JETI model®

electronics for models

Controllers SPIN

JETIBOX

You have obtained a product from new line of controllers for brushless motors, named **SPIN**. Our intention was to implement our best experience and know-how collected over the last ten years of brushless controller development.
All controllers (except **OPTO** types) contain a new type of voltage regulator for supplying the receiver and servos, the so called switched BEC. Owing to this element, a considerable increase of applicability of controllers with BEC towards higher numbers of flight battery cells could be achieved. Another advantage is the independence of number of servos from the input voltage.
For **SPIN** controllers, we have developed new programming tool – **JETI BOX**, which may be used independently (see page 10-11) or in connection with selected **JETI model** products.

General conditions for connecting the controller:

- apply only new high quality connectors properly soldered to the cables
- for controllers SPIN 11 and SPIN 22 we recommend to use G2 connectors, for higher types G3.5 or G4. After soldering the connectors, check that the springy front part remains rotary. It may happen that the flux rises along the connector surface and in the worst case galvanically separates the springy part from the connector body. A remedy is possible by brushing the connector with nitro diluent. During the operation, observe that the connectors stay clean and the plug-in force remains high. If this force decreases, replace the connectors immediately. We recommend replacement of connectors after 1-2 flight seasons.
- the distance between motor and controller should not exceed 10-15 cm. Flight battery cables can be extended to 20-25 cm (remark 1, page 9)
- connect the JR connector to the throttle channel of the receiver

SPIN 200 OPTO and SPIN 300 OPTO connection:

Controller SPIN 200/300 contains ancillary circuit which avoids sparking when the controller is being connected to accumulators.

Controller connecting procedure:

1) connect minus pole of controller (2x4 mm^2 wire) to minus pole of accumulator
2) connect red thin wire (1,5 mm^2) to plus pole of accumulator
3) connect plus pole of controller (2x4 mm^2 wire) to plus pole of accumulator

Once the main power pack is connected, handle the model with extreme care – ensure that everyone is well clear of the propeller all the time.

Basic parameters of SPIN controllers with BEC:

Type	Sustained current [A] (2,2Ah batt.)	Quiescent current [mA]*	Batteries NiXX/LiXX/voltage	Min. shut down voltage [V]	Dimensions [mm]	Weight [g] (with cable)
SPIN 11	11	1,4	5-12 / 2-4 / 5-17V	4,5	32 x 23 x 6	12
SPIN 22	22	1,4	5-12 / 2-4 / 5-17V	4,5	32 x 23 x 7	26
SPIN 33	33	1,4	5-14 / 2-5 / 5-21V	4,5	42 x 23 x 7	32
SPIN 44	44	1,4	6-18 / 2-6 / 5-26V	5	52 x 25 x 10	44
SPIN 55	55	1,4	6-24 / 2-8 / 5-34V	5	52 x 25 x 12	60
SPIN 66	70	1,4	6-18 / 2-6 / 5-26V	5	52 x 25 x 12	56

* controller current consumption with batteries connected and switch in OFF position

Typ	Voltage BEC [V]	Max.current BEC [A]	Max. servo number	Resistance in conducting state [mΩ]	Number of power transistors	Cable crossection (input / output) [mm²]	Input capacitance [µF]
SPIN 11	5,5	2,5	6	2x 8,00	6	1,0/0,5	1x 220
SPIN 22	5,5	2,5	6	2x 4,00	12	1,5/1,0	1x 470
SPIN 33	5,5	3	7	2x 2,60	18	2,5/1,5	2x 220
SPIN 44	5,5	5	8	2x 2,00	24	2,5/2,5	2x 330
SPIN 55	5,5	5	8	2x 0,94	48	2,5/2,5	2x 330
SPIN 66	5,5	5	8	2x 1,00	48	4,0/2,5	2x 470

SPIN OPTO controllers

These controllers have galvanically separated input (signal from receiver) from power accumulators, therefore it's necessary to use independent supply for receiver and servos (4-5 NiXX or 2-3 LiXX with linear voltage regulator, such as **MAX BEC**).

