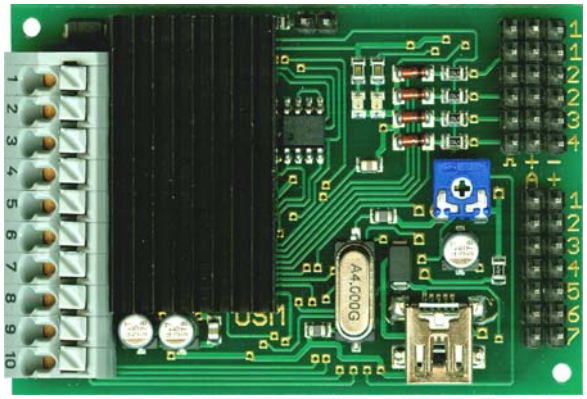
Operating Manual

Sound module USM-RC V1.30



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Introduction

The Sound module USM-RC was developed for the RC model construction in order to equip models, with an as realistic as possible, speed-dependent engine sound (e.g. engine sound). To make the background noise perfect, in addition to the engine sound, up to 16 additional sounds can be played. Moreover automatic turn on-, turn off-, starting-, stopping-, idling-, braking- and engine noises can be played. In addition 8 easy configurable random sounds are possible as well.

The sound output occurs on this module with 4 channels, which means in addition to the engine sound, 3 further additional-/random sounds can be played simultaneously.

Information of the driving speed (up to 255 steps!) can either be taken from 1 to 2 motors (analogue and mix mode), or 1 to 2 proportional channels (digital mode) of the receiver are used for the speed information.

Each sound can be changed at any time on the Sound module. For this purpose, just a Windows PC with an USB port and our software "USM-RC Sound-Teacher" is necessary. You can use this Sound module for a variety of models.

An efficient audio amplifier is already available on the board. Therefore only a loudspeaker is needed to be connected for the sound output.

In addition there are 7 switching outputs for the connection of LEDs, lamps, relays for example. Furthermore different light effects (light, stop light, indicators, hazard warning light, MG fire, flickering-light and so forth) can be implemented at these outputs.

Safety notes

- Please read this operating manual carefully and keep it for future use!
- The integrated circuits on the Sound module are sensitive to electrostatic charge. Therefore it is important that you don’t touch these components, before you do have discharged yourself (e.g. through a grip onto a grounded device).
- In order to guarantee an interference-proof operation, the Sound module should be built in a suitable case.
- The Sound module should be only used with supply voltages, which are given in the technical data.
- Always switch off power first before connecting the module!
- The Sound module is not suitable for children under 14 years.

Technical Data

Supply Voltage (U_b):	5 – 14V DC
Power consumption:	Standby-current: approx. 30mA Operation (only sound): max. 0,4A Operation (sound + switching outputs): max. 2,5A
Switching-inputs:	5 pieces LO-Signal = U < 2V HI-Signal = U > 5V Integrated pull-up resistors (4k7/10k)
Switching-outputs:	7 pieces max. 0,3A (npn – open collector) universal, freely programmable e.g. for light, reverse drive light, stop light, indicators (left and right) or hazard warning light
Proportional Inputs:	4 pieces
Voltage inputs for drive speed for analogue mode:	0 – 14V DC
Audio amplifier:	max. 3W
Recommended loudspeakers:	at U_b 5,0 – 9,6V: 8 – 16Ω (3 – 20W) at U_b 9,6 – 14,0V: 16 – 32Ω (3 – 20W)
Volume control:	By external potentiometer (100kΩ) and/or remote control possible
Memory for sound files :	4MB Flash (32MBit)
Max. length for the sounds:	380s (at 11kHz)
Supported sound files:	WAV-format, 8 bit, mono, 11kHz or 22kHz
Sound output:	12 bit D/A-converter
Number of possible sounds:	5 running steps/gears 8 change sounds between the running steps/gears 1 turn on noise (automatic) 1 turn off noise (automatic) 1 starting noise (automatic) 1 stopping noise (automatic) 1 idling noise (automatic) 1 brake noise (automatic) 1 reverse engine noise (automatic) 4 additional sounds (via inputs) 12 additional sounds (via prop.-channels) 8 random sounds (random generator)
Random generator:	Times between 1 to 250s adjustable
Interface:	USB 2.0 Mini B
Permissible ambient temperature:	0 – 60°C
Permissible relative air humidity:	max. 85%
Measurement:	67 x 46 x 16 mm

Operating Modes: Digital, analogue and mix mode

In order to make the Sound module universal usable, 3 different operating modes are available. The operating mode is very important for the possible functions and especially for the connection of the Sound module. Therefore it should be decided at the beginning which one of the two operating modes is better suitable for the used model. The selected operating mode of the Sound module is set in the USM-RC Sound-Teacher (see page 37).

If possible, please use the digital or mix mode, owing to their extended selection of functions.

Digital mode:
The digital mode is always applied if you use standard RC remote control radios and receivers with PPM-signals. In this case the Sound module is connected directly to the RC-receiver, and it recognizes the driving speed directly from 1 or 2 proportional channels (parallel to the speed controller). Via 2 more proportional channels up to 12 additional sounds can be played. In addition the engine sound can be switched on and off, the volume can be adjusted as well as light and indicators can be operated. Furthermore 4 more additional sounds can be played via digital switching inputs.

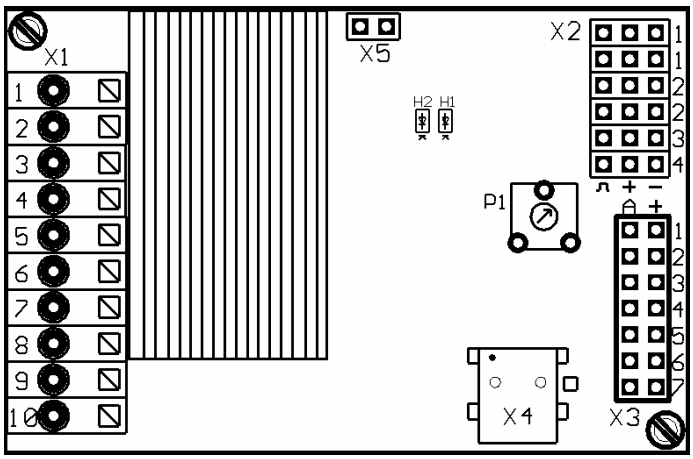
Analogue mode:
The analogue mode is used, if you don't have „standard" RC equipment.

In the analogue mode the driving speed is determined by a voltage measurement at 1 or 2 motors. In order to activate additional sounds or to turn on and switch off the engine sound the digital switching inputs of the Sound module must be connected (e.g. with switching modules).

Unfortunately due to the missing proportional channels, a few functions are not possible in the analogue mode. For instance you can activate just 6 additional sounds with 6 switching inputs. In addition the light and the volume cannot be switched or controlled in this mode by the remote control.

Mix mode:
The mix mode is a combination of digital and analogue mode. Like in the analogue mode the driving speed is determined directly by the motor voltage. However, the proportional channels #2 - #4 still working in digital mode and can interpret straight signals of the RC receiver.

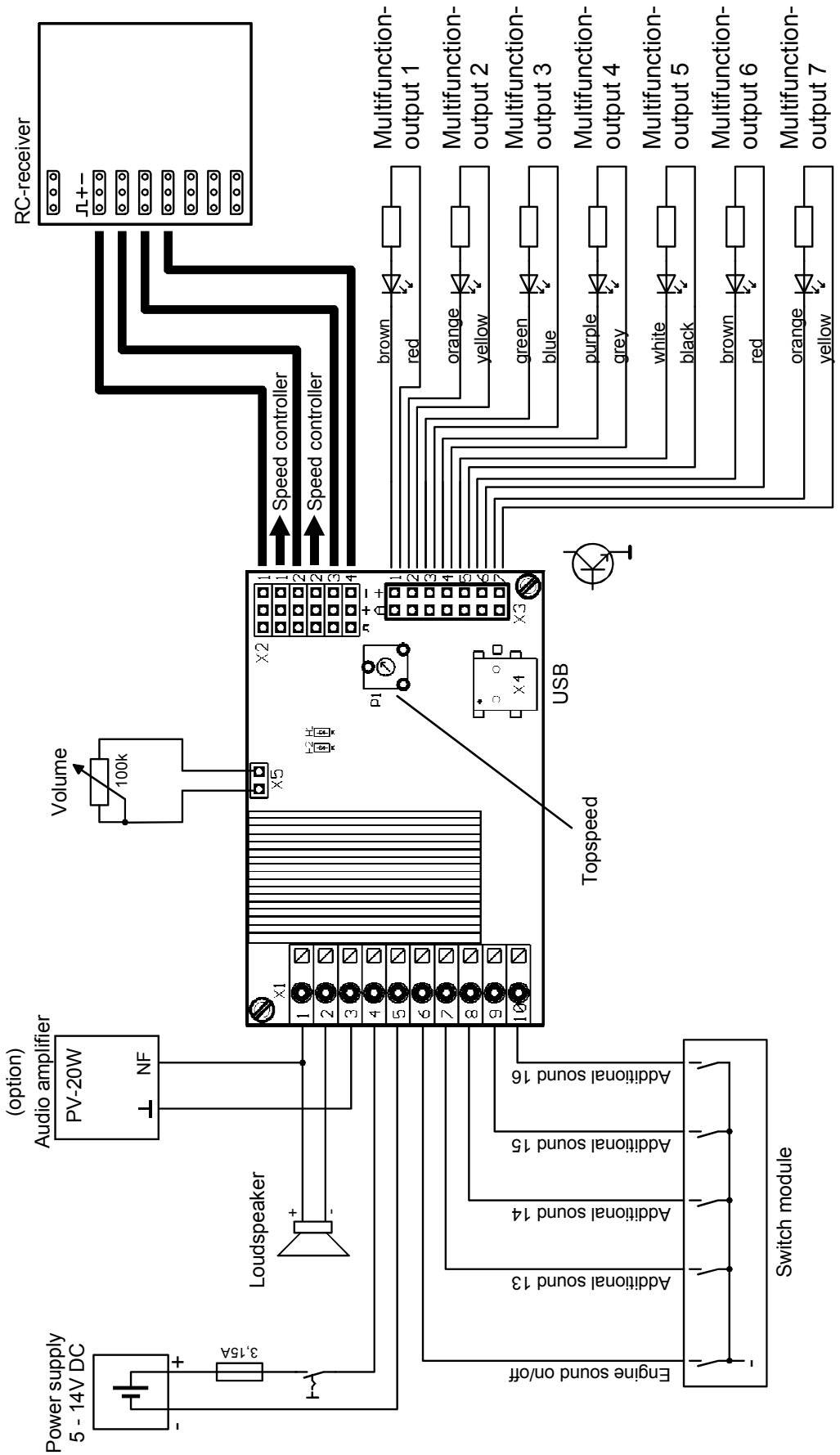
Pin assignments in digital mode



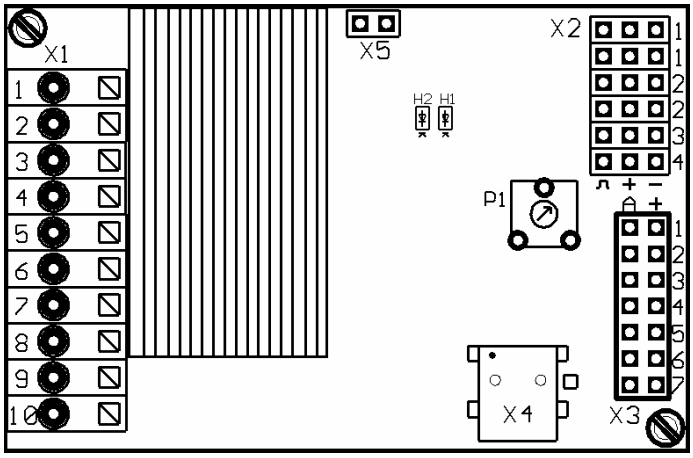
Connections on the Sound module:

X1/1	Loudspeaker +
X1/2	Loudspeaker -
X1/3	Ground for additional audio amplifier
X1/4	Supply voltage + (5 – 14V DC)
X1/5	Supply voltage -
X1/6	Input for engine sound on/off
X1/7	Input for additional sound 13
X1/8	Input for additional sound 14
X1/9	Input for additional sound 15
X1/10	Input for additional sound 16
X2/1	Connection for proportional channel 1 (speed)
X2/2	Connection for proportional channel 2 (speed or additional sound 9-12)
X2/3	Connection for proportional channel 3 (additional sound 1-4)
X2/4	Connection for proportional channel 4 (additional sound 5-8)
X3/1	Connection for output 1
X3/2	Connection for output 2
X3/3	Connection for output 3
X3/4	Connection for output 4
X3/5	Connection for output 5
X3/6	Connection for output 6
X3/7	Connection for output 7
X4	USB connector
X5	Connection for the potentiometer for the volume control

