



BEAT Speed Controller Operation Manual

Technical data of the BEAT speed controllers

The BEAT speed Controllers are designed for brushless motors. They work without sensors in the motor and have full part load capability. They are very sensitive and have a soft and yet very fast start up. The built-in RPM control optimizes the application with helicopters and the mode programming helps essentially to program all the various parameters. The Car Mode 2 allowed to drive back and forth.

BEAT controllers with BEC, 6-12 cells:

BEAT 40-6-12

- 40 A continuous current, 50 A for 15 sec
- 14 g / 33 g without / with cables - 52 x 26 x 7,5 mm

BEAT 70-6-12

- 70 A continuous current, 90 A for 15 sec
- 21g / 37 g without / with cables - 52 x 26 x 11 mm

BEAT – controllers with opto, 6-18 cells:

BEAT 40-6-18

- 40 A continuous current, 50 A for 15 sec
- 14 g / 33 g without / with cables - 52 x 26 x 7,5 mm

BEAT 55-6-18

- 55 A continuous current, 70 A for 15 sec
- 14 g / 33 g without / with cables - 52 x 26 x 7,5 mm

BEAT 80-6-18

- 80 A continuous current, 100 A for 15 sec
- 21g / 37 g without / with cables - 52 x 26 x 11 mm

BEAT FAI 7/10

- 150 A continuous current, 200 A for 15 sec
- 28g / 40 g without / with cables - 52 x 26 x 12 mm

BEAT – controllers with opto., 8-24 cells:

BEAT 40-8-24

- 40 A continuous current, 50 A for 15 sec
- 14 g / 33 g without / with cables - 52 x 26 x 7,5 mm

BEAT 60-8-24

- 60 A continuous current, 70 A for 15 sec
- 21g / 37 g without / with cables - 52 x 26 x 11 mm

BEAT FAI 24

- 150 A continuous current, 200 A for 15 sec
- 28g / 40 g without / with cables - 52 x 26 x 12 mm

BEAT – controllers with opto., 8-30 cells:

BEAT 30-8-30

- 30 A continuous current, 38 A for 15 sec
- 14 g / 33 g without / with cables - 52 x 26 x 7,5 mm

BEAT 50-8-30

- 50 A continuous current, 60 A for 15 sec
- 21g / 37 g without / with cables - 52 x 26 x 11 mm

BEAT FAI 27

- 100 A continuous current, 150 A for 15 sec
- 28g / 40 g without / with cables - 52 x 26 x 12 mm

Features of the BEAT speed controllers

The BEAT speed controllers utilize a operation mode programming for the users convenience. In most cases it makes it unnecessary to program the individual properties itself (as the EMF-brake or the undervoltage cut off ect.). If the properties should be modified individually this is possible via the computer programming software CPS PRO (order no. 9650).

- sensorless, no sensor signals from the motor are required
- mode programming
 - Auto-Programming-Mode (APM)
 - Glider-Mode
 - Motor-Plane- / Boot-Mode
 - Heli-Mode, active RPM control possible
 - Competition-Mode (F5B / F5B 10 cells / F5D)
 - Car-Mode 1: one direction, proportional brake
 - Car-Mode 2: back and forth
 - Reverse Motor Rotation
- EMF-brake with variable brake rate, can be disabled
- automatic undervoltage cut off at 0.8 V/cell, adjustable, can be disabled, reducing power instead of cut off possible.
- unlimited part load capability
- analysis of switching off reason (shown by LED)
- adjusting monitored by LED or audible signal
- smooth start up
- very sensitive control characteristic
- selfadjusting beat frequency (8-32kHz), based on the sensing and computing of the actual motor data
- sensing of motor rotation direction
- loose of one phase detection (connection off)
- start up protection at power up, blocked motor protection, overtemperature protection
- over current limitation
- 100% surface mount technology (very small and light)
- digital microprocessor control, therefore no thermal drift
- highly flexible, heat-resistant cables
- 24 months warranty, fast repair service
- CE tested, Made in Germany

Connection of the cables



Motor cables (red - green - blue)

The sequence is arbitrary. The motor rotation will be reversed by changing 2 motor cables (see also mode programming Mode 7).

This speed controller needs no sensor information. If there is a sensor cable at the motor, it will not be used.

Use only polarized connectors for the battery cables! Connecting the battery with reverse polarity will destroy the speed controller. It contains a polarity sensor, so incorrect polarity can easily be monitored.