SPIN OPTO controllers are provided with two JR connectors. Connector on longer three-line cable **with black ending** is to be linked to the receiver. Connector on shorter three-line cable **with red ending** is intended for communication with **JETI BOX**; for programming or data reading connect it into slot marked **imp. + -** on **JETI BOX**.

WARNING! Black connector may be connected with the receiver, but the supply of the receiver must be switched OFF! JETI BOX is supplied via controller from power accumulators, which must be connected with controller during the setting by JETI BOX.

Basic parameters of SPIN OPTO controllers:

Type	Sustained current [A]	Batteries NiXX/LiXX/voltage	Min.shut down voltage	Dimensions [mm]	Weight [g] (with cable)
SPIN 44 OPTO	44	6-18 / 2-6 / 6-26V	5V	52 x 25 x 10	35
SPIN 48 OPTO	48*	14-30 / 4-10 / 12-42V	12V	52 x 25 x 12	45
SPIN 66 OPTO	70	6-18 / 2-6 / 6-26V	5V	52 x 25 x 12	45
SPIN 75 OPTO	75*	14-30 / 4-10 / 12-42V	12V	52 x 25 x 15	55
SPIN 77 OPTO	77	14-36 / 4-12 / 12-50V	12V	65 x 55 x 17	110
SPIN 99 OPTO	90	14-36 / 4-12 / 12-50V	12V	65 x 55 x 17	110
SPIN 200 OPTO	170	24-40 / 6-14 / 18-59V	12V	63 x 120 x 27	326
SPIN 300 OPTO	220	24-40 / 6-14 / 18-59V	12V	63 x 120 x 27	360

* with good cooling and outside temperature under 20°C

Setting with the help of the R/C equipment

- In manual setting menu (**MAN Setting**), the item **Setting thru R/C** must be **ON** (factory preset)
- connect the controller by means of the JR connector to the receiver throttle channel and connect the motor.
- shift the throttle stick to position „full throttle", switch on the transmitter and connect the flight batteries.
- switch on the switch - receiver power supply (void for SPIN 11), after five seconds four tones sound ♪♪ ♪♪. If the throttle stick is immediately shifted back to low throttle position the value of the full throttle position is stored in the memory (END POINT), otherways follow groups of five repeating tones according to the appropriate mode :

♪ single tones - **mode 1** ***Acro inrunner***.
- this mode is appointed to aerobatic models driven by motors of classic conception. (inrunner)
- brake not active
- timing 0°
- gradual switching off when 68% of the starting voltage is reached.

♪♪ two tones - **mode 2** ***Acro outrunner:***
- this mode is appointed to aerobatic models driven by motors of the reversed conception (outrunner).
- brake not active
- timing 24°
- gradual switching off when 68% of the starting voltage is reached.

♪♪♪ groups of three tones - **mode 3** ***Glider inrunner:***
- this mode is appointed to gliders driven by motors of classic conception (inrunner).
- brake activated
- timung 0°
- gradual switching off when 68% of the starting voltage is reached.

♪♪♪♪ groups of four tones - **mode 4** ***Glider outrunner***.
- this mode is appointed to gliders driven by motors of the reversed conception (outrunner).
- brake activated
- timing 24°
- gradual switching off when 68% of the starting voltage is reached.

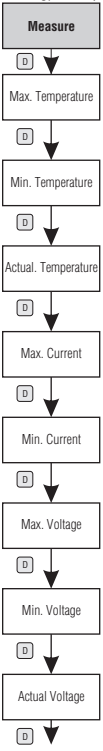
♪♪♪♪♪ groups of five tones - **mode 5** ***Heli constant RPM:***
- this mode is appointed to model helicopters with the claim or constant speed regulation with changing load/unload of the rotor. This mode does not support fast speed changes
- timing 0°
- gradual switching off when 68% of the starting voltage is reached.