Wiring diagram for digital mode



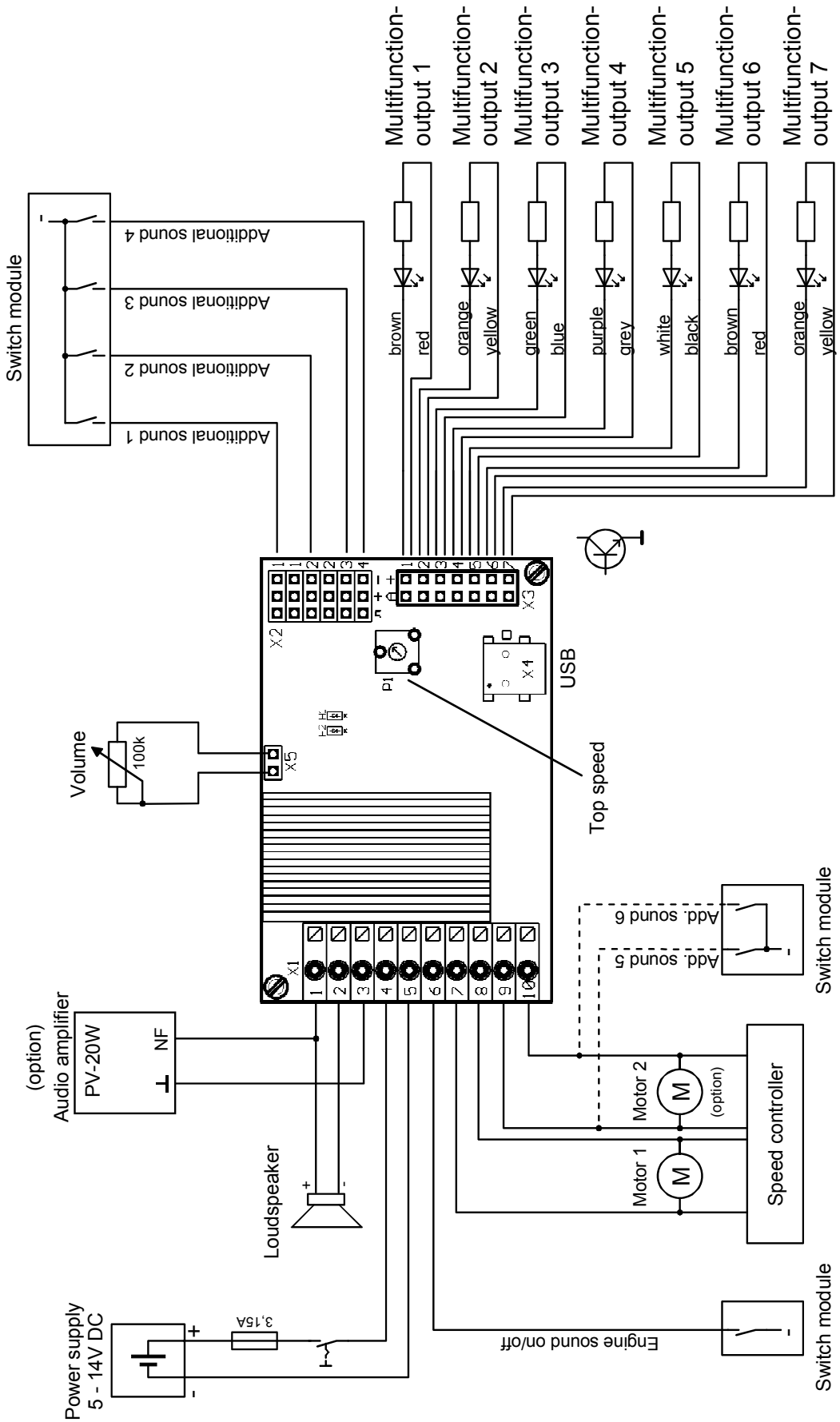
Pin assignment in analogue mode



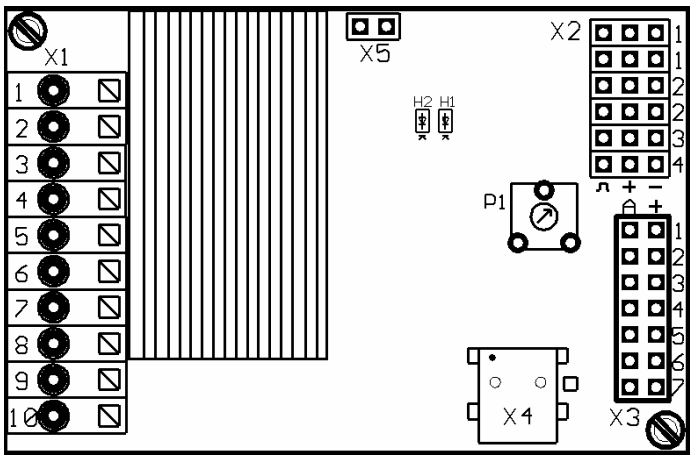
Connections on the Sound module:

X1/1	Loudspeaker +
X1/2	Loudspeaker -
X1/3	Ground for additional audio amplifier
X1/4	Supply voltage + (5 – 14V DC)
X1/5	Supply voltage -
X1/6	Input for engine sound on/off
X1/7	Motor 1 (speed)
X1/8	Motor 1 (speed)
X1/9	Motor 2 (speed)/Input for additional sound 5
X1/10	Motor 2 (speed)/Input for additional sound 6
X2/1	Input for additional sound 1
X2/2	Input for additional sound 2
X2/3	Input for additional sound 3
X2/4	Input for additional sound 4
X3/1	Connection for output 1
X3/2	Connection for output 2
X3/3	Connection for output 3
X3/4	Connection for output 4
X3/5	Connection for output 5
X3/6	Connection for output 6
X3/7	Connection for output 7
X4	USB connector
X5	Connection for the potentiometer for the volume control

Wiring diagram for analogue mode



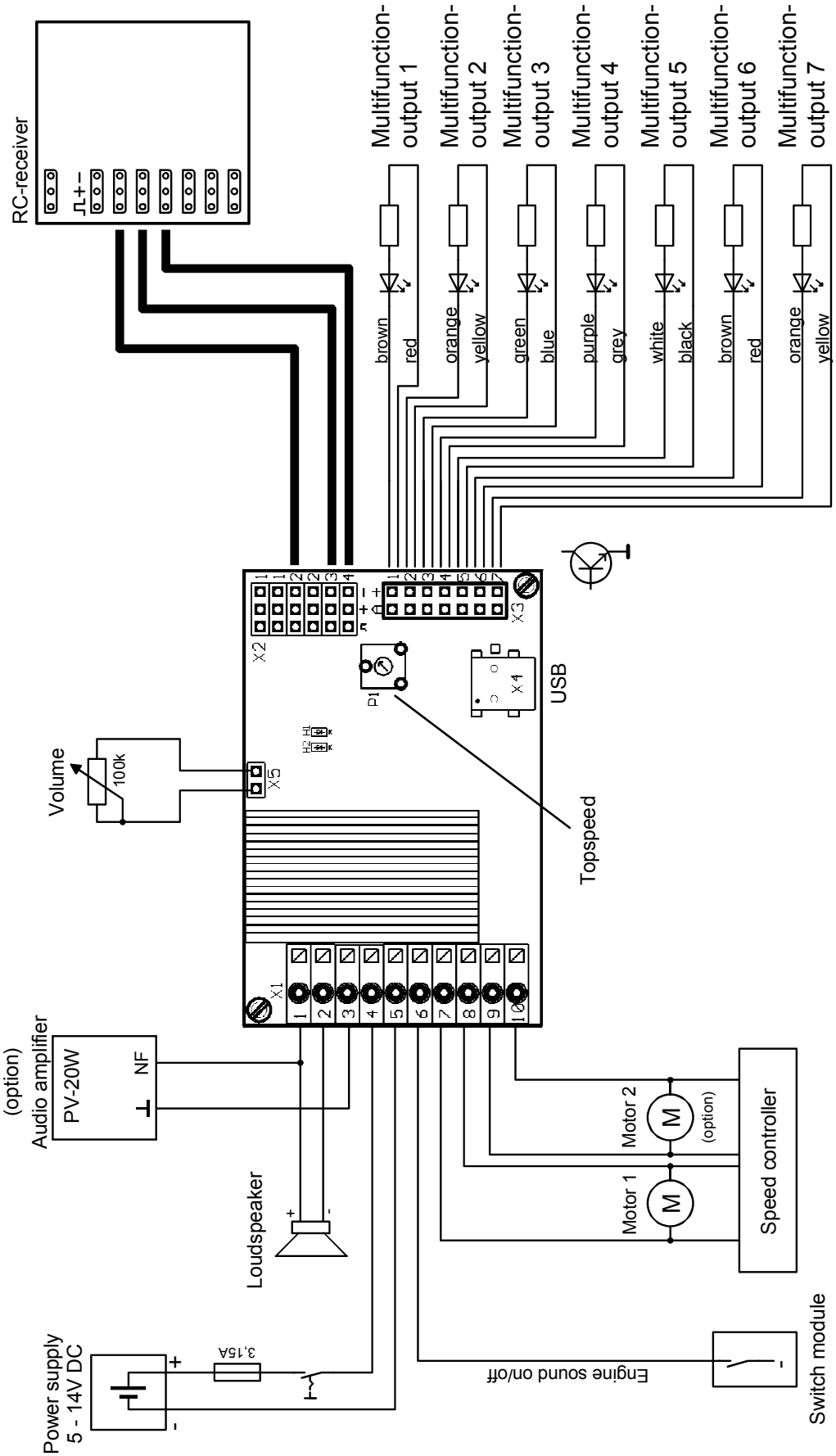
Pin assignment in mix mode



Connections on the Sound module:

X1/1	Loudspeaker +
X1/2	Loudspeaker -
X1/3	Ground for additional audio amplifier
X1/4	Supply voltage + (5 – 14V DC)
X1/5	Supply voltage -
X1/6	Input for engine sound on/off
X1/7	Motor 1 (speed)
X1/8	Motor 1 (speed)
X1/9	Motor 2 (speed)/Input for additional sound 5
X1/10	Motor 2 (speed)/Input for additional sound 6
X2/1	-
X2/2	Connection for proportional channel #2 (speed or additional sound 9-12)
X2/3	Connection for proportional channel #3 (additional sound 1-4)
X2/4	Connection for proportional channel #4 (additional sound 5-8)
X3/1	Connection for output 1
X3/2	Connection for output 2
X3/3	Connection for output 3
X3/4	Connection for output 4
X3/5	Connection for output 5
X3/6	Connection for output 6
X3/7	Connection for output 7
X4	USB connector
X5	Connection for the potentiometer for the volume control

Wiring diagram for mix mode



Installation of the Sound module

In order to fix the Sound module in the model, 2 mounted holes with Ø 2,1mm are available. Please pay attention that no components or conducting paths of the board touch any metal parts during the installation of the module! This can cause short-circuits which can destroy the Sound module and connected devices.

Connection of the Sound module

The connection of the supply voltage, the loudspeaker and the outputs are always identical, independent on the used mode (digital, analogue or mix mode).

By contrast the remaining wiring is dependent on the operating mode.

Always switch off power before connecting the module!

The terminal X1 is a spring cage terminal which allows a fast and simple connection of the Sound module. To put a wire in or out, you simply push from above onto the actuating lever of the terminal with a small screwdriver. The wires should be approximately 7-8mm stripped and should ideally be tin-plated prior the connection.

Connection of the supply voltage (battery):
The Sound module is designed for a DC voltage from 5V to 14V. Just connect terminal X1/4 with the positive pole and terminal X1/5 with the negative pole of the supply voltage. If the supply voltage is connected correctly, the green LED at the Sound module is glowing.

We recommend switching a fuse (3,15A) to the power line as well, in order to avoid serious damages at your model or the Sound module in case of a wrong wiring or another defect.

As a further option you can also connect a switch into the power supply of the Sound module to make it powerless. In particular the switch offers an advantage with battery used models, if you don’t need sound effects for a long period.

Connection of the loudspeaker:
The positive pole of the loudspeaker should be connected with the terminal X1/1 the negative pole with the terminal X1/2.

Connection of the outputs:

The 7 outputs of the module are located at the pin connector X3. We recommend using the supplied attachable ribbon cable. Of course you can also connect other wire/plugs to the pin connector. For every output 2 pins are available, at which the load (e.g. lamps, LEDs, small engines) can be connected.
The positive pole is located at the pin of the board edge; the output (switched negative pole) is located next to the pin.

Output	Ribbon cable	
#1	brown (-)	red (+)
#2	orange (-)	yellow (+)
#3	green (-)	blue (+)
#4	purple (-)	grey (+)
#5	white (-)	black (+)
#6	brown (-)	red (+)
#7	orange (-)	yellow (+)

In order to receive the right cable colors, the ribbon cable must be put on correctly to the connector. Theoretically it could be put on rotated by 180°; however, the configuration would be changed in this case. To put the cable on correctly the brown wire must face upwards (board middle), the yellow wire downwards (board edge).

The switched voltage at the outputs is always as high, as the supply voltage of the Sound module. For example if the Sound module is supplied with 12V, only lamps with 12V should be connected. If you want to connect LEDs, series resistors are always required. In addition attention must be paid at LEDs to the correct polarity. The series resistors for the LED's are depended on the supply voltage, the LED-color and the LED-current. Modellers familiar with electronics will certainly be able to calculate the ideal value for the models' LEDs, but everyone else should refer to the table below, which shows the resistance values required for standard LEDs (approx. 15mA rating):

Supply voltage	Series resistor
6V	270 Ohm
7,2V	330 Ohm
8,4V	470 Ohm
9,6V	510 Ohm
12V	680 Ohm

If multiple LEDs are connected to one output (e.g. front and rear direction indicators), it is always better to use separate dropping resistors than to wire the LEDs in series.

Connection of an external audio amplifier (optional):
To the terminals X1/1 and X1/3 an additional audio amplifier can be connected. We recommend using our **PV-20W** as an audio amplifier. This amplifier is optimally designed for the USM-RC Sound module. Of course other amplifiers can be connected as well; however, this requires an additional voltage divider to break the audio-voltage to the amplifier required audio-input voltage.

General references to the wiring in the model:
Unfortunately the speed controllers and motors in the model are often strong interference sources, which could disturb the electronic of the Sound module or the sound output (whistles, humming in the loudspeaker). Therefore all motors should be absolutely interference-suppressed!

It is also important to pay attention, to best possible „clean" wire routing. You should use always short wires and avoid any unnecessary loops. The wires for the supply voltage of the Sound module, should be connected to the driving-battery as direct as possible, and not connected over the same wires with other devices or speed controllers.