Setting up the speed controller to your equipment:

The speed controller comes with an APM (Auto-Programming-Mode), so it will adapt itself to the throttle positions of the RC.

Proceed as follows:

- Switch on the Tx and Rx.
- Set the throttle control to off.
- Connect the battery to the BEAT speed controller.
- Give 1 sec. full throttle or start with full throttle.
- Ready.

If the motor fails to start, disconnect the battery and change over the throttle servo reverse switch in the Tx. Start again from a) above.

Auto-Programming-Mode APM (Mode 1)

In APM the speed controller equalizes itself after every battery connection to the actual throttle control. The brake rate is set to average (appx. 0.5 sec.), the undervoltage cut off to 0.8 V/cell. **Programming the APM deletes all previous settings.**

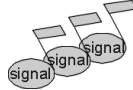
Programming sequence of Auto-Programming-Mode APM

Affix the jumper on any two of the 3 pins.
For an audible signal connect the motor to the BEAT.

Turn on the Tx and the Rx. Set the throttle to EMF-brake position (back position).

Connect the battery.

Wait 2 sec. or until



Remove the jumper.



Set the throttle to full speed (front position).



Monitoring output 

Ready - Disconnect the battery.

Glider-Mode (Mode 2)

All required properties for electric powered glider airplanes are preadjusted in this mode.

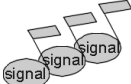
- The brake speed is set to average (app. 0.5 sec) and therefore suitable for direct drive and many geared drives.
- The undervoltage cut off is set to 0.8 V/cell and improves the battery endurance.
- The overtemperature cut off and the overcurrent cut off is activated in order to disconnect the motor at over load condition.
- The throttle characteristic is optimized for the use of propellers.
- The start parameters are optimized for large propellers running at low RPM.
- The throttle positions are stored during the mode programming, so the equalizing procedure is no more in use.
- It's possible to program a separate motor off position. In this throttle position the motor is off and the EMF-brake is not activated. So a folding propeller keeps open and can be used as an air brake.
- If no separate motor off position is programmed, the motor off position is identical to the brake position.
- If flying with undervoltage disconnection and with out brake, change the trim after programming so that the brake position is not reached in flight.

Programming sequence of Glider-Mode (Mode 2)

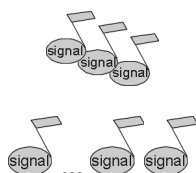
Affix the jumper on any two of the 3 pins.
For an audible signal connect the motor to the BEAT.

Turn on the Tx and the Rx. Set the throttle
to EMF-brake position (back position).

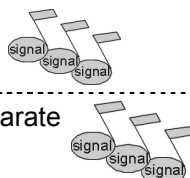
Connect the battery.

Wait 2 sec. or until 


Remove the jumper.



Set the throttle to full speed (front position).



Now it's possible to adjust a separate
motor off position (optional).

Monitoring output 

Ready - Disconnect the battery.

The Motor-Plane-/ Boat-Mode (Mode 3)

All required properties for electric powered motor airplanes and boats are preadjusted in this mode.

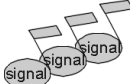
- The EMF-brake is disabled.
- The undervoltage cut off is disabled because the decreasing battery voltage can easily be recognized. So the maneuverability will not be affected.
- The overtemperature cut off and the over current limitation are activated to cut off the motor at over load conditions.
- The throttle characteristic is optimized for the use of propellers in boats and planes.

Programming sequence of Motor-Plane- / Boat-Mode (Mode3)


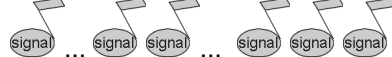
Affix the jumper on any two of the 3 pins.
For an audible signal connect the motor to the BEAT.

Turn on the Tx and the Rx. Set the throttle
to motor off position (back position).


Connect the battery.

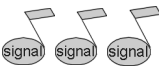
Wait 2 sec. or until 

Remove the jumper.

Set the throttle to full speed (front position).



Monitoring output 

Ready - Disconnect the battery.

The Heli-Mode (Mode 4)

In Heli-Mode the BEAT operates with active RPM control. This means, that the motor RPM will be kept constant and changes of the load and the battery voltage will be compensated. So it's not necessary to use any mixer in the Tx to stabilize the RPM. Just plug the receiver cable of the BEAT in a free slot of the Rx which can be independently operated from the Tx with a slider. Program the BEAT to Heli-Mode using this slider.