♪♪♪♪♪♪ groups of six tones - **mode 6** ***Heli Auto:***
- the same like mode 5, but RPM range is set automatically

Confirmation of the setting is carried out by shifting back the throttle to low throttle position during the tone signals of the factual mode.

Setting with the help of the JETI-Box

This setting is carried out by means of four push-buttons: left [L], right [R], up [U], down [D] .
Plug in the JR connector of the controller (SPIN OPTO red ending) into the plug designated Impuls + - , which is positioned on the right side of the **JETI-BOX.**
Before connecting the flight battery remove for the sake of safety the propeller.
Do not connect anything to the connector designated with + -.
Connect the flight batteries and switch on the switch - receiver power suply(void for Spin11).
On the display appears the name of the connected controller. By means of the push-buttons **L** and **R** more detailed informations are acquired of your controller.
By means of the push-button **D** we get to the option line of basic régimes where we either can choose reading out of measured values or setting of controller parameters (Measure or Setting), with push-buttons **L** and **R** we choose **MEASURE**–**MAN. SETTING**–**AUTO SET**.



MEASURE – continue with push-button **D**

The controller registers the max. temperature during operation and the time of its occurrence. The time measurement begins with the first revolution of the motor.

The controller registers the min. temperature during operation and the time of its occurrence.

The display indicates the actual temperature.

The controller registers the max. current at full throttle, the time at which this value occurred and the voltage of the flight batteries corresponding with this current. The measured value corresponds to the current peak which mostly occurs when the motor is abruptly accelerated.

The controller registers the min. current at full throttle, the time at which this value occurred and the voltage of the flight batteries corresponding with this current. The measured value corresponds to the minimum current at full throttle which mostly occurs at horizontal or descending flight, when the motor is unloaded.

The controller registers the max. voltage of the flight batteries beginning with the first revolution of the motor as well as the time when this value occurred.

The controller registers the min. voltage of the flight batteries beginning with the first revolution of the motor as well as the time when this value occurred.

Instantaneous battery voltage.

Off Voltage

Value at which the motor has been switched off or its power throttled down as well as the time, at which this value occurred.

Remark concerning current measurements:

1.) In order to measure correctly, the controller must run at full throttle at least 4 s in the course of the whole flight. In case of constant rpm setting (Heli const. RPM) this condition may not be fulfilled and the measurement will not correspond to real values.

2.) The real average current may travel between the measured value of maximum and minimum current. According to flying style it may approach one or the other value.

Motor Run Time

The controller registers the overall motor run time.

D

Power ON Time

The controller measures the overall time from the first switch-on of the switch (activation) until switch-off. The time is measured from the first move of the prop (rotor).

D

Motor Pole No.

Set the number of motor poles by means of the push-buttons **L**-**R** . This parameter is important for correct readings of the max. rpm.

D

Gear

Set the gear ratio of the gearbox. Apply 1:1,0 for direct drive

D

Max. Motor RPM

In the course of operation the controller registers the max. motor rpm and the time at which these rpm have been achieved.

D

Max. Prop RPM

The controller registers the max. rpm of the propeller in the course of operation and the time at which these rpm have been achieved.

D

Errors

If parameters have been exceeded – voltage (U), temperatures (T), commutation (C) and current (I), protections will be activated and the motor will be cut-off. The reading y means that parameters became exceeded (an error occurred), the reading n indicates that parameters have not been exceeded. With the help of this error notification the cause of motor cut-off can be determined.

D

Return to the menue Measure

Remark. **Protection in case of incorrect commutation (C)** – if operation becomes unsafe due to many commutation errors as a result of incorrectm otord esign.I ns omec asest hisp roblemc anb es olvedb y increasing the motor timing.

Measure

MAN Setting

Certain parameters of the controller can be set or checked manually.

