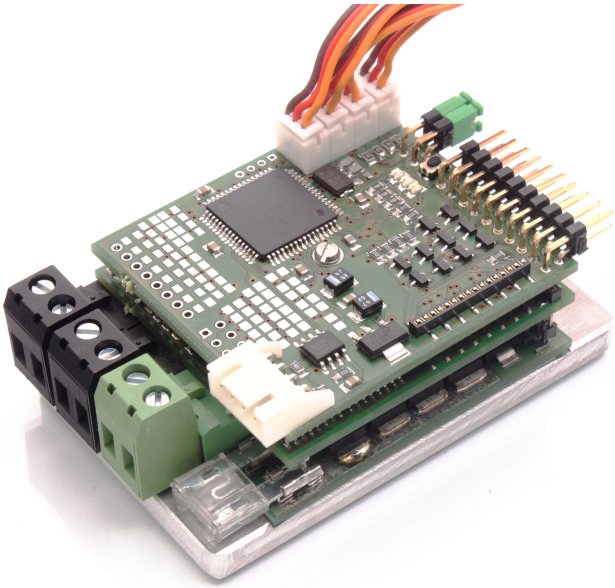
TVC-B10L

10A dual speed controller with light control for RC tracked vehicles

The controller contains all components for controlling two DC motors in a tracked vehicle.

The behavior of the integrated mixer can be set for different vehicle types. The controller can thus be set for full tracks, half tracks and wheeled vehicles with differential drive. In addition, there are variants for historical tracked vehicles without tableturn as well as the possibility of inertia simulation.

The controller is equipped with BEC and has an EMK brake, which is released in the middle position of the throttle and steering stick. The braking effect can be set either via an RC channel, or fixed.



1 Note

Installation of the module requires intermediate to advanced modeling skills. Soldering skills are required to connect the wiring. Inexperienced modelers and persons aged under 16 years old should seek the assistance of an experienced modeler. Always switch off power when working on the wiring. Especial take care when connecting more than one receiver energy source. Prevent the device from getting wet. Check loads before connecting them to the modul at a current limited, or fuse protected source.

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2 Introduction

The controller is designed for an input voltage range from 6.5V to 24V. This means that the controller works with the 6 cell NC packs commonly used in the RC car sector, but also with lead batteries up to 24V. Two standard automotive fuses protect the model and the battery from excessive currents.

The controller has a built-in BEC circuit to power the receiver from the drive battery.

Please note that the removable BEC current decreases as the supply voltage increases.

To disconnect the internal BEC regulator from the receiver supply, a jumper must be removed.

As a failsafe function, an extensive plausibility check of the transmitter signals is integrated in the software.

In addition, the controller has a temperature monitoring of the output stage.

It switches off at 75°C and can be switched on again at 65°C and above.

To do this, the transmitter sticks must be set to the neutral position to prevent a sudden start after the controller has cooled down.

2.1 Technology

The controller is microprocessor controlled. The processor works with 16MHz clock frequency.

The output stage is constructed from N-channel MOSFETs, which have an inrush resistance of only 0.008 ohms and a continuous current capability of 60A. To make effective use of the low internal resistance, the output stage transistors are driven by sophisticated MOSFET push-pull output stages with integrated charge pump.

Under normal ambient conditions, a continuous current of 10A is achieved. The controller operates with a PWM frequency of 16kHz.
reicht. Der Regler arbeitet mit einer PWM-Frequenz von 16kHz.

2.2 Scope of delivery

The controller is supplied with the connectors for the motor connection and the battery connection.

3 Functional description

3.1 Manual control

A radio remote control with at least one proportional channel is required to control the module. To use all functions, four RC channels are required.

3.1.1 Channel 1 - proportional forward/back

Direction of rotation for the motor. From the throttle channel is also derived reverse light on/off, brake light).

3.1.2 channel 2 - proportional left/right

The control of the turn signals is derived from this channel. It is usually connected to the steering channel with a V-cable, parallel to the steering servo. If the channel is not connected, the turn signals only function as warning turn signals.

