ElMod Fusion ECO & Fusion PRO Rev.F

## Detailed installation instructions and user manual

Before installation always read carefully all these instructions.

We congratulate on your purchase of the *ElMod Fusion*, the innovative and universal full-option-solution for different types of vehicles. The *ElMod Fusion* enhances your model by true to scale movement, extensive weapon-, lighting- and other functions combined with simple installation. All functions right down to the last detail may be easily adjusted on your Windows® or Apple® Computer or an Android® Smartphone or Tablet by over 100 parameters which are logically grouped and explained in detail. By ongoing improvements and software updates, which may be easily applied at home within few minutes, you bought a future-proof product.

Scope of delivery

Before starting the installation, check the scope of delivery for completeness.

- *ElMod Fusion* PCB
- volume control rotary knob with cable
- cable for the RC receiver
- plug with for connecting to the battery
- plug for connecting up to two drive motors
- cable for connecting to the loudspeaker
- microSD card (already plugged-in on the PCB)
- USB dongle and an USB cable for connecting to the computer
- *ElMod Fusion PRO* only: housings and cables for assembly of up to 5 external light sources
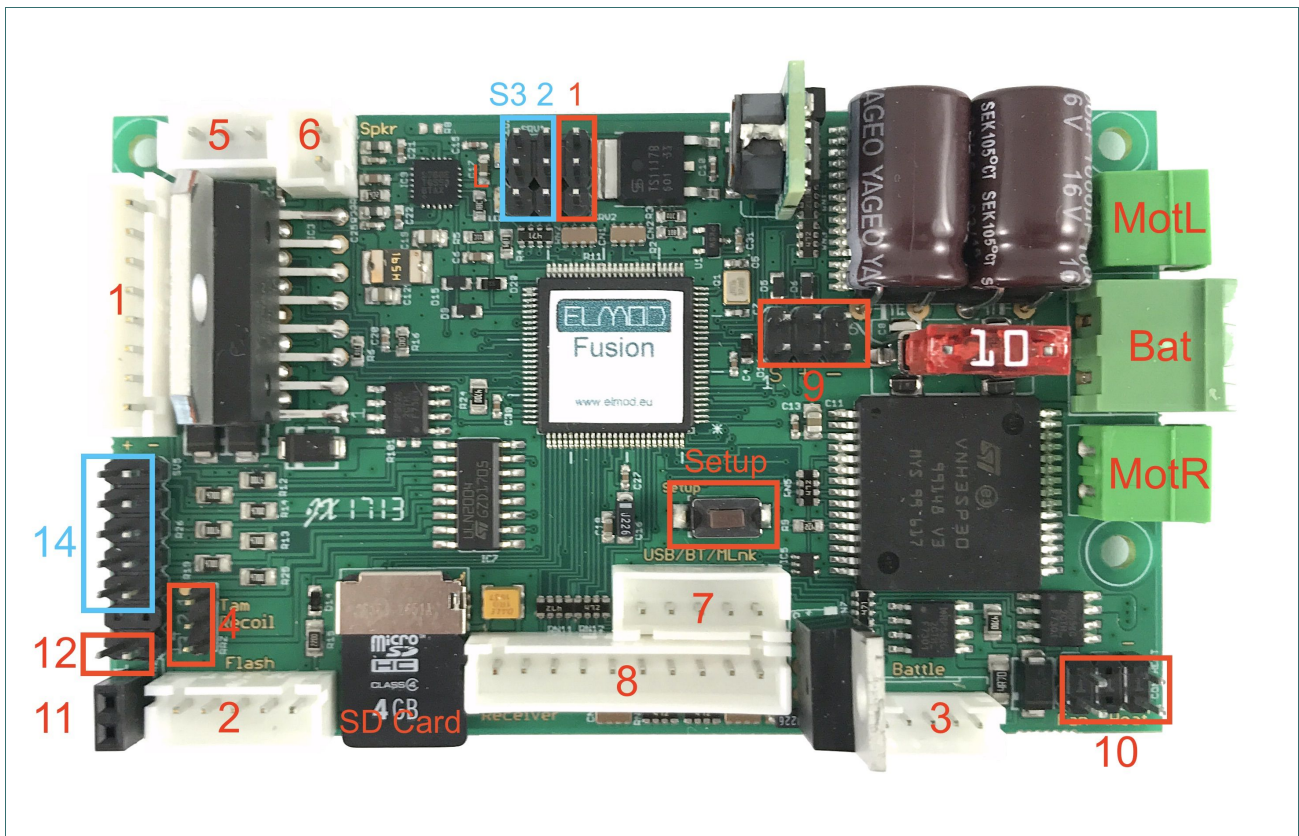
	Fusion ECO and Fusion PRO	5	connector for the volume control rotary knob
Bat	battery connector	6	connector for the loudspeaker
MotR	connector for the right motor	7	connector for the USB dongle and ElMod BT adapter
MotL	connector for the left motor	8	connector for the RC receiver
Sw	pushbutton for the setup, firmware update and reset	9	connectors for external motor drivers
S1	servo connectors	10	connector for a smoke unit
L	status LEDs	11	connector for Taigen®, HengLong® recoil/shot mechanics
SD	microSD card	12	connector for Taigen®, HengLong® recoil servo pcb
1	turret connector (HengLong®)		
2	muzzle flash connector (Taigen®, HengLong®)	**additively Fusion PRO (marked blue)**	
3	connector for IR battle functions	14	connector for additional lights
4	connector for the Tamiya® barrel recoil mechanics	S2,S3	servo 2 & 3

Hint: all connectors are marked and described on the bottom side of the PCB.

Connection of the power supply

- connect the red cable with the + terminal and the black cable with the – terminal of the battery plug. Incorrect connection causes the destruction of the electronics!
- keep the cable length as short as possible in order to prevent interferences

The following battery types are supported:

Variant	Battery type	Cells	Voltage	under voltage shut down
ECO/PRO	NiMh/NiCd	6	7,2 V	6 V
ECO/PRO	NiMh/NiCd	7	8,4 V	7 V
ECO/PRO	NiMh/NiCd	8	9,6 V	8 V
PRO	NiMh/NiCd	9	10,8 V	9 V
PRO	NiMh/NiCd	10	12 V	10 V
ECO/PRO	LiPo	2S	7,4 V	6,4 V
PRO	LiPo	3S	11,1 V	9,6 V
PRO	Pb	-	12V	10V
ECO/PRO	LiIon	2S	7,4 V	6 V
PRO	LiIon	3S	11,1 V	9 V
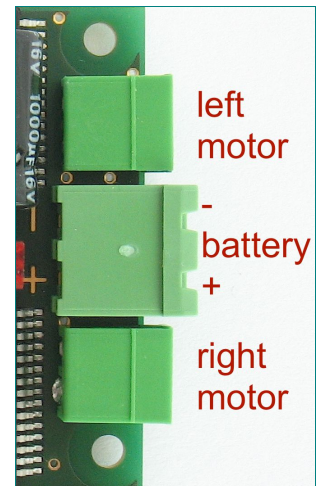
If the battery voltage drops below a certain threshold, the protective under voltage shut down will be activated. The voltage value depends on the used battery type as listed in the table.

If the battery voltage exceeds a maximum value, the protective over voltage shut down will be activated.

The protective shut down (under voltage and over voltage) deactivates all functions of the *ElMod Fusion*. The engine turns off and the vehicle cannot be operated any more. The announcement "Low Battery" or "Voltage too high" follows via loudspeaker every 5 seconds and the red status LED shows an error state (see chapter "Status LEDs").

