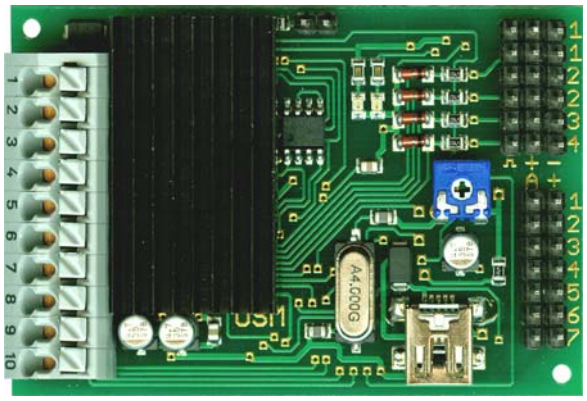
Operating Manual

Sound module USM-RC



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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 faithful as possible, speed-dependent driving sound (e.g. engine sound). To make the background noise perfect, in addition to the driving sound, up to 16 additional sounds can be played. Automatic turn on-, turn off, starting-, stopping-, idling-, braking- and driving noises can also be played. Also another 8 conveniently configurable random sounds are possible.

The sound output occurs on this module four channeled, so in addition to the driving sound, 3 further additional-/random sounds simultaneously can be played.

The information of the driving speed (up to 75 steps!) can be taken from 1 to 2 motors (analogous operation), or 1 to 2 proportional channels (digital operation) of the receiver are used for the speed information.

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

Since there is already an efficient audio amplifier on the board, only a loudspeaker needs to be connected for the sound output.

At 7 switching outputs for example LEDs, lamps, relays can be connected, and different lighting effects (light, stop light, indicators, hazard warning light, MG fire, flickering-light and so forth) can be realized.

Safety notes

- Read this operating manual carefully and keep it for a future use well!
- The integrated circuits on the sound module are sensitive to electrostatic charge. You may not touch therefore these components, before you don’t have discharged yourself (e.g. through a grip onto a grounded device).
- To guarantee an interference-proof operation, the sound module should be built in a suitable case.
- The sound module may be use only with those, in the technical data given supply voltages.
- Always switch off power before connecting the module!
- For children under 14 years, the using of the sound module is not suitable.

Technical Data

Supply Voltage (U_b):	5 – 14V DC
Power consumption:	Standby-current: ca. 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) - 2 mulitfunctional outputs - light - reverse drive light - stop light - indicators (left and right) / hazard warning light
Proportional Inputs:	4 pieces
Voltage inputs for drive speed:	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:	380 seconds (at 11kHz)
Supported sound files:	WAV-format, 8 bit, mono, 11kHz or 22kHz
Sound output:	12 bit D/A-converter
Number of possible sounds:	75 for driving noise in full load 75 for driving noise in partial load 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 driving 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 A
Permissible ambient temperature:	0 – 60°C
Permissible relative air humidity:	max. 85%
Measurement:	67 x 44 x 16 mm

Operating Modes: Digital- and analogue operation

In order to make the sound module as universally usable as possible, 2 different operating modes are available. Since the operating mode is very decisive for the possible functions, and particularly for the connection of the sound module, it should be decided now at the beginning, which one of the two operating modes is better suitable for the respective model. The operating mode of the sound module, is set in the USM-RC Sound-Teacher (see page 32).

If possible, always the digital operation should be used, because this offers more functions than the analogous operation.

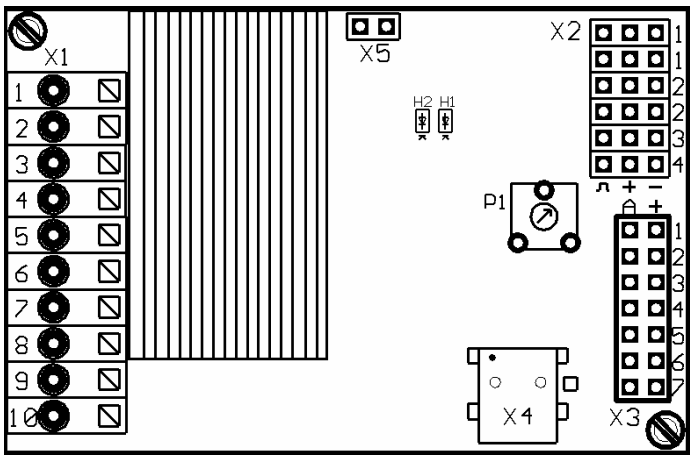
Digital operation:
The digital operation will be presumably always be used if you use standard RC remote control radios and receivers with PPM-signals. Here is the sound module connected directly to the RC-receiver, and it recognizes the driving speed directly from 1 or 2 proportional channels (parallel to the speed controller). Via 2 more proportional channels, up to 12 additional sounds can be played, the engine sound can be switched on and off, the volume can be adjusted, also light and indicators can be switched. Via digital switching inputs also another 4 more additional sounds can be played.

Analogous operation:
The analogous operation always becomes used, if you didn't have a "standard" RC equipment.

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

Because of the missing proportional channels, as many functions unfortunately are not possible in the analogous operation, as in the digital operation. So for example you can only activate 6 additional sounds with 6 switching inputs. Also the light and the volume cannot be switched or controlled here by the remote control.