3.1.3 Channel 3 - Light mode control

This channel can be used to switch the all-round light and the hazard warning lights, as well as two freely assignable outputs. If the channel is not used, the rotating beacon is permanently active and the hazard lights are switched off. The two freely assignable outputs are also switched off.

3.1.4 channel 4 - EMF brake

This channel can be used to set the braking effect of the holding brake. If this channel is not connected, the brake function can be permanently set on the controller.

Channel	connector	optional	function
1	X50	no	gas
2	X51	yes	steering
3	X52	yes	light control
4	X53	yes	brake action

Table 1: Overview rc inputs

3.2 Function of light mode switching

There are two light modes which are controlled independently by RC channel.

3.2.1 Light mode 1

Light mode 1 controls two outputs for universally usable lamps (auxlight 1 and 2). They can be used, for example, for the low beam, the front headlights or searchlights.

Light mode 1 is switched on by tapping the control element from the center position to **front**. The modes are switched on by briefly tapping the channel (1 → 2 → 3 → 4 → 1, etc.). Long pressing (approx. 2s) always selects ”state 1” (all off).

state	1	2	3	4
auxlight 1	off	on	off	on
auxlight 2	off	off	on	on

Table 2: Light mode 1

Light mode 2 Light mode 2 controls the automatic light functions for the turn signal and the rotating light. In the different light modes, the lamp outputs are switched as shown in the table.

By pressing the key for a long time (approx. 2s), ”state 1” is always selected. After switching on, the model is in light mode ”state 1”.

state	1	2	3	4
Hazard warning lights	off	on	off	on
Rotating light 1,2,3,4	off	off	on (Running lights)	on (Running lights)

Table 3: Light mode 2

Note Typically, one uses a channel with three-position pushbutton on the transmitter side (A pushbutton with automatic center position). Proportional channels with sliding or rotary potentiometers make the selection of the light mode more difficult, because the switching should be done by short actuation with reset to the center position. This is difficult to handle with sliding or rotary potentiometers.

3.3 Drive dynamic functions

3.3.1 Reversing lights

The reverse light output is turned on as soon as the throttle lever steers backward. Once the throttle is in neutral or straight, the reverse light is turned off.

3.3.2 Around light

The rotating light runs at approximately 1.5 revolutions per second. It is turned on/off by light mode 2.

3.3.3 Indicator Left + Right

From a minimum speed of approx. 10% of the maximum speed, the automatic blinker switches on. When the steering is in the right position, the right turn signal is flashing, when the steering is in the left position, the left turn signal output flashes with a frequency of approx. 1Hz. The automatic turn signal is only active in the driving mode. The hazard warning light can be switched on or off by the light mode 2.

3.3.4 Brake light

The brake light turns on automatically when the vehicle is decelerating. The more deceleration, the longer the brake light is on. If acceleration is resumed, the brake light switches off immediately.

4 Installation

4.1 Battery connection

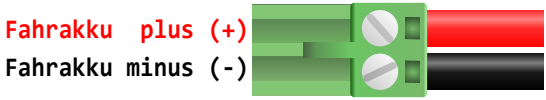

Figure 1: Assignment of the connector for power supply

Power is supplied via the green, plug-in screw terminal. Please pay attention to the correct polarity of the supply voltage! (see figure 1).

It makes sense to include a switch in the positive supply line to the battery to switch the model on/off. Never switch the minus in RC model building, because the minus also the reference potential of the servo signals.

There are two automotive fuses for the motor output stages on the circuit board. They are pluggable and can be easily replaced if necessary.

If one of the power stage fuses has blown, the BEC still works and the LED indicates the function. However, the corresponding motor output stage no longer supplies power. In addition, the BEC circuit also has a fuse. This is soldered onto the circuit board. If this fuse has blown, the BEC no longer supplies voltage and the controller no longer shows any function.

4.2 Connecting the motors

Black, plug-in screw terminals are provided for the drive motors. One motor is connected to each screw terminal. The motors must be radio interference suppressed, as is usual in model building.

4.3 Connecting the servo cables

The controller is equipped with JR servo cables. The pinout is shown in figure 2.

