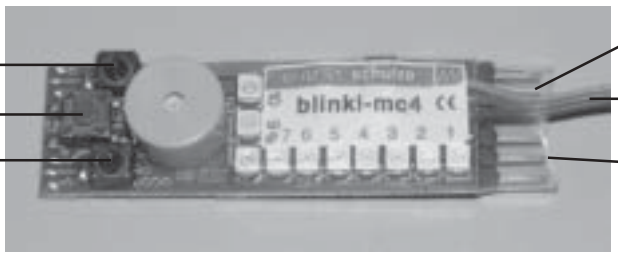

1 Characteristics

The ***blinki-mc4*** is a 4th generation monitoring instrument for the receiver power supply.

The ***blinki-mc4*** can be configured to match various battery types and load conditions in order to provide an accurate display of on-board voltage in your particular application.

The unit can be connected directly to any vacant servo socket on the radio control system receiver (see also the section: Using the unit for the first time).

The ***blinki-mc4*** combines the following functions in one unit:

• Measures and stores the average and minimum receiver battery voltage under load during a flight. The measured values are stored until the receiver is switched off.

• Simultaneously displays minimum receiver battery voltage as a continuous light (average load) and the lowest momentary voltage value as a flashing light (brief maximum load on the receiver battery); the display takes the form of a chain of multi-colour LEDs.

• Simple configuration to the operating voltage of your receiver battery, i.e. 4, 5 or 6 cells.

• Simple configuration of the 3-colour LED voltage display to match your receiver battery type and its load profile.

• An integral glitch (interference) counter registers transmission errors at the receiver output to which the ***blinki-mc4*** is connected.

• The glitch counter can be interrogated using the integral push-button.

• The integral piezo beeper warns you of the critical state of your receiver battery if the battery voltage falls to a dangerous level.

• The integral piezo beeper can optional sound if the receiver signal fails and/or be triggered from the transmitter to help you find a lost model.

• The integral alarm output is triggered additional to the warnings of the piezo beeper.

2 Important safety notes

Please read right through these instructions before operating the unit for the first time. These instructions must be passed on to the new owner if you dispose of the unit.

• The ***blinki-mc4*** can only be used if the receiver is powered by a separate battery. If the system is powered by a BEC system or similar, i.e. it is connected to a different power source, the unit will not provide a reliable indication of battery state.

• The ***blinki-mc4*** is intended exclusively for use in battery-operated radio-controlled models. No other type of use is permissible.

• Do not carry out modifications or alterations of any kind to the ***blinki-mc4***. The unit may only be operated within the limits stated in the Specification.

• The ***blinki-mc4*** will not tolerate damp. If the unit gets wet it should not be used again even after drying out thoroughly, as it may not work reliably thereafter.

• The ***blinki-mc4*** should be installed in the model in a position protected from dust, dirt, heat and vibration. Avoid shock and pressure loads.

• Before operating the unit check the wiring carefully for errors. This applies in particular if you are using the three-pin pin-row.

• Carry out a series of tests to ensure that the unit is working perfectly, and is compatible with your circuit arrangement. Be sure to carry out a range check. Don't operate the model until you have carried out this check successfully.

• The voltage at which you should cease operating your model varies from case to case, and it is important that you carry out your own checks and adjust the voltage display to suit your requirements if necessary.

• Always disconnect your batteries from the receiver and the ***blinki-mc4*** after use, and prior to charging.

3 Installation

As it is so light in weight, the ***blinki-mc4*** can easily be mounted in the model using Velcro tape, double-sided adhesive tape, contact cement or non-acidic silicone sealant.

4 Using the unit for the first time Display functions

The unit can be connected directly to any vacant servo socket on the radio control system receiver.

If you don't need the glitch counter, the ***blinki-mc4*** can be connected directly to any channel, i.e. one already in use, especially if you are short of channels. However, in this case we recommend that you connect the unit to the throttle channel (low current drain of connected components). The channel selected is looped through by the ***blinki-mc4*** to the 3-pin pin-row below the receiver cable, where you can then connect your throttle servo or speed controller; the controller must feature an opto-coupler.

