



Model Sounds Inc.

SFX7.0 Sound Module

Version **4.0.1** Hardware Manual

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SPECIFICATIONS

- Sound file format : Uncompressed 16 bit/44100 samples/second maximum
- Supply voltage range : 10Volts – 26Volts
- Current Consumption: 165mA from receiver or USB supply. Switched output loads such as LEDs etc. are extra.
190mA from receiver or USB supply when writing to micro-SD Card
3Amps max. from main power supply of 26Volts when playing sounds
- Supplied micro-SD Card : 1GB – virtually unlimited 172 minutes of playback without looping!
- Loudspeaker Impedance : 4/8 Ohms – DO NOT use lower than 8 Ohms on voltages greater than 14V
- Output Power into 8 Ohms : 9 W/12V, 20W/18V, 40W/26 Volts supply
- Output Power into 4 Ohms : 18W/12V – higher voltages not permitted when using 4Ohms
- Number of Audio Channels : **TWO channel playback is possible using an external stereo amplifier.**
The onboard amplifier is mono and plays a mix of left and right channels.
- Audio Line Out Signal Level: 1.0V RMS – AC coupled into 10KOhms load minimum
- Size : 44mm x 68mm x 14mm
- Weight : 31 grams (1.1OZ)
- Output is Short-Circuit, Overload and Thermally Protected, BUT IS NOT REVERSE BATTERY PROTECTED.
- Up to sixteen sounds + Two separate Engine sounds :
- Three sounds can play simultaneously at 16 bits/44100 samples/second.
- Each Engine sound has speed proportional to its own Throttle input.
- Two Throttle outputs can drive ESCs directly avoiding need for a Y servo lead.
- Sound Select Modes : Switched R/C 1 x N, Switched R/C 1 x 1 and Proportional R/C,
Keypad or Rotary Encoder.
Modes are selected in the SFXPC4 SW Control Panel
- Switched R/C 1 x N : One ON/OFF channel or stick is used to switch N sounds on/off. (Default Mode)
1. Toggle Sound Select 1 from off to on and back to off N times to select sound N.
After a short timeout (adjustable), Sound N will start playing.
Repeat to switch Sound N Off. This is **Latched** Mode.

2. OR Toggle Sound Select 1 from off to on and back to off N-1 times and then move to on and hold it there – Sound N will play for as long as the switch is in that On position.
Release the switch to the Off position to switch Sound N Off. This is **Momentary** Mode.

Switched R/C 1 x 1: One ON/OFF channel is used to switch 1 sound on/off.

1. Move the switch from Off to On position to switch sound N On.
2. Move it back to Off to switch sound 1 N Off. Set which sound is assigned to that switch using the SFXPC4 Control Panel.

Proportional R/C : One proportional channel is used to switch four sounds on/off.

1. Move Tx stick half-forward for more than 1 second = Sound 1 ON;
2. Move stick quickly full forward = Sound 2 ON;
3. Move Tx stick half-backwards for more than 1 second = Sound 3 ON;
4. Move stick quickly full backwards = Sound 4 ON;

Keypad/Rotary Encoder:

An 8 or 16 button keypad or a rotary encoder is used to select 8, 12, or 16 sounds, or any of four optional switched outputs (if they have been purchased).

WARRANTY

The SFX7 Module is warranted against manufacturing defects for a period of 12 months from the original date of purchase, not from when you start using it. You are **STRONGLY** advised to test out the sound module on your bench before installing it in a model to make sure you know how to wire it up and use it.

The warranty covers manufacturing defects only and does not cover damage or malfunction due to user wiring errors, incorrect loudspeaker impedance or power handling capacity, getting the module wet or other misuse or abuse of the module. Product returns are only accepted after you communicate the problem to us, we have researched the issue with you, and we have authorized its return.

We reserve the right to change technical specifications and/or features at any time without notice.

MOUNTING THE MODULE

Mount the module using screws **WITH THE PROVIDED NYLON WASHERS UNDER THEIR HEADS.**
Failure to use the included insulating washers under the screw heads voids the warranty.

Mount the module where good air circulation can take place, especially when operating it above 18 Volts. The module will get warm on 12 Volts and quite hot on 24Volts if operated continuously when playing sounds. Do not be overly concerned. The output amplifier is thermally protected and will shut down if it gets too hot.

**Mount the module securely in a position that will not get wet.
The warranty DOES NOT cover damage due to the module getting wet.**

APPLYING POWER TO THE SFX7 SOUND MODULE

The SFX7 module can be powered using three methods.