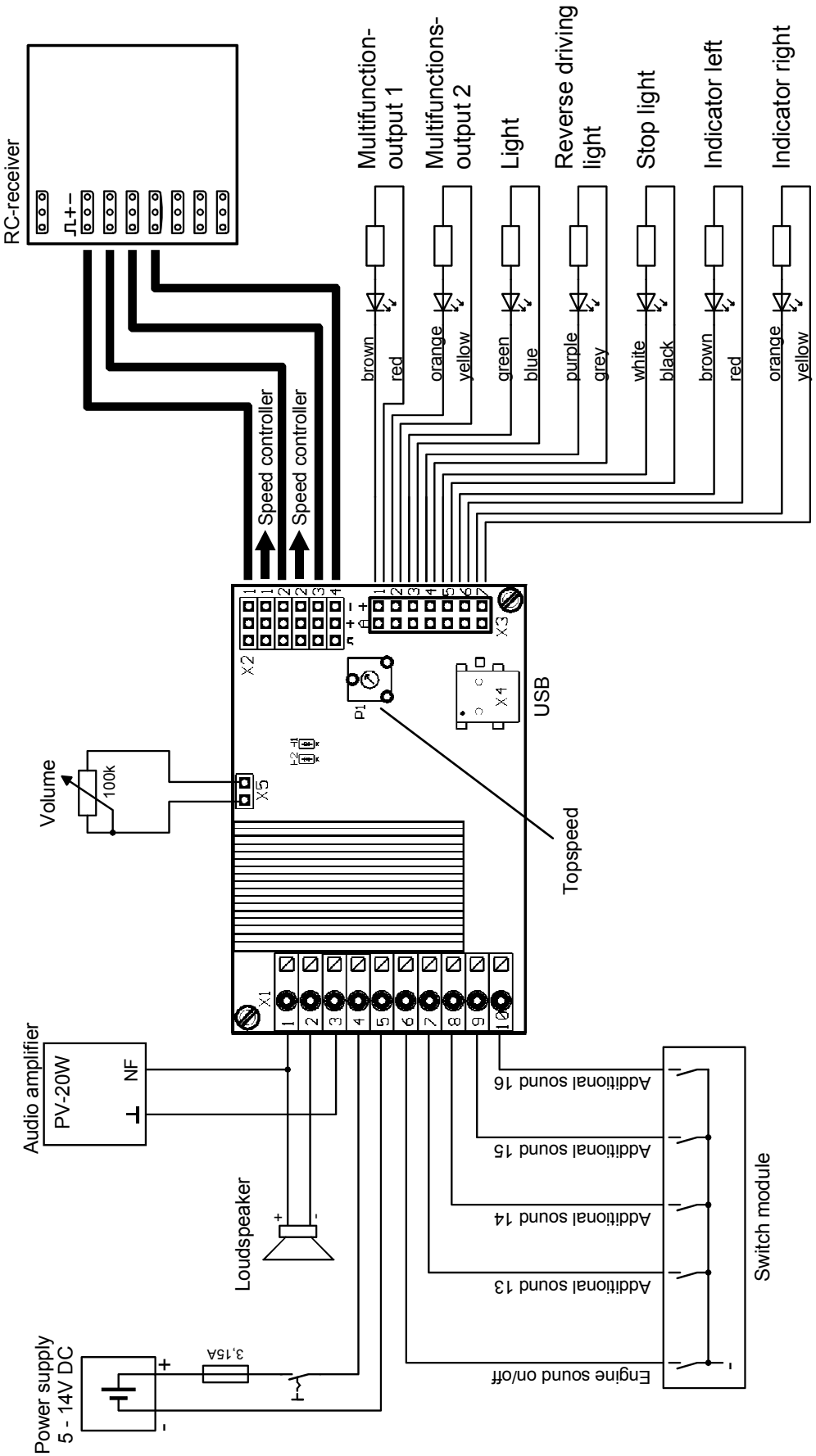
Pin assignments in digital operation



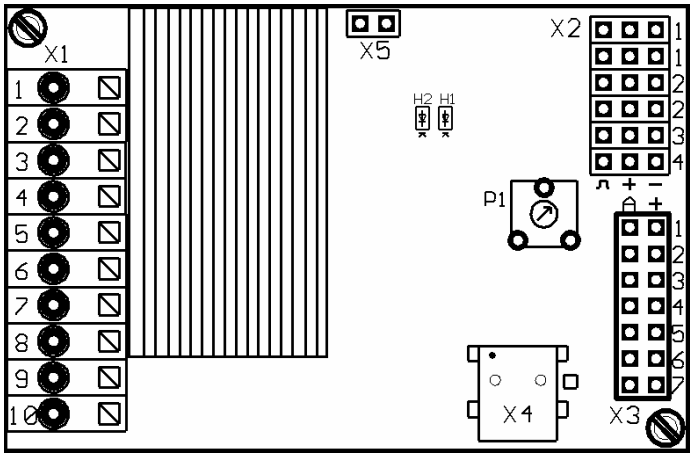
Connections on the sound module:

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 (multifunctional output)
X3/2	Connection for output 2 (multifunctional output)
X3/3	Connection for output 3 (light)
X3/4	Connection for output 4 (reverse driving light)
X3/5	Connection for output 5 (stop light)
X3/6	Connection for output 6 (indicator left)
X3/7	Connection for output 7 (indicator right)
X4	USB connector
X5	Connection for the potentiometer for the volume control

