic: the fire sequences are irregular and the frequency is taken from the originals.

Use bright, orange or Yellow LEDs to install into weapon dummies. Connect it to **output 6**, which offers 3 different fire sequences: Gattling Gun (very fast), Machine Gun (fast) and Machine Canon (slow).

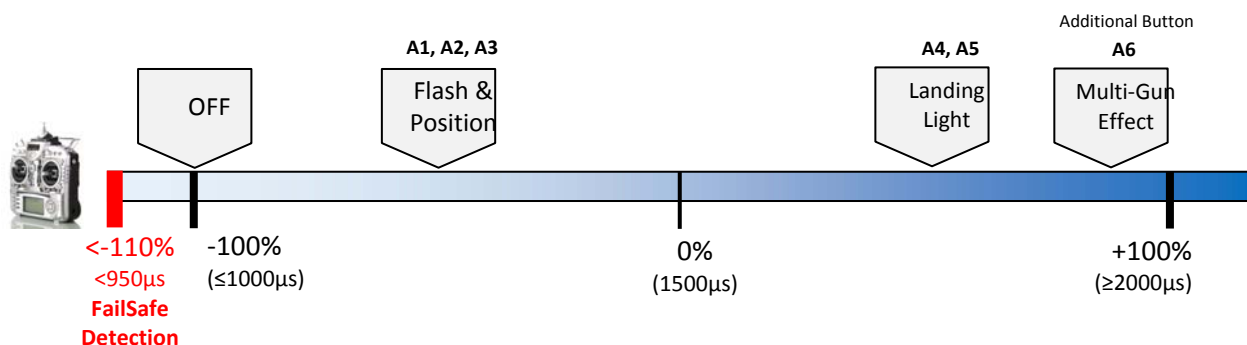
It is possible to connect several LEDs in parallel up to a total current of 5A.



Example of usage

When programming the Multi-Gun Light Effect, consider the following: the Activation Point of the Effect has to be the highest programmed one, even higher as the landing light sequences. Additionally to the triple-switch used for the scale lighting, use a button which sends the signal for Multi-Gun Light Effect, when pressed.

Scale-Lighting & Multi-Gun Light Effect: 3point-Switch for OFF – Position & Flash – Landing Lights + Button for Fire-Effect



Important: The Activation Point of the Multi-Gun Effect has to be the highest programmed one. If this is not considered, the Multi-Gun Effect will **NOT** be saved!

Resistor Table

The required resistor for your desired LED Type can be gathered from the following table. The values can be used both for operation directly at a battery and for operation at the **AURORA LCU $\epsilon\upsilon_2\delta$** . Also pay attention to the required power-rating of the resistor.



For choosing the supply, generally consider: The voltage should be as small as possible, because LEDs do not need more than 3,5V (red/ yellow only 2,4V). Everything above that voltage has to be converted into heat in the series-resistor. That is why the operation at 3,6V/4,8V (3s/4s NiMh) or 3,7V 1s Lipo) has to be preferred.

Leuchtmittel Illuminant	Versorgung Supply	4s NiMh	5s NiMh	1s Lipo	2s Lipo
LEDs (3mm - 5mm - SuperFLUX - BlitzLED) Weiß / Grün / Blau / Violett		75	130	27	200
LEDs (3mm - 5mm - SuperFLUX - BlitzLED) Rot / Gelb / Orange		120	160	68	240
3-Chip SuperFlux LEDs Weiss		22	39	7,5	56
3-Chip SuperFlux LEDs Rot / Grün		43	62	20	91
10mm 4-Chip Power LEDs Weiß / Warmweiß / Grün		22	39	7,5	56
10mm 4-Chip Power LEDs Rot		36	56	22	68
SEOUL 1Watt Weiß / warmweiß / Grün		4,7	8,2	1,5	12
SEOUL 1Watt Rot		8,2	12	4,7	18
SEOUL 3Watt Weiß / Warmweiß / Grün		2,7	4,7	1,0	6,8
SEOUL 3Watt Rot		4,7	6,8	2,7	8,2
Legende		0,5Watt	2Watt	3Watt	4Watt

Operating the AURORA LCU $\epsilon\upsilon_2\delta$

Startup Sequence

When you connect the power supply to the **AURORA LCU $\epsilon\upsilon_2\delta$** , you will notice the following behavior of the **6 blue status LEDs**:



Startup Sequence

The LCU is starting...