1. From the USB port when connected to a PC.
2. From the R/C receiver through the Throttle or Sound Select cables.
3. From the Blue terminal block on the module.

Either of the first two methods will power the low level circuitry and make the sound module functional. Audio line signals are available through the line outputs pins on Header 2. However, only method 3, powering the module through the Blue terminal block, powers the audio power amplifier which drives the loudspeaker(s). If you want to hear sound from the sound module's internal power amplifier you must have power applied to the Blue terminal block. Also, if USB power is not connected, you must have receiver power applied through the Throttle or Sound Select cables, in addition to power supplied to the Blue terminal block for the audio power amplifier.

SUPPLY VOLTAGE CONSIDERATIONS

The minimum supply voltage for the power amplifier is 10V. The 26Volts maximum must not be exceeded. A 6 cell Li-Po flight pack will give out a nominal voltage of $6 \times 3.7V = 22.2V$, but close to 26V when fully charged. Be aware that output power changes with the square of the supply voltage, so $1/2$ the supply voltage results in $1/4$ the output power for any given loudspeaker impedance.

The single channel audio amplifier to drive the loudspeaker is powered from the main terminal block terminals 2 and 3 (see later). It will play a mix of the left and right audio channels.

There are two sets of pins for Throttle1 and Throttle2 on each side of the sound module. They are internally connected to each other. One set can be used to connect to the receiver throttle output and the other set can be used to feed the ESC for its respective throttle channel. There is therefore no need for a Y servo lead to be used.

FLASHING LEDS WHEN MODULE IS POWERED UP

When power is applied to the SFX7 sound module the red and/or green LEDS will flash at various rates and combinations. If everything is normal and correct signals are applied, the Red and Green LEDs will flash alternately for six seconds. Most of this initialization period is spent waiting for the radio control receiver to provide valid signals. Experience has shown that many receivers, particularly 2.4GHz varieties, can take several seconds to initialize themselves and provide valid signals at their outputs.

STARTUP BEHAVIOUR WITH NO TRANSMITTER SIGNAL

Some receivers give out invalid signals when the transmitter is not switched on. If the sound module is connected to the receiver and is switched on before the transmitter, some sounds may start playing. In this case switch off the receiver and sound module, switch on the transmitter **FIRST** and **THEN** power up the receiver and sound module.

THE SFX7 SOUND MODULE AND ITS MICRO-SD CARD

As soon as you receive the SFX7 sound module, remove the micro-SD card and backup all its files onto your computer hard drive. A free USB micro-SD Card reader is included to assist with this.

The SFX7 micro-SD Card connector is a push-push type, i.e. you push the card in to insert and lock it and push it again to release the card for removal. When inserting the micro-SD Card, make sure it is pushed fully home so that the latching mechanism prevents it from accidentally being removed. To remove the card, push it again and it will spring out so that it can be removed fully.

During installation in your model or other testing it is possible to accidentally push the card in without noticing and it may then fall out and get lost. It is therefore advisable to put a piece of adhesive tape over the card and its connector to make sure this does not happen.

The SFX7 sound module uses the micro-SD Card to store its digitized sounds on, as well as various configuration and hardware settings. Thus it is very easy to add or change the sounds on a SFX7 sound module by simply plugging in a different micro-SD Card with the new files on.

When the SFX7 sound module has its micro-SD Card inserted and it is connected to a Windows PC through its USB port, it will appear as a “USB Mass Storage Device”, i.e. a removable “hard drive” will appear in Windows Explorer. The name of this “drive”, or its disk label, is **ALWAYS “MSISFX7SD”**.

DO NOT re-label the SFX7 micro-SD Card as any other name. This specific disk label is searched for by the SFXPC4 Software to detect the necessary files on the module.

In order to use the SFXPC4 SW Application, a SFX7 sound module must be connected to the PC through its USB port. The SFXPC4 application will not launch if a SFX7 module is not connected. This is a security measure to ensure the SFXPC4 application is not being used by unauthorized persons such as our competitors.

However, the SFX7 sound module can be connected to the PC either with, or without, its micro-SD Card. If the micro-SD Card is missing, you will get a warning dialogue box, but this is for information only. The dialogue box can be closed and the SFX7 sound module will still be detected. However, the Red and Green LEDs will now flash together slowly to indicate that it is in USB MODE, but with the micro-SD Card missing. If the micro-SD Card is present when the SFX7 module is connected, then the Red LED alone will flash slowly to indicate that it is in USB MODE, and with the micro-SD Card present.