Wiring diagram for digital operation



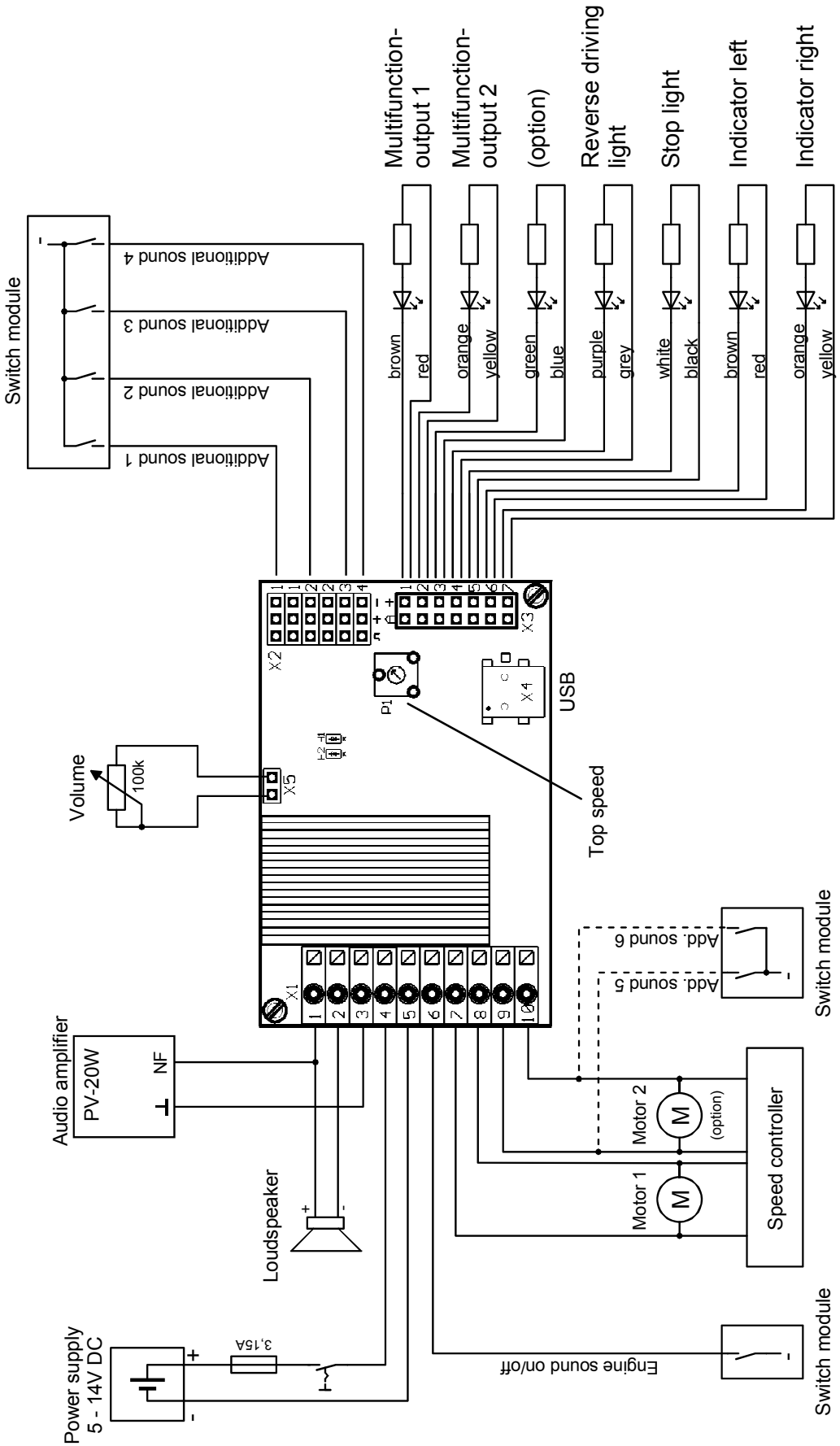
Pin assignment in analogue operation



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 (multifunctional output)
X3/2	Connection for output 2 (multifunctional output)
X3/3	Connection for output 3 (option)
X3/4	Connection for output 4 (reverse driving light)
X3/5	Connection for output 5 (stop light)
X3/6	Connection for output 6 (indicator left)
X3/7	Connection for output 7 (indicator right)
X4	USB connector
X5	Connection for the potentiometer for the volume control

Wiring diagram for analogue operation



Installation of the sound module

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

Connection of the sound module

The connection of the supply voltage, the connection of the loudspeaker and the connection of the outputs are always identical, independent whether you would like to use the module in the digital or analogous operation.

The remaining wiring is dependent in which operating mode you want to use the module.

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 in from above, with a small screwdriver, onto the actuating lever of the terminal. The wires should be approximately 7-8mm stripped and before connecting ideally be tin-plated.

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

We recommend switching also a fuse (3,15A) into power line, so if you have a wrong wiring or a defect, you don't get any greater damages at your model and the sound module.

As an option you can connect a switch into the power supply of the sound module to make it powerless. There is especially an advantage with battery used models, if you don't want to have a permanently sound.

Connection of the loudspeaker:
The positive pole of the loudspeaker is connected into the terminal X1/1 the negative pole is connected into the terminal X1/2.

Connection of the outputs:

The 7 outputs of the module are on 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. Per output there are always 2 pin's availably, at which the load (e.g. lamps, LEDs, small engines) can be connected.
The pin at the board edge is the positive pole, next to the pin is the output (switched negative pole).

Output	Function	Ribbon cable	
#1	multifunctional output 1	brown (-)	red (+)
#2	multifunctional output 2	orange (-)	yellow (+)
#3	light	green (-)	blue (+)
#4	reverse driving light	purple (-)	grey (+)
#5	stop light	white (-)	black (+)
#6	indicator left	brown (-)	red (+)
#7	indicator right	orange (-)	yellow (+)

So that the cable colors are right, the ribbon cable must be put on correctly on the connector (it could be put up theoretically rotated around 180 °, however, the configuration is changed then). The brown wire must point above (board middle), the yellow below (board edge).

The switched voltage at the outputs is always as high, as the supply voltage of the sound module. If the sound module is supplied e.g. with 12 V, only lamps with 12 V should be connected. If you want to connect LEDs, series resistors are always needed. In addition attention must be paid at LEDs to the correct polarity. The series resistors for the LED's are depended from the supply voltage, the LED-color and the LED-current. Here is a small table of series resistors, they can used with standard LEDs (approx. 15 mA):

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

If you want to connect several LEDs to one output, use for every LED an own series resistor. It's better not to make any series circuits of the LEDs.

Connection of an external audio amplifier (option):
To the terminals X1/1 and X1/3 an additional audio amplifier can be connected. We recommend using our **PV-20W** as audio amplifier. This amplifier is optimally designed for the USM-RC sound module. Of course also other amplifiers can be connected, but a voltage divider which divides the audio-voltage, to the voltage of the audio-input, of the used amplifier is needed.

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

It is also important to pay attention, to most possible „clean" wire routing. You should use always short wires and don't make 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 operation

Connection of the proportional channels

At connectors X1/1 - X1/4 up to 4 proportional outputs of an RC receiver can be connected. You use the 2 supplied servo patch cables for the connection. If more than 2 proportional channels should be connected, further servo patch cables are needed, which you can order in our shop.

There is a labeling that characterizes where the 4 channels on the board are. The channels #1 and #2 are carried out twice, so the proportional signal keeps on being able to be continued directly to the speed controller or servo. If further speed controllers or servos should be connected to the channels #3 and #4, Y-cables are needed.

To put on the servo patch cables onto the sound module, be sure that the brown wire points to the board edge (to the right), the orange wire to the board middle (to the left).