The factory setting is NiMh/NiCd-battery 7,2V (6 cells). If another battery type is used, it has to be set in the configuration software, otherwise the under voltage protection shut down won't work correctly.

Connection of the drive motors (integrated drivers)

The *ElMod Fusion* supports one or two DC motors for the main drive. Brushless motors and motors with an extra high current consumption may be used optionally by commercially available external drivers (see next chapter). It is not possible to operate integrated and external drivers simultaneously.

The maximum current consumption of the drive motors is internally limited to 30 A peak. The allowed permanent load is 10 A. The motor drivers need no further cooling. They are protected against short circuit and overload.

- attach the motor wires for the right drive to the connector *MotR*
- attach the motor wires for the left drive to the connector *MotL*
- for vehicles with only one drive motor use one of the two connections
- it makes no difference which cable (+/- of the motor) is connected to which screw of the corresponding terminal
- keep the cable length as short as possible in order to prevent interferences! For additional interference protection the motor cables can be twisted.
- IMPORTANT! The motors must be interference-suppressed. This is accomplished with the use of three capacitors as shown in the figure. Many motors are interference-suppressed already. Please check this by asking the producer or distributor of your motors.
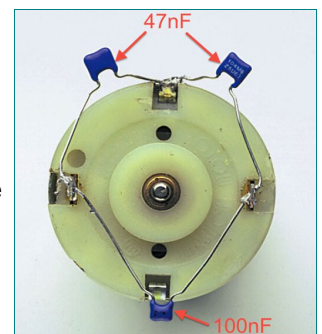
For checking the correct wiring of the motors proceed as follows:

- make sure that the driving shaft is free to rotate and the model cannot move uncontrollably
- connect a fully charged battery to the electronics and connect the power supply in accordance with section "connection of the power supply"
- please wait for 3-4 sec. until the blue LED starts blinking constantly
- press and hold the setup pushbutton
- the motors start rotating after around 3 seconds. The motors are connected correctly if the left one is rotating slightly slower than the right one

- every few seconds the motors change their rotation. Release the button when the chains or wheels rotate forward. Now the motors are set up correctly.
- when only one motor is attached proceed accordingly. Release the button when the motor rotates forward.

Connection of the drive motors (external drivers)

Commercially available external drivers may be connected directly to the *ElMod Fusion*. The operating type (internal/external drivers) must be set by the *ElMod App* (tab "drive", parameter "motor drivers"). It is not possible to operate integrated and external drivers simultaneously. The external drivers are connected with the *connectors 9*. The black ground wire of the drivers points to the right edge of the PCB (towards the battery connector).

Smoke generator

The smoke generator is connected to the connector for the smoke generator (*connector 10*).
- if the smoker generator provides two wire operation only (combined fan and heater), attach it to the fan labeled connector
- if the smoker generator provides four wire operation (separated fan and heater wires), attach the fan wires and the heater wires to the respective connector
- the polarity of the connectors are printed on the board

Turret and weapon functions

The *ElMod Fusion* provides a HengLong® compatible 8-pin turret terminal (*connector 1*). It is used by the turret rotation motor, gun elevation motor, main gun trigger motor, front lighting and muzzle flash of the main MG.
- an optional adapter allows the use of a Tamiya® turret. The functions turret rotation, main gun elevation and also main lighting and muzzle flash of the main MG are supported
- the Taigen® barrel recoil mechanic may be connected according as follows
  - the basic function of the recoil is already given if only the 8-pin turret connector is attached and the parameter "Recoil type" in the *ElMod App* (located in the tab "Weapons") is set to "Standard", which is the factory setting
  - the orange white cable (end position switch of the shot mechanics) which comes from the turret should be attached to *connector 12* of the *ElMod Fusion*. The orange wire faces the edge of the board (marked with an "O")
  - if your tank features the Taigen® / HengLong® servo recoil, attach the thin black red cable (power supply of the servo PCB) with the *connector 11* of the *ElMod Fusion*. The red wire faces the "+" marking, the black cable faces the "-" marking.
  - to activate the shot/recoil function, set the parameter "Recoil type" in the *ElMod App* to "HL/Taigen".
- the Tamiya® barrel recoil mechanic may be attached directly to the *connector 4* of the *ElMod Fusion*. The white wire of the plug points to the mark left of the connector.
- the Taigen® xenon flash and the HengLong® muzzle flash LED are equipped with a 5 pin plug and may be attached to *connector 2*. The Tamiya® xenon flash is not supported.
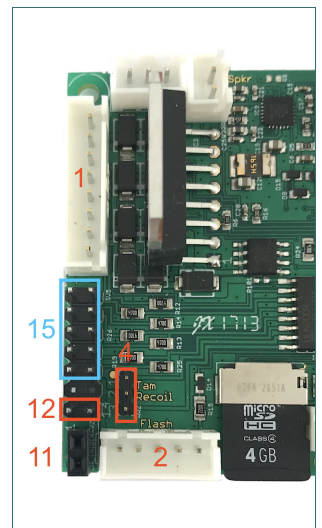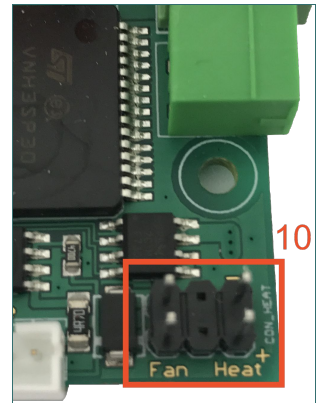
The voltage on all turret components is always equal to the voltage of the battery. If you plan to use motors with lower voltage, reduce the setting for maximum speed in the *ElMod App* of the corresponding motor. For example the maximum speed of a 7.2 V motor in a 12 V tank should not excess 60% (60% of 12V = 7,2V).
Also keep in mind that the maximum current per motor must not exceed 2 A. Higher current may destroy the electronics.

Light functions

The *ElMod Fusion* is able to control several light channels:
- front light (white LEDs) and MG muzzle flash (ultra bright white LED) on the HengLong® turret connector (turret and weapon functions)
- xenon or LED muzzle flash of the main gun and muzzle flash of the MG (see chapter turret and weapon functions)
- *ElMod Fusion Pro* provides further light sources:
- one ultra bright white LED for muzzle flash of the auxiliary MG
- one or two red LEDs for combined rear and brake lights. The rear light is controlled together with the front light. The brake light is active independently of the state of the main/rear light.
- one or two white LEDs for auxiliary light (e.g. camo light)

All light outputs are short circuit protected and current limited.
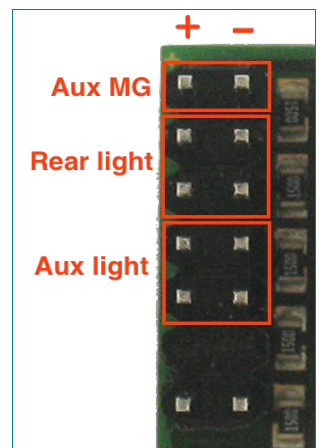
Pin assignment

| Turret (connector 1) from top		Muzzle flash (connector 2) from left		Battle (connector 3) von links	
o	motor turret rotation	o	not used	o	signaling LEDs cathode
o	motor turret rotation	o	not used	o	sensor signal
o	motor elevation	o	power supply – (LED and xenon flash)	o	ground
o	motor shot	o	signal + (LED and xenon flash)	o	IR sender cathode
o	common motor elevation and shot	o	power supply + (xenon flash only!)	o	+5V power supply
o	Light common +				
o	main light -				
o	muzzle flash MG -				