For those that are technically minded with computers, see Appendix A for further details of the USB Classes used by the SFX7 sound module.

CONNECTING THE SFX7 MODULE TO YOUR PC

Note: YOU DO NOT need to connect the SFX7 sound module to a PC in order to use it or set it up – it is fully configured and ready to use when you receive it. If you want to change any of its many configurable settings or change the sounds then you will need to connect it to a PC and install the provided SFXPC4.0.0 software application. Alternately you can simply plug in another micro-SD Card that you purchase from us with the new sounds and configuration settings already installed.

Unlike the previous SFX4, SFX5, and SFX6 sound modules, the SFX7 USB interface requires no special USB drivers – the USB drivers it requires are already part of any Windows 7, Vista or Windows XP Operating System. When you connect the SFX7 sound module to the PC for the first time, you will see a message indicating that the required USB drivers are being installed. Shortly afterwards it will say “Your New Hardware is ready to use”.

The SFXPC4.0.0 installer program is in the SFXPC4.0.0 folder on the micro-SD Card that is part of the sound module. Push to remove the micro-SD Card from the sound module and insert it into the provided USB micro-SD card reader. Plug this USB card reader into any spare USB port and wait for the USB drivers for it to be installed. You will then see the micro-SD card appear as a “hard drive” with the name **“MSISFX7SD”**.

In the SFXPC4.0.0 folder on the micro-SD Card, double click on the SFXPC4.0.0.exe file and follow the instructions. The manual for the Software Application is in the Manuals folder in the SFXPC4.0.0 folder on the micro-SD Card.

TRANSFERRING FILES BETWEEN THE PC AND THE SFX7 SOUND MODULE

If you want to transfer files and configuration data between the PC and the SFX7 module, it is recommended to remove the micro-SD Card from the SFX7 module and insert it into the USB micro-SD Card reader that comes with the SFX7 sound module. **Be careful not to lose the micro-SD Card!!** Then plug the micro-SD Card reader into any spare USB port. The operating system may install USB drivers the first time it is plugged into that port.

The SFX7.0 module conforms to the USB2.0 Full Speed (12MBits/sec) specification. If you save files to the micro-SD Card whilst it is in the SFX7.0 module, it will be much slower than when the micro-SD Card is in the USB card reader which conforms to USB 2.0 High Speed (480MBits/sec) specification.

Launch the SFXPC4 application **AFTER** the USB micro-SD Card reader has been plugged in. The SFXPC4 application will search all hard drives for one that has the disk label “**MSISFX7SD**”.

FILE STRUCTURE ON THE SFX7 MICRO-SD CARD

The files on the SFX7 micro-SD Card must be in a certain format and structure. In the micro-SD Card Root Folder there are two files:

1. **HardwareSettings7.bin** (binary). This file stores the hardware settings of the module that are independent of any particular sound set. If you change the micro-SD card, then copy this file over to the new card in order to keep the original hardware settings. This file should **NOT** be edited in any application. It is managed by the SFXPC4 application using its **Control Panel** and the firmware in the SFX7 sound module.
2. **SELECT_YOUR_SOUNDSET_HERE.txt**. This file must contain one line as follows:
One line naming the **.sfx7** file you want the SFX7 sound module to use.

Example:

SpitfireMerlinSoundSet.sfx7

In this example, when powered up, the SFX7 module will expect there to be a **.sfx7** file named “SpitfireMerlinSoundSet.sfx7” in the root folder of the card.

In this way you can have many **.sxf7** sound sets on the micro-SD Card and they can be changed at will by simply editing the **SFX7ROOTFOLDER.txt**. Each time this information is changed the module should be powered down and then powered up again.