Connection of the Sound module in digital mode

Connection of the proportional channels

Up to 4 proportional outputs of an RC receiver can be attached to connectors X2/1 - X2/4. Just use the 2 supplied servo patch cables for the connection. If more than 2 proportional channels should be connected, further servo patch cables are required. For your convenience the cables can be purchased in our online shop.

A special label on the board indicates the locations of the 4 channels. The channels #1 and #2 are labeled twice, so as to transmit the proportional signal straight to the speed controller or servo. Y-cables are needed if further speed controllers or servos should be connected to the channels #3 and #4.

Please attach the servo patch cables to the Sound module with the brown wire face the board edge (to the right) and the orange wire to the board middle (to the left).

Following functions can be triggered with the 4 proportional channels on the Sound module:

Channel	Model with 1 motor	Model with 2 drive motor
#1	speed-dependent engine noise	speed-dependent engine noise
#2	additional sounds 9-12 light, indicators, hazard warning light	speed-dependent engine noise
#3	additional sounds 1-4 one-channel multifunction selection nautic mode	additional sounds 1-4 one-channel multifunction selection nautic mode
#4	additional sounds 5-8 engine sound on/off volume control	additional sounds 5-8 engine sound on/off volume control

If you have a model with 2 motors (e.g. chain vehicle) and use the proportional channel #2 for the driving speed identification, unfortunately it is not possible to activate the additional sounds 9-12 with this proportional channel. Also no outputs for light, indicators and hazard warning light can be used.

Connection of the switching-inputs

At the terminals X1/7 - X1/10, the additional sounds 13-16 can be triggered. To activate a sound, the negative pole of the supply voltage must be connected to the respective input. Generally switch modules are used for this (as our RC-SM-2 or other standard multi-switch-modules). If the switch modules are negative switched (usually they are) they can be directly connected to the inputs of the Sound module.

Terminal X1/6 is the switching-input, to turn on and off the engine sound. For switching, simply the negative pole (e.g. by a switch module or switch) must be connected to this input.

In the digital mode, the engine sound can be directly switched with the proportional channel #4, the one-channel multifunction selection or the nautic mode.

The engine sound is always switched off, if neither the terminal X1/6 nor the proportional channels #3 or #4 are connected and switched on for the engine sound.

Connection of the sound operation in analogue mode

Connection of the motors

In the analogue mode, the driving speed is determined by the motor voltage. 1 or 2 DC motors can be connected to the terminals X1/7 / X1/8 and X1/9 / X1/10. The connection to the Sound module is implemented parallel to the existing connections of the speed controllers which powers the motors.

Only if you want to use the output for the reverse driving light you have to pay attention to the polarity of the motor connections. If the reverse driving light shines at the forward drive, the connections must simply be changed.

If only 1 motor is connected, the terminals X1/9 and X1/10 can be used as switching-inputs, for 2 more additional sounds and indicators.

Connection of the switching-inputs

At the connectors X2/1 - X2/4, the additional sounds 13-16 can be triggered. The input pin is the left pin (direction board middle). The other two pins have no function.

To activate a sound, the negative pole of the supply voltage must be switched to the respective input. Usually switch modules are used for this (as our RC-SM-2 or other standard multi-switch-modules). These switch modules are all negativ-switched, therefore the outputs of the switch module can be connected to the inputs of the Sound module.

Terminal X1/6 is the switching-input, to turn on and off the engine sound. For activation, the negative pole (e.g. by a switch module or switch) must be connected to this input.

If this switching-input is not connected, the engine sound is always switched off!

Connection of the sound operation in mix mode

Connection of the motors

In the mix mode, the driving speed is determined by the motor voltage like in the analogue mode. 1 or 2 DC motors can be connected to the terminals X1/7 / X1/8 and X1/9 / X1/10. The connection to the Sound module is implemented parallel to the existing connections of the speed controllers which powers the motors.

Only if you want to use the output for the reverse driving light you have to pay attention to the polarity of the motor connections. If the reverse driving light shines at the forward drive, the connections must simply be changed.

If only 1 motor is connected, the terminals X1/9 and X1/10 can be used as switching-inputs, for 2 more additional sounds and indicators.

Connection of the switching-inputs

Up to 3 proportional outputs of an RC receiver can be attached to connectors X2/2 – X2/4. Just use the 2 supplied servo patch cables for the connection. If more than 2 proportional channels should be connected, further servo patch cables are required. For your convenience the cables can be purchased in our online shop.

A special label on the board indicates the locations of the 4 channels.

Please attach the servo patch cables to the Sound module with the brown wire face the board edge (to the right) and the orange wire to the board middle (to the left).

Following functions can be triggered with the 3 proportional channels on the Sound module:

Channel	Function
#2	additional sounds 9-12 light, indicator, hazard warning
#3	additional sounds 1-4 one-channel multifunction selection nautic mode
#4	additional sounds 5-8 engine sound on/off volume control

In the mix mode no additional sounds can be activated by the switching-inputs.

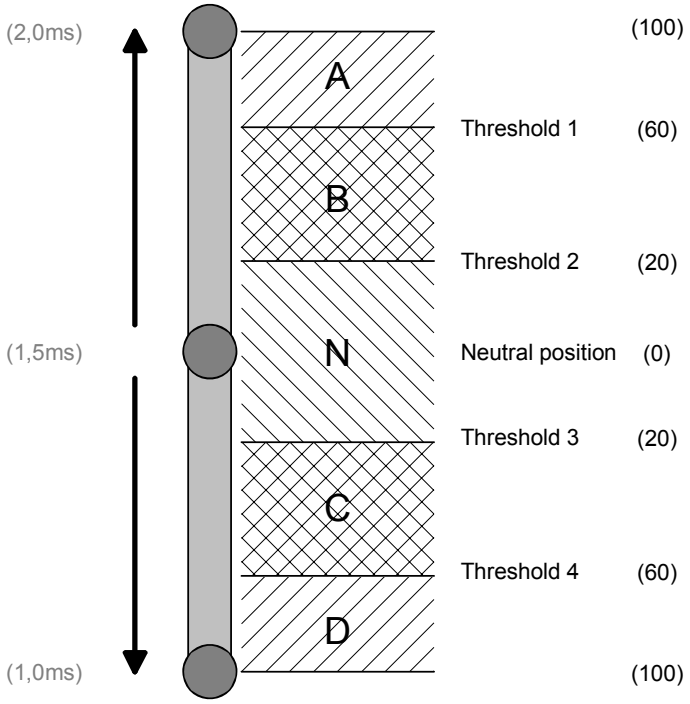
Functional assignment at proportional channels #1- #4

The proportional channel #1 is responsible only for the speed recognition. The other 3 channels have several functions. If channel #2 is used also for the speed determination, the other functions (light, indicators and additional sounds 9-12) are not available.

To occupy the proportional channels #2 - #4 with several functions, these channels are split into 5 areas "A, B, N, C and D". These areas represent the possible positions of a joy-stick.

The area N is the neutral position that is the center position of the joy-stick.

The same principle is also valid for a horizontal joy-stick. The area A is in this case to the left and area D to the right.



The areas can also adjusted/optimized to your remote control, by setting the 4 thresholds in the USM-RC Sound-Teacher.

Assignment of channel #2:

Area	Functions		
	in position (>0,5s)	**short in position (0,1-1,0s)**	**long in position (>2,5s)**
A		additional sound 9 indicator left on/off	light on/off
B	additional sound 11		
C	additional sound 12		
D		additional sound 10 indicator right on/off	hazard warning light on/off

Assignment of channel #3:

Area	Functions
A	additional sound 1
B	additional sound 3
C	additional sound 4
D	additional sound 2

Assignment of channel #4:

Area	Functions		
	in position (>0,5s)	**short in position (0,1-1,0s)**	**long in position (>2,5s)**
A		additional sound 5	volume control on
B	additional sound 7		
C	additional sound 8		
D		additional sound 6	engine sound on/off

Of course, you do not have to use all the functions listed here. This overview should just show all the possibilities of the channels #2 - #4.

In order to activate the additional sound 5 for example, the joy-stick of proportional channel #4 must be brought from center position N to position A. This movement should be done quite fast (< 0, 5s), because during this movement the joy-stick passes also the area B. If you move the joy-stick too slow, the additional sound 7 would be played as well.

Neutral position of channel #1

In order to play the right driving sound, the neutral position of channel #1 must be correctly set at the Sound-Teacher. On page 51 you can see how the setting can be used.

Neutral position of channel #2 - #4

In general, remote control manufacturer do not define a standard neutral position, due to this lack you can configure several neutral positions for the channels #2 - #4 (if you use two engines it is #3 - #4) with the Sound-Teacher by your own, varied from 1.3 to 1.7ms.

In addition it is possible to recognize the neutral position automatically at the turn-on procedure. It is important to ensure that the remote control position is at the neutral position otherwise wrong data are used. Please check the right position before switching on the Sound module.

Tips:

You can check the data your Sound module receives from your remote control when you connect the Sound module to your PC and start the Sound-Teacher over the menu “Help” and “Diagnosis”. This can be helpful to find a malfunction as well. Furthermore it is a good practice to learn how to control the 5 areas A, B, C and D over the remote control.

Joy-stick simulation with switches

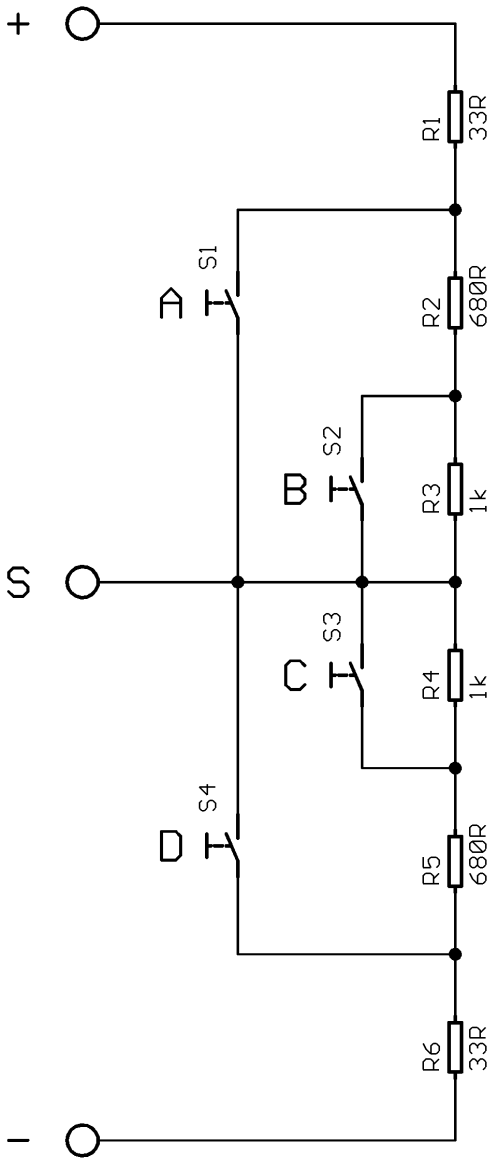
To use all functions of the proportional channels #2 - #4 conveniently, you can simulate the different potentiometer positions of a joy-stick, through a simple keystroke. If you press the key S1, a joy-stick position is simulated for position A.

Often the available joy-sticks are already taken by other functions, but mostly the remote control has still other free channels. This schematic can be used for the further channels to activate the additional sounds.

You need only 6 resistors and 4 switches for each channel.

With the indicated resistors values, this schematic should work with all standard remote controls. If needed, you can also configure the thresholds of the 5 areas in the Sound-Teacher.

How and where this schematic is connected in the remote control, is unfortunately always a little different according to manufacturer and model.



Loudspeaker

You can connect every loudspeaker to the Sound module USM-RC, which has an impedance of 8 - 32Ω and was designed for the respective maximal power. The maximum power and the volume of the Sound module, is heavily dependent on the height of the supply voltage and the loudspeaker impedance.

The following table shows which maximum sine-wave power at different voltages and loudspeaker impedances can be reached.

	U=6V	**U=7,2V**	**U=8,4V**	**U=9,6V**	**U=12V**
Power at 8Ω	1,3W	2,0W	3,0W	4,1W	-
Power at 16Ω	0,6W	1,0W	1,5W	2,1W	3,5W
Power at 32Ω	0,3W	0,5W	0,7W	1,0W	1,7W

If the supply voltage of the Sound module is over 9,6V, only loudspeakers with an impedance of 16Ω should be connected. Otherwise the amplifier circuit could become too hot.

If only loudspeakers with 8Ω are available, you can connect also 2 loudspeakers in series to get 16Ω.

To reach an optimal volume and sound quality, the loudspeaker must be installed in a suitable resonating body.

If the volume of the integral output stage is not adequate to your purpose, or if you wish to use lower-impedance speakers (2 - 4Ω), then you can connect a more powerful external amplifier (e.g. our PV-20W).

At every amplifier heat arises through power dissipation. This heat must be dissipated by a cooling element into the air. Please pay always attention to a good air circulation to prevent overheating.

Volume control

A volume control is possible by an external potentiometer (100kΩ).

You connect this potentiometer to connector X3 (see wiring diagram, page 8).

If no potentiometer is connected, always the maximum volume is used.

If the Sound module is used in the digital mode, the volume can be controlled also by the remote control. The proportional channel #4 is used for that. To activate the volume adjustment, the joy-stick must be brought for at least 2,5s in position A. Afterwards the volume control is active. You will recognize this also by the red LED on the Sound module which glows during the activated volume control.

If you move the joy-stick now in position D, the sound becomes louder. In position A the Sound becomes quieter. In order to adjust the volume precisely it is better to switch the engine sound on, before changing the volume.

If the joy-stick from channel #4 is not moved for 5s anymore, the volume control is switched off. The red LED turns off and the sound output is interrupted shortly. The joy-stick has now its normal function.

General notes to the volume

Please also notice that the sound data you transfer to the Sound module should have an optimal modulation. For instance a common mistake is that the record of the sound is far too quiet and therefore it can not be played properly.