The unit carries out a self-test each time you connect the receiver power supply and switch it on. The first stage is sequential lighting of the LED chain, allowing you to check that all the LEDs are functioning. The following parameters are then displayed:

a) the stored medium load value (LED 10),
b) the stored peak load value (LED 9),
c) the stored cell count (LED 8)
d) the stored battery type (LED 7)
e) the model finder function (LED 6), and
f) the alarm output function (LED 5).
g) the glitch counter output function (LED 4- V2 only).

(LEDs = programming position: see Configuration)
At the same time the beeper is triggered briefly for each new displayed value.
When the process is complete, the LED chain lights sequentially again.
The ***blinki-mc4*** is now ready for use, and indicates the operating voltage.

5 Functions

5.1 LED display function medium voltage

The LED chain has a dual function: it displays average battery voltage by means of a continuous light, and displays minimum battery voltage (caused by a severe load such as digital servos) as a flashing voltage value on the same chain. If both values should coincide with the same LED, the LED flashes at the test ratio of 3 to 1 (ON to OFF).

Note: if the battery voltage falls below the absolute limit of 4.0 V, LEDs 10, 9 and 8 glow or flash; this represents an extremely dangerous state, i.e. the receiver power supply is critical! If LEDs glowing: Battery low and/or if flashing: It may reflect a serious problem in the wiring between the battery and receiver (inadequate cross-section), the connectors and/or the switch (excessive transfer resistance); it may also indicate that the internal resistance of the battery in use is too high for the current load to which it is subjected.

5.1.1 Methode of working

The ***blinki-mc4*** checks several times per second the battery voltage, averages the measured values and compared the value with on of the "known" essential voltage characteristic curves of the battery types most commonly used, i.e. "pure sintered cells", "hybrid cells" and "nickel-metal-hydride cells", as well as their voltage curves at an average discharge current of 0.5 ... 4 C.

5.1.1.1 Notes

"1C" means that the cell is discharged at its nominal capacity rate, e.g. a 500 mAh cell discharged at a rate of 500 mA. In this case the battery is flat after one hour. If the load is 2C, i.e. "double capacity value" the battery will be flat after half an hour (2C with a 500 battery = 1A, with a 2000 pack = 4 A). At a discharge current of 0.5C a battery lasts two hours.

The display can only work precisely when the cell count and battery type is adjusted correctly - because the voltage curve of rechargeable cells varies according to type and load (internal resistance). Since the ***blinki-mc4*** analyses the voltage curve in order to display the battery's capacity, it is possible to adjust the unit to match the typical battery load. In most cases all that is required is that the voltage is displayed accurately between LED 7 (yellow) and LED 8 (red), so that the warning function works correctly.

5.1.2 Configuration medium load voltage

Setting ***blinki-mc4*** into configuration mode see chapter 6.

The load value should be set according to the expected battery duration, or - even better - the measured duration based on flight testing (delivery state underlined):

LED 1= 0.5C= 2 hours, **LED 2**= 1C= 1 hour,
LED 3= 1.5C= 40 minutes, **LED 4**= 2C= 30 minutes,
LED 5= 2.5C= 24 minutes, **LED 6**= 3C= 20 minutes,
LED 7= 3.5C= 17 minutes, **LED 8**= 4C= 15 minutes.

5.2 LED display function minimum voltage

Since the voltage curve of battery cells varies according to type and load, the peak value display would remain in the red range most of the time even though the battery were not flat. That is why the load value for the peak voltage display is set separately from the continuous load display. The display for peak value (flashing) should be the same as, or slightly lower than, the continuous load display (continuous light).

5.2.1 Methode of working

The ***blinki-mc4*** finds out the lowest voltage peak of the measurements of chapter 5.1.1 which is then displayed flashing.

5.2.2 Configuration maximum load voltage

Setting ***blinki-mc4*** into configuration mode see chapter 6.

The load value should be set to suit the servo types used and/or the maximum load (delivery state underlined):

LED 1 = 1C, **LED 2** = 2C, **LED 3** = 3C, **LED 4** = 4C, **LED 5** = 5C, **LED 6** = 6C, **LED 7** = 7C, **LED 8** = 8C.

In our experience you should generally set a value twice as high as the continuous load, i.e. select the same LED as under 5.1.2. With digital servos the load will be higher than with analogue servos.