With the 4 proportional channels following functions on the sound module can be triggered:

Channel	Model with 1 motor	Model with 2 drive motor
#1	speed-dependent driving noise	speed-dependent driving noise
#2	additional sounds 9-12 light, indicators, hazard warning light	speed-dependent driving noise
#3	additional sounds 1-4	additional sounds 1-4
#4	additional sounds 5-8 driving sound on/off volume control	additional sounds 5-8 driving 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 you can't activate the additional sounds 9-12 with this proportional channel. In the same way, no outputs for light, indicators and hazard warning light can be switched then.

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 switched to the respective input. Normally switch modules are used for this (as our RC-SM-2 or other standard multi-switch-modules). Because these switch modules are all negativ-switched, only the outputs of the switch module must be connected to the inputs of the sound module.

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

In the digital operation, the engine sound can also be switched directly with the proportional channel #4.

Connection of the sound operation in analogue mode

Connection of the motors

In the analogous operation, 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 occurs parallel to the existing connections of the speed controllers which powers the motors.

To the polarity of the motor connections, attention must be paid only if you want to use the output for the reverse driving light. 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, with which 2 more additional sounds and the indicators can be activated.

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 do not have any functions.

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

Terminal X1/6 is the switching-input, with which the driving sound is turned on and off. For switching, simply 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 driving sounds will be always switched off!

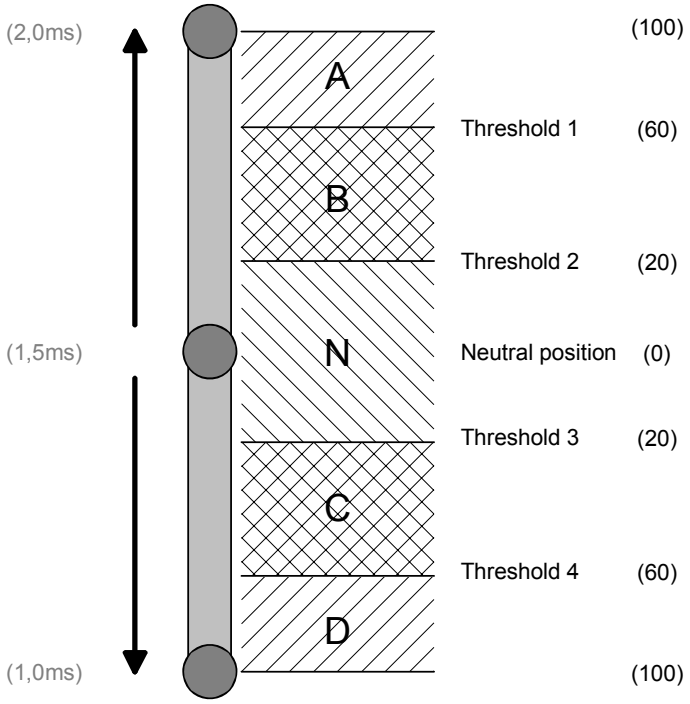
Functional assignment at proportional channels #1- #4

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, additional sounds 9-12) are not available.

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

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

The same principle is valid also for a horizontal 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:

Position	Function	
	short (0,5-1,0s) in position	**long (>2,5s) in position**
A	additional sound 9 (#22) indicator left on/off	light on/off
B	additional sound 11 (#24)	
C	additional sound 12 (#25)	
D	additional sound 10 (#23) indicator right on/off	hazard warning light on/off

Assignment of channel #3:

Position	Function
A	additional sound 1 (#10 - #12)
B	additional sound 3 (#16)
C	additional sound 4 (#17)
D	additional sound 2 (#13 - #15)

Assignment of channel #4:

Position	Function	
	short (0,5-1,0s) in position	**long (>2,5s) in position**
A	additional sound 5 (#18)	volume control on
B	additional sound 7 (#20)	
C	additional sound 8 (#21)	
D	additional sound 6 (#19)	engine sound on/off

The functions which are here described, do not have to be used all of them. It is only supposed to be represented in this overview, what with the channels #2 - #4 can be done.

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

Neutral position

You can configure in the Sound-Teacher, whether the neutral position of the 4 sticks should be read in automatically after switching on the power supply of the sound module, or whether the neutral position is put on the usual default value (1,5ms) firmly.

If the automatic neutral position search is used, pay attention that the sticks are really in neutral position, during the switch-on of the sound module!

Stick simulation with switches

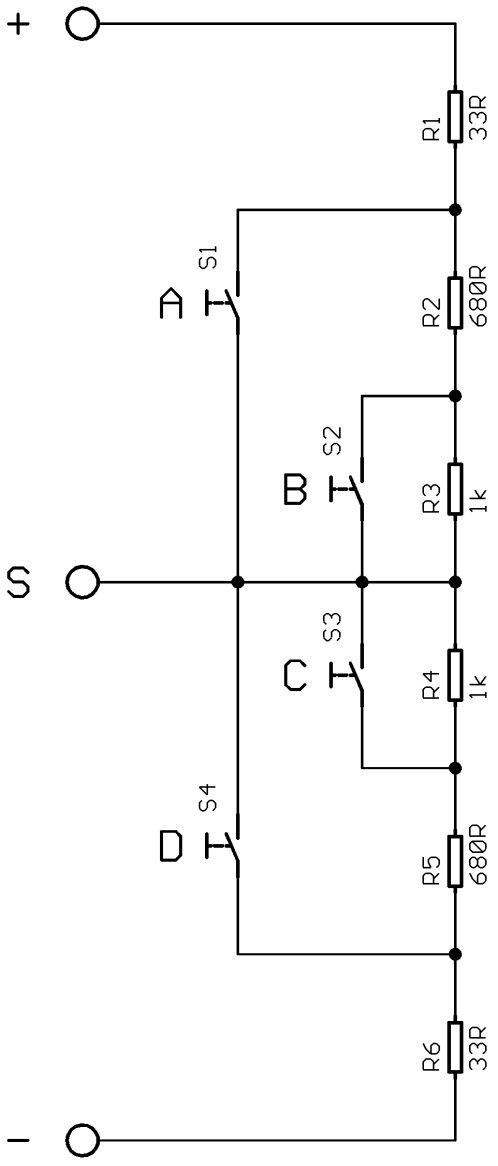
To use all functions of the proportional channels #2 - #4 conveniently, you can simulate the different potentiometer positions of a stick, through a simple keystroke. If you press the key S1, a stick position is simulated for position A.