With the supplied software „GoldWave" you can change and improve the volume of single sound files according to your wishes.

With low supply voltage (e.g. 6V) the sound can be sometimes overdriven and therefore unclear with scratch noises. In this case, the volume should be turned down.

Sounds

All sounds are stored in the Sound module with our software USM-RC Sound-Teacher, in so called „slots". Generally we can say you don't have to occupy every slot with a sound. If you don't want e.g. any starting-noise, let the slot #3 simply free.

Here an overview, which sounds in which slots, can be stored:

Sound
Engine start sound
Idling noise
Vehicle start sound (idling → drive)
Engine sound (depend on speed)
Engine sound partial load (depend on speed)
Vehicle stop sound (drive → idling)
Engine stop sound
Reverse engine sound
Brake sound
Additional sound 1 (start)
Additional sound 1 (loop)
Additional sound 1 (stop)
Additional sound 2 (start)
Additional sound 2 (loop)
Additional sound 2 (stop)
Additional sound 3
Additional sound 4
Additional sound 5
Additional sound 6
Additional sound 7
Additional sound 8
Additional sound 9
Additional sound 10
Additional sound 11
Additional sound 12
Additional sound 13
Additional sound 14
Additional sound 15
Additional sound 16
Random sound 1
Random sound 2
Random sound 3
Random sound 4
Random sound 5
Random sound 6
Random sound 7
Random sound 8

Engine sound

The engine sound consists of several single noises. Normally there is a turn on noise, idling noise, driving noise and turn off noise. This Sound module also offers the possibility to imitate a starting noise, a stop noise, up to 5 different driving sounds (for example for gears), up to 8 change sounds between the driving sounds (for example when you change the gears), a reverse engine sound and a break noise.
All engine sounds (therefore also the reverse driving- and brake noise) are played only when the engine sound is switched on.

Turn on noise
The turn on noise is played when the engine sound is switched on. After the turn on noise is played, the sound changes into the idling noise.
If the engine sound is switched on and the vehicle is already in motion, the turn on noise will skip and the module directly plays the engine noise.

Idling noise
The idling noise is always played when the vehicle is in idle. The sound is played in an endless loop. Therefore just a short sound (approx. 1-5s) is required in this sound slot.

Starting noise
The starting noise is played uniquely when the vehicle sets off (idle → drive).

Engine noise / Gears FG1 – FG5
The engine noise is always played when the vehicle drives. The engine noise is always played like the idling noise in an endless loop. The playing speed is dependent on the speed of the vehicle. The Sound module recognizes how fast the vehicle moves, and plays the engine noise also in the corresponding speed. How fast the engine noise should be played at the corresponding speed can be set at the driving sound diagram. For further information see page 51.

You can set with the Sound-Teacher how many different sounds should be available for driving forwards and backwards. This could be for instant sounds for different gears for a truck or you can choose different driving sounds for each driving speed (e.g. slow, normal and fast).

Please obey that the gears are just generated by the sound and not through a mechanic gearshift. Yet it is not possible to activate the different sounds through an engine control or a real gearshift.

For each driving sound FG1 – FG5 you can use 3 different settings (normal, decelerate and accelerate). The latter options are just additional to generate a more authentic sound but in most cases the “normal” sound is sufficient.

If you use the sound slot “slow down” and the model slows down, the driving sound switches automatically from “FGx normal” to “FGx slow down”. The same happens when the model accelerates and you have occupied the sound slot “speed up”.

To divide the entire speed range into sections for the 5 engine sounds/gears you can use the engine sound diagram (see page 51).

Sounds for changing the running step/gear
If you use more than one running step/gear for your driving sound you can also use sounds to simulate the changing between the different running steps/gears. At all times when you change the running step/gear the changing noise will be played.

Furthermore you can differentiate between acceleration- and deceleration sounds and therefore use for example different sounds for changing the gear from FG1 to FG2 and another for switching from FG2 to FG1.

The changing sound will always be played once and completely when the running step/gear is changed. For this reason the sound should be preferably short. Otherwise, it might occur for example that the model is already standing but the changing sound is still played.

Stopping noise
The stopping noise is played uniquely when the vehicle stops (drive → idle).

Turn off noise
The turn off noise is played when the engine sound is switched off.

Reverse engine noise
The reverse engine noise is played when the vehicle drives backwards. This could be e.g. the beeping of a reverse driving warn sound of a truck. The reverse engine noise is an additionally sound which is mixed/added to the engine sound.

Brake noise
The brake noise is played when the driving speed is strongly reduced.

In the folder „USM-RC Sounds”, on the supplied CD-ROM, you will find some exemplary sounds for different vehicle types. In order to store a new sound on the Sound module, simply start the program „USM-RC Sound-Teacher", open an *.usm project file in the respective folder and upload the new sound with the USB cable to the Sound module.

A great advantage of this Sound module is that you can edit and compile your own engine noises to make your model unique, individual and realistic.

Additional sounds 1 - 16

With the proportional channels and the switching-inputs, depending on the operation mode (digital, analogue and mixed) and the number of motors up to 16 different additional sounds can be played.

To play an additional sound, it must be started over a start pulse. This happens either, if you activate the corresponding switching-input shortly or, in the digital mode, putting the joy-stick into the corresponding position (A, B, C or D).

Additional sound (Slot)	Digital mode	Analogue mode	Mix mode
1	Prop. #3 - Pos. A	X2/1	Prop. #3 - Pos. A
2	Prop. #3 - Pos. D	X2/2	Prop. #3 - Pos. D
3	Prop. #3 - Pos. B	X2/3	Prop. #3 - Pos. B
4	Prop. #3 - Pos. C	X2/4	Prop. #3 - Pos. C
5	Prop. #4 - Pos. A	X1/9	Prop. #4 - Pos. A
6	Prop. #4 - Pos. D	X1/10	Prop. #4 - Pos. D
7	Prop. #4 - Pos. B	-	Prop. #4 - Pos. B
8	Prop. #4 - Pos. C	-	Prop. #4 - Pos. C
9	Prop. #2 - Pos. A	-	Prop. #2 - Pos. A
10	Prop. #2 - Pos. D	-	Prop. #2 - Pos. D
11	Prop. #2 - Pos. B	-	Prop. #2 - Pos. B
12	Prop. #2 - Pos. C	-	Prop. #2 - Pos. C
13	X1/7	-	-
14	X1/8	-	-
15	X1/9	-	-
16	X1/10	-	-

The two additional sounds 1 and 2 offers a special feature:
Each of these sounds consists of 3 single sound slots. When the additional sound 1 is started, the slot **“start”** is played first. Then the sound changes to the slot **“loop”** and plays this slot in an endless loop so long as the start signal for the additional sound 1 is still present. When the start signal for additional sound 1 disappears, the slot **“stop”** is played uniquely. Additional sound 2 works in the same way.

In this way, a sound like a ship horn with variable length (without a hard cut at the end), can be realized. Also for example a MG fire can be fitted with a great reverberation.

The start and stop slots are only options which can be used. You can let these slots also free.

For additional sounds 3-16 various play-back modes can be set up using the USM-RC Sound-Teacher. Thereby it is possible to fine-tune every additional sound to produce a perfect match to your particular mode.

Sound play-back modes when triggered using proportional channels #2 - #4:

Mode	Function
Once/Complete	When the sound is started, it is played exactly once, from start to finish, and then it stops. It is not possible to halt the sound prematurely; it is always played completely.
Once/Immediate stop	When the sound is started, it is played exactly once, from start to finish, and then stops. However, if the sound is started again while it is already or still running, the sound is stopped immediately.
Loop/Complete	When the sound is started, it is played again and again from start to finish in an endless loop. To switch the sound off again it must be virtually “started” again. The sound then runs from start to finish once more completely, and then it stops.
Loop/Immediate stop	When the sound is started, it is played again and again from start to finish in an endless loop. To switch the sound off it must be virtually “started” again. The sound then stops immediately.

Sound play-back modes when triggered via switched inputs:

Mode	Function
Once/Complete	When the input is switched on, the sound starts and is played exactly once, from start to finish, and then stops. It is not possible to halt the sound prematurely; it is always played back completely.
Once/Immediate stop	When the input is switched on, the sound starts and is played exactly once, from start to finish, and then stops. However, if the input is switched off again while it is still running, the sound is then stopped immediately.
Loop/Complete	When the input is switched on, the sound is played again and again from start to finish in an endless loop. If the input is switched off again, the sound runs from start to finish once more completely, and then stops.
Loop/Immediate stop	When the input is switched on, the sound is played again and again from start to finish in an endless loop. If the input is switched off again, the sound then stops immediately.

Random sounds

Up to 8 random sounds can be played with the Sound module USM-RC. The time of the sound play-back is determined then by a random generator. The time spans (min/max) can programmed by 1 – 250s for every sound separately. In the same way the conditions (idling/drive - engine sound on/off) the sound should be played can be programmed for each of the 8 random sounds. For instance you can define that at a tank a randomized “chain squeaking” is played, but only during the drive and not in the idling.

Because the 8 random sounds run completely independently from each other, it could happen that 2 or even 3 of the random sounds are played simultaneously.

Turning on/off engine sound

To turn on and switch off the engine sound, the switching-input X1/6 must be connected. When this input is connected e.g. over a switch module on the negative pole, the engine sound turns on. When this input is open, or not switched on the switch module, the engine sound turns off.

In the digital mode, the engine sound can also be turned on and switched off by the proportional channel #4. If you move the joy-stick at a minimum of 2,5s in position D (see page 16), the engine sound will turn on or switch off. Here the switching-input X1/6 is not needed.

Furthermore an automatic engine sound activation can be set up by the Sound Teacher. Thereby you can turn on the engine sound by moving the joy-stick for awhile while the model is standing. After an adjustable time (1-255s) in the standing position the engine sound is switched off automatically. This setting is perfect if you don’t have a free channel at your remote control to turn on and off the engine sound.

Adjusting the engine sound to the driving speed

With the trimmer P1 the speed of the driving sound can be adjusted. However, in case you more than one driving sound (FG1-FG5) we recommend setting this trimmer to the middle and adjusting the speed of the driving sound by the driving sound diagram (see page 51).

If the engine sound listens interrupted at a high driving speed, please convert and save the sounds at the slots “FG1 – FG5” in 11,025 kHz sample rate.

Switching outputs

The Sound module has 7 outputs, which can be used to drive electrical consumer units such as lamps, light-emitting diodes, relays etc. Different switching functions can be attached to the 7 outputs by using the Sound-Teacher.

Following functions are possible:

- Static output when playing back one or more sounds
- Flashing output when playing back one or more sounds
- Flickering output when playing back one or more sounds
- Light 1, 2, 3
- Reversing light
- Brake light
- Indicator right
- Indicator left
- Output on when model is in motion
- Output on when model is stationary
- Output on when model is accelerating
- Output on starting from a user-defined running speed

“Static” output when sounds are played back

If this function is selected, the output is always switched on when the unit is generating a sound for which this output is selected. To accomplish this, the selected outputs have to be activated in the sound slots.

“Flashing” output when sounds are played back

This function is similar to the previous one, but the output flashes at a user-defined rate (frequency) while the sound is running, instead of being switched on continuously.

The flashing frequency can be set separately for each output in the Sound-Teacher. Values within the range 1 to 255 can be set: 1 corresponds to the fastest flashing frequency (50Hz) and 255 the slowest (0.196Hz).

The flashing frequency can be calculated as following: f = 1 / (value x 0.02)

“Flickering” output when sounds are played back

When this function is selected the outputs flicker at the same rhythm as the sound that is played currently.

This can be used to generate very impressive light effects, such as a simulation of fire or a welding torch.

The Sound-Teacher allows you to adjust the sensitivity of the flicker effect separately for each of the outputs; values can be chosen between 1 and 255. The higher the value the higher the sound volume must be to activate the flicker effect.

“Light 1”, “Light 2” and “Light 3” output
To turn on/off the outputs for the lights the joy-stick should be shift for longer than 2,5s from the channel #2 to the positions A (light 1), B (light 2) or C (light 3).

Of course this output can also be used to switch other systems, not only lights.

“Reversing light” output
The output for the reverse driving light is always switched on when the vehicle runs backwards. If the Sound module is configured for 2 drive motors, the reversing light is only triggered when both motors are running in reverse.

“Brake light“ output
The brake light is always shortly turned on when the driving speed is reduced substantial. The sensitiveness can be configured in the USM-RC Sound-Teacher.

“Indicator left” output
To switch the indicator on or off, the joy-stick of proportional channel #2 must be put very shortly in position A.

In the analogue mode the indicator is switched by the switching-input X1/9.

“Indicator right” output
To switch the indicator on or off, the joy-stick of proportional channel #2 must be put very shortly in position D.

In the analogue mode the indicator is switched by the switching-input X1/10.

Hazard warning light
To switch the hazard warning light on or off, the joy-stick of proportional channel #2 must be put for at least 2,5s into position D. In the analogue mode the two switching-inputs X1/9 and X1/10 must simply be activated. If the hazard warning light is turned on, the left and the right indicators are flashing.

“Motion” output
This output is always switched on when the model is in motion, whether it is moving forwards or in reverse.

“Stationary” output
This output is always switched on when the model is stationary.

“Accelerate” output
This output is always switched on briefly as soon as the model accelerates from rest.

“Driving speed” output
This output is switched on when the model exceeds the running speed previously selected in the Sound-Teacher.

One-channel multi-function selection (EKMFA)

If “One-channel multi-function selection” (EKMFA) is activated, you can control virtually all the functions of the Sound module using just one proportional channel, namely channel #3. As in “normal” mode, the travel of the transmitter joy-stick is divided into 5 areas A, B, N, C and D (see page 20). Of course, other switches that are already fitted to the transmitter can also be used to control the functions in this mode.

