

# SMART HD SWITCH

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## DUAL BATTERY BALANCING HEAVY DUTY REDUNDANT MAIN POWER SWITCH

### USER MANUAL

#### Description

DUAL BATTERY BALANCING HEAVY DUTY REDUNDANT MAIN POWER SWITCH, was created especially for large RC models which are powered by two independent batteries. This SMART HD SWITCH is designed in a way that eliminates few common problems that shows up in this type of devices.

SMART HD SWITCH significantly reduces the risk of a power failure in RC model.

The device is equipped with safety and functional features for increased reliability:

**- Supports two independent batteries with their constant balancing.**

Input of SMART HD SWITCH can be connected to two independent batteries as a main power of RC model. This switch has a functionality of continuous load balancing and sharing between the two batteries. If one of the battery is defective (sudden voltage drop compared to the second battery or significantly reduced capacity), SMART HD SWITCH will automatically disconnect the faulty battery. The principle of operation is based on continuous voltage monitoring of both batteries. If both batteries voltage are the same within +/- 0.2V then the two batteries are loaded and supply the output device. However, if one battery has a lower voltage, then it is automatically ignored until again both batteries will have equal voltage. As a result, two identical batteries of the same capacity will be discharged equally, simultaneously or alternately giving energy to the output.

**- Immunity to damage or short-circuit of one battery.**

If one of two batteries is defective (much smaller voltage or short circuit) then it is ignored and does not participate in powering the output.

**- Immunity in case of open circuit of one battery.**

If one of the batteries has suddenly open circuit (due to vibration or wire damage), then it is ignored and is not involved in the load sharing.

**- Automated battery managing.**

Switching between the batteries during normal operation or when a fault is detected is completely automatic and does not cause temporary power blackout at the output. There is no moment in which none of the battery supplies the output.

**- In case of failure of two batteries, the output is powered by a stronger one.**

If in some cases, will happen that both batteries are damaged (worn or badly stored), SMART HD SWITCH will power the output using the one battery that is stronger.

**- No risk of switch failure due to model vibration caused by a gas engine.**

When powered OFF, the device has inserted a mechanical safety pin-flag, which must be removed in order to enable the device (turn ON) and power up the switch output. Switch circuit is based on semiconductor components and during normal operation (when ON) it does not have any mechanical parts that can fail due to vibration or mechanical issues.

**- Eliminated the risk of power lose due to safety pin-flag slot wire failures.**

Safety Pin-Flag is used to power OFF the RC model by shortening the slot contacts and putting the switch in sleep mode (OFF). During the normal operation (Safety Pin-Flag removed, switch is ON) slot jumper contacts are open. This provides additional safety and reliability in case of slot wires failure. No current flows through slot wires during normal operation, when the switch is ON.

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**- Zero voltage drop across the switch.**

This design of a semiconductor switch is characterized by a zero voltage drop. It means that the output voltage is exactly the same as the input (battery) voltage. This feature is very useful when there is voltage regulator installed or other voltage monitoring device that estimates battery discharge level (including RC telemetry). This feature is met for the whole range of supply voltages 2.5 - 28.0 V, and full range of allowable current load up to 25 Amps.

**- No heat dissipation on the switch.**

During a normal operation, in the voltage range up to 12V and current load up to 10A there is no noticeable heating of the switch. Thanks of that there is minimized loss of energy from the battery and also enhanced reliability of electronic circuits. At higher voltages and currents, switch can start to heat up slightly to an acceptable level. This is absolutely normal.

**- Dual electronic circuits (redundancy).**

For even greater safety and reliability for uninterrupted power supply of RC model, this switch is designed in such a way that its key high-current circuits are duplicated.

**- Dual output wires for powering the receiver, servos, etc. (redundancy).**

For even greater safety and reliability of uninterrupted power supply for RC model, this switch is equipped with a dual output wire pairs. Both wire pairs behave exactly the same way, and voltage is applied to both of them. Doubling the wires enhances safety and reliability of power connecting. It also affects for even distribution of current flow in the case of high power load. If needed, one of the output wire pair can be left unplugged.