Often the available sticks are already reserved by other functions, but 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 this per channel.

With the indicated resistors values, this schematic should work with all standard remote controllers. 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 - 32 Ω and was designed for the respective maximal power. The maximum power and the volume of the sound module, is depending very much from 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 8 Ω	1,3W	2,0W	3,0W	4,1W	-
Power at 16 Ω	0,6W	1,0W	1,5W	2,1W	3,5W
Power at 32 Ω	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 16 Ω may be connected. Otherwise the amplifier circuit could become too hot.

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

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

If the volume of the built-in amplifier does not suffice, or you would like to use lower ohm-leveled loudspeakers (2 - 4 Ω), also an external, more efficient amplifier (e.g. our PV-20W) can be connected.

At every amplifier a certain heat arises through power dissipation that must be mentioned by a cooling element into the air. Generally attention should always be paid to a heat dissipation as good as possible (air circulation).

Volume control

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

You connect this potentiometer to connector X3 (see wiring diagram, page 7).

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

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

If you move the stick now in position D, the sound becomes louder. In position A the Sound becomes quieter. In order to hear, how you adjust the volume, it is of course reasonable, to switch the engine sound on, before adjusting the volume.

If the stick from channel #4 is not moved for 5 seconds anymore, then the volume controlling is switched off. The red LED turns off and the sound output is interrupted very shortly. The stick has now his normal function.

General notes to the volume

Please also notice that the sound data's which you transfer into the sound module should have an optimal modulation. Therefore e.g. not already record the sounds much too quiet.

With the supplied software „GoldWave" you can adjust the volume of the single sound files accord to your wishes.

With low supply voltage (e.g. 6 V) it can happen that the Sound is overdriven, so it can come to an unclean sound output (scratch noise). In this case, the volume should be turned down a little.

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:

Slot	Sound
#1	Turn on noise
#2	Idling noise
#3	Starting noise (idling → drive)
#4	Driving noise (depend on speed)
#5	Driving noise partial load (depend on speed)
#6	Stopping noise (drive → idling)
#7	Turn off noise
#8	Reverse driving noise
#9	Brake noise
#10	Additional sound 1 (Tune in)
#11	Additional sound 1 (Loop)
#12	Additional sound 1 (Tune out)
#13	Additional sound 2 (Tune in)
#14	Additional sound 2 (Loop)
#15	Additional sound 2 (Tune out)
#16	Additional sound 3
#17	Additional sound 4
#18	Additional sound 5
#19	Additional sound 6
#20	Additional sound 7
#21	Additional sound 8
#22	Additional sound 9
#23	Additional sound 10
#24	Additional sound 11
#25	Additional sound 12
#26	Additional sound 13
#27	Additional sound 14
#28	Additional sound 15
#29	Additional sound 16
#30	Random sound 1
#31	Random sound 2
#32	Random sound 3
#33	Random sound 4
#34	Random sound 5
#35	Random sound 6
#36	Random sound 7
#37	Random sound 8

Engine sound (Slot #1 - #9)

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 offers also the possibility to imitate a driving noise under partial load, a reverse driving noise, a brake noise, a starting noise and a stopping noise. All engine sounds (therefore also the reverse driving and brake noise) play only when the engine sound is switched on.

Turn on noise (#1)
The turn on noise is played when the engine sound is switched on. After the turn on noise was 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 driving noise.

Idling noise (#2)
The idling noise is always played when the vehicle is in idle. The sound is played in an endless loop. It suffices therefore, when in this sound slot a relatively short sound (approx. 1-2s) is stored.

Starting noise (#3)
The starting noise is played uniquely when the vehicle sets off (idle → drive).

Driving noise (#4)
The driving noise is always played when the vehicle drives. The driving 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 driving noise also in the corresponding speed. In this sound slot the driving noise is stored in the **slowest** driving speed. The sound module produces all faster driving steps (up to 75) itself.

Driving noise in partial load (#5)
When the driving speed of a real vehicle is reduced, the sound character of the driving noise changes (engine produces less power). This effect is also possible with this sound module. In slot #5 “another" driving noise can be stored, that always is played when the driving speed is reduced. The driving-noise in partial load is played speed-dependently, too.

Stopping noise (#6)
The stopping noise is played uniquely when the vehicle stops (drive → idle).

Turn off noise (#7)
The turn off noise is played when the engine sound is switched off.

Reverse driving noise (#8)
The reverse driving noise is played when the vehicle drives backwards. This could be e.g. the beeping of a reverse driving warn sound of a truck.

Brake noise (#9)
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 that is in the respective folder and upload the new sound with the USB cable to the sound module.

The great advantage of this sound module is that you also are able to edit and compile your own driving noises. That could make your model into a unique, individual object.

Additional sounds 1 - 16 (Slot #10 - #29)

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

To play an additional sound, it must be started with a start pulse. This happens either, if you activate the corresponding switching-input shortly or, in the digital operation, putting the stick into the corresponding position (A, B, C or D). When an additional sound is started once, it will be played always completely to the end.

Additional sound (Slot)	Digital operation	Analogue operation
1 (#10 - #12)	Prop. #3 - Pos. A	X2/1
2 (#13 - #15)	Prop. #3 - Pos. D	X2/2
3 (#16)	Prop. #3 - Pos. B	X2/3
4 (#17)	Prop. #3 - Pos. C	X2/4
5 (#18)	Prop. #4 - Pos. A	X1/9
6 (#19)	Prop. #4 - Pos. D	X1/10
7 (#20)	Prop. #4 - Pos. B	-
8 (#21)	Prop. #4 - Pos. C	-
9 (#22)	Prop. #2 - Pos. A	-
10 (#23)	Prop. #2 - Pos. D	-
11 (#24)	Prop. #2 - Pos. B	-
12 (#25)	Prop. #2 - Pos. C	-
13 (#26)	X1/7	-
14 (#27)	X1/8	-
15 (#28)	X1/9	-
16 (#29)	X1/10	-

The two additional sounds 1 and 2 offers a special feature:
These sounds consist in each case of 3 single sound slots. When the additional sound 1 is started, the slot #10 is played at first once (tune in). Then the sound changes to the slot #11 (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 #12 (tune out) is played uniquely. Additional sound 2 works in same principle.