To trigger a particular sound or function, the transmitter joy-stick must be moved from position N to position A or D for a specific number. In the one direction (A) the movement only triggers sound effects; movement in the other direction (D) switches the running sound, the 7 switched outputs and the indicator/warning indicator on and off.

The last numerical value is always stored, enabling you to repeat the last sound or the last function as many times as you wish by holding the joy-stick at position B (sound) or C (function) for one second. Thereby this eliminates the need to count a specific number of movements again.

Example - sound:
We want to trigger additional sound 3 which we have programmed in the “Loop” play-back mode. Therefore we quickly move the joy-stick three times from the neutral position N to position A. If the joy-stick is not moved for one second, the sound starts, and runs in an endless loop. There are two methods of switching it off again:

1. We can move the joy-stick again three times from position N to position A, and wait one second.
2. We can move the joy-stick to position B and hold it there for one second.

If the play-back mode is programmed as “Once” instead of “Loop”, there is no need to switch the sound off again, because it only runs through once, and then it stops automatically.

Counter position A	Sound
1	Additional sound 1 (on)
2	Additional sound 2 (on)
3	Additional sound 3 (on/off)
4	Additional sound 4 (on/off)
5	Additional sound 5 (on/off)
6	Additional sound 6 (on/off)
7	Additional sound 7 (on/off)
8	Additional sound 8 (on/off)
9	Additional sound 9 (on/off)
10	Additional sound 10 (on/off)
11	Additional sound 11 (on/off)
12	Additional sound 12 (on/off)

In the case of the three-stage additional sounds 1 and 2 the control is a little bit different from the rest of the additional sounds. In this case the sound is played back constantly as long as the joy-stick is held in position A or B.

Example - function:
We want to switch output #4 on. Thus we quickly move the joy-stick five times from the neutral point N to position D. If the joy-stick is afterwards not moved for one second, the output is switched on. There are two options to switch off the same output again:

1. You can move the joy-stick five times from position N to position D, and wait one second.
2. You can move the joy-stick to position C and hold it there for one second.

Counter position D	Function
1	Running sound (on/off)
2	Output #1 (on/off)
3	Output #2 (o/off)
4	Output #3 (on/off)
5	Output #4 (on/off)
6	Output #5 (on/off)
7	Output #6 (on/off)
8	Output #7 (on/off)
9	Indicator left (on/off)
10	Indicator right (on/off)
11	Warning indicator (on/off)

To ensure that the seven outputs can be switched, it is essential to set them to **“static”** or **“flashing”** in the Sound-Teacher. An output which is configured as a reversing light or brake light cannot be switched on in this way.

If EKMFA mode is activated, all the functions which are assigned to proportional channels #2 and #4 (light, indicator, warning indicator, running sound on/off, volume control) can still be controlled by using these channels.

If sounds should be controlled by the proportional channels #2 and #4 during EKMFA-mode you just can use it with the setting “once/complete”. The options “loop” and “stop at once” are not possible with the proportional channels in this configuration.

Nautic mode

The Nautic mode is probably the most convenient method of operating the sound module when using your remote control, although it requires the appropriate switch module at the transmitter. At present the USM-RC supports the following switch modules (and modules compatible with them):

- Grauppner Nautic-Expert Modul (No. 4108)
- Robbe Multi-Switch 16 Modul (No. 8084) V1 and V2
- Mergen 12-Kanal and 16-Kanal Multiswitch

Some of the latest remote controls include a “software nautic module” as well. In most of these cases no additional hardware switch modules are necessary. Please refer to the operating instructions supplied with your transmitter for further details.

To activate the nautic mode, access Configuration in the Sound-Teacher program and select the point “Prop. #3: Nautic mode” under “General - sound module configuration”.

A particular function can now be assigned to each switch position. Operating the corresponding switch triggers the set function at the sound module. The following functions are possible:

- additional sounds 1 - 12
- switch outputs 1 - 7 (must be configured as static or flashing)
- switch right and left flashers
- switch hazard flasher
- switch running sound on/off
- adjust volume (the volume setting is not stored)

A memory function can also be activated for each switch position. If the memory function is active, the function at the sound module is switched on or off when the switch is operated, and remains in that state until the switch is operated a second time.

Use a servo patch lead to connect the corresponding receiver output (according to the channel which your switch module occupies at the remote control) to proportional channel #3 (X2/3) of the sound module.

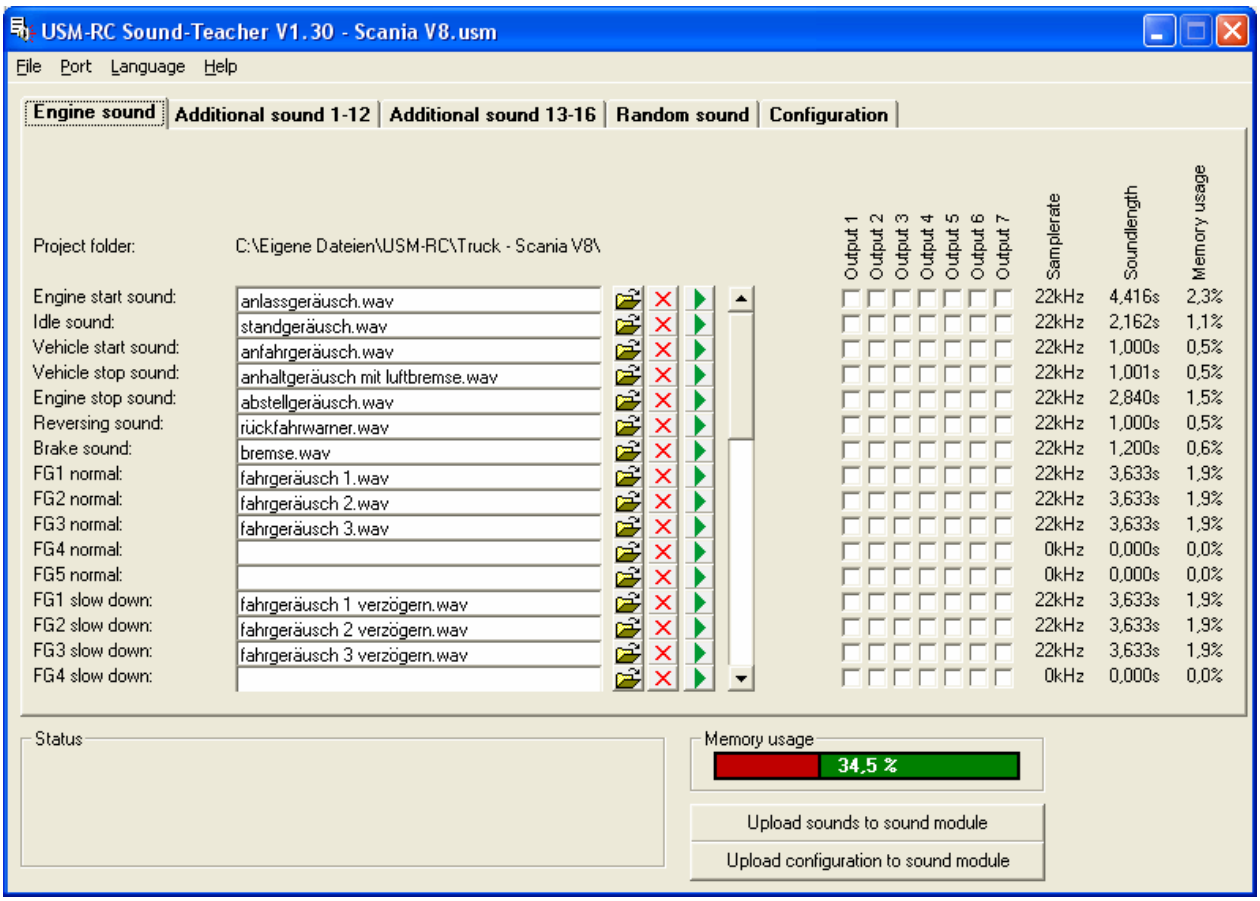
If the sound module is picking up the data correctly from your switch module, the red LED on the sound module will flash briefly at regular intervals.
If the red LED does not flash, or if the Nautic switches do not work, check the settings at your transmitter. If you are unsure about this, please read the operating instructions supplied with your transmitter, as they generally provide information on the settings required for Nautic modules (e.g. servo travel at maximum).

If you you a equipment with Jeti Duplex 2.4GHz, the “output period” of the receiver must be set on “byTransmitter” by the Jeti-Box.

If sounds should be controlled by the proportional channels #2 and #4 during Nautic-mode, you have to use the setting “once/complete”. The options “loop” and “stop at once” are not possible with the proportional channels in this configuration.

PC-Software „USM-RC Sound-Teacher“

With our software „USM-RC Sound-Teacher", the Sound module can be configured and the sound files can be transferred to the Sound module.



System requirements

- Windows compatible PC
- 3 MB of free HD space
- Windows 98, ME, 2000, NT, XP or Windows Vista
- free USB-port (1.0, 1.1 or 2.0)
- CD/DVD-ROM disk drive

Software installation

In most cases the “CD-Installer” starts automatically when you insert the CD-ROM. If this does not occur, please start the file „CD-Installer.exe" which is in the main folder on the CD-ROM.

To install the Sound-Teacher, click on the „USM-RC Sound-Teacher” button and follow the further instructions on the screen.

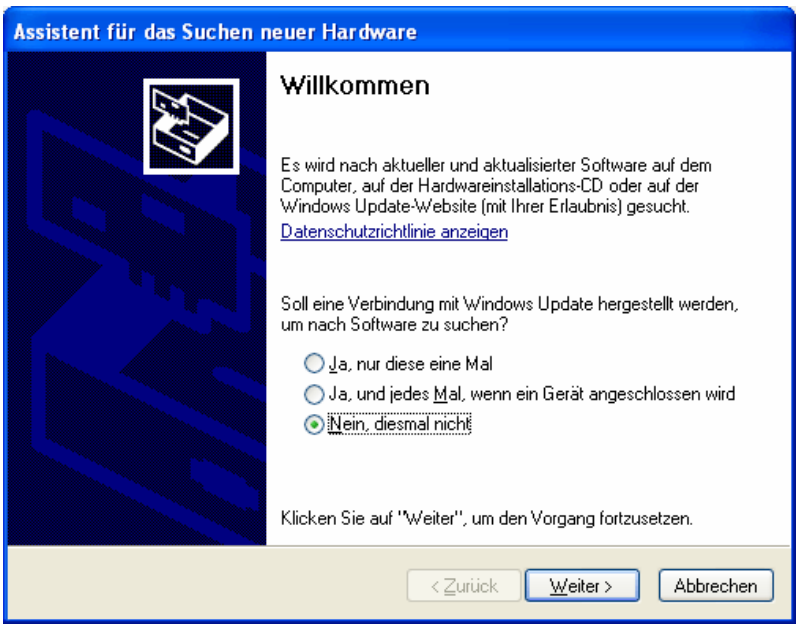
USB-Driver installation

Before connecting the Sound module for the first time to the PC, you have to install the USM-RC Sound-Teacher!

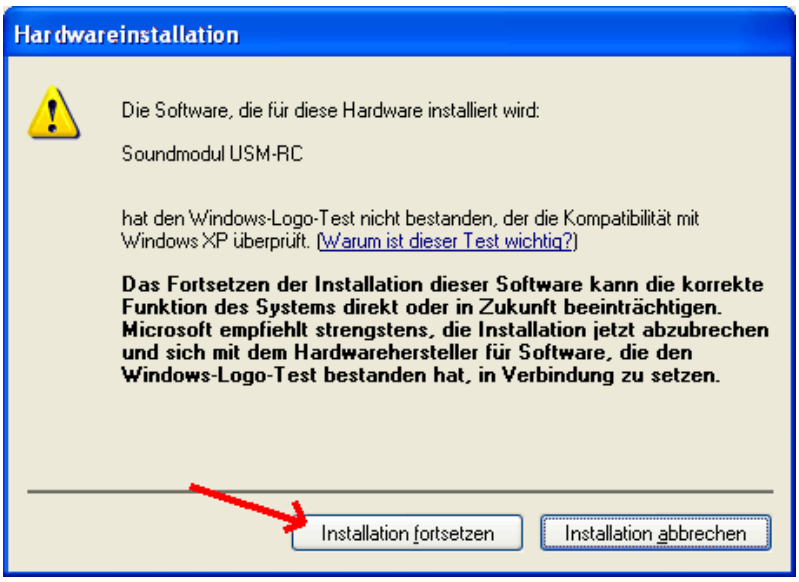
After installation of the USM-RC Sound-Teacher, connect the USB cable to a free USB port (1.0, 1.1 or 2.0) of your computer, and connect the other end into the USB socket on the Sound module. No additional power supply is necessary for this, as the USB port supplies currently directly to the sound module.

The Windows automatic hardware detection system now detects the new Sound module and starts the Hardware Assistant. This looks a little different at the different operating systems and languages, but it always run in a similar way. It is only important that the supplied CD-ROM is in a CD/DVD-drive.

You can click on “Next” until the driver installation is complete.

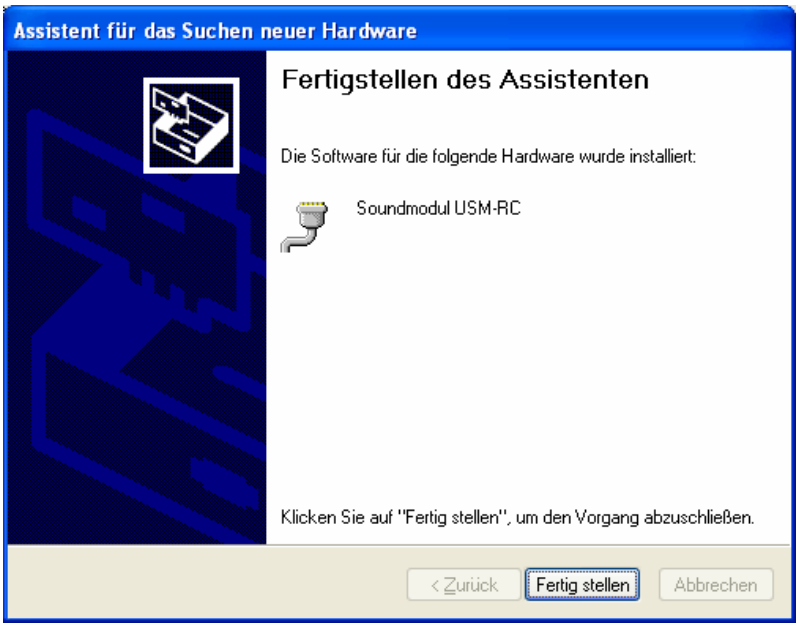


If the message “The driver did not pass the Windows Logo-test” appears during the installation, it is important to click on “Continue”.