5.2.3 Notes

Please operate all the control surfaces of your model simultaneously before taking off, to check your model's supply voltage. The unit will now display the voltage under load, varying according to battery type, battery capacity, battery age and the load being applied. This display is constantly updated during the flight.

The two memories for voltage value and glitch counter are stored in the unit, and are only erased when you switch off the operating voltage.

Caution: helicopters, gliders with camber-changing flaps:

To set up the ***blinki-mc4*** correctly, we recommend that you carry out a series of test flights with the switch harness removed, and with two parallel power supply cables running directly from the battery to the receiver (increased cable cross-section = twice 0.34 mm² = 0.68 mm²).

Reason: this is the weak link in the receiver power supply: cables of insufficient cross-section, excessive connector transfer resistance, and also high-resistance batteries. These are the prime reasons for failures in the receiver power supply. The ***blinki-mc4*** can detect these problems reliably, but only if it is set up with these components not already in the circuit. If you ignore this, you will think that the peak load is displayed correctly, lulling you into a false sense of security.

5.3 Cell count

Here you set the cell count of your receiver battery: LEDs 4...6 correspond to the number of cells in the pack.
Setting ***blinki-mc4*** into configuration mode see chapter 6 (below: delivery state underlined).

5.4 Type of battery

This is where you set the type of battery of your receiver battery. Setting ***blinki-mc4*** into configuration mode see chapter 6 (below: delivery state underlined):

a) **LED 1** = Ni-Cd, pure sintered cells, low-resistance (e.g. N500AR, N700AR, CP1300SCR, RC-4/5SC, RC-2/3SC, N1700SCR, RC-2400, CP2400SCR, and also the NiMH cells HR-SC (2600 mAh) and RC3000H and HV).

b) **LED 2** = NiCd, hybrid cells (e.g. N270AA, N800AE, KR1400AE, P60AA, KR1800SCE).

c) **LED 3** = Ni-MH cells (e.g. GP25AAH, GP60AAH, GP100AFH, HR-AAA (Twicell 700), HR-AA (Twicell 1600), HR-4/5A (2150 mAh)).

5.5 Model finder

If the ***blinki-mc4*** is connected to a vacant channel output, you can call up the special "model finder" function from the transmitter simply by operating this channel.

5.5.1 Methode of working

If the ***blinki-mc4*** detects a longer pulse than configured in 5.5.2 the piezzo buzzer sounds "SOS".

If the model finder is set to "On", the alarm output (5.6) is in circuit with the alarm signal as defined under 5.6.2, allowing you to switch another alarm indicator simultaneously with the beeper.

5.5.2 Individual configuration

Setting ***blinki-mc4*** into configuration mode see chapter 6 (below: delivery state underlined):

a) LED 1 = OFF (">=" means "greater than or equal to")
b) LED 2 = ON when receiver pulse >= 1.6 ms
c) LED 3 = ON when receiver pulse >= 1.75 ms
d) LED 4 = ON when receiver pulse >= 1.9 ms
e) LED 5 = ON when receiver pulse >= 2.05 ms

5.5.2.1 Hints

If a proportional control is used to trigger the model finder, this will affect the glitch counter when you operate that channel; you can avoid this by assigning a toggle switch to the model finder channel at the transmitter, as this then abruptly transmits a signal value above the configured trigger pulse width (permissible pulse widths: see Section 5.3.15).

Alternatively the ***blinki-mc4*** can be connected directly to the battery via a Y-lead, but in this case the model finder function cannot be controlled from the transmitter, and the glitch counter function will not be available (no receiver signal present).

5.6 Alarm output

The alarm output can be connected to an LED (anode to **p**, cathode to **GND** - select configuration **a**) or a servo (or electronic relay - select configuration **c**).

5.6.1 Methode of working

The alarm output is switched on when the beeper is triggered (e.g.: model finder in configuration mode b...e - section 5.5.2), a single receiver pulse is missing (V 2 only), the glitch counter runs over and also low voltage warning (at least one red LED is glowing)). The values stated in the table below are fed to the pulse pin **p** of the three-pin pin-row.