In this way, now such things 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 beautiful reverberation.

The tune in and tune out slots are only options that can be used, but they not have to be used. You can let these slots also simply free.

Random sounds (Slot #30 - #37)

Up to 8 random sounds can be played with the sound module USM-RC. The point of time of the sound playback, is determined then by a random generator. The time spans (min. /max.) can, for every sound separately, programmed by 1 - 250 seconds. In the same way it can be programmed for each of the 8 random sounds, under which conditions (idling/drive - engine sound on/off) the sound should plays. So you can define, e.g. at a tank a randomized “chain squeaking” is played, 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 at once.

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

Adjusting the driving sound to the top speed

With the trimmer P1 the top speed sound can be adjusted. Run your model with the highest driving speed and turn the trimmer until the wanted speed of the driving-noise is reached.

Switching outputs

The sound module has 7 outputs, which them for example lamps, LED, relays… can be switched.
These 7 outputs are assigned with:

Output #1 and output #2 (Multifunction outputs)
These two outputs can be programmed by the USM-RC Sound-Teacher with different functions.

These outputs can be related to one (or several) sound slots and switches always on, when the related slot is just playing. You can also specify whether these outputs static (always on), flickering or flashing types should be.

By flickering outputs the output is turned on again and again very shortly, dependent on the played sound. With this, fabulous light effects, as for example a fire simulation or a welding light, can be realized.
The thresholds, at which volume the flickering should begin, can be adjusted for each of the 2 outputs separately in the USM-RC Sound-Teacher. Values between 1 and 255 are possible. As larger the value, as higher the volume of the sounds have to be, to activate the flickering.

At flashing outputs, the output flashes during the time the sound is played. The flashing frequency can be chosen for every output separately in the USM-RC Sound-Teacher. Values between 1 and 255 are possible. 1 corresponds to the fastest flashing frequency (50Hz) and 255 of the slowest (0,196Hz).

The flashing frequency can be calculated as follow: f = 1 / (value x 0,02)

Output #3 (Light)
The output for the light is only available in the digital operation mode, and only, if the proportional channel #2 isn't used for a second drive motor. To switch the light on/off the stick from channel #2 must be put longer then 2,5s in position A.

Of course other things as light can be switched by this output.

Output #4 (Reverse driving light)
The output for the reverse driving light always switches on, when the vehicle drives backwards. If the sound module is configured for 2 drive engines, also both motors have to work backwards, to switch the reverse driving light on.

Output #5 (Stop light)
The stop light is turned on always shortly when the driving speed is reduced strongly. The sensitiveness can also be configured for that in USM-RC Sound-Teacher.

Output #6 (Indicator left)
To switch the indicator on or off, the stick of proportional channel #2 must be put very shortly in position A.

In the analogous operation the indicator is switched by the switching-input X1/9.

Output #7 (Indicator right)
To switch the indicator on or off, the stick of proportional channel #2 must be put very shortly in position D.

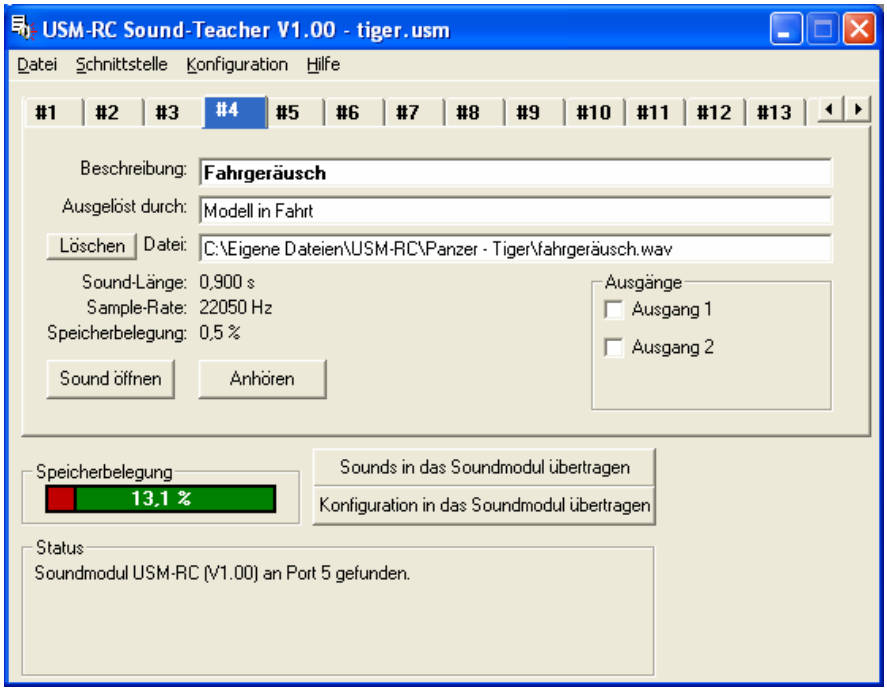
In the analogous operation the indicator is switched by the switching-input X1/10.

Hazard warning light
To switch the hazard warning light on or off, the stick of proportional channel #2 must be put for at least 2,5s into position D. In the analogous operation 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.

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 PC
- 16 MB RAM
- 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

Normally the “CD-Installer” starts automatically after you insert the CD-ROM. If this not happens, please start the file „CD-Installer.exe" which is in the root folder of the CD-ROM.

