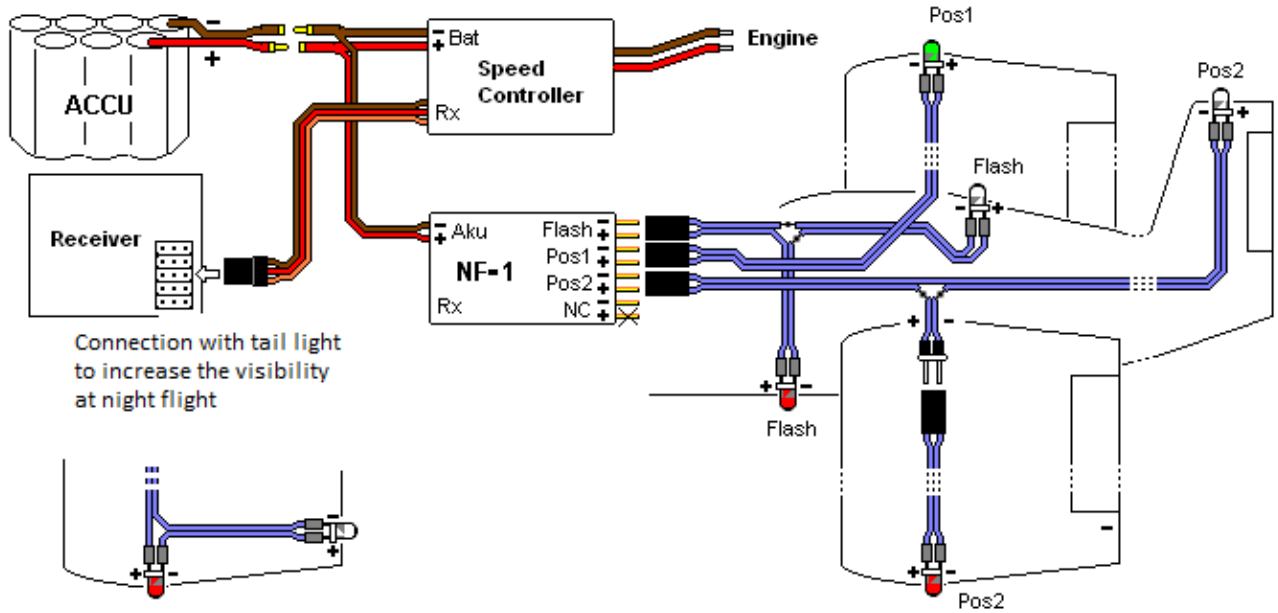
Illumination Unit NF-1

Description: NF-1 is a unit designed for illumination of tailless models, and SlowFly and ParkFly models for flying at night. They are used to power colour ultra bright LEDs (Light-Emitting Diode) with nominal current of **20mA**. It contains three independent current-powered outputs for connection of diodes. Two outputs are on permanently and are designed for position lights (**Pos1, Pos2**). The third one (**Flash**) is flashing with one-second frequency and is designed to power the anti-collision flash lights.

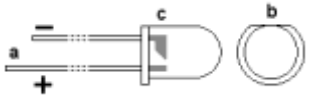
The circuits maintain the nominal current in the wide range of voltage from 6 to 14V without the need to connect compensating series resistance in the circuit. The stabilization starts working from 5.0 V so it is possible to connect the unit with the used NiCd or NiMH batteries with 4 -10 cells. As the number of the cells of the powering accumulator increases, so does the number of diodes that can be connected (serially) in one circuit. Using seven-cell-accumulator, two green or white diodes (voltage about 3.2V) or three red or yellow diodes (voltage about 2V). The colours of diodes in one circuit can be combined.

A short-term short circuit does not harm the circuits thanks to the current outlets. The circuits are powered from the positive pole of the accumulator and the negative pole is joint by all circuits. The unit input is diode-protected against reversing of polarity.

Installation procedure: The typical connections are shown by the scheme below. Number, colour as well as position of diodes in a specific model may vary.



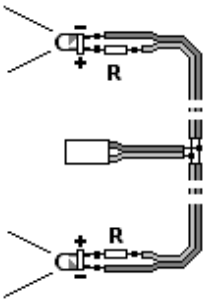
You may check function of the unit by connecting it to the accumulator. There are two diodes shining through the cover sheet on the rear side. One diode indicates connection to power, the other indicates the flashing function. You may also check function of the unit by touching light circuits with diodes. In this way it is also possible to check the diode's colour. If you observe the input voltage, there is neither danger for the unit nor for the diodes. Do not try the diodes by connecting them directly to the accumulator. Without using a compensating series resistance you would destroy the diodes. When connecting the diodes you have to observe the polarity. The positive pole has a longer outlet (**a**) and the negative pole has a trimmed edge **(b)** and usually extends inside the body **(c)** to hold the chip.



The circuit regulates the current by burning the voltage difference between the supply voltage and the necessary voltage for diodes in the transistor. The worst condition for the unit is the case when the circuit is supplied by high voltage and short circuit at the output occurs. In that moment, the entire power (the passing current x power supply voltage) changes to heat in the transistor. The transistors cannot burn more than 0.25W for a long-term period which means there is voltage of maximum 12 V. In case there is at least one diode connected to the circuit, the transistor is relieved. The maximum operational voltage of 14V stated in the parameters is in accordance with that (12V transistor + approx. 2V diode). By a bigger amount of diodes in all circuits the circuit can theoretically operate up to the voltage of 17V (twelve-cell). However, the warranty does not apply by such an operation.