Sound: installation and connection

- plug the provided volume rotary knob to *connector 5*
- the *ElMod Fusion PRO* also provides the option to control the main volume by the radio. To activate this feature the appropriate parameter has to be set in the *ElMod App* to "external" (tab "sound volume", parameter "main volume control"). In this case the volume control knob on *connector 5* will be deactivated.
- connect the loudspeaker's cable with the output of a suitable 8 Ohm loudspeaker (*connector 6*). The loudspeaker's polarity (+/-) makes no difference at this. We recommend the Visaton® FRS7-8 speaker (loud, high pitch) or Visaton® FRS8-8 (quieter, lower/deeper pitch)
- for the best possible sound experience install the loudspeaker in an insulated airtight chassis with as large volume as possible
- check the correct fitting of the micro SD card. If the card is not well fitted or its contents is faulty, the sounds cannot be played.
- connect a fully charged battery to the *ElMod Fusion* and wait 3-4 sec. until the blue LED starts blinking constantly
- now tap the setup button. The call "battle mode..." is played. Tap several times more on the setup button until you hear "battle mode off".
- if you cannot hear the call, please check if the volume is set too low
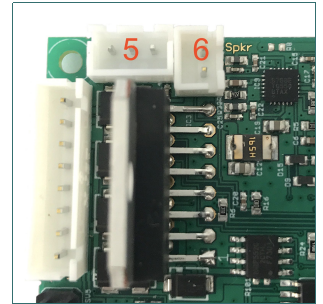
Servos

Depending on the type of your *ElMod Fusion* one servo (*ElMod Fusion ECO*) or three servos (*ElMod Fusion PRO*) may be driven. The servos are power supplied by the board. The maximum current is 0,8 A (*ElMod Fusion ECO*) or 1,5 A (*ElMod Fusion PRO*). The servos are connected so that the ground line points to the upper edge of the PCB (see image).

Each servo may be assigned to one of the functions listed below. The same function may be assigned to several servos simultaneously but every instance of this function may be configured independently (e.g. for the control of three steering axles of a truck with different steering lock angle). For each function the servo lock angle may be reversed or limited (right and left side separate). This is useful if the attached mechanic has a smaller movement clearance as the servo's side arm). By two other parameters each function may be further adjusted (see table).
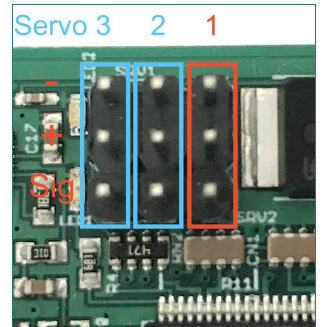
function	module type	effect	param 1 (0-100%)	param 2 (0-100%)
barrel recoil	ECO/PRO	barrel recoil after firing the main gun	retraction speed	extraction speed
steering	ECO/PRO	steering axle	speed dependent steering lock angle (0% - off, 100% - no steering on max. speed)	-
elevation	PRO	vertical movement of the main gun. The larger the stick deflection the faster the movement	max. speed	
elevation, modern	PRO	as above. After each shot the barrel moves to the reload position	max. speed	duration of reloading in 0.1 secs
traversion	PRO	horizontal movement of the main gun. The larger the stick deflection the faster the movement	max.speed	

turret rotation	PRO	turret rotation with an external ESC	-	-
hatch function	PRO	simulation of an open/close function. On: servo moves to the end position. Off: servo moves to the origin position	opening speed	closing speed
radar/wiper function	PRO	wipe function. On: servo moves between both end positions, Off: servo moves back and remains in the starting position	speed of the "to" movement	speed of the "fro" movement

The hatch and radar function are auxiliary functions that are activated by the special functions on the radio (see chapter "function control"). E.g. the commander's hatch may be attached to servo 1, AA radar to servo 2 and the driver's hatch to servo 3, the functions are triggered as follows:

- switch on channel 5 must be positioned to auxiliary functions
- left lever to the left for activation/deactivation of the first servo's function (commander's hatch)
- left lever to the top for activation/deactivation of the second servo's function (radar)
- left lever to the right for activation/deactivation of the third servo's function (driver's hatch)

IR battle functions

The *ElMod Fusion* provides a Tamiya® Battle Unit compatible battle function. The configuration takes by tapping on the setup button. Each tap changes the currently active setting which are:

- "battle mode light tank"
- "battle mode middle tank"
- "battle mode heavy tank"
- "battle mode test setting". If active, you may trigger a hit by nearly any infrared remote control.
- "battle mode off". This setting should be selected, when you do not use the battle function.

The selection of the vehicle's type affects its behavior during the battle. These features are listed in the following table:

setting	Hit count			Time in seconds			Mushroom blinks after power up
	slight slow down*	strong slow down*	destruction	reload time	invulnerability after a hit	delay until resurrection	
test mode	1	3	6	3	2	5	4x
light	1	2	3	3	15	15	1x
middle	1	4	6	5	12	15	2x
heavy	1	5	9	9	10	15	3x

* reduction of the maximum velocity of the vehicle

The *ElMod Fusion* indicates specific events with four sounds:

- a fanfare after switching on with activated battle function and after each resurrection. The vehicle stays invulnerable for several seconds (see table: reload time).
- reloading sound. Until this sound is heard you cannot fire again.
- metal impact after a hit. The vehicle stops and cannot be operated for two sec.
- an explosion during vehicle's destruction. The vehicle cannot be operated for the interval shown in the table (delay until resurrection).

For the IR battle function an additional gear is required:

- an IR sensor for the detection of a hit and signaling LEDs (sensor mushroom)
- an IR transmitter that is preferably installed in the main gun barrel

These components are supported in the following version:

- the *ElMod Fusion IR battle set* is connected directly to *connector 3*
- Tamiya® sensor mushroom and transmitter are connected to *connector 3* by using an optional adapter
- HengLong®/Taigen®sensor mushroom and transmitter are connected to *connector 3* by using an optional adapter

Vehicle control by computer or tablet

The *ElMod Fusion* is capable to control the vehicle by a Windows® or Apple® Computer or Android® Smartphone/Tablet. An optional available *ElMod Bluetooth* is required for best experience. Of corse the wired USB connection may be also used.

The vehicle control is located in the *ElMod App* in the tab "vehicle control". The left virtual joystick controls the turret rotation and the elevation, the right virtual joystick is for steering and acceleration. The buttons activates and deactivates the corresponding functions.

The computer/tablet vehicle control is only active if no other type of receiver is attached to the board at any time of operation.