If the USB-Driver is successfully installed, this final message appears. Click on “Finish” to complete the installation.

The USM-RC Sound-Teacher can now be started and the Sound module is ready to be programmed.



Starting Sound-Teacher

During the installation of the Sound-Teacher an entry is added to the Start menu, which can be used to start the program. Click on the “Start” button at the bottom left-hand corner of the screen then on “Programs”, on to “USM-RC Sound-Teacher” and finally click on “USM-RC Sound-Teacher”. The program should now start. If you chose to place an icon on the desktop during the installation procedure you can start the program by double-clicking on that icon.
When the program starts, it automatically opens the project on which you last worked.

Brief instructions for loading new sounds into the module

Instruction for transferring a new sound into the Sound module:

1. Connect the Sound module to your PC using the USB lead supplied in the set.
2. Start the USM-RC Sound-Teacher.
3. Locate the menu “**File**” at the top of the screen, and click on “**Open project**”.
4. Now select (typically) the desired sound project (.usm file) e.g. on a CD-ROM, and click on the button “**Open**”.
5. Transfer the new sounds to the Sound module by clicking on the button “**Upload sounds to sound module**”.

Using the software ”USM-RC Sound-Teacher“

The software is designed to be as simple as possible to operate, with the intention that you should be able to use it intuitively. Many seasoned Windows-users will certainly be able to control the program without any further help.

The following section provides a brief explanation of all the program’s functions:

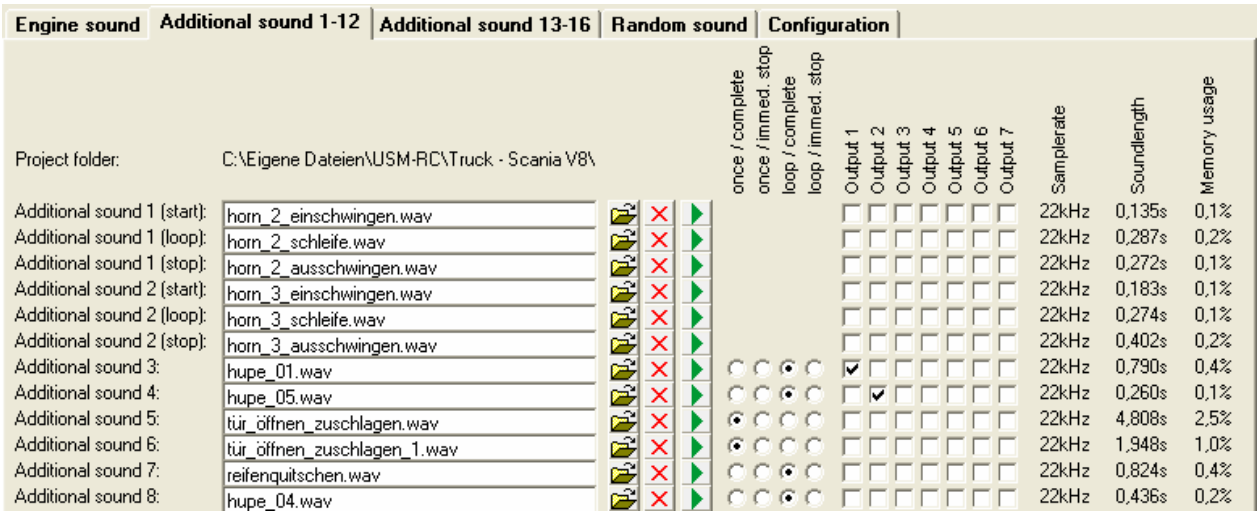
Menu:

File	**Create new project**	Creating a new project
	Open project	Opening an existing project
	Save project	Saving the current project
	Save project as	Saving the current project with a new filename
	Download Sound-Teacher update from the internet	Downloading updates for the USM-RC Sound-Teacher
	Download firmware from the internet	Downloading a new firmware from the internet
	Start firmwareupdate	Updating the Sound module with a new firmware
	Download sounds from the internet	Downloading new sounds from the internet
	Open Sound-Center	Opening the BEIER-Electronic Sound-Center
	Close	Closing the program
Port	**Search sound module**	Searching the Sound module at the USB ports
Language	**German**	Switching the language to German
	English	Switching the language to English
Help	**Manual**	Opening this operating manual
	Diagnosis	Starting a diagnostic tool
	Info	Shows information about the software

Configuring sounds
Up to 62 different sounds can be stored in the slots in the Sound module.
The sounds are divided into four different ranges:

- Engine sounds
- Additional sounds 1 - 12
- Additional sounds 13 - 16
- Random sounds

With the sound-select-bar you can choose the sound slots you would like to edit.



Project folder	Indicates the folder where the sound project is to be saved.
Slot name	Indicates the name of this slot, i.e. what sort of sound can be saved here (e.g. engine start sound).
File	File name of the WAV file which is saved in this slot.
	This button is used to load a new sound file into the slot.
	Erases the file from the slot.
	Plays back the file via the PC's integral loudspeaker.
Play-back mode	At this point you can select the different play-back modes
Outputs	Determines which outputs are used when particular sounds are played back.
Sound length	Length of the sound in seconds.
Sample rate	Quality of the sound.
Memory use	Indicates the percentage of the sound module's total memory occupied by the sound.

Opening of sound files

With a click on the button, the Windows usual "file open dialog" opens, in which you can select the wanted sound file on your hard disk.
All WAV-files with following properties can be opened:

- 8 bit
- mono
- 11,025kHz or 22,050kHz

If you want to open a file, which is not in the necessary format, an error message appears. If you still want to use this file, you must first convert it using a suitable program. You will find an example on page 56 which explains how this works.

We recommend, to store all sound files for a complete project, in an own separate folder on your hard disk.

“Memory usage” indicates how much memory is already occupied in the Sound module.

After all wanted sound files were assigned to their slots and the module was configured, it is recommended to save the complete project (**File → Save project**).

In the folder „Sounds" on the CD you will find some generally example sounds.
In addition there are examples for different engine sounds in the folder „USM-RC Sounds".

Configuring the Sound module

Click on the “Configuration” tab in order to carry out adjustments to the sound module.

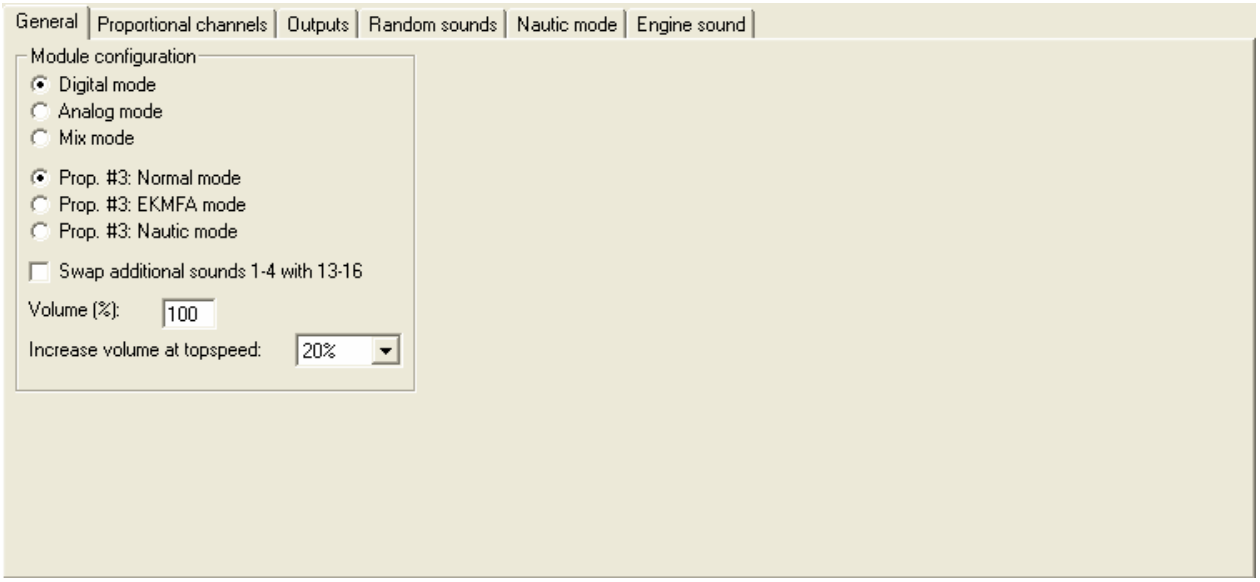
The settings are divided up into different ranges:

- General
- Proportional channels
- Outputs
- Random sounds
- Nautic mode
- Engine Sound

If you alter a value in the configuration, you must remember to transfer the new configuration into the sound module; otherwise the changes will not take effect!

When saving a project, the sound settings for the slots are saved in the project file together with the sound module configuration.

Configuration - General



Module configuration

Module mode:

At this point you determine whether the module is to operate in digital, analogue or mixed mode (see page 6).

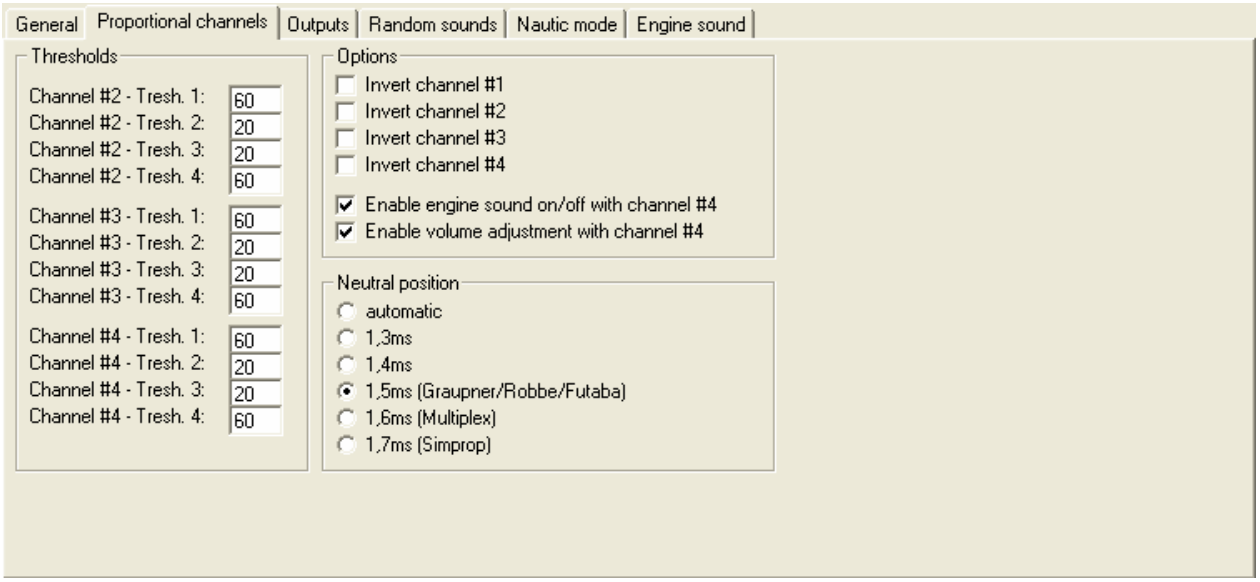
For the proportional channel #3 you have the option of operating it in normal mode, in EKMFA mode or in Nautic mode.

As an option the auxiliary sounds 1 – 4 can be swapped with the auxiliary sounds 13–16. Of course, the auxiliary sound 1 is normally triggered by the proportional channel #3, and the auxiliary sound 13 by the switched input X1/7. If you activate this option, then proportional channel #3 triggers auxiliary sound 13, and the three-stage auxiliary sound 1 is assigned to the switched input at X1/7. The purpose of all this is to allow both the three-stage sounds to be triggered using the switched inputs.

At this point you can also define the volume which will be set on the sound module after the data transfer.

To receive a more realistic driving sound you can adjust the volume of all sounds (driving sounds and additional sounds) to the speed. This means the faster the model drives, the louder the sounds will get.

Configuration – Proportional channels



Thresholds

At this point it is possible to set the thresholds for the proportional channels #2 - #4 at which the five ranges A, B, N, C and D are limited (see page 20).

Options

It is possible to invert the direction of the four proportional channels. For example, if the reversing light output is triggered when the vehicle moves forward, you can correct it by inverting the corresponding channel at this point.