D

Temperature Protection

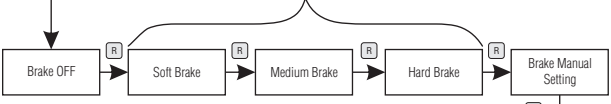
D

With the aid of push-buttons **L**-**R** the level of the controller temperature protection can be set.

Redefined brake:

The first value is the initial braking level in %, **the second value** – the final braking level in %, **the third value** – time of brake application between the first and second intensity. Confirm brake setting with push-button **D**.

If the brake is switched off jump to line **OPERATION MODE** – switching between modes Aircraft-Helicopter.



D

Time from motor cut-off until brake activation. By means of push-buttons **L**-**R** setting between 0-7s is possible.

Dead Time

D

Initial braking level in %.Setting by push-buttons **L**-**R**

Initial Brake

D

Final braking level in %. Setting by push-buttons **L**-**R**

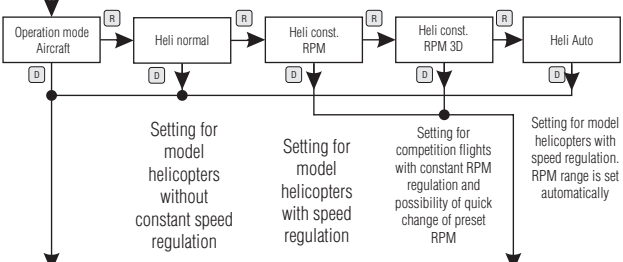
Final Brake

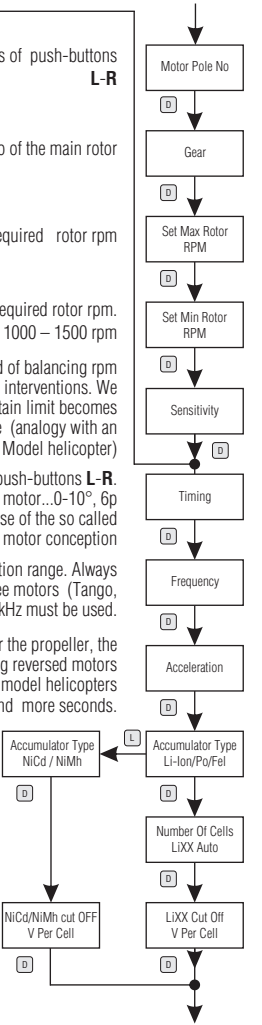
D

Speed of braking (time between the begin of braking and attainment of the preset final braking effekt). The time is set by push-buttons **L**-**R**

Brake Speed

D





Setting of motor pole numbers of Helicopters by means of push-buttons **L**-**R**

Setting by (**L**-**R**) of the total gear ratio of the main rotor

Setting by (**L**-**R**) of the max. required rotor rpm

Setting by (**L**-**R**) of the min. required rotor rpm. We recommend to set the value to 1000 – 1500 rpm

By means of the push-buttons **L**-**R** we set the speed of balancing rpm deviations. The smaller the number, the faster are the interventions. We always proceed from the higher number. If a certain limit becomes exceeded the controller starts to operate unstable (analogy with an overgyrated Model helicopter)

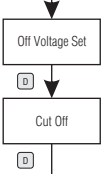
Motor timing (pre-ignition) – setting by means of push-buttons **L**-**R**. Recommended values: 2pole motor...0-5°, 4p motor...0-10°, 6p motor..0-20°, 8p and more...20-30° - necessary in case of the so called reversed motor conception

Motor control modulation frequency within the regulation range. Always use 8kHz. The only exception are the so called iron free motors (Tango, Samba). For these motors a frequency of 32 kHz must be used.