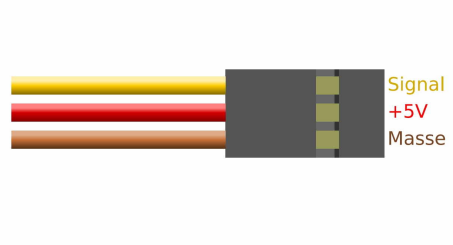

Figure 2: pinout servo cable

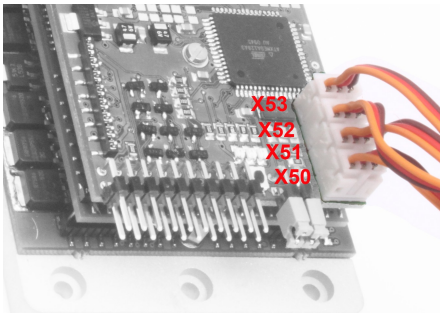

Figure 3: servo cable position

chan-nel	Stecker	connector	Function
1	X50	no	throttle
2	X51	yes	steering
3	X52	yes	light control
4	X53	yes	break

Table 4: servo cable assignment

4.4 BEC jumpers

The controller contains a BEC circuit that generates a regulated voltage of 5V from the voltage of the drive battery to supply the receiver and servos.

Since in function models often several controllers with BEC are installed, but the parallel operation is problematic under certain circumstances, the connection of the installed BEC to the receiver can be disconnected. Two green jumpers are used for this purpose.

1	2	3	4	5	6	7	8	9	10
1. Aux -	2. Aux -	1. Rundumlicht -	2. Rundumlicht -	3. Rundumlicht -	4. Rundumlicht -	Rückfahrscheinwerfer -	Bremslicht -	Blinker rechts -	Blinker links -
1. Aux +	2. Aux +	1. Rundumlicht +	2. Rundumlicht +	3. Rundumlicht +	4. Rundumlicht +	Rückfahrscheinwerfer +	Bremslicht +	Blinker rechts +	Blinker links +

Table 5: Belegung der Lichtausgänge

If the jumpers are inserted vertically, the internal BEC voltage is passed on to the receiver and from there to the servos.

If the jumpers are inserted horizontally (or are not inserted), the voltage is not passed on. In this case, another module must supply the receiver with power.