Vehicle control by a RC receiver

The *ElMod Fusion* may operate with a common radio gear. The number of required channels depend on the demands and is summarized in the table below. The power supply of the receiver is provided by the *ElMod Fusion* (5V BEC, servo plug with red/black wire). An additional battery for the receiver is not necessary.

module type	channel	function	wire color	control
ECO/PRO	1	acceleration and ignition	brown	stick
ECO/PRO	2	steering	orange	
ECO/PRO	3	turret, weapons, light and auxiliary functions	yellow	stick
ECO/PRO	4		green	
ECO/PRO	5	selection of the function group	blue	3-way switch (up/off/down) or slider/knob (reduced function when using an on/off switch)
ECO/PRO	6	user functions 1 & 2	violet	3-way switch (up/off/down) (reduced function when using an on/off switch)
PRO	7	user functions 3 & 4	grey	3-way switch (up/off/down) (reduced function when using an on/off switch)
PRO	8	volume control	white	slider/knob

The number of connected channels is determined automatically. For the correct identification and the correct function all mixers must be deactivated, the servo angle lock must be set to 100% and the trimming must be centered. Please contact the support of your dealer if you have problems with the identification and the operation of your radio with the *ElMod Fusion*. In the majority of cases the cause is detected and fixed easily by the configuration software.
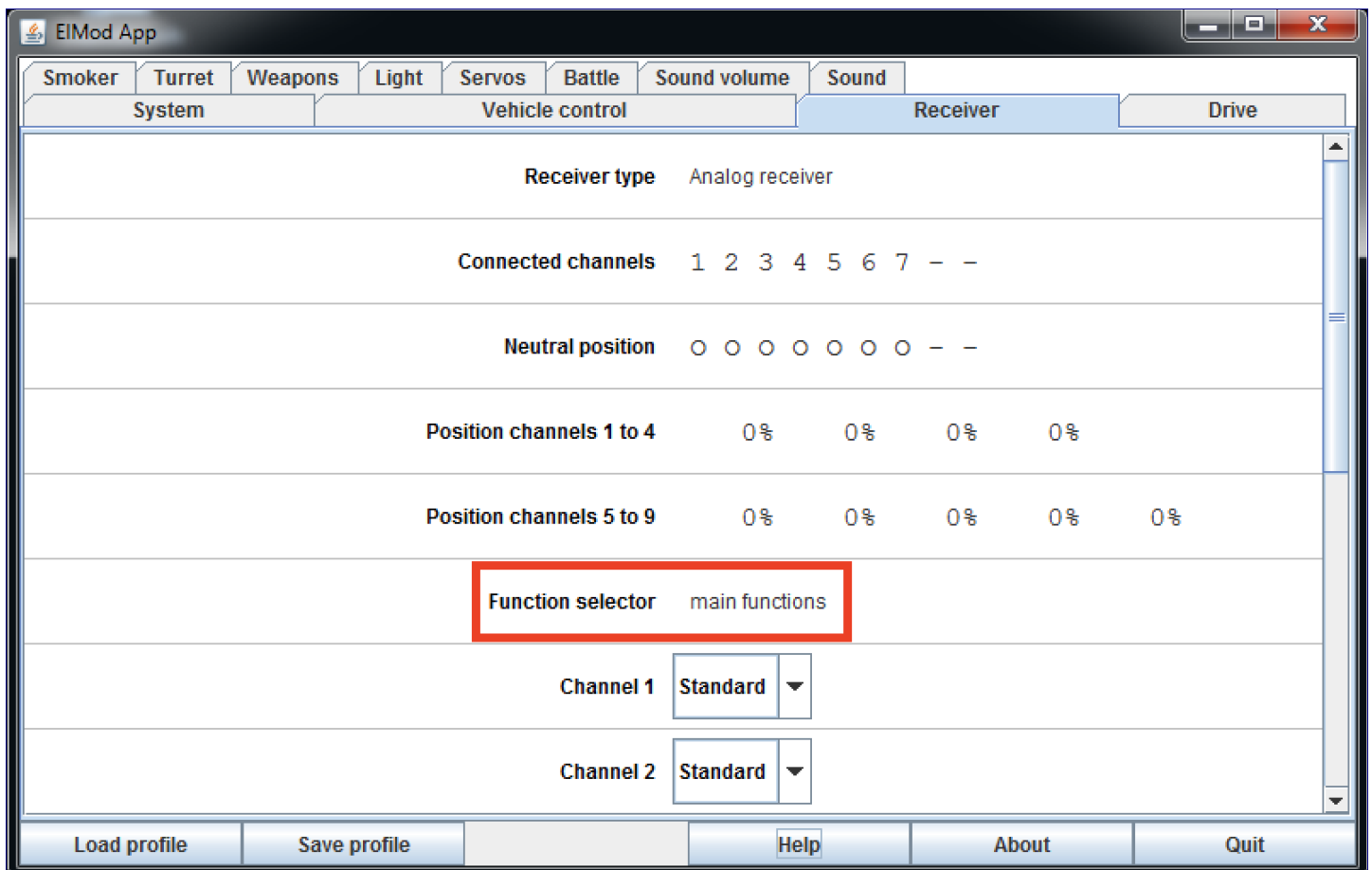
The control of channel 5 should be either a three way switch (top - center - bottom) or a slider/knob. The switch's position determines which function group is active on the left stick (main functions, auxiliary functions or user sounds). In case the 5th. channel is not present, only the main functions are available. If an on/off switch is installed, two of three function groups are accessible. Use the configuration software to figure out which function groups are available (tab "receiver" parameter "Function selector". See image above).

The wires carrying the receiver's signals must be plugged in on the receiver so that the cable on the plug is connected with the signal carrying receiver's pin (usually the upper or inner pin on the receiver, see image). The black wire of the red/black power supply plug must be connected with the ground pin (usually the lowest or furthest pin at the power supply connection of the receiver). If your receiver doesn't provide polarity protected terminals, read the manual of the receiver to find out the correct pin assignment. Wrong connected plugs won't damage the components in most cases but the receiver won't work.
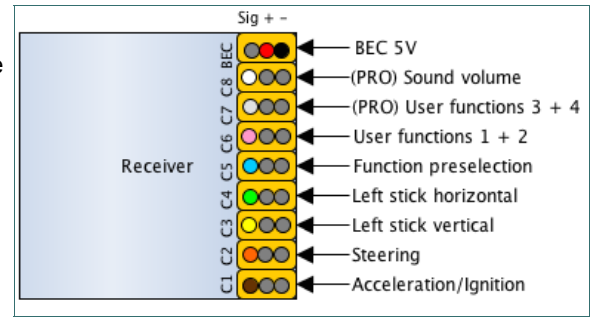

Depending on the used RC it may be necessary to change the order of the channels or to inverse the servo travel. Please read the manual of your RC gear for details. The signal of channels, that remains unused must not be connected.

Motor control (channels 1 & 2)

The ignition and acceleration/brake control is made by channel 1 (brown wire). After power up the engine doesn't run and the vehicle cannot be moved. To start the engine the throttle control must be moved to the upper most position and hold until the ignition sequence starts (see image below). Wait until the ignition sequence is finished and the idle sound is played. Now the vehicle is operational.