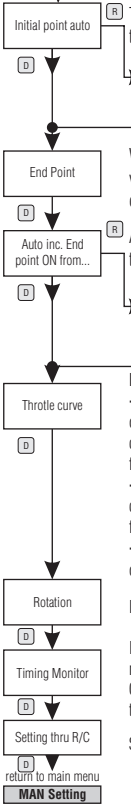
Speed of motor acceleration. On principle – the larger the propeller, the longer the acceleration time value must be. For big reversed motors apply an acceleration time of 2 and more seconds. For model helicopters we recommend acceleration times of 5 and more seconds.

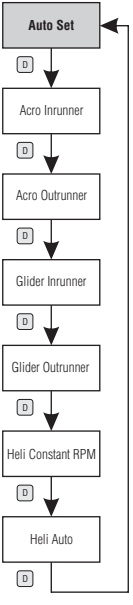
Enter by means of the push-buttons **L**-**R** the type of flight battery. For NiCd/NiMh cells the min. voltage per cell is entered by push- buttons **L**-**R**. For LiIon/LiPol batteries we can either enter the automatic cell number recognition (comfortable if flying battery sets with different cell numbers) or set the exact cell number. When using Li-Fe (A123) cells: we do not recommend using the automatic detection of cell number; just set the number of cells manually. Continue with push-button **D** and by means of. **L**-**R** set the min. voltage per cell.

Information about the preset cut off voltage. With NiCd/NiMh cells or when setting the automatic detection for LiIon/LiPol cells this value results of the actual voltage of the connected flight batteries.



Mode of motor cut-off when the voltage of the flight batteries decreases to the preset value. **Slow Down** – gradual decreasing of the motor power. **Hard** – immediate stop of the motor. This mode we recommend for safety reasons on models with electric motors and flight batteries of the NiCd or NiMh type.





We apply this mode for putting the controller into operation in a fast and simple way for instance after loosing track during setting. The setting content is practically the same as setting with the help of R/C equipment (page 2). Confirmation of the setting is carried out by means of the push-button **R**.

Remark 1: **Extending the battery cables.**

As a matter of principle only cables from the battery to the controller can be extended. If the extension is larger than 20 cm it is unavoidable to connect between the cables a low impedance electrolytic capacitor of a capacity 100-300 µF. These capacitors must be inserted between every cable section longer than 25-30 cm.

Remark 2: **Multi motor models**

We recommend to use the same controller type for each motor. In case of SPIN controllers switch on only one BEC. The switches of the other controllers remain in the "SWITCHED OFF" position. When using controllers with BEC it is generally necessary to use only one common flight battery. If we want to to utilize 2 and more batteries these must be connected in parallel.

TIP:

If you do not know the pole number of your motor please contact the manufacturer.
If you own a revolution counter and know the gear ratio of your gear box (direct 1:1) you will be able to find the pole number as follows.
Switch on the motor and with the help of the revolution counter measure the maximum propeller (rotor) rpm. Connect the JETI Box and go in the menu MEASUREMENT to the maximum propeller RPM display (Max. Prop RPM). If the shown value does not correspond with your measured value check the gear ratio setting (Gear) and change the pole number inputs until your measured RPM will be identical with the value in the JETI Box display (Max. Prop RPM). As a result you will obtain the pole number of your motor (Motor Pole No.)

Utilization of the JETI Box as self contained unit:

1. Measurement of receiver channel outputs pulse widths
2. Servo pulse generator
3. Servo cycler
4. Measurement of servo transfer speeds
5. Communication with controllers SPIN (see controller SPIN operating instructions)
6. Communication with sensor controllers for BLDC
7. Communication with new MPD receivers

For application **#1** you need a receiver, transmitter and receiver batteries (4,8-6V). Plug batteries into socket **GRAY**, receiver to socket **BLUE**, both on the right side of the **JETI BOX**.

For applications **#2**, **#3** and **#4** you need the receiver batteries (4,8-6V) and a servo. Connect the batteries to socket first **GRAY** and the servo to socket **BLUE**.