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

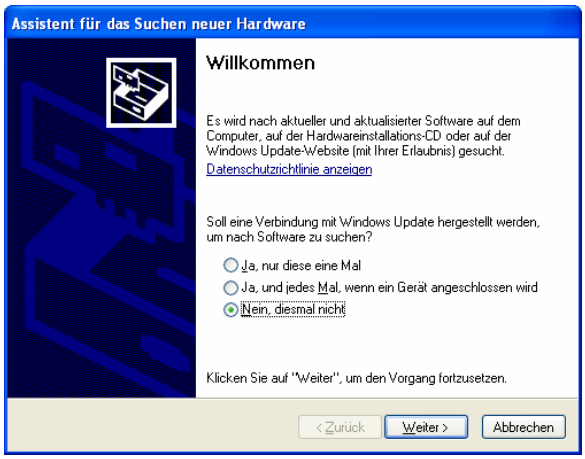
USB-Driver installation

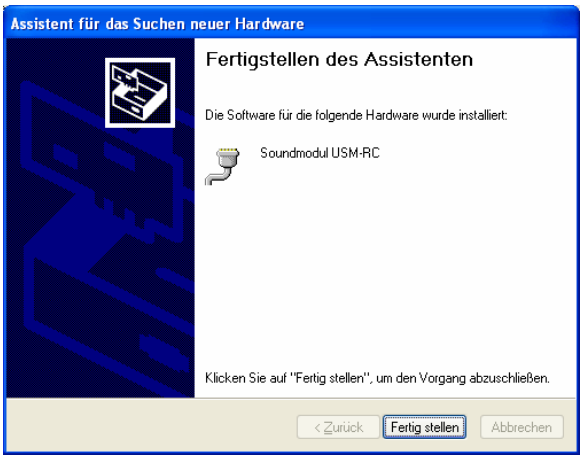
Before you start the USM-RC Sound-Teacher, the USB driver for the sound module should be installed first.

Connect the USB cable to a free USB port (1.0, 1.1 or 2.0) of your computer, and put the other end into the USB socket on the sound module. A further voltage supply is not necessary, because the sound module gets his power directly from the USB port.

The new sound module is recognized by the automatically hardware recognition and Windows 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.

Now you can basically click always on „continue" until the driver installation is finished.





Using the software ”USM-RC Sound-Teacher“

The design of the software was as simple as possible in order to make an intuitive handling possible.

Subsequently all functions of the program are explained shortly:

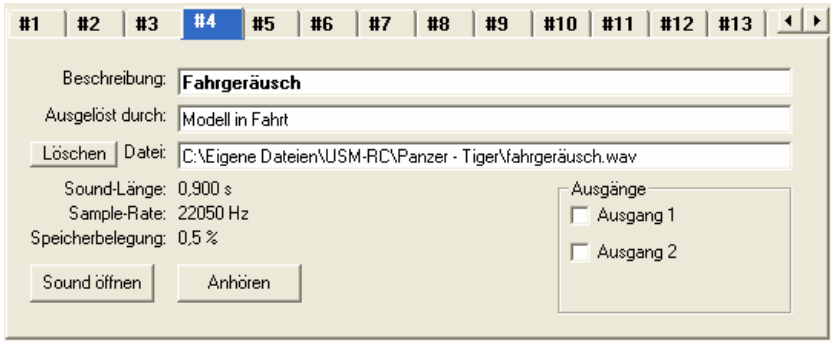
Menu:

Datei	**Neues Projekt erstellen**	Creating a new project
	Projekt öffnen	Opening an existing project
	Projekt speichern	Saving the current project
	Projekt speichern unter	Saving the current project with a new filename
	Firmware aus dem Internet laden	Downloading a new firmware from the internet
	Firmwareupdate durchführen	Updating the sound module with a new firmware
	Sounds aus dem Internet laden	Downloading new sounds from the internet
	USM-RC Sound-Teacher Update aus dem Internet laden	Downloading updates for the USM-RC Sound-Teacher
	Beenden	Closing the program
Schnittstelle	**Soundmodul suchen**	Searching the sound module at the USB ports
Konfiguration	**Konfiguration ändern**	Configuring the sound module
Hilfe	**Bedienungsanleitung**	Opening this operating manual
	Diagnose	Starting a diagnostic tool
	Info	Shows information about the software

Configuring sounds

In the sound module USM-RC up to 37 different Sounds can be stored in the slots. With the sound-select-bar you can choose the sound slot, which you would like to edit. Simply click for this purpose on the wanted number.

If data are already available for this sound number, these are shown and can be edited now.



Beschreibung	A description of the Sound in this slot.
Ausgelöst durch	Shows how the sound can be started.
Löschen	With this button the current sound file will be deleted.
Datei	Path and filename of the WAV-file, which is stored in this slot.
Sound-Länge	Length of the current sound in seconds.
Sample-Rate	Quality of the current sound.
Speicherbelegung	Shows you how much memory usage is needed in %.
Sound öffnen	With this button a new sound file can be loaded into the slot
Anhören	Playing the current sound over the PC-loudspeakers. Therefore a soundcard in the PC and connected loudspeakers are needed.
Ausgänge	Configure which outputs were activated by playing the current sounds.

Opening of sound files

With a click on the Sound öffnen 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. To be able to use this file, you have to convert it with a suitable program. How this works, is explained in an example on page 36**Fehler! Textmarke nicht definiert.**.

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

“Speicherbelegung” indicates how much memory is already occupied in the sound module.