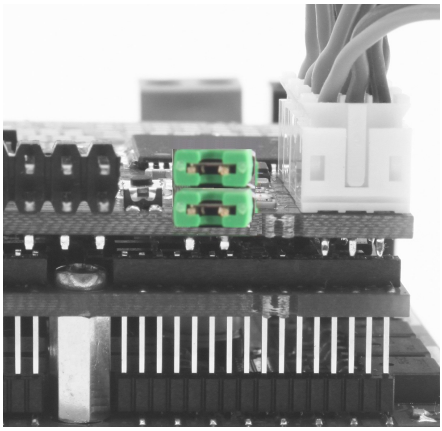

Figure 4: do not forward BEC voltage to receiver

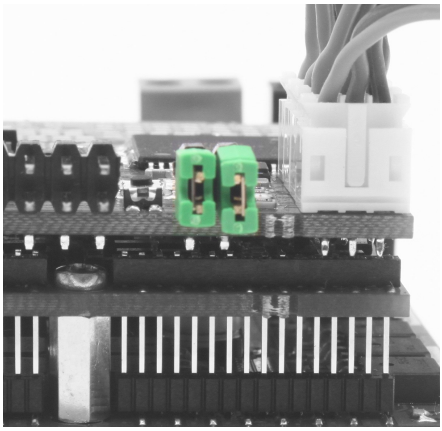

Figure 5: forward BEC voltage to receiver

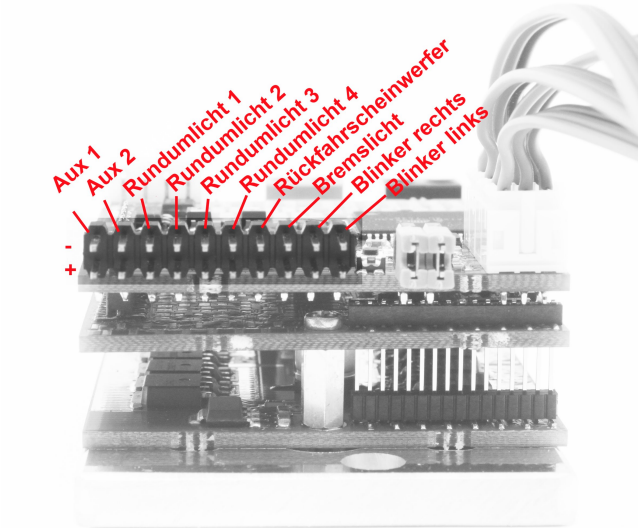

Figure 6: Belegung der Lichtausgänge

4.5 Anschluss der Lichtausgänge

Die Ausgänge schalten die Akkuspannung, daher muss der angeschlossene Verbraucher für diese Spannung geeignet sein. Wird der Regler z.B. mit einem 12 Volt Akku betrieben, sollte der Verbraucher ebenfalls für 12V Nennspannung ausgelegt sein. Bei LEDs sind entsprechende Vorwiderstände vorzusehen.

Das Schaltvermögen pro Kanal beträgt 300mA.

4.6 Scalebus operation (optional)

As an alternative to control via the receiver and the servo cables, the controller can also be controlled via the scale bus. To do this, the controller is connected to the other modules with the scale bus cable (white, four-pin connector).

For example, the FO module TVC-MF-10 can control the controller. The controller switches to scale bus mode if no servo signal is present at the two servo cables when it is switched on. Accordingly, the servo cables must

not be plugged into the receiver during scale bus operation.

In scale bus mode, the controlling module specifies the mixing function. Therefore, a controller for a half-track vehicle can also be operated with an FO module for a battle tank.

The controller then works as a full track mixer.

Not only the information for controlling the drive motors, but also the information for the auxiliary drives is sent via the scale bus.

If no jumper is plugged in, the information of the drives is output.

If coding bridges are plugged into servo cables 1 or 2, the motor outputs are controlled as specified in the description of the FO module.

Example tracked vehicle:

1. No coding jumper plugged
   → Controller works as drive controller (drive chains)
2. coding jumper plugged into servo cable 1
   → Controller works as tower control (barrel elevation and tower rotation)

It is of course possible to connect several controllers to the scale bus. It is also possible for two controllers to output the same information.

5 Commissioning

5.1 Startup

1. Connectconnect the drive battery on the transmitter the throttle and control levers to the center position (the corresponding trim as well). on the receiver. The green LED lights up for approx. 1s.
2. The green LED on the board flashes until the controller has detected the center position of the channels. If zero point detection is not possible, the LED does not light up. The zero point is not determined again until the receiver is switched on/off.
3. If the green LED is continuously on, the vehicle is ready to drive.

This automatic calibration is done in this way at **every** switch-on. I.e., the position detected at power-up is stored as the neutral position. This applies to both steering and speed.

5.2 Correct driving direction

The direction of travel depends on the mechanical arrangement of the engines in the vehicle. Usually, the motors are mounted so that the motor shafts are in opposite directions. As a result, the motors must be connected with different polarity in order to drive in one direction.

Of course the correction of the driving direction can be done directly on transmitters with the servo reverse setting. If the transmitter does not have this possibility, you can proceed as follows:

1. *model moves forward when steered backward and vice versa:* Change connections on both motors (reverse polarity).
2. *Model moves left when steered to the right and vice versa:* Change connections from both motors, reversing polarity. (connecting line from motor 1 to motor 2 and vice versa).
3. *The directional control is set to neutral, but the model does not drive straight ahead:* Correct with steering trim

5.3 EMF brake

The controller has an adjustable EMF brake. It is activated by moving the throttle and steering sticks to the center position.

The braking effect with which the brake is applied is indicated by the yellow LED. The longer the yellow LED is on, the stronger the braking effect.

- LED Off corresponds to 0% braking effect.
- LED On corresponds to 100% braking action.