In case of change of the application you must disconnect the supply battery from the **JETI BOX** and activate them again. In order to choose the required application use the push-buttons **R** and **L**.

If you do not have RX batteries or another kind of voltage source (range of 4,8-6V) you can supply the **JETI BOX** from the BEC of the controller (do not for SPIN OPTO). Plug the JR connector of the controller into socket **GRAY** (pulse (orange cable) into the unmarked position). Connect the flight batteries to the controller an switch on the switch (if available).

1. Measurement of receiver channel output pulse widths

By means of this application the width of the output pulse of any arbitrary Rx channel output can be measured. Furthermore, measurement of the receiver battery supply voltage is also possible.

Connect the receiver batteries to the receiver. With the aid of the connecting cable as delivered along with the **JETI Box** connect socket **BLUE** with a definite RX channel output. Switch on the transmitter and receiver. The display shows now **IMPULS DETECTION** and you can read the values of the output pulse width in ms and the Rx battery voltage.

2. Servo pulse generator

This JETI Box application renders the generation of servo controlling pulses as well as the measurement of the servo supply voltage possible. By means of the push-buttons you can change the range from 1,024 ms to 2,047 ms either in steps of thousendth or hundredth of a ms. This function is for instance very well suited for setting the center position of a servo (1,500 ms) without receiver and transmitter. Connect batteries and servo.

The pulse width can be set by means of all four push-buttons:
With push-button **L** the pulse becomes narrower in steps of 0,001 ms
With push-button **D** the pulse becomes narrower in steps of 0,01 ms
With push-button **U** the pulse becomes wider in steps of 0,01 ms
With push-button **R** the pulse becomes wider in steps of 0,001 ms

3. Servo cycler

In this application it is possible to set the number of cycles, the servo throw and the cycling speed. This item serves for verification of longevity, burning in and function tests of servos.

Connect batteries and servo and choose by means of push-buttons **L** and **R** the function **SERVO CYCLE**.

By push-buttons **U** and **D** set the number of cycles from 10 to 990 (setting in steps of ten cycles).

The speed can be set from 1 to 99 by push-buttons **L** and **R**. A speed of v=1 means that every following pulse in comparison with the foregoing pulse will change by 0,001 ms until you reach the limit position. (analogous v=20 means a change by 0,020 ms). The pulse period is 20 ms.

By means of push-buttons **U** and **D** a value can be set which defines the servo throw in µs, going from 100 to 500 µs from the center position of 1,5 ms.

If the setting is **α**=500 µs the control pulse for the servos will change from 1,000 ÷ 2,000 ms (i. e. 1,500 ms ± 500 µs). The value after the # gives the number of cycles which are still left until the end of the test.

When the test is finished the program returns back to the start **SERVO CYCLE**.

4. Measurement of servo transfer speeds

By means of this test we can find out how much time the servo needs to transfer from one defined position to the other one. Measurements can be carried out without load or with the servo directly installed in the model at real lever conditions.

The pulse width of the first limiting servo position can be set within a range of 1,024 ms to 1,400 ms and the second one within 1,600 ms to 2,047 ms. If we want to measure the speed when the servo output shaft turns for instance by 60°, we have to adjust this angle for instance with a protractor.

Connect the battery and the servo, by means of the push-buttons **L** and **R** select the function **SERVO SPEED.**

By means of the push-buttons **U** and **D** set the first limit position of the servo. Proceed with push-button **R** until you reach the second limit position, which also must be adjusted by push-buttons **U** and **D**.

Start the test.

On the display you will read the resulting time in seconds, which the servo needs for the transfer from one set position to the other one. This measurement can be repeated several times or you can set different limit positions.

We wish you a pleasant time and much fun with our products.

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SPIN 33, 44, 55, 66

SPIN 11, 22

SPIN 77 OPTO
SPIN 99 OPTO

SPIN 44 OPTO, 48 OPTO
SPIN 66 OPTO, 75 OPTO

SPIN 200 OPTO

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