Now, the **AURORA LCU $\epsilon\upsilon_2\delta$** is ready to operate and can be controlled by your transceiver or for testing issues also with a servo tester.

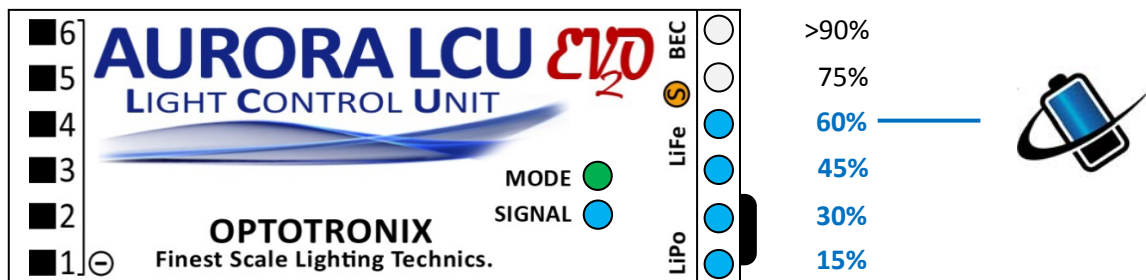
The activation points of the outputs, which define WHEN a output should be activated, can be programmed in the programming mode.

Battery Test

The battery test function of the **AURORA LCU** **AV2** can be started at any time by short pressing the "Set" button, during the battery test (about 3 seconds) the connected LEDs are disabled!

At first, 2 of the **blue status-LEDs** are blinking up, showing which battery type is programmed (Lipo, LiFe, or BEC).

The voltage level of the battery can be read with the 6 **blue status-LEDs** of the **AURORA LCU** **AV2**. If 4 LEDs are active, the battery state of charge is 60-75%. If no LED is active any more, the battery should be disconnected and recharged.



If the programmed battery voltage becomes critical, the **AURORA LCU** **AV2** completely shuts down after a fast flashing-sequence of the **green Mode LED** to protect the battery. It can only be restarted by reconnecting the battery.

Stand Alone Mode

This "autonomous operation mode" mode allows to operate the model lighting, even if the receiving system is not active (e.g. exhibitions or showroom), or may not be switched on (e.g. Building competition).

*Activate all light outputs which should be active and then push the button for at least 2 seconds. The 2-second-long-push always will be confirmed by flashing the **green Mode LED** three times. The **blue Signal LED** now starts to blink, the **Stand Alone mode** is active and the electronic is no longer controlled by the receiver signal!*

*Exit the **Stand Alone mode** by pushing the button 2 seconds again.*

Programming Mode

Connect the power supply **and** receiver signal (or a servo tester) to the **AURORA LCU** **AV2**.

Hold the button permanently pushed before the startup sequence is completed.

If the programming mode has been successfully started, all blue **status-LEDs** are flashing very quickly for 4 seconds. Release the button as soon as the flashing starts.

Now you entered the Programming Mode.

Programming Battery Type

At first you have to program the used battery supply (Lipo, LiFePO, BEC / others).

Before programming, connect the fully charged battery to the **AURORA LCU 2**. By pressing the Button short ("zapping") you can choose between the offered three types (Lipo, LiFePO, BEC / others). The battery type is displayed by two **blue status-LEDs** (see graphic below). Save the choosed battery type by pressing the Button **for two seconds**. The number of used cells will be detected automatically and it will be shown by blinking of the **blue status-LEDs**.

If you choose "others" (e.g. for BEC-supply), the safety-shutdown will be **deactivated**, it will be displayed the supply voltage in six steps from 3,2V to 13V.



If the battery type is chosen, it will be saved immediately.

If you like to change the battery type only, you do not have to enter the rest of the programming mode. Just switch off and on again the **AURORA LCU 2**.



If the programming step for battery type shall NOT be executed / changed, you can skip this step by doing nothing for 5sec.

Programming the Light Outputs

The first **blue status-LED** lights up and is now waiting for programming activation point and light function. By pressing the Button short ("zapping") you can choose out of the different flash, beacon and afterburner light functions and view it with the **blue status-LEDs**.



Activation Point

Save activation point for every output.

*Zap through the different flash sequences by short-pressing the button. Put the switch or proportional slider on the transceiver to the position at which the selected output should be active. Hold the button for 2 seconds to save activation-point and function and edit the next Output. The 2-second-long-push always will be confirmed by flashing the **green Mode LED** three times.*

For each flash sequence, you can choose if it should flash at the beginning, some time delayed, or long time delayed. This allows you to flash three positions on the model successively.