The setting can be made in two ways: Via an RC channel of the controller, so it can be changed via the transmitter at any time, or a button on the controller. Mode A is automatically selected if the brake channel is inserted in the receiver when switching on.

5.3.1 Setting via an RC channel of the controller

Here, the braking effect is adjusted directly via the transmitter. As soon as you press the corresponding slider/rotary knob, you will see that the pulse/pause ratio changes.

You can thus at any time, for example, lightly brake and further strengthen the braking effect.

If you have a channel free on your RC system, we recommend this method. Make sure that they do not stop from full speed with full braking effect, this puts a lot of strain on the entire drive train. The braking effect is indicated by the duration of the yellow LED.

5.3.2 Without RC channel with pushbutton

If you want to change the braking effect, you must press the button. The button is located between the light connector and the jumpers for the BEC. Use a thin stick made of plastic or wood to press the button. The push button has a clearly noticeable pressure point.

If you move the throttle in one direction the on phase of the yellow LED gets longer and longer, in the other direction shorter and shorter until it is completely off. The stronger the lever deflection, the faster the adjustment.

The green LED lights up continuously as soon as you take the lever out of the neutral position to indicate that the controller is making a change.

If you press the button again, the brake setting is saved and is retained even after switching off and on again.

5.4 Error states

Normally, the green LED is permanently on. If the controller detects an error, it indicates this by briefly flashing the green LED n times. In addition, the red LED lights up. All error conditions lead to the motor being switched off.

blink code	fault	Acknowledgement / Troubleshooting
2 times	no signal from receiver	Check receiver and connections / eliminate radio interference
3 times	overtemperature	allow controller to cool down

Table 6: Error codes

5.5 Changing the mixing function

Different vehicles and transmission types need different mixers. In the past, we offered different versions of the controller (”OG”, ”CM”, ”HT”, etc.).

With this controller, you can now define the mixer function yourself. An overview of the available mixers is shown in table 7 on page 19.

Notes Note that the maximum current consumption of mixers with tableturn is not significantly higher because the drives work against each other in tableturn.

Be careful when operating with inertia simulation. The vehicle then naturally reacts with a delay to the commands of the radio remote control.

5.5.1 How to change mixer function

1. Connect everything as described under commissioning and switch on the transmitter.
2. press the button when switching on the controller. The setting mode is indicated by the red and yellow LEDs lighting up.
3. With the throttle and steering channel you can now select nine positions by setting the sticks in left/right stop or leave neutral position. The position number is indicated by the red LED flashing while the green LED is lit. If the green LED goes out, the cycle starts again.
4. For example, if the red LED flashes three times, mixer number three of the table is selected. save this, hold the sticks in position and press the button again.
5. Then release the stick. Now the mixer is selected and saved.

Code	drive type	name	table-turn	vehicle type	description
1	full track	simulation superposition gearbox 100%	yes	tracked construction machines, modern tanks, snow groomers	Simulation of the driving behavior of a mechanical superimposed transmission without limitation of the drive power
2	full track	simulation superposition gearbox 80% / 60%	yes	tracked construction machines, modern tanks, snow groomers	Simulation of the driving behavior of a mechanical superimposed transmission with straight-line driving limited to 80% and steering limited to 60%. Only when cornering is 100% given to the drives to account for the increased friction.
3	half track/ wheeled	classic mixer	no	wheeled construction machines, halftracks	The chain inside the curve is reduced from 100% to 50% of the driving speed at steering angle
4	full track	mechanical superimposed gearbox	yes	modern tanks, snow groomers	This setting is for mechanical superimposed gear units
5	full track	no mixer, single chain control	yes	Operation via manual mixer or mixer in radio	This variant has no mixer, only a brake that acts when both drives come to a standstill.
6	full track	classic mixer with tableturn	yes	tracked construction machines, modern tanks, snow groomers	Mixing function as used e.g. by Tamiya
7	full track	classic mixer without tableturn	no	historical construction machinery and tanks	Mixing function as used for example in Tamiya but when cornering the chain does not run backwards.
8	full track	simulation superposition gearbox 100% and inertia simulation	yes	tracked construction machines, modern tanks, snow groomers	

Table 7: list of optional mixing functions available

6 Glossary of terms

BEC **B**attery **E**liminator **C**ircuit
This circuit replaces a extra Battery needed for the receiver and connected servos, by generating a fixed voltage from the drive battery.