• for moving the vehicle forward, the throttle control must be moved to the top. After engaging a gear the vehicle starts moving gently.
• is the throttle control released or moved back to the center, the vehicle slows down (engine brake)
• is the throttle control moved in the opposite to current direction, the vehicle brakes (actively braking)
• the brakes are full proportional. That means, the higher the deflection in the opposite direction the stronger the brake force.
• if the vehicle comes to a stop and the throttle control is not put back to the center, the vehicle will stand still for a moment and start moving in the opposite direction.
• the vehicle direction is controlled by the horizontal deflection of the right throttle stick (depending on the configuration by chains and/or steering axles)
• if the model stands still and the right throttle stick is moved horizontal, the vehicle fulfills a spin turn. Depending on the model type this behavior may not be desired and can be deactivated.
• all drive related parameters, such as maximum speed ahead and back, acceleration and deceleration power, hold time during directional change and many more may be configured by the *ElMod App*.
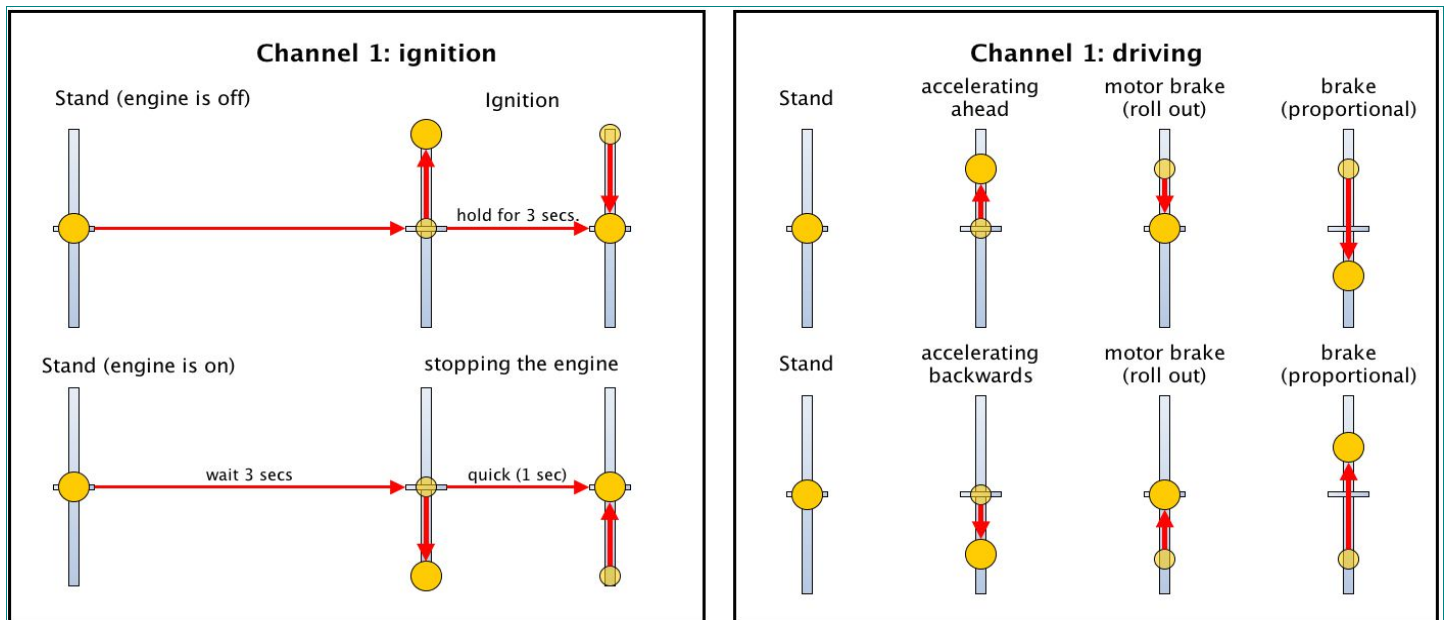
To switch off the motor, proceed as follows: stop the vehicle for at least three seconds. After that the throttle stick must be put to the bottom and released back quickly to the center position. This procedure may not last longer than one second.
Is the motor restarted after just a short time, a shorter start up sequence (warm start) is played. The time of cooling down the engine may also be configured by the software.
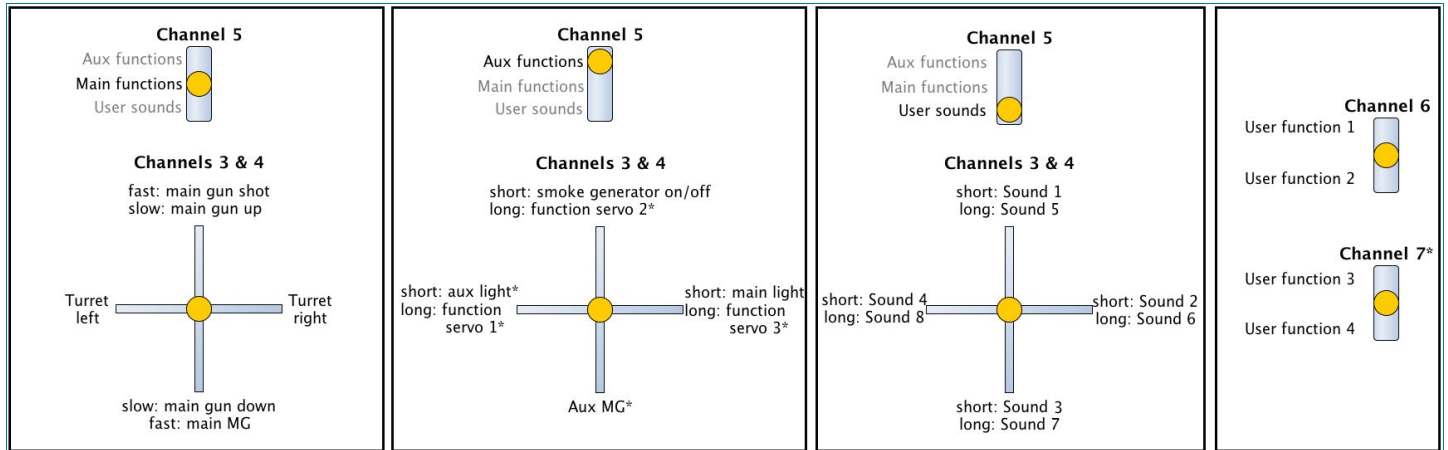
Function control (channels 3 to 7)

The control of the functions of the turret, weapons, lights and the servos is done by the left throttle stick and the switch or slider/knob on channel 5. Depending on the position of the switch on channel 5, the right stick controls

• main functions (turret rotation, elevation and traversion of the main gun, fire the main gun and the primary MG),
• auxiliary functions (switch on/off of the light, operation with auxiliary MG and activation of the servo's auxiliary functions),
• or the playing of user sounds (e.g. horn).

Depending on the sample set there are different numbers and contents of user sounds. If a particular user sound is not defined, the call "User 1" to "User 8" is played. Custom user sounds may be easily added with the Sound Manager.

Channel 6 (*ElMod Fusion ECO*) or channels 6 & 7 (*ElMod Fusion PRO*) may be assigned freely to different functions with the *ElMod App*. This allows quick access to frequently used functions such as light control or smoker operation.

The function layout is shown below. Short operation means holding for about 1 sec. Long operation means holding for 2 sec or longer.

Channel 5	
Aux functions	
Main functions ●	
User sounds	
Channels 3 & 4	
fast: main gun shot	
slow: main gun up	
Turret left — ● — Turret right	
slow: main gun down	
fast: main MG	

Channel 5
Aux functions ●
Main functions
User sounds

Channels 3 & 4
short: smoke generator on/off
long: function servo 2*

short: aux light*
long: function servo 1*   short: main light
long: function servo 3*

Aux MG*

Channel 5
Aux functions
Main functions
User sounds ●

Channels 3 & 4
short: Sound 1
long: Sound 5

short: Sound 4   short: Sound 2
long: Sound 8   long: Sound 6

short: Sound 3
long: Sound 7

Channel 6
User function 1 ●
User function 2

Channel 7*
User function 3 ●
User function 4

* *ElMod Fusion PRO* only.

Status LEDs

The blue and red status LEDs on the PCB show the current operating status of the *ElMod Fusion*.

| off	🟥🟦	on	ready to operate. blue LED blinks once after stick movement
off	🟥🟦	blinking	no receiver signal identified
on	🟥🟦	off	under or over voltage protection active
on	🟥🟦	on	no SD card inserted, card empty or its contents faulty (operation with default settings and without sound) blinking red LED means that the currently played sound is clipped. That happens when the volume of several sound types was raised in the configuration software. To fix the problem, lower these settings. Otherwise the sound may be distorted.