The following table shows the functions provided by the **AURORA LCU** :

Nr.	Light Function	...delayed	...long delayed	Factory setting
0	Permanent Light			A4, A5, A6
1	Water Airplanes & Gelicopter Landing Light Sequence: Alternating lighting up of two landing lights, only available on A5 & A6!			
2	Single Flash			
3		Single Flash		
4			Single Flash	A3
5	Blink (150ms on)			
6		Blink (150ms on)		
7			Blink (150ms on)	
8	Long Blink (300ms on)			
9		Long Blink (300ms on)		
10			Long Blink (300ms on)	
11	Double Flash			
12		Double Flash		A2
13			Double Flash	
14	Double Flash + late ignition			
15		Double Flash + late ignition		
16			Double Flash + late ignition	
17	Tripple Flash			
18		Tripple Flash		
19			Tripple Flash	
20	Strobo Flash			A1
21		Strobo Flash		
22			Strobo Flash	
23	Special Flash			
24		Special Flash		
25			Special Flash	
	Beacon Effects			
26	Beacon fast			
27	Beacon medium			
28	Beacon slow			
29	Beacon 40% dimmed + Double-Flash			
30	Soft-Start Permanent Light (Slowly dimming up of permanent lights)			
	Nachbrenner Effects			
31	Nachbrenner – random generated flame effect – without glowing up			
32	Nachbrenner – random generated flame effect – slowly glowing up			
33	Nachbrenner – random generated flame effect – fast glowing up			
34	Nachbrenner – random generated flame effect – very fast glowing up			
35	Nachbrenner – random generated flame effect – misfire and slowly glowing up			
36	Nachbrenner – random generated flame effect – misfire and fast glowing up			
37	Nachbrenner – random generated flame effect – multiple misfires			
38	Nachbrenner – random generated flame effect – slowly glowing up in two phases			
39	Nachbrenner – random generated flame effect – fast glowing up in two phases			
40	Afterburner – proportional diming to gas-channel – Misfire and flame effect			

Multi-Gun Effects		
41	Gattling Gun	(only on A6)
42	MG Feuer	(only on A6)
43	MK Feuer	(only on A6)

After the program mode is completed, the **AURORA LCU** **AV2D** restarts.

COMPLETE - The **AURORA LCU** **AV2D** is fully programmed and can be used.