To start the motor push the slider towards full throttle. The BEAT will ramp up the motor RPM in a few seconds in open mode. When the designated RPM is reached the BEAT switches over to close loop speed. The more the slider position comes to full throttle, the higher is the designated motor RPM.

With the slider back in motor-off position the motor will be switched off. Be aware not to do so in flight, otherwise it would take several seconds to start the motor again.

The range of RPM selected by the slider is self adjusted by the BEAT. When the motor is started for the first time after the Heli-Mode has been programmed, the BEAT is doing this adjustment. You must start the motor build in the helicopter, with blades mounted. Otherwise RPM control will not work correct. So it may be necessary to reprogram the BEAT to Heli-Mode when using an other cell count or an other motor. Also if the BEAT is tested in HELI-Mode before it is used in the helicopter, than it will be necessary to reprogram the BEAT to Heli-Mode again before the first flight.

There is a check whether the battery, the motor, the gear ratio and the helicopter are fitting well together: with the lowest possible RPM which can be selected after the BEAT has adjusted it should not be possible to hover the helicopter. If it is possible, the BEAT is operating out of it's limit and can be destroyed! Use a higher gear ratio or a motor with less RPM and more torque.


2 protection functions are still active in Heli-mode. If there is no Tx signal for a longer time the motor is set to off. On overtemperature, the speed controller lowers the power slowly (30 sec.) to zero. Restart is possible after disconnecting and reconnecting the battery. (see also errors during flight)

Programming sequence of Heli-Mode (Mode 4)

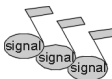
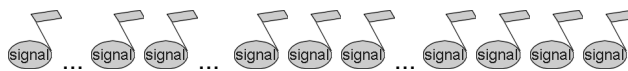
Affix the jumper on any two of the 3 pins.
For an audible signal connect the motor to the BEAT.

Turn on the Tx and the Rx. Set the throttle
to motor off position (back position).

Connect the battery.

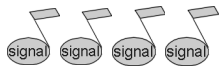
Wait 2 sec. or until 

Remove the jumper.

Set the throttle to full speed (front position).



Monitoring output 

Ready - Disconnect the battery

Competition-Mode (Mode 5)

All required properties for competition F5B airplanes are preadjusted in this mode.

- The EMF-brake is set to maximum rate to fold the propeller immediately.

Caution: All components have to resist the resulting forces.

- The undervoltage cut off and the overtemperature cut are disabled for competition purpose.

Caution: Have enough cooling.


- The start-up sequence is optimized to start the motor with large propellers as quick as possible.
- To prevent the speed controller from overload the time for partial load is limited. If the speed controller is used in partial load too long it will switch off.
 - For launch, the time period of partial load is limited to 6sec. If you want to test before, a total running time of less the 2sec is free of charge. During flight, a time of 1sec per running time is allowed. If the FAI Beat is used longer in partial load it will be switched off.

Programming sequence of Competition-Mode (Mode 5)

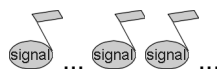
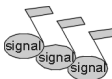
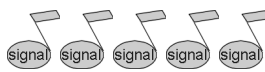
Affix the jumper on any two of the 3 pins.
For an audible signal connect the motor to the BEAT.

Turn the Tx and the Rx on. Set the motor switch
to brake position (back position).

Connect the battery.

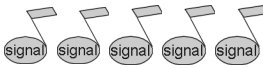
Wait 2 sec. Or until 

Remove the jumper.

 ...  ... 

Set the motor switch to full speed (front position).



Monitoring output 

Ready - Disconnect the battery.

Car-Mode 1: one direction, proportional brake (Mode 6)

All required properties for car models are preadjusted in this mode.

- The EMF-brake is proportional. Therefore enough distance between the EMF-brake position and the motor-off position of the throttle control is necessary.
- The undervoltage cut off of 0.8V/cell is disabled.
- The overtemperature cut off and the overcurrent limitation is activated to cut off the motor at over load conditions.
- The throttle characteristic is optimized for cars.
- The response of the BEAT is as fast as possible to start driving as quick as possible and to provide a direct drive feeling.
- The throttle characteristic is optimized for cars.

Reverse Motor Rotation (Mode 7)

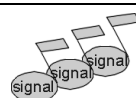
The motor rotation will be reversed by changing 2 motor cables or programming mode 7. This mode does not change any other feature programmed before. Wait during the programming on 7 signals, all others like programming mode 3. Mode 7 only works if any mode except mode 1 has been programmed before.