**- Ultra small footprint of safety pin-flag socket.**

Fantastic ultra small footprint of socket where Safety Pin-Flag is placed to turn OFF the switch, will surely find its followers among the RC scale modelers. When installed and ready to fly it has no protruding parts of the switch, or those which can accidentally turn OFF the power supply as a result of being caught by the high grass or accidental touching by a hand or a garment. Appropriate length of Safety Pin-Flag also allows to install the slot under a fuselage laminate or plastic cover so that the only trace of switch presence in this place is a 3.5mm hole.

**- Bright LED for operating status**

Not only clearly visible but also small in diameter (3.0 mm) LED indicates when the power is ON or OFF. The LED is equipped with a clip for easy installation in model fuselage.

**- High-quality power wires**

Input wires for battery connection are high quality wires, with silicone insulation. These wires have a conductor cross section equal to 1.0 mm<sup>2</sup> (17AWG). Output wires for connecting receiver or other devices are high quality wires in PVC insulation, with a wire cross section equal to 0.75 mm<sup>2</sup> (18AWG) each pair.

**- Wide range of supply voltage**

This switch works properly in the range of 2.5 - 28.0V. The maximum allowable current is 25.0 Amps. At the extreme values it is able to transfer power equal to 700W!

**- No need to disconnect the battery from the switch**

Standby current, when the device is turned OFF is only! 23uA (micro Amps) at 6.0V, and 104uA at 28V. This means that the battery with 3000mAh capacity and 6V will be completely discharged after 14 years! This standby current is much less than self-discharge of the battery during storage.

When using a battery with additional pair of wires for charging, also there is no need to disconnect the battery from a switch. It is important that the switch is OFF during charging (Safety Pin-Flag inserted).

## Technical data

- Dimensions: 40.0 mm x 22.0 mm x 5.0 mm
- Weight: 15.0 grams
- RX plug: Futaba / JR female 2x18AWG (0.75mm<sup>2</sup>) wire 200 mm PVC
- BAT connector inputs : 2x17AWG (1.0 mm<sup>2</sup>) wire 150 mm silicon
- Works with Ni-Cd, Ni-MH, Li-Po, Li-Fe, Li-Ion
- LED, wire 300 mm
- BAT: power supply 2.5 V - 28.0 V, max 25 Amp = 700
- Safety Pin-Flag slot, wire 300mm
- Zero voltage drop. No heat dissipation
- Continuous battery balancing and load sharing
- Negligible standby current consumption
- NO NEED TO DISCONNECT BATTERY!

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## Installation and use

The switch must be installed inside the RC model fuselage. Device is immune to vibration but, as far as possible it should be installed on a flexible substrate.

The batteries should be connected to the input wires of the switch (BAT1 and BAT2). Red wire is positive polarity (+), when black wire is negative polarity (-). It is important to use two batteries of the same type (Li-Po, Li-Fe, Ni-Mh etc.) with the same number of cells and technological voltages and the same capacity. It is recommended to use both batteries from one manufacturer.

If needed, the SMART HD SWITCH can also work with only one battery. In this case, one pair of inputs can be left not connected and insulated, or also it is allowed to connect two pairs of supply wires BAT1 and BAT2 to one battery.

The receiver, servos or voltage regulator connects to the outputs (one or both) marked OUT. It should be remembered that if the voltage regulator is used, always must be installed after the switch (output side of the switch).

LED indicator should be installed on the outside of the fuselage in a clear visible place. It provides useful information about the operating status of the switch.

Slot for Safety Pin-Flag should be securely attached to the rigid fuselage elements. The thread nut socket should be secured by using a thread glue.

Switch is activated when removing the Safety Pin-Flag. The Safety Pin-Flag should be put away in a safe place so it does not lost. By removing the Safety Pin-Flag the power will be provided to the elements connected to the switch output. LED will be turned ON also.

To turn OFF the power, reinsert the Safety Pin-Flag in to the socket. The Safety Pin-Flag should slide to a depth of 15.0mm with a noticeable "click" and up to pronounce resistance. The LED goes OFF.

## Useful tip

When charging the batteries using the microprocessor charger, it is worth to check if both batteries are discharged equally (or have charged the same amount of power during charging). SMART HD SWITCH balances both batteries during operation and discharges them equally, so that during the charging process it can be easy to verify if any of the batteries is behaving suspiciously or is significantly weaker.

***Thank you for the trust and purchase of devices. Simultaneously we wish successful flights and unforgettable moments while piloting your wonderful models.***