5.6.2 Individual configuration

Setting ***blinki-mc4*** into configuration mode see chapter 6 (below: delivery state underlined):

Alarm	**OFF**	**ON**
a) LED 1 =	0 V	constant 3.3 Volts
b) LED 2 =	constant 3.3 Volts	0 V
c) LED 3 =	pulses of 1.0 ms	pulses of 2.0 ms

5.7 Glitch counter

Once your model has landed, you can read out the glitch count from the ***blinki-mc4*** by pressing the push-button (to activate the glitch counter function in softwareversion 1 (V 1) it is necessary to activate the model finder (chapter 5.5.2 - b, c or d). Note that the LED display does not indicate the number of glitches directly, i.e. the display is non-linear (see Specification).

Depending on the configuration the piezo buzzer and the alarm output can be activated by every glitch in softwareversion V 2. In V 1 single glitches will neither be showed by the piezo buzzer nor by the alarm output.

5.7.1 Methode of working

When you switch on the receiver the glitch counter measures the pulse width of the servo output.

Thereafter any deviation (longer / shorter) is interpreted as interference. This means that the unit detects and counts each instance of “servo jitter” on “its” channel. That is why the channel to which the unit is connected should be vacant, i.e. not in use, if you wish to count glitches; ideally it should stay permanently at “neutral” (pulse width approx. 1.5 ms).

5.7.1.1 Hints

If the glitch counter’s memory should over-run (serious interference) the unit triggers the integral piezo beeper (model finder).

The glitch counter run-over by continuous interferences. This is shown by the software version 1 with "long-short" beep sequences. In V2 you have to activate the piezo buzzer separately (5.7.2).
The alarm output is not activated in V 1, in V 2 he reacts as configured in 5.6.2.

If *blinki-mc4* does not detect any receiver channel pulses after power on (connected to the battery socket), the glitch counter is deactivated

5.7.2 Individual configuration (V 2 only)

Setting ***blinki-mc4*** into configuration mode see chapter 6 (below: delivery state underlined):

Display	**Function**
a) LED 1 =	Piezo buzzer OFF, alarm output OFF
b) LED 2 =	Piezo buzzer ON, alarm output OFF - but ON to show glitch counter over-run.
c) LED 3 =	Piezo buzzer ON, alarm output ON

5.7.3 Hints

If the ***blinki-mc4*** cannot be connected to a vacant channel, the model finder should be switched off or set to the maximum possible pulse width (>2.05 ms) which can normally be transmitted on this channel (see Section 5.5.2).

PCM receivers: since a PCM receiver goes into Hold mode if interference occurs, the glitch counter will not detect glitches, because no change in the output signal occurs with such equipment.

For this reason we recommend that you configure the PCM receiver’s fail-safe function so that the channel to which the ***blinki-mc4*** is connected is normally at “neutral”, and if fail-safe is triggered the channel generates “short pulses” (= motor stopped). Set the Hold period to minimum.

Alternatively the ***blinki-mc4*** can be connected directly to the battery via a Y-lead, but in this case the model finder function cannot be controlled from the transmitter, and the glitch counter function will not be available (no receiver signal present).

6 Configuration

6.1 Default state

The ***blinki-mc4*** is pre-configured as standard to the following values:

6.11) LED 10	Medium load value	1 C
6.12) LED 9	Peak load value	2 C
6.13) LED 8	Cell count	4
6.14) LED 7	Battery type	NiCd-SCR
6.15) LED 6	Model finder	OFF
6.16) LED 5	Alarm output	OFF
6.17) LED 4	Glitch counter alarm (V2)	OFF

6.2 Changing the configuration

a) Hold the push-button on the ***blinki-mc4*** pressed in.
b) Switch the receiver on.
c) Release the push-button when you hear the beeper.
— You are now in configuration mode —
d) Using a screwdriver with a blade exactly 2 mm wide, rotate the left trim pot to a position at which one of the LEDs (LEDs # 10-5) listed under **5.11 - 5.17** lights up.

e) LEDs # 1-8 now initially show the old value stored in the ***blinki-mc4*** at the position of the left trim pot described under **d)**. If you rotate the right trim pot, the LED display then jumps to the value corresponding to the right trim pot position (e.g. for continuous load value LED # 1-8 = 0.5C-4C or cell count LED # 4, 5 or 6).
f) Press the push-button to store the value set using the right pot (the button press is confirmed by the beeper and by LEDs 10-8 lighting up).
g) To alter another value resume the process at **d)**.
h) To quit configuration mode simply switch the receiver off again.