**Programming sequence of Car-Mode 1:
one direction, proportional brake (Mode 6)**

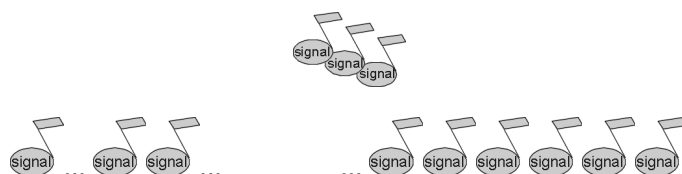
Affix the jumper on any two of the 3 pins.
For an audible signal connect the motor to the BEAT.

Turn the Tx and the Rx. Set the throttle
to on motor-off position (middle position).

Connect the battery.

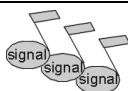
Wait 2 sec. or until 

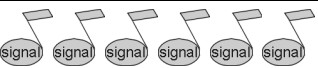
Remove the jumper.



Set the throttle to full speed (front position).



Now set the throttle to EMF-brake position
(back position) 

Monitoring output 

Ready - Disconnect the battery.

Car-Mode 2: back and forth direction (Mode 8)

All required properties for car models are preadjusted in this mode.


- The speed controller is prepared to run back and forth
- Runs the car in opposite direction as commended, it will be braked to stop and then accelerated correctly.
- The start parameters are optimized for cars.
- The undervoltage cut off is disabled.
- The overtemperature cut off and the overcurrent limitation are activated to cut off the motor at over load conditions.
- The throttle characteristic is optimized for cars.
- The response of the BEAT is as fast as possible to start driving as quick as possible and provide a direct drive feeling.

**Programming sequence of Car-Mode 2:
both directions (Mode 8)**

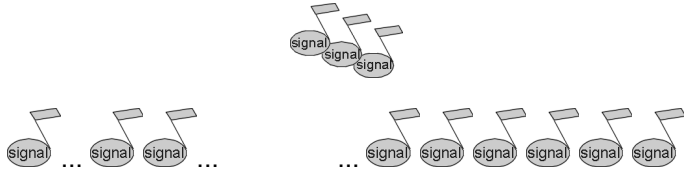
Affix the jumper on any two of the 3 pins.
For an audible signal connect the motor to the BEAT.

Turn the Tx and the Rx. Set the throttle
to on motor-off position (middle position).

Connect the battery.

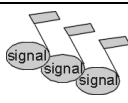
Wait 2 sec. or until 

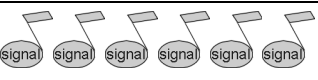
Remove the jumper.



Set the throttle to full speed (front position).



Now set the throttle to EMF-brake position
(back position) 

Monitoring output 

Ready - Disconnect the battery.

Notes on safety

- Never plug off the battery from the BEAT speed controller as long as the motor is running.
- In principle, do not attach the speed controller with cable ties, or similar things. Electronic parts may be damaged.
- As soon as a battery and a motor are connected to the speed controller, the possibility exist, that the motor starts (e.g. by operating error or through electric defect). **Use caution from now on!**
- A motor (especially with propeller) can cause considerable injuries. Also parts flying away can cause considerable injuries.
- The use of this speed controller is only permissible in situations in which damage of objects and injuries to persons are excluded.
- Under no circumstances use a damaged speed controller further on (e.g. through mechanical or electric reason, through moisture, a.s.o.). Otherwise it can come later to a sudden failure of the speed controller.
- The speed controller is constructed only for use in environments in which no discharge of static electricity occurs.
- The speed controller may only be supplied by NiCd or NiMH batteries. A use of power supply or lead batteries units is not permissible. Any contact to the AC mains network is prohibited.
- A prolongation of the battery or motor cables should not be done. Otherwise compliance with legal rules is not guaranteed. Also a destruction of the speed controller can happen.
- In the case of current measurement, a tie meter has to be used since an inserted meter can damage the speed controller.

Error while programming

- No signal appears:
 - The Tx is not turned on.
 - The receiver battery is not connected.
 - The speed controller is not connected to the Rx or pocketed wrong.
 - The jumper was not affixed and/or not removed again.