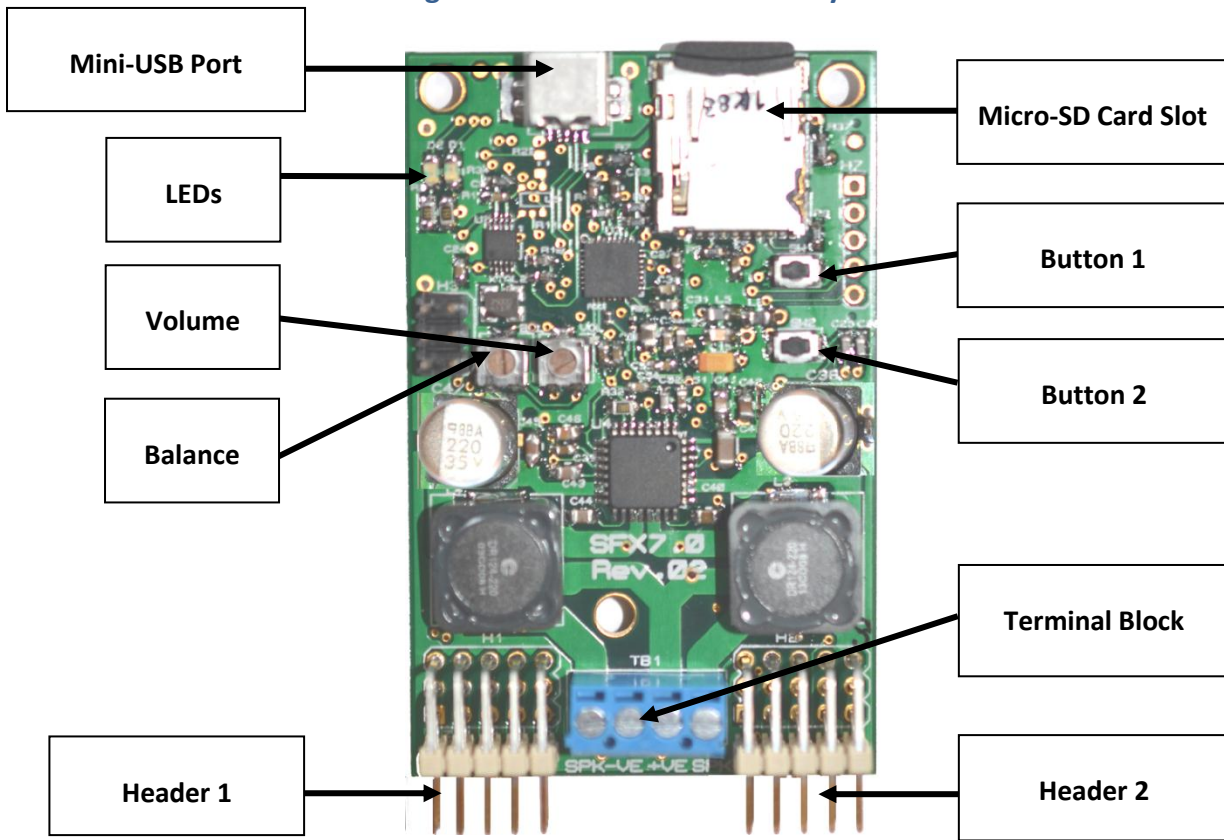
The **HardwareSettings7.bin** file stores the many configurable Hardware Settings of the SFX7 sound module that are independent of any particular sound set. Configuration settings that are dependent on specific sounds in the **.sxf7** file are stored within the **.sxf7** composite sound file itself.

Figure 1: Hardware and Configuration Settings – Storage Locations

Hardware Settings5.bin File	Configuration section in .sxf7 File
Throttle and Sound Select Input modes	Engine Mode (“Auto with Throttle” or “Switched As Sound Clip #”)
Throttle Neutral Off Delay	Proportional R/C Position/Sound Clip Assignment
Throttle Forwards Mode	All settings relating to the four optional Switched Outputs which are tied to various sounds
Throttle neutral, maximum forward and reverse pulse widths (when using Button setup mode)	
Sound Select Channel Number Offset for both Sound Select inputs	
Keypad Calibration Settings (where available)	
GPS Feature Settings (where available)	

SFX7 SOUND MODULE LAYOUT

Figure 2: SFX7 Sound Module Layout



Power supply input and loudspeaker connections are made through the centre terminal block. All R/C receiver inputs for Throttles and Sound Select are made at Connector H1. A second set of Throttle connections and the Switched Outputs and Audio Line Outputs are made at Connector H2. All these connectors are located at the bottom of the board.

TERMINAL BLOCK AND CONNECTOR H1/H2 DETAIL



HEADER 1 Detail – Use Male-Male Servo Leads

NOTE: The silk screened markings on the board may have the THTTL1/SOUND1 and THTTL2/SOUND2 interchanged. The Board markings are incorrect. The markings in this manual are correct.

Pin Numbers	Board Legend	Function	Notes
1, 2, 3	GPSIN	Input from external GPS receiver for enhanced Doppler effects. 1 is GND, 2 is internal +3.3V power, 3 is GPS IN signal.	Do not draw power from pin 2
4, 5, 6	SOUND2	Sound Select2 signal in from receiver. 4 is GND, 5 is receiver power, 6 is Sound Select2 signal.	Receiver power is on pin 5