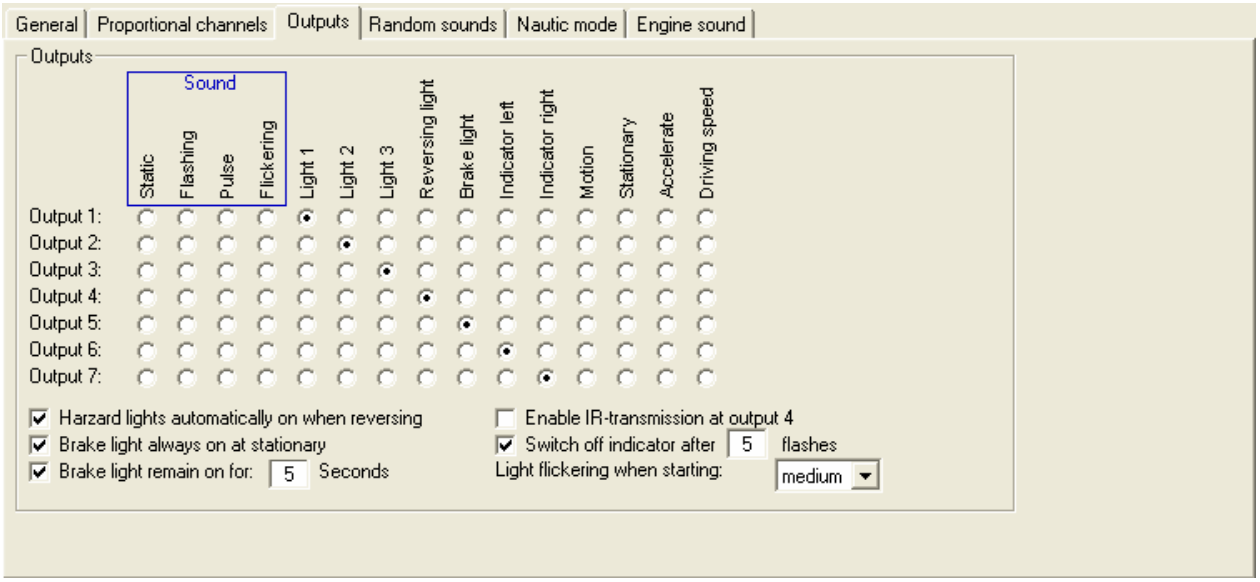
The software also offers the option of disabling the special functions of proportional channel #4, i.e. driving sound on/off and volume control.

Neutral position prop. #2 - prop. #4

At this point it is also possible to set whether the neutral position of the transmitter sticks should be read in automatically when the sound module is switched on, or whether a pre-defined value is to be adopted for the neutral position.

Caution: If you activate automatic neutral position, it is essential to check that your entire transmitter's sticks, sliders, switches etc. really are in the neutral position when you switch on the transmitter and / or the sound module. If you ignore this, it is possible that incorrect values will be read in, and in the worst case it will no longer be possible to operate the sound module correctly.

Configuration - Outputs



Outputs

Here you can assign the seven multi-function outputs to the various functions.

For the flashing outputs you can set the flashing speed by selecting how fast the outputs should flash (1 - 255).

For the flickering outputs you can set how intensive the outputs should flicker by adjusting the sensitivity (1 - 255).

For outputs which are required to be triggered when a particular running speed is reached, it is possible to set the threshold at which speed the outputs should be activated (1 - 100).

If you activate the select point ”Brake light always on at stationary”, the brake light is always switched on when the vehicle is in idle.

If you activate the select point “Hazard lights automatically on when reversing”, both flashers are always switched on as soon as the model starts moving backwards.

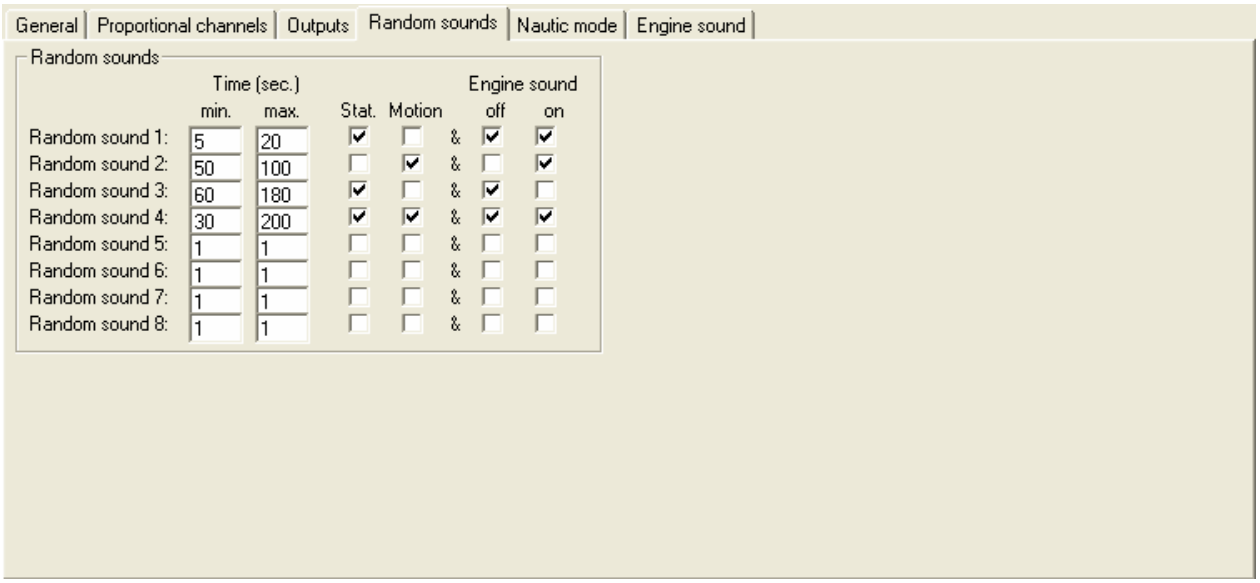
It is possible to set a variable period for the brake light to remain on by entering the desired seconds.

It is also possible to define a particular number of flashes after which the flashers should switch off automatically.

One option at this point is to activate Infra-Red (IR) transmission at output 4. This would typically be used to transmit the lighting signals to a truck trailer wirelessly. Caution: if you activate IR-transmission, you cannot use output 4 of the sound module for any other function.

By selecting the option “Light flickering when starting” all seven outputs will flicker while the engine start sound is played.

Configuration – Random sounds



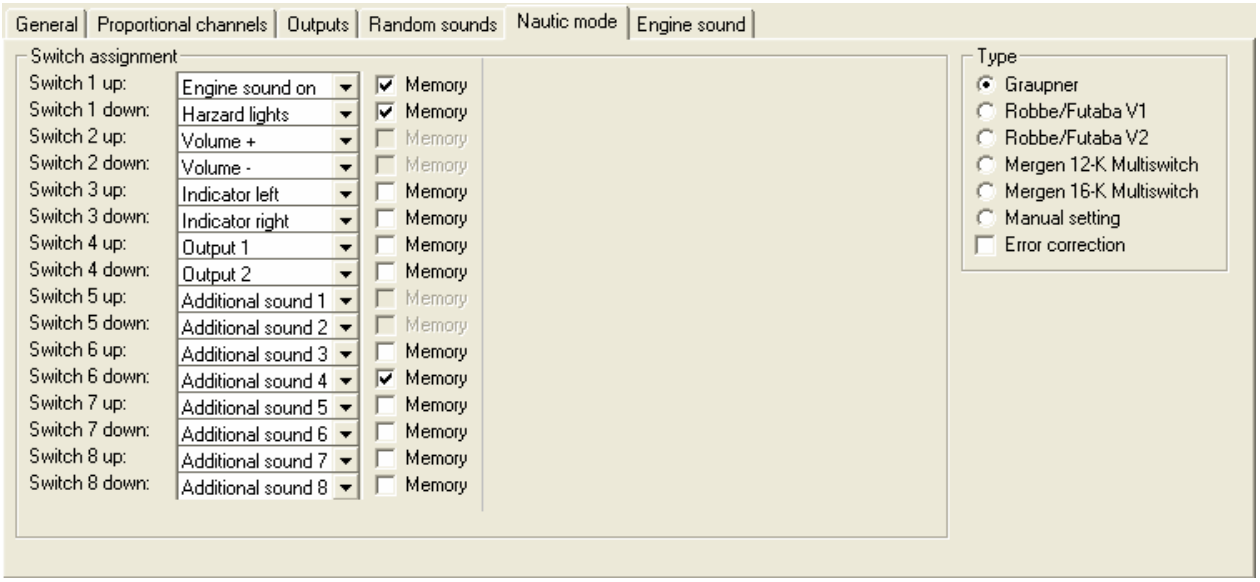
Random sounds

If you wish to play-back random sounds using your sound module (see page 31), at this point you can set the time intervals at which the random sounds are to be generated. The available time range is 1 to 255 seconds.

At this point it is also possible to define the conditions under which the random sounds are to be triggered, i.e. whether the random sounds are to be produced only when the model is stationary and / or moving, or whether the running sound must be on and / or off.

If a random sound is to be played, there must be at least one tick to right and left of the “&” character.

Configuration – Nautic mode



Switch assignment
The desired function can be assigned to each switch position at this point (see page 36).

At this point you can also activate a memory-function for each switch.

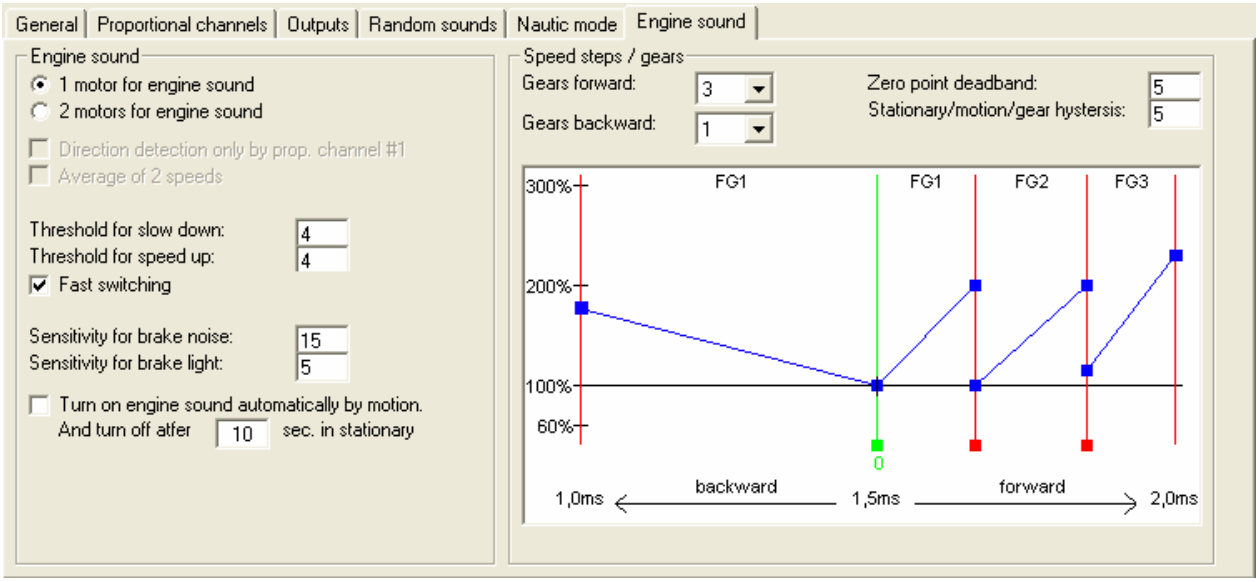
Please pay attention that it is not possible to use one function twice, therefore it is not possible to activate the same function over two different switches.

Type
Here you should select the type of your radio control system and your switch module.

If problems occur in picking up the Nautic signal, at this point you can activate error correction, as this may cause the Nautic switch transmission to operate more reliably. Activating error correction does slow down the transmission of the switched state slightly (approx. +200 ms) compared with operation without error correction. In particular in the case of some 2.4 GHz transmitters it is advisable to switch error correction on, as under certain circumstances incorrect switch positions are occasionally transmitted, and this could trigger undesired actions.

Manual settings
Opting for manual settings enables you to set the values for the transmission protocol of the Nautic mode manually. These values should only be altered as instructed. Normaly it is not necessary to set the values manually.

Configuration – Engine sound



Driving sound

At this point you can define whether the model is fitted with one or two motors whose speed dictates the driving sound.

If the model has two motors, you can decide whether the direction of the vehicle should be defined only by proportional channel #1. This may be necessary, for example, if the throttle channels and steering channels are superimposed using a mixer after the sound module. In addition you can decide if an average speed of both motors should be used to set the volume of the motor sound. Otherwise the faster motor will be used to define the sound volume of both motors.

Thresholds for “slow down” and “speed up”:
These thresholds set how strong the speed must be changed so that the normal driving sound is changed to deceleration or acceleration.

If you activate “fast switching”, the module immediately switches when the speed is changing. This is particularly useful for long sounds in the driving sound slots. If the module is required to simulate a slow-revving engine (e.g. single-cylinder motor), fast switching should be deactivated.

The brake sound threshold determines how strongly the vehicle must be decelerated before the brake sound is played.

The brake light threshold determines how strongly the vehicle must be decelerated before the brake light is switched on.

The higher these thresholds are set, the more must the vehicle be decelerated in order to trigger the associated functions.

Automatic driving sound activation:
As an option you can select an automatic driving sound activation (please see Turning on/off engine sound, page 31). The engine sound always switches on

automatically, as soon as you move the accelerator shortly while standing. After an adjustable time the engine sound is turning off automatically.