Setup of the sample set

The provided micro SD card contains several sample sets for different vehicle types (tanks, half-tracks, ships and trucks). At delivery the sample set for a german Tiger tank is activated. If you want to activate a different set, select the desired set by choosing it in the *ElMod App* (tab "sound", parameter "current sample set"). The new sample set will be immediately active, no restart of the *ElMod Fusion* is necessary.

There are two different types of sample sets available:
- *NextGen*. These are advanced sample sets, that reproduce the different driving conditions prototypically. These sample sets should always be preferred.
- Legacy. These are sample sets that are compatible to older ElMod sound generators. This sample sets won't exhaust the abilities of the *ElMod Fusion*
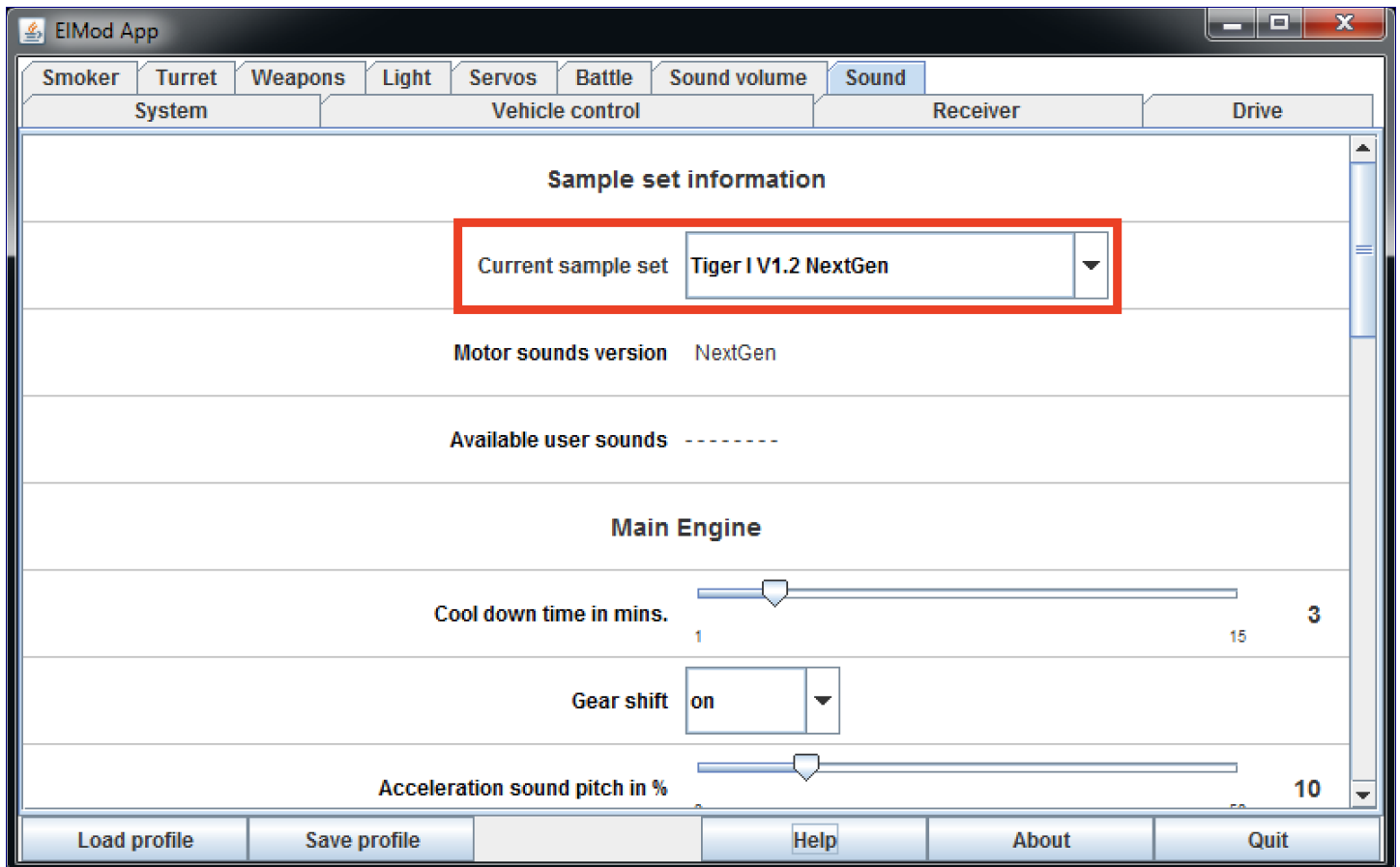
Alternatively insert the microSD in your computer (use a suitable card reader or card adapter) and start the file "SoundManager.exe" (for Windows®) or "SoundManager.app" (for MacOS®) located in the root folder of the card and follow the screen instructions.
To remove the SD-card from its slot, move it gently towards the displayed direction.

Never pull the SD-card in any other direction than the displayed! It may cause mechanical damage to the card slot ant thus to destruction of the board.
The SD card must not be removed or inserted in the ElMod Fusion board during operation!

First start up

- ensure that all wires are connected correctly
- switch on the RC or connect your computer or tablet to the board using the optional Bluetooth® adapter
- attach a fully charged battery to the electronics and turn on the vehicle
- the blue status LED blinks shortly after turning on and goes out again
- after 2-3 sec. the blue LED starts blinking periodically (search for receiver signal)
- the blue LED lights permanently as soon as valid receiver signals have been detected
- start the engine and have fun!

Installation

By choosing the fitting position please consider the following points:

- make sure that short circuits are excluded. The board must not touch any voltage carrying parts. Insulate all open wire connections with a shrinking tube.
- keep the cable length (especially the cables for the motors and the battery) as short as possible in order to prevent interferences!
- ensure that the antenna of the receiver is not located near metal parts (e.g. within a metal hull of a tank model) or between strong power consumer (motors). This can lead to a radical disturbance of the radio signal, the malfunction of the radio signal and cause the loss of control of the model. The *ElMod Fusion* provides fail-safe-mechanisms that help to detect the malfunction of the radio signal. For proper function the fail safe of the receiver should be deactivated.
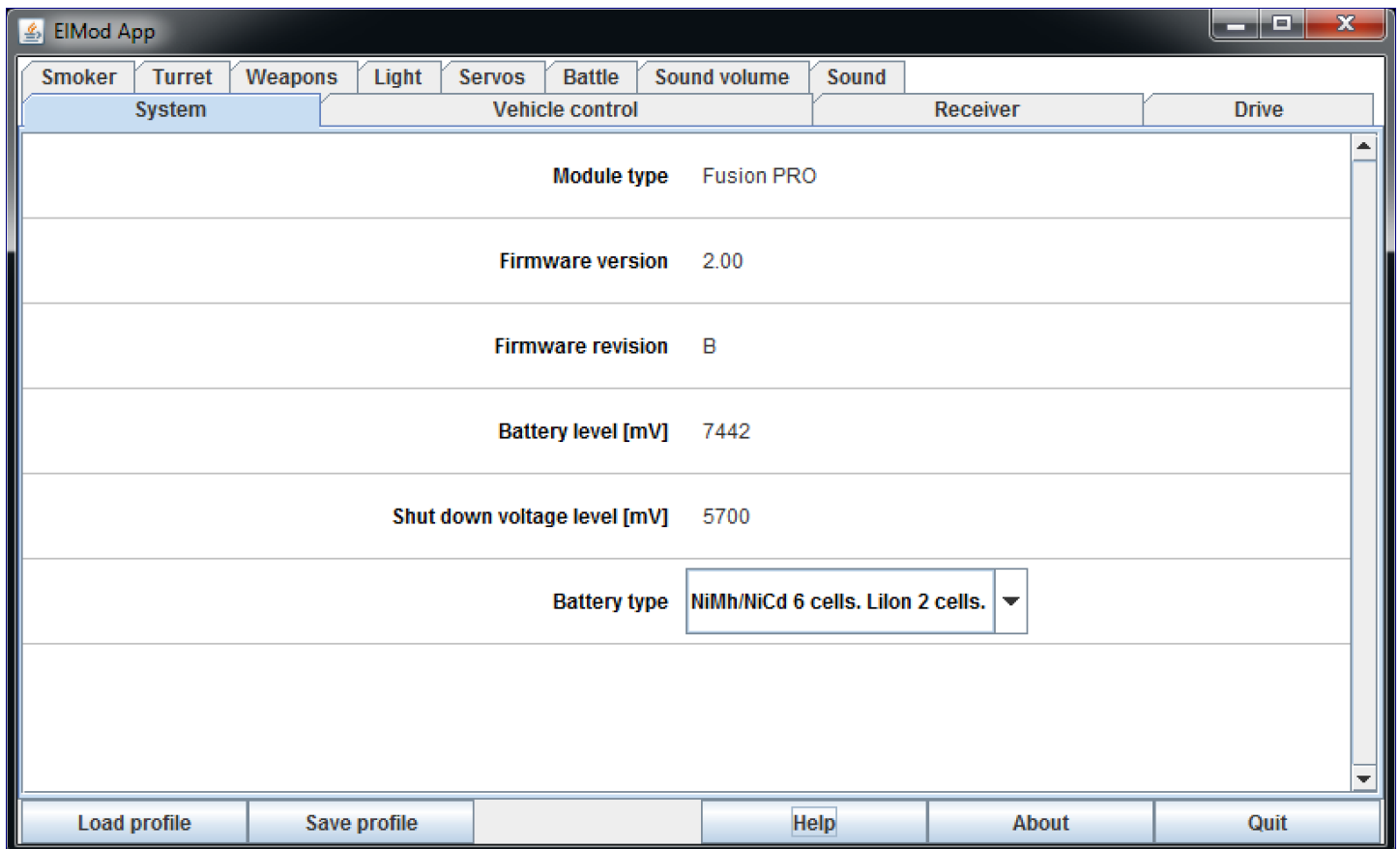
Configuration

The freely available *ElMod App* software for Microsoft® Windows®, MacOS® and Android® provides more than 100 different parameters which may be altered to get the most out of your vehicle. Furthermore firmware updates of the *ElMod Fusion* may be transferred to the board (not supported by Android®) . Please notice, that the software needs direct access to the USB hardware and thus must be run with administrator rights when running on Microsoft® Windows®. Also ensure that your malware protection software doesn't block the USB hardware access.

To attach the board to your computer, plug the *ElMod USB Dongle* to the designated connector and use the included USB cable to link the dongle to the computer.
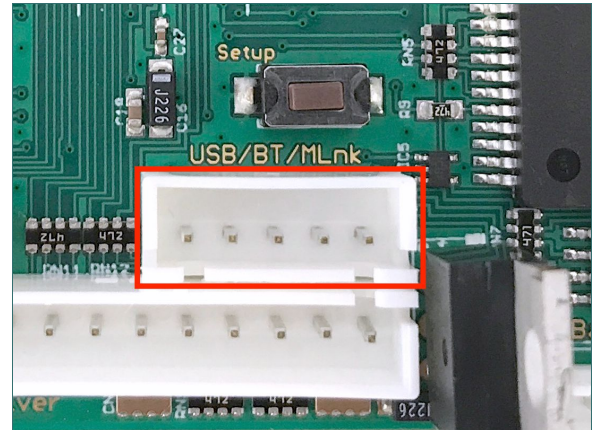
A wireless connection to the *ElMod App* is possible with the optionally available *ElMod Bluetooth Adapter*.

Configuration and tuning

The factory settings of the *ElMod Fusion* matches a german 1:16 World War 2 tank with a weight of about 5 kg, metal tracks and an *ElMod* gear box or a reduced metal gearbox. The settings for some other common vehicle types are provided with the *ElMod App*. Press the button "load profile" to choose one of them. You can also safe your own profiles by pressing the "save profile" button.

To change settings with the *ElMod App* a connection to the *ElMod Fusion* must be established. Proceed as follows:

- power on the *ElMod Fusion* and connect it to the computer
- start the *ElMod App*
- after 2-5 sec. the *ElMod Fusion* will be detected and the current settings are shown on the screen.

With the *ElMod App* various settings can be made and different informations are displayed. The main screen is divided in four areas:

- on the upper edge there is a tab to choose the parameter's group
- in the center area the parameters of the current category are listed. Each parameter has a detailed description. It is shown whenever you hoover the mouse pointer over the parameter's name.
- below are several buttons:
  - "Load profile" loads a previously saved or provided setting profile from your hard disk
  - "Save profile" saves all current settings on your hard disk
  - "Help" shows a brief manual for the *ElMod App*
  - "About" shows the version number of the software and legal notes
  - "Quit" closes the *ElMod App*

Create a profile

A profile which fits perfectly to the model is extremely rare. Different battery voltage, motor types, gear boxes and types of transmission, track material and weight are just a few examples for properties that may influence the drivability drastically. In most cases a new profile must be created for optimal drive experience. To do so proceed as follows:

- switch on the RC, start your model and connect it with your computer. Start the *ElMod App*
- adjust the correct battery type (tab "system", parameter "battery type"). Check, if the battery is fully charged (tab "system", parameter "battery level"). If not, please charge the battery now!
- start the engine. Adjust the parameter "Vmin" (this and all further parameters are located in the tab "drive") so that the starting sound and the motion of the vehicle occur in the same moment. Depending on the motor type and the chassis the value is between 1 and 20.
  - if the model starts driving while the idle sound is still heard, raise the value.
  - if the model doesn't move although the driving sound can be already heard, reduce the value.
- adjust the parameters "Vmax ahead" and "Vmax back" to the desired value. The formula for converting the speed to scaled value is : velocity of the model (in m/s) = velocity of the prototype (in km/h): (scale x 3,6). Example: the maximum speed of a tank is 60 km/h. The model has the scale 1:16. So the model should drive with a velocity of 60:(16x3,6) = 1,05 m/s.
- set the shift points for the second and third gear so that they are evenly distributed (parameter: "2nd gear speed" and "3rd gear speed").
- if necessary adjust the acceleration values until you are satisfied with the result (value for "Acceleration 3rd gear" higher as "Acceleration 2nd gear", higher as "Acceleration 1st gear").
- adjust the speed of the spin turn (parameter "spin turn speed") so that the vehicle is well controllable. If a spin turn is not desired adjust the value 0.
- now drive several curves with max. speed
  - if the curve radius is too high (vehicle doesn't steer strong enough), raise the value of the parameter force outer track and force inner track evenly
  - while driving out no jerk or change of the speed should be seen
    - if the tank is moving faster, raise the value of the parameter "Outer chain turn power"
    - if the tank is moving slower, reduce the value of the parameter "Outer chain turn power"
  - if your vehicle doesn't have track steering, set the parameters "Outer chain turn power" and "Inner chain turn power" to 0 and activate axle steering (tab "Servo", parameter "Mode")
- adjust the starting speed of the turret rotation so that the sound of the turret rotation corresponds to the turret movement (tab "Turret", parameter "Turret min. speed")
- adjust the max. speed of the turret rotation so that it corresponds to the prototype (tab "Turret", parameter "Turret max. speed").
- proceed appropriately with the adjustments for elevation of the main gun (tab "Turret", parameter "Gun elevation min speed" and "Gun elevation max speed").
- the most important adjustments are now set. Save the new profile on the hard drive (button "Save profile") for future use in case you need it for another *ElMod Fusion* board.