If you are going to connect diodes, see to it that the total voltage on the circuit diodes plus 1.8 V (necessary for optimum regulation) is below the voltage of accumulator. The smaller is the power supply voltage i.e. the closer it is to the above figure, the circuit regulation starts to decrease the current in the diodes and the luminosity goes down. The chart 1 shows the reference voltage rates on diodes according to colour, e.g. if we want to have green and white position light on the same circuit at the right wing, the minimum voltage = 3.4 + 3.2 +1.8 = 8.4V. The result is that at least a seven-cell NiCd, NiMH or two-cell LiPol should by used.

Insertion in the model: You have also to keep certain rules to ensure the model to be visible in all positions so that flying at the night time is secure. Ultra bright LEDs are directional light sources compared to light bulbs. The directional feature of diodes should be adjusted; otherwise the model will be hardly visible in some angles. The easiest way to do it is to coarsen the diode surface with sandpaper. You can also drip a small amount of glue from the fusing gun onto the diode or to combine both methods. In case the wing is a hard-profile wing, two lights placed are of benefit, one on the wing entering edge and the other on the wing trailing edge and to point them to the front and to the back.

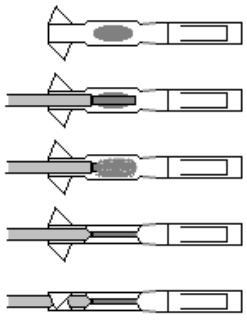


Additional light insertion in the ready model is not easy. It is easier to begin with a new model. The wires should not form surface loops. Both wires should go as close as possible to each other. Twisting double-line is ideal. The wiring should also be designed with disassembly in mind. Additional connectors or serial adaptors can be used, either home made or ordered. In case of EPP models (made of expanded polypropylene) a groove of 2mm can be cut off and a twisting enamel wire can be pushed in and glued every few centimeters with a drop of glue to prevent releasing. Enamel is not good in case of flexible joints as it can be broken or worn through due to rubbing and bending. However, it is lighter than the stranded conductor. If the weight is important to you, you may combine enamel-coated wire with the stranded conductor where stressed.

The diode wiring is not a source of interference. However, it might distribute interference through the entire model from an insufficiently shielded engine. Therefore, it is not recommended to lay them concurrently with the receiver antenna as they could affect the reception. Thus it can happen that a model that used to fly without problems starts plucking after installation of lights (e.g. by certain revolutions). After installation it is better to check the model's behaviour on the ground first and improve shielding if necessary or (in especially severe cases) to put a suppression component before the illumination unit supply. A separate supply for the model illumination can be used too, but it is easier to connect the unit to a power supply accumulator the way it is shown in the picture. The total average current consumption by all circuits being connected is about 55 mA in case of seven-cell supply. During 10 minutes of fly the light circuits burn only a little bit more than 1 % of capacity of 700mAh accumulator.

Making the cable : Whether you use any pair-cable or enamel, it is necessary to prepare cables with a sufficient reserve. A few centimetres in excess can always be hidden but just one missing centimetre will cause a big trouble. Before connecting the diodes remove the insulation from 5mm of the cable and tin the diode and the cable. This will shorten time needed for soldering. If you intend to put thermo-shrinkable insulation tube over the connection, prepare 8mm-long pieces of insulation. They shall be pulled on the wire beforehand as far as possible from the intended soldered connection – if you don't do so, they might shrink in a wrong place. After soldering in both stems and cooling pull the insulation on the connection and heat it gently from all sides with the solder so that it would shrink (you need to try it). It is recommended to heat at a place behind the tip where the solder is clean. Thus the insulation will not be littered with tin and resin.

After fixing the diodes and checking the length of cables connectors have to be connected. They could be crimped without soldering but once you have the solder in your hand or do not have the tools for crimping, I would recommend soldering.



Divide the couple of wires for about 20-25mm and remove about 4mm of the insulation of wire and tin it. If you are not fast, the insulation will recede a little more. Shorten the un-insulated tinned wires to 2-3mm. Break off two sockets and gently clamp them parallel in a clamp at a distance at which they will be in the connector. The included fork adaptor can be used for clamping as well. Ideally you fix the sockets and the wire on a surface area. Drop a little tin in the middle part of the socket, not too much. The thin tube tin is easier to dose. Put the wire in the farther socket and heat it so that the tin connects. Then repeat it with the closer socket. See to it that the wire and the socket would be in line. If your hand slips, you can heat the wire again and when it gets released, fix it. Keep eye on the solder temperature, you might lose the insulation. Keep the same polarity with all the cables, it is aesthetical. If, for instance, you always solder the diodes' positive pole on the farther socket, the locks of all connectors will be oriented upwards.

Bend the borders of the channels round with flat pliers. Then bend the plates around the insulation and finally put the sockets into the connector so that the locks would lock on and cannot be pulled out again. If there is resistance, gently try to lift the lock on the connector with a tip. Not too much, otherwise it will stay open forever. Lean the tip at the edge of the socket and gently move it forward. You probably used too much tin or bent the borders too little.

Have a nice flying at the night.

Night Fly NF-1

Technical parameters :	**min.**	**typ.**	**max.**
Input voltage:	4,5V	9V	14V
Consumption:	15mA	17mA	20mA
Circuits 1 and 2 :	19mA	20mA	23mA
Circuit 3 (1 Hz flashing) :	typ.38mA, pulses 75ms		
Dimensions:	45 x	24 x 5mm	
Operational temperature:		0 - 70°C	
Weight:		4,7g	
One diode weight:		0,32g	

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