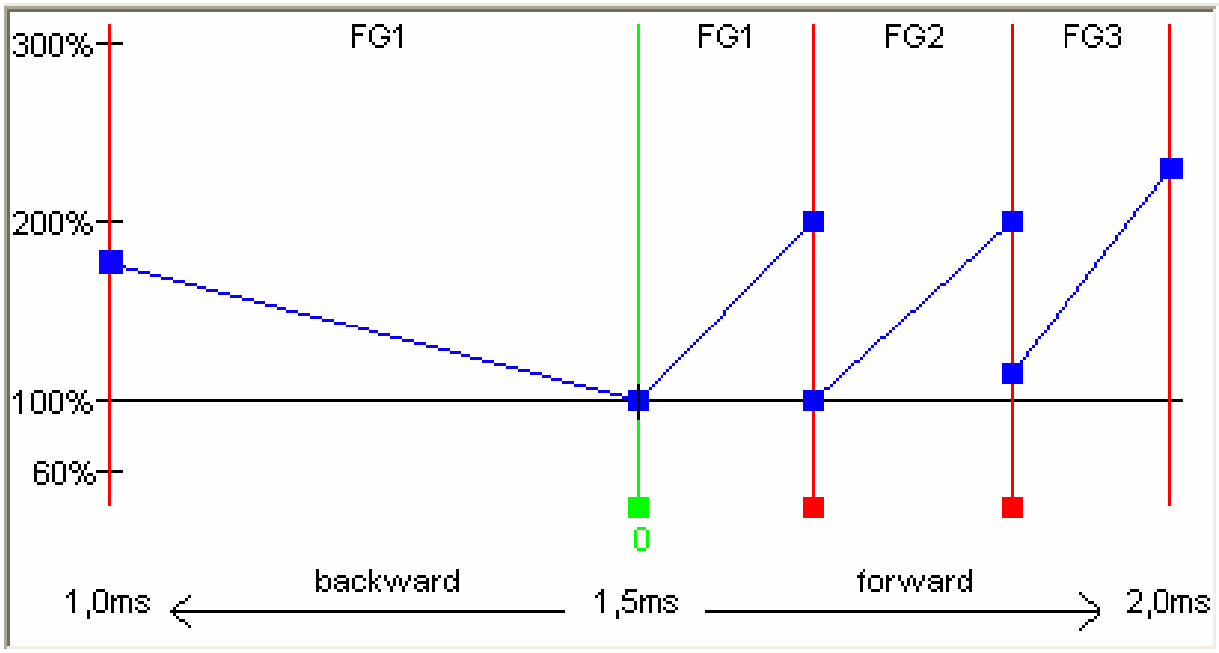
Speed steps/gears:
You can decide how many different speed steps/gears the driving sound for backward- and forward gears should have.

Zero point deadband threshold:
When your vehicle is standing, i.e. the drive motors are not running the sound module should generate the idle sound. If it occasionally plays the driving sound instead, then this value should be raised slightly.
On the other hand, if the idle sound continues to play when the vehicle is no longer stationary, then this value can be reduced slightly. Before adjusting please check first if the neutral position (green line) is set correctly!

Stationary/motion/gear hysteresis:
When the vehicle is moving very slowly and the sound constantly alternates between idle and running sound, then this value should be raised slightly.

Driving sound diagram:
The diagram shows graphically which driving sound/gear is played at the corresponding speed. In addition it is possible to set the driving sound directly in the diagram.

Adjustments with the driving sound diagram



With the driving sound diagram you can set:

- The neutral position of the joy stick (just in digital mode),
- The position of change sounds,
- The start and end thresholds for the different speeds and their corresponding, sounds for each driving sound (FG1 – FG5).

Explanation of the diagram:

The diagram consists of two axes:

1. The horizontal axe (from the left to the right) shows the driving speed of the model (respectively the position of the joy-stick). In digital mode the range goes from 1,0ms to 2,0ms. Resulting from the minimal and maximal pulse width of the proportional signal, which comes from the RC receiver. In analogue and mix mode the range is from -12V to +12V (motor voltage).

2. The vertical axe (from up to down) shows the play-back speed of the driving sound and the range comprises settings from 60% to 300%. This percent refers to the play-back speed of the driving sounds saved in the Sound module.

Explanation of the different coloured lines and quadrates in the diagram

Green line
In our example you can see in the middle at 1,5ms a green line which indicates the neutral position of the joy-stick. In case the joy-stick is in the neutral position, the module idles and the sound module plays the idle noise.

In digital mode the neutral position can be adjusted with the green quadrate (below the line). Just click with the left mouse button on the green quadrate, hold it and move the mouse to the right or the left to change the neutral position.

In analogue or mix mode the adjustment of the neutral position is not necessary and thus not possible.

Red lines
The both red lines on the outside left (1,0ms) and on the outside right (2,0ms) represent the maximal driving speed (backwards and forwards). The other red lines below with the small red quadrates indicate the driving speed at which the driving sound/gear should be changed. The thresholds can be adjusted at the red quadrates. As soon as the driving speed reaches/excess the red line, a change of the driving sound takes place.

Depending on the adjusted amount of speed steps/gears the same amount of red lines will appear.

Blue lines
The blue lines show the play-back speed (60%-300%) of the driving sound corresponding to the model speed. 100% represent the original play-back speed (the same speed as the original sound is played at the PC). At 300% the sound is played three times as fast the original sound and the engine sounds faster. At values smaller than 100% the sound is played more slowly.

On the right and on the left of each blue line is a blue quadrate where you can set the start and end play-back speed for each driving sound. At these quadrates you can set the different speeds with the left mouse button.

If the cursor is on one of the coloured quadrates further explanations of the value and the current value occurs below the diagram.

Approach of setting the driving sounds

1. Adjustment of operating mode:
Please set in your sound teacher the required operating mode: digital, analogue or mix mode (page 6)

2. Adjustment of neutral position:
In digital mode you have to set the neutral position of the joy-stick in the driving sound diagram. In analogue and mix mode this adjustment is not necessary.

In Case you do not know the neutral position of your transmitter, you can see the value with the help of the diagnosis function of your Sound-Teacher.

1. Connect the proportional channel #1 (X2/1) of the sound module with a servo patch cable and the corresponding receiver output.
2. Switch on the transmitter, the receiver and the sound module.

3. Connect the sound module and your PC with a USB cable and start the Sound-Teacher.
4. Open “Diagnosis” (in Menu Help - Diagnosis) and put the joy-stick in the neutral position. You can read the value at proportional channel #1.
5. Close the diagnosis

Now you can change the green line in your driving sound diagram to the neutral position of you joy-stick. Mostly the neutral position is at 1,5ms.

3. Adjustment of speed steps/gears:

Please set the required speed steps/gears for backwards and forwards in the Sound-Teacher.

4. Adjustment of thresholds:

If you choose more that one speed step/gear, red lines will occur automatically in the driving sound diagram to set the thresholds for each sound (FG1-FG5).

5. Adjustment of start and end speed of the play-back speed of driving sounds:

The play-back speed of driving sounds can be adjusted by shifting the blue quadrates in the diagram and therefore the sounds can be adjusted to the driving speed of the model.

The play-back speed can be affected by the trimmer P1 as well. Please consider that the change sounds may not fit exactly to the driving sounds anymore. Thus we recommend leaving the trimmer in the middle and adjust the sound speed with the driving sound diagram.

In case that interruptions in the driving sound appear while driving at high speed, please convert and save the sounds at the slots “FG1 – FG5” in 11,025kHz sample rate.

6. Control of the driving sounds:

Next you should check if all slots are occupied with the necessary driving sounds. For example if you like to have three gears for your driving sound you need to use FG1 - FG3 for your different sounds. Otherwise your sound module might get problems with finding the different sounds.

Uploading sounds into the Sound module

!!! ATTENTION !!!
If the Sound module is only powered via the USB lead, do **not** connect the seven switched outputs and do **not** switch them on!

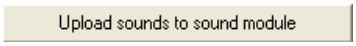
If you ignore this and you switch on the outputs, the current required by the connected loads, will be drawn directly from the USB port. Under unfavourable circumstances this could ruin your PC's USB port!

Therefore put off the ribbon cable from X3 during the programming!

For the upload of new sound files or a changed configuration, you connect the supplied USB cable to your PC and then to the Sound module. The Sound module is supplied with power over the USB port; it must be not powered by an external power source (battery).

You start the USM-RC Sound-Teacher now and the new sounds can be selected, and/or make the wanted configuration of the Sound module.

Only the complete sound files can always be uploaded into the Sound module, not every sound separately.

Through a click onto the button 

the file transfer is started. Depending on the quantity of data, this process may take up to 4 minutes. After the upload, the files are available in the Sound module and can be played. During the transfer of the sound files, always the configuration of the Sound module is transferred automatically.

If only a setting in the configuration is changed, the whole sound files do not need to be uploaded again. It suffices then to transfer only the configuration. This happens through a click on the button .

During the transfer to the Sound module the red LED flashes.

If an error happens during the transmission, this is shown at the PC. If a transmission error occurs often, you should restart your PC, close all not needed programs and try the transfer again.

Attention: The sounds and the configuration cannot be downloaded from the Sound module!

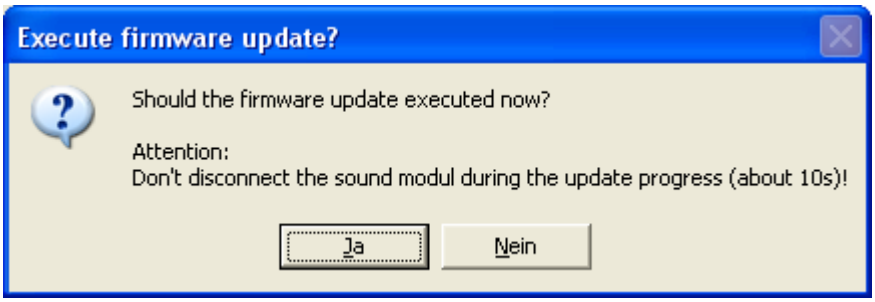
Firmware update

Also the firmware (the internal software) of the Sound module can be updated by the USM-RC Sound-Teacher

With the menu **File → Download firmware from the internet** it can be checked whether a new firmware (e.g. with new functions) for the USM-RC Sound module is available. You can download these from our internet page to your hard disk.

The firmware update is uploaded to the Sound module by the USB cable. Connect the Sound module with the USB-cable to your PC. An external power supply isn't necessary.

With the menu **File → Update firmware** you can start the update. At first the version of the firmware is read out from the Sound module and shown. Now you select the new firmware (.bin file) on your hard disk, which should be uploaded to the Sound module. After loading the firmware file, the update is started by a click on the „Yes"-button.



Now the Sound module may not be disconnected from the USB cable! The pure update takes now about 10s. After this, the Sound module can be used with the new firmware as usual.

Converting sound files

If the sound files aren't in the necessary format, they must be converted before they are able to be transferred into the Sound module.

Every arbitrary sound converter which offers the necessary functions can be used for this.

There is a demo version of the software **„GoldWave"** on the supplied CD. You find the software in the folder **„Goldwave"**. For installing the software, you start the „CD-Installer", click on „Goldwave installieren" and follow the instructions on the screen.

This program is only a free test version which has a single restriction, it allows only saving files with maximum sound length of 45s. Normally this should suffice for the most applications. You find further information about this software or other versions at the page: http://www.goldwave.com

Please notice that we aren't the developer of the software **„GoldWave"** and we don't offer any support for this product.

Here is an example how a conversion of a sound file is done with the software **„GoldWave"**:

1. Start the software **„GoldWave"**
2. Open the file that you want to convert
3. You click in the menu **„Effekte"** on **„Resample"** and choose 11025 or 22050.
4. Now save the file with a new name:
   a. Click on **„Speichern als"** in the menu **„Datei"**.
   b. Choose the folder and filename
   c. At **„Dateityp"** you have to choose **„Wave (*.wav)"**
   d. At **„Attribute"** you have to choose **„8-bit, mono, unsigned"**.
5. Now you can upload the new file with our software „USM-RC Sound-Teacher" to the Sound module.

If you have any questions please read the help section of the software.

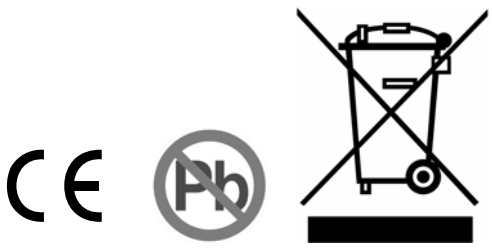
Record and edit new sounds with the PC

There are some sample sounds on the supplied CD-ROM, with which you can make first attempts with the Sound module. The Internet offers a virtually infinite array of sound data which you can download generally for free and transfer them to your Sound module if you want to use your own sounds.

A good start to search a sound data is to enter the name of the desired sound and the term “download” into any search engine, e.g. (http://www.google...).

A further possibility is the recording of own sounds with your sound card. As sources for example a cassette recorder, a MP3-Player, a CD/DVD or a microphone can be used.

In following example it is shown how you can do this with the software **„GoldWave**".

1. Start the software **„GoldWave**"
2. Choose in menu **„Datei**" the entry **„Neu**".
3. Click in the opened window on **„Radio**" and then on **„OK**".
4. Adjusting the volume for the recording source (e.g. line, microphone or audio CD):
   a. Choose in the menu **„Werkzeug**" the entry **„Lautstaerkeregler**" (opens the configuration of the volume).
   b. Adjust the volume at the wanted recording. Normally the slider is mostly in the upper third. During the recording, the recording level indicator in windows **„Gerätekontrolle"** should reach maximally the yellow field.
   c. Close the window **„Lautstaerkeregelung**"
5. With a click on the record button in the window **„Gerätekontrolle"** the recording starts.
6. Control now whether the volume control which you have done in step 4 was correct. If necessary correct your volume configuration.
7. With a click on the stop button in the window **„Gerätekontrolle"** the recording stops.
8. Now in the blue window the recorded sound appears. You can listen to the recorded sound by a click on the play button .
9. The sound can be edited by the extensive functions of the software. Now a example how you can cut a sound:
   a. Click with the **left mouse button** at the place where the sound should begin.
   b. Click with the **right mouse button** at the place where the sound should end.
   c. You click now in the menu **„Bearbeiten**" on **„Trimmen**", to remove the not needed sound.
10. Save now the file to your hard disk:
    a. Click on **„Speichern als”** in the menu **„Datei**".
    b. Choose the folder and filename
    c. At **„Dateityp”** you have to choose **„Wave (*.wav**)"
    d. At **„Attribute**" you have to choose **„8-bit, mono, unsigned**".
11. Now you can upload the new file with our software „USM-RC Sound-Teacher" to the Sound module.

If you have any questions please read the help section of the software.