Reset to factory defaults

To reset all settings to factory values proceed as follows:
- switch off the voltage and wait for 3 sec. Preventively disconnect the motors from the electronics or jack up the vehicle so that it cannot move
- switch on the voltage again
- as soon as the blue LED lights up (about 0.5 sec. after power on) press and hold immediately the setup pushbutton
- the blue LED goes off. After about 4 sec the blue LED and the red LED light up together
- release the setup button. All parameters are set to delivery condition.

Firmware update

For updating the firmware the *ElMod Fusion* must be connected to a computer. To set the PCB in update mode, switch off the voltage and press and hold the setup pushbutton on the *ElMod Fusion*. Switch the voltage on again. The blue status LED blinks three times. Now start the *ElMod App* and press the red "Update" button. Follow the instruction. on the screen.
The newest firmware versions are always included in the current installation package of the *ElMod App*. A new version of the *ElMod App* may be installed anytime. It's not necessary to deinstall the existing version before.
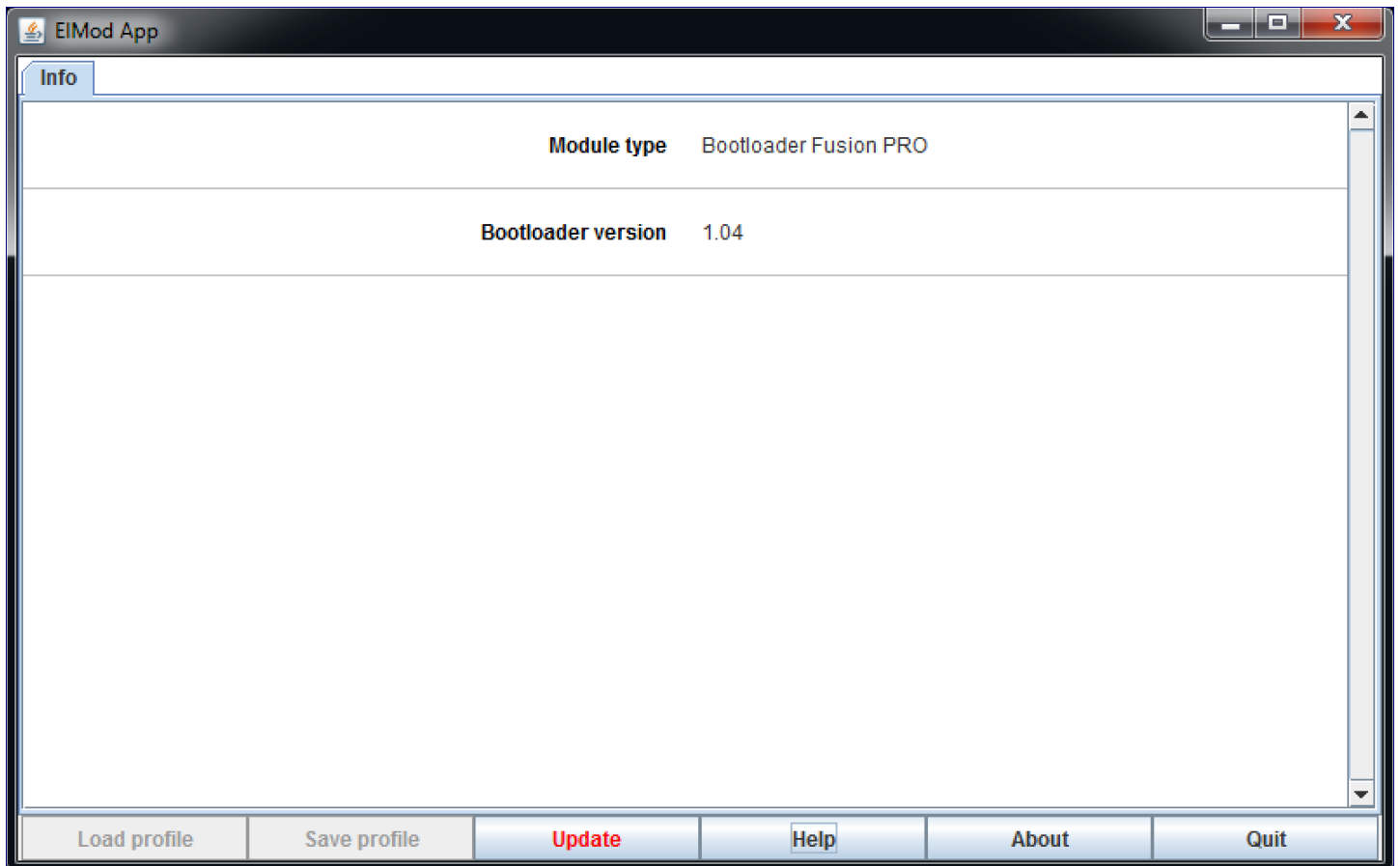
In-Depth informations

Several documents describing various aspects of the *ElMod Fusion* Modules are available in our knowledge base. The link is placed in the news section on the main page of our web site.

SAFETY INSTRUCTIONS

General

- In case of damage incurred by disregarding these operating instructions, the warranty claim is void. Liability for any and all consequential damage is excluded!

- We do not assume any liability for damage to property or personal injury caused by improper use or the failure to observe the safety instructions! The warranty is voided in these cases.

- For safety and licensing reasons (CE), it is not permitted to change or modify the product. Only use original or equivalent replacement parts for repair.

- Ensure that all electrical connections and connection cables conform to the regulations and comply with the operating instructions.

- Upon sudden change of climatic conditions (e. g. transfer from a cold place to a warm room) water may condense on the device, which may lead to damage. Allow approx. 2 hours to acclimate before powering on the device.

- Do not operate the device near easily inflammable objects, liquids or gases. Danger of explosion!

- Do not expose the device to high temperatures, strong vibrations, high humidity or chemically aggressive environment.

- Operate the device only in dry environment (below 80 % humidity, non condensing) and at normal room temperature (0 °C to 40 °C).

- Do not operate the device unattended.

- When in doubt about safety, or the connection or operation of the device, which is not explained in these operating instructions, please contact your dealer or a recognized expert.

Electrical hazards

- Operate the module only with low voltage according to the specifications in the technical data chapter. Only use appropriate batteries for power supply. Connection of voltages higher than 12 V is not permitted. There is danger to life through an electric shock and a risk of fire!

- Adhere to the limits on maximum allowable current according to the specifications in the technical data chapter. Exceeding the limits leads to overload and destruction of the device and bears the risk of fire or electric shock.

- Switch off the power supply before working on the electrical connections.

- Pay attention to appropriate wire cross sections.

Heat generation

- Electronic components on the product may heat up significantly during operation.

- When mounting the product, ensure sufficient air circulation around the device to prevent heat build-up and overheating.

- When mounting the product, keep sufficient distance to heat sensitive and inflammable objects (e. g. wood or plastic surfaces, cable insulation).

- When touching the product, there is danger of skin burn.

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