6.3 Overview about the individual configurations

LED 10 = Medium load value

LED 1= 0.5C= 2 hours,	LED 2= 1C= 1 hour,
LED 3= 1.5C= 40 minutes,	LED 4= 2C= 30 minutes,
LED 5= 2.5C= 24 minutes,	LED 6= 3C= 20 minutes,
LED 7= 3.5C= 17 minutes,	LED 8= 4C= 15 minutes.

LED 9 = Medium load value
LED 1= 1 C, LED 2= 2 C, LED 3= 3 C, LED 4= 4 C, LED 5= 5 C, LED 6= 6 C, LED 7= 7 C, LED 8= 8 C.

LED 8 = Cell count
LEDs 4...6 correspond to the number of cells

LED 7 = Battery type
a) LED 1 = Ni-Cd, pure sintered cells, low-resistance
b) LED 2 = NiCd, hybrid cells
c) LED 3 = Ni-MH cells

LED 6 = Model finder
a) LED 1 = OFF
b) LED 2 = ON when receiver pulse >= 1.6 ms
c) LED 3 = ON when receiver pulse >= 1.75 ms
d) LED 4 = ON when receiver pulse >= 1.9 ms
e) LED 5 = ON when receiver pulse >= 2.05 ms

LED 5 = Alarm Output	**OFF**	**ON (V 2 only)**
a) LED 1 =	0 V	constant 3.3 Volts
b) LED 2 =	constant 3.3 Volts	0 V
c) LED 3 =	pulses of 1.0 ms	pulses of 2.0 ms

6.4 Testing, changing the configuration

For most applications (gliders, sports models) no changes are necessary.

Electric helicopters generally have fairly small receiver batteries with a flight duration of only about 20-30 minutes; in this case the display should be changed to around 2-3C continuous and 4-6C peak value.

We recommend that you check the function of the red LEDs as follows: starting with a discharged battery, charge around 12% of its capacity into the pack, then discharge it by moving the model's servos (model on the ground). After a short period (around 60 seconds) at least the first red LED (8) should light up continuously. If in practical flying operations the servo load is higher, causing a premature flat battery warning, correct the display by setting a different load value (5.3.11 or 5.3.12).

7 Legal matters

CE approval: the ***blinki-mc4*** satisfies the relevant statutory EU directives and basic norms.

Liability exclusion: We at Schulze Elektronik GmbH are unable to ensure that you observe these instructions, and are not in a position to influence the way you install, operate and maintain this unit. For this reason Schulze Elektronik GmbH is obliged to deny all liability for loss, damage or costs which arise due to the incompetent or incorrect use and operation of our products, or which are connected with such operation in any way.

8 Specifications

Operating range, Ni-Cd:	4...6 cells
Mass:	approx. 10 g
Dimensions incl. beeper:	approx. 61 x 17 x 10 mm
Idle current drain:	approx. 10 mA
Current drain per LED:	additional 10 mA
Current drain, beeper:	additional 35 mA
Average value generation:	8 values within 1 sec.
Glitch detection:	Pulse value > 80 us

LED code, glitch counter
LED 1 = 1 glitch (2 to the power of 0)
LED 2 = 2...3 glitches (2 to the power of 1)
LED 3 = 4...7 glitches (2 to the power of 2)
LED 4 = 8...15 glitches (2 to the power of 3)
LED 5 = 16...31 glitches (2 to the power of 4)
LED 6 = 32...63 glitches (2 to the power of 5)
LED 7 = 64...127 glitches (2 to the power of 6)
LED 8 = glows continuously after 128 glitches

LED capacity assignment (approx.)
LED 1 > 87.5%, LED 2 > 75%, LED 3 > 62%
LED 4 > 50.0%, LED 5 > 37.5%, LED 6 > 25.0%
LED 7 > 12.5%, LED 8 > 8.3%, LED 9 > 4.0%
LED 10 < 4.0%