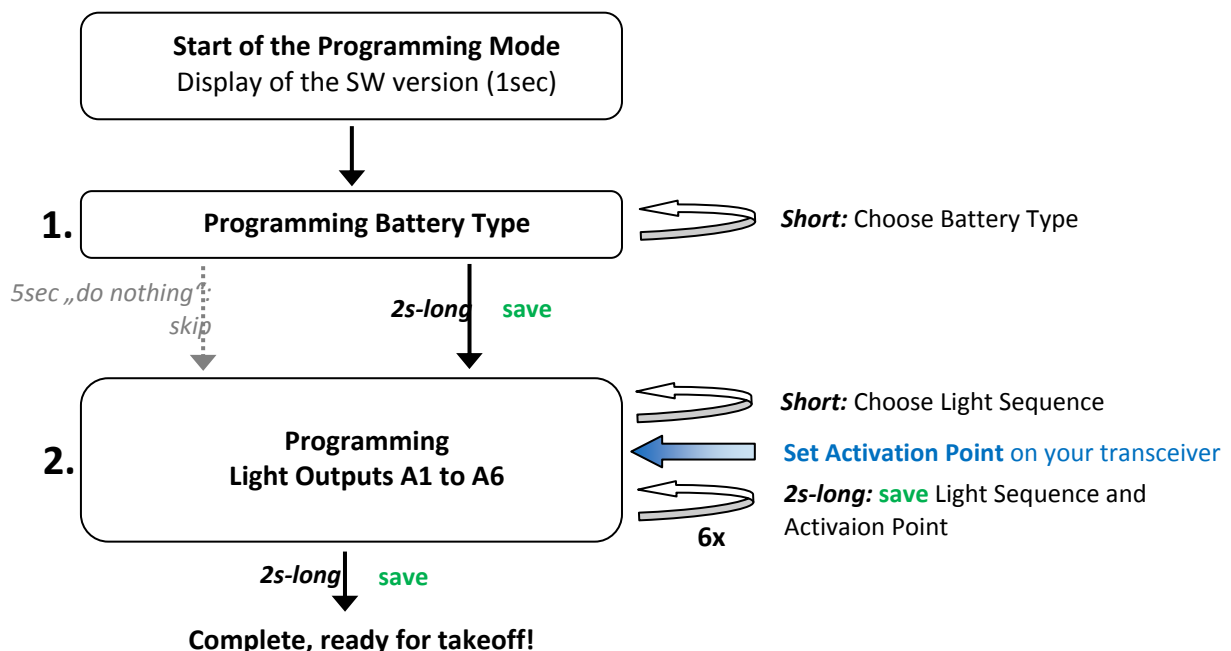
WICHTIG

Connect Landing Lights beginning with Output 6 and Flashlights beginning with output 1. So the **AURORA LCU** **AV2D** identifies the switching direction of the transceivers channel and adapts automatically.

Programmed flash sequences and activation-points are only stored, if the programming mode was executed completely.

Overview of the Programming Steps

Here you see an overview of the programming steps and how to use the „Set“ button (short and 2sec-long press of the button).



Reset to Factory Settings

The **AURORA LCU** **EV₂D** can be easily reset to factory settings.

Turn on the **AURORA LCU** **EV₂D**. Keep the button pressed till the welcoming flash light sequence is ended. Since this lasts 2 seconds you have enough time after connecting the battery to press the button and hold. The start of the programming mode is indicated by a 3 second long, very fast flashing of all LEDs. Keep the button **permanently pressed also during this sequence** until the **AURORA LCU** **EV₂D** restarts again and the welcoming sequence shows again. You can now release the button. The settings are reset to factory settings.

Overview Button Functions

	Operating Mode	Programming Mode
Short push	Battery Test	Choose function
Pushing 2 seconds ¹	Stand-Alone Mode	Save, edit next output

Overview MODE-LED Sequences

This is an overview of the sequences of the **green Mode-LED**:

	Operating Mode	Programming Mode
Permanent ON	Operation Mode, State of Charge >30%	Ready
Slow Blinking ON / OFF	State of Charge < 30%	-
3x short flash	2sec-long push of the button	
1x very short flash	No valid Receiver Signal, LCU starts sleep mode after 5sec	
20x short flash	LCU starts sleep mode, battery critical!	

Overview Signal-LED Sequences

This is an overview of the sequences of the **blue Signal LED**

	Meaning
Permanent ON	Signal is read and valid
Slow Blinking ON / OFF	Stand-Alone Modus, signal is not read
Very fast blinking ON / OFF	FailSafe Signal active!
Permanent OFF	No signal or no valid Signal
20x short flash	LCU starts sleep mode, because of no signal

Transceiver Range Test

Before using the **AURORA LCU** **EV₂D** the first time in a model, you have to do a transceiver range test just as for every new built in electronic.

The distance of the **AURORA LCU** **EV₂D** to the receiver has to be maximized, just as for every built in electronic.

Warranty and legal information

Optotronix issues a 24-month warranty for the **AURORA LCU EV₂O**. There is no right to repair, Optotronix reserves the right to share in case of warranty the device against an equivalent product if a repair is not possible.

This warranty expires when the module takes damage resulting from misuse, because the manufacturer has no influence on adherence to the manual, proper installation, use, maintenance and operation, no liability is assumed for the non-proper operation of the **AURORA LCU EV₂O**. The customer himself is responsible, because this product is installed into the corresponding model without checking of the manufacturer. For consequential damages, caused by a proven defect in the operation of **AURORA LCU EV₂O** we assume no liability. Further claims are excluded. The product is used only for model aircrafts.

The **AURORA LCU EV₂O** has been suppressed by constructive measures. Negative influences on the quality of receiving cannot be completely ruled out. Therefore, before each use a trouble-free function should be checked. A receiver range test has to be carried out. General advise for RC-models: the distance of an electronic module and the cables which are laid in the model to the receiver and the antenna should be maximized!

Hacker Motor reserves the right to amend this document without prior notice. We assume no responsibility for possible mistakes contained in this manual or for damages resulting from the provision of these instructions.

Hacker Motor GmbH
Schinderstrassl 32
D-84030 Ergolding

shop@hacker-motor-shop.com

WEEE-Reg.-Nr. DE 55352581
VerpackV Reg.-Nr.: DE4145467607355



Developed & made in Germany.