- Signals, then steady burning light or nothing:
 - The throttle position „back" (brake and/or motor off position) is too dense to the throttle position „front" (full speed position).
 - The distance between the throttle position „back" (brake and/or motor off position) and throttle position „front" (full speed position) is too large. This error can only occur with a computer Tx.
Correction: Program throttle control to +/-100%, if necessary lower.
 - The speed controller is pocketed in a wrong receiver socket.
 - Large shift of the throttle positions to long pulses (one of the throttle positions must have a pulse length less than 2 msec.). This mistake can only occur with computer Tx.
Correction: Set no shift to the throttle control (offset) at the Tx.

Errors in use

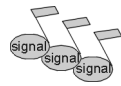
- Unexpected motor cut off: The LED shows the reason if not turned on the throttle again after cut off
 - LED is blinking one time - Under voltage disconnection of 0.8V/cell reached.
 - LED is blinking two times (not in Heli-mode) - Over current disconnection while too long to much current.
Correction: Smaller prop or less cell count.
 - LED is blinking tree times - Over temperature.
Correction: Improve the cooling of the speed controller

- LED is blinking four times - No Tx pulses.
Correction: Install the Rx and the antenna with more distance from the speed controller and motor.
- LED is blinking five times - Too long partial load in F5B modes.
- LED is blinking six times - Internal error.
Correction: disconnect the battery and start again.
- LED is blinking seven times (only in Heli-mode) - Over current disconnection.
Correction: Better cooling or other gear ratio.

If the disconnection can not reliable be stopped, the KONTRONIK service should be contacted to avoid the damage of the speed controller.

- Motor can not be started:

The speed controller only unlocks the motor after connection of the battery when recognising the throttle position EMF-brake and/or motor-off position. If the speed controller do not recognise these positions no



is produced and the motor remains off.

Correction:

- Consider the position of the trim of the throttle control and adjust to motor-off and/or brake position.
- Program the speed controller to the current throttle positions.
- Some Rx's show thermal drift. In this case, it's recommended to keep some distance to the end of the throttle control positions while programming, in order to have some reserve available in use.
- If there is a blinking signal the speed controller has detected a damage during start-up. Send to KONTRONIK with description of blink code.

General Information

With this BEAT speed controller you've bought a high quality product. To keep it the use of high quality connectors (as KONTRONIK silver connectors #9010) and well soldered batteries with low resistant are mandatory. If any questions are left, especially on the motor current of your actual application please feel free to contact the KONTRONIK service.

Cooling / Fixing

Enough cooling improves the efficiency and the service life of the speed controller. If the BEAT has to be fixed in the model use the cables if possible. Otherwise the side with the label has to be used for fixation.

Part Load Capability

The BEAT can be operated unlimited in part load conditions if at full throttle and full load the battery current not exceeds the BEAT continuous current limit (e.g. BEAT 40-6-18 40A).

The active free wheeling circuit

To optimize the efficiency at part load the BEAT contains a special circuitry, called active free wheeling circuit. It increases the efficiency of the speed controller at part load and so reduces the heating. The active free wheeling circuit can not be used with very little load, there it is switched off. This can result in a little discontinuity of the motor RPM. If this is a problem, the active free wheeling circuit can be disabled by the CPS Pro, but then the part load conditions have to be limited.

Sensorless

The BEAT speed controller works without sensors in the motor. Therefore the commutation of the motor will be optimized to the application automatically. But this means also that the BEAT can not detect the motor position at zero RPM. Therefore it is possible that the motor will at start oscillate a little bit.

Beat frequency

The beat speed controllers varies the beat frequency between 8 and 32kHz. Which beat frequency is used depends on the physical motor data and the actual load of the motor. Therefore the motor is always used in the point of best efficiency.

Warranty

KONTRONIK guarantees this product to be free from factory defects in material and workmanship for a period of 24 months from date of purchase. This warranty does not cover: suitability for specific application, components worn by use, application of reverse or improper voltage, tampering, misuse or shipping. Our warranty liability shall be limited to repairing or replacing the unit to our original specifications. Because we have no control over the installation or use of these products, in no case shall our liability exceed the original cost of the product.

By the act of using this speed controller the user accepts all resulting liability.

KONTRONIK Service

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FAX: +49 / (0)7457 / 9435-90
Email: info@kontronik.com

EG conformity declaration



For all products of the Beat family we confirm that the electromagnetic compatibility directives 89/336/EWG, 91/263/EWG and 92/31/EWG are met.

The following fundamental standards were used:
EN 50081-1, EN 50082-1

A handwritten signature in black ink, appearing to read 'J. Kowalski'.