ESC **E**lectronic **S**peed **C**ontroller
This is a unit to control the speed and direction of a DC motor.

LED **L**ight **E**mmitting **D**iode
A light-emitting diode (LED) is a semiconductor device that emits visible light when an electric current passes through it. Benefits of LEDs are low power requirement and long life. Disadvantages is the more complicated wiring, compared to a classic bulb, it has a polarity and a resistor is needed to limit the current.

Scalebus The Scalebus is a development of **SGS electronic** to connect controllers and modules to compose solutions for complex RC models.

SBus The Sbus has been introduced by **Futaba** to simplify the wiring between RC Receivers and servos / esc.

SBus The SBus was introduced by the company **Futaba** to simplify the wiring between receiver and servos/controllers. This is especially useful for models with many controllers.

IBus The IBus was introduced by the company **Flysky** to simplify the wiring between receiver and servos/controllers. This is especially useful for models with many controllers.

SUMD The SUMD sum signal has been introduced by the company **Graupner** to simplify the wiring between receiver and servos/controllers. This is especially useful for models with many controllers.

Abbre-vation	meaning	explanation
Stick	**S**tick	Stick not self centering
StickS	**S**tick **S**elfcentering	self centering Stick
TSMS	**T**hree **S**tage **M**omentary **S**witch	self centering momentary switch with three stages
TSS	**T**hree **S**tage **S**witch	switch with three stages
Pot	**Pot**entiometer	linear- or rotary knob
PotC	**Pot**entiometer with **C**enter key	linear- or rotary knob with a center key

Table 8: Abbrevation for the manipulators in the transmitter housing

7 Technical data

Rated motor current drive (per motor)	15 Ampere 1 minute: 20 Ampere / 10s: 220 Ampere
Supply voltage (with BEC)	6,5 to 24 V
Allowable BEC current	1000mA short term, 600mA at 12V, 300mA at 24V
PWM frequency	16kHz
Typical maximum power dissipation	5 Watt
Typical voltage drop in the output stage	0,15 Volt
Rated current light outputs	0,3 Ampere per output
Voltage light outputs	equals supply voltage
Dimens	75x47x30mm
software version	1.2

8 Important

This equipment described above has been tested and inspected for quality and function. And it is intended for installation and use only as described above. This equipment does not contain any user serviceable parts. The supplier accepts no responsibility, financially or otherwise, for damages caused by use or misuse of the equipment described above. The equipment must be protected from exposure to water to prevent short circuit. Do not open the equipment or attempt to change function, wiring, or documentation in any way. Do not connect to incorrect voltage or reverse the battery polarity. Do not use in a careless or abusive fashion around persons or property. Do not attempt to repair. Any legitimate use, e.g. Installation in a model makes the user responsible to ensure that the operating instructions and non-liability agreement are provided to the purchaser of the module described above.

Do operate the device only in the permissible operating conditions. Do not make any changes to the controller through. The device shall not be exposed to splashing water or rain (causing a short circuit).

8.1 Warning

Due to choking hazard caused by small parts that may be swallowed, this product is not suitable for children under 6 years of age.

8.2 Environmental protection

For defective devices, repair is possible in many cases. Please contact us. If you do decide to dispose of the device, you will be making a contribution to environmental protection if you return the device to a municipal collection point for recycling. Electronic devices do not belong in household waste.

8.3 Address

SGS electronic
Zeppelinstraße 36
47638 Straelen
Germany / Europe

8.4 Contact

Web www.sgs-electronic.de
Email info@sgs-electronic.de

Ust-IdNr.: DE 249033623
WEEE-Reg.-Nr.: DE 90290947

8.5 Document date

This document was created on 2024-02-17 12:19:07+01:00

8.6 Documentation

We reserve the right to make updates, changes or additions to the information and data provided.

The documentation that accompanies your product applies.

Please note that documents obtained later via download may not correspond to the status of your module.