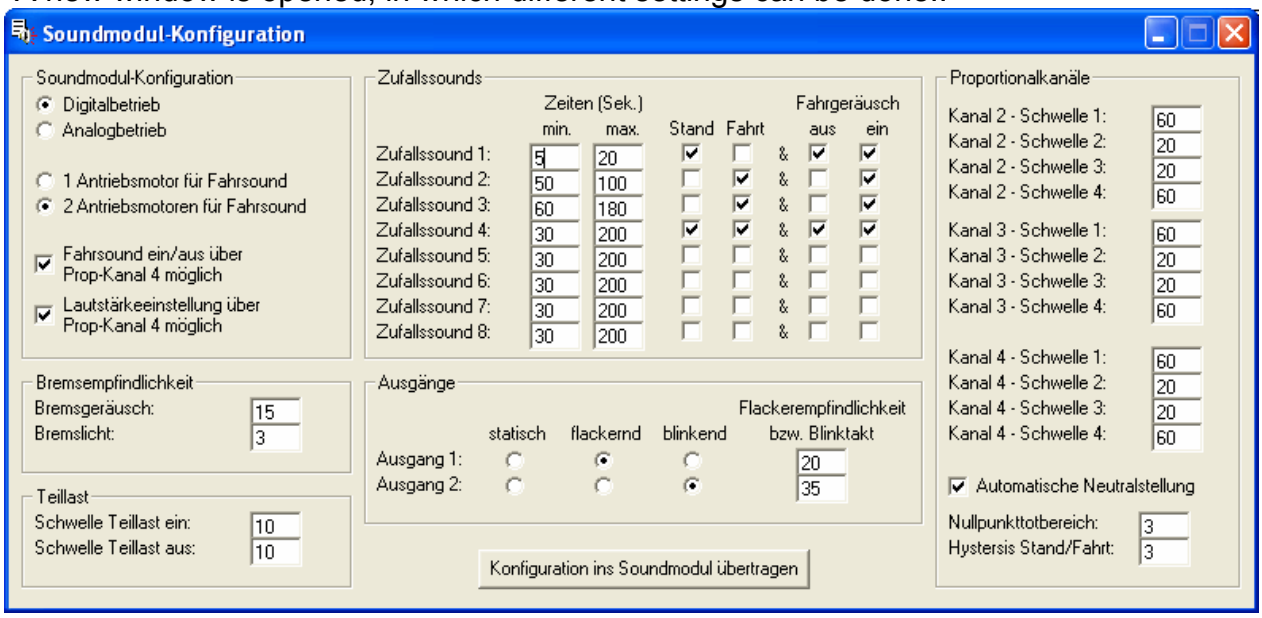
After all wanted sound files were assigned to their slots and the module was configured, it is recommended to save the complete project (**Datei → Projekt speichern**).

If you would like to delete a sound in a slot, select the slot, and click simply on the button Löschen.

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

Configuring the sound module

To make different settings on the sound module, please click in the menu **„Konfiguration"** on **„Konfiguration ändern".**
A new window is opened, in which different settings can be done..



"Soundmodul-Konfiguration"

Here is defined, whether the module should works in the digital or analogous operation mode (see page 5).

Here is also defined, whether the model has 1 or 2 driving motors.

You have here the option to deactivate the special functions of the proportional channel #4 (driving sound on/off and volume control).

"Bremsempfindlichkeit"

Here are 2 thresholds which are responsible for the brake recognition.

The threshold for the braking noise (sound #9) determines how strong the vehicle must be slowed down, so that the brake noise is played.

The threshold for the stop light determines how strongly the vehicle must be slowed down, so that the stop light lights.

The higher the thresholds are set, the more strongly must be slowed down, to activate these functions.

"Teillast"

With the 2 thresholds for partial load on and partial load off, will be configured how strongly the speed must be changed, that between full load (sound #4) and partial load (sound #5) is switched over.

“Zufallssounds”
If you want to play random sounds with your sound module (see page 25), you can configure here, in which temporally distances the random sounds are supposed to be played. Times between 1 and 255 seconds are possible.

Here is also configured under which conditions the random sounds should be activated. For example, whether the random sounds only should playing when the model stands and/or moves or whether the driving sound is on and/or off.

“Ausgänge”
The two multifunctional outputs can be programmed here. It can be defined, whether the outputs static, flickering or flashing types should be.

At flickering or flashing outputs you can configure how strong the outputs flicker and how fast they flash. Values between 1 and 255 are possible (see page 26).

“Proportional-Kanäle”
You can configure here, the thresholds which separates the proportional channels #2 - #4 into the 5 areas A, B, N, C and D (see page 16).

It can also be configured, if the neutral positions of the sticks should be read in automatically, after the switch-on of the sound module.

There are also another 2 more thresholds which are responsible for the optimal crossing from idling to drive. These 2 thresholds should only be changed, if it’s really necessary.

Thresholds for the zero dead zone:
When your vehicle doesn’t move and the drive engines doesn’t runs, but the sound module doesn’t play the idling noise and play the driving noise, this value must be increased.
If the idling noise is also still played although the vehicle already moves, this value can be reduced a little.

Hysteresis idling/drive:
If you drive very slowly and the sound changes always from idling noise to driving noise, this value should be increased a little.

If a value is changed in the configuration, the configuration must be uploaded to the sound module so that a change becomes effective!

While saving a project, the sound configurations of the slots and the configuration of the sound module are saved together in the project file.

Uploading sounds into the sound module

!!! ATTENTION !!!

If the sound module is only powered via the connected USB-cable, the 7 switching outputs may not be connected and/or may be switched on.

If attention is not paid to this, the needed current for the connected loads is pulled out directly from the USB port. This can destroy the USB port of the PC under unfavorable circumstances!

Put off the ribbon cable from X3 during the programming!

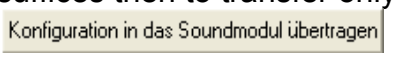
For the upload of new sound files or a changed configuration, you connect the supplied USB cable to your PC and then to the sound module. The sound module is supplied with power over the USB port, it must be not powered by an external power source (battery).

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. This can according among of files 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!

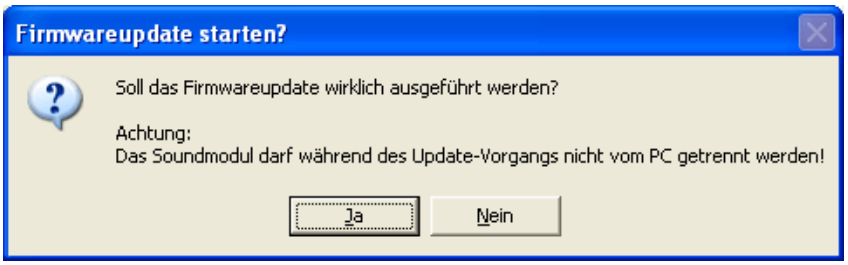
Firmware update

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

With the menu **Datei → Firmware aus dem Internet laden** 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 **Datei → Firmwareupdate durchführen** 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 5 seconds. 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 45 seconds. 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 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. But sometimes you want to use your own sounds on your sound module. The Internet offers an almost infinite number of sound files which you can download mostly freely and transfer them to your sound module.

You simply enter the wanted sound in with „download" into a search engine (http://www.google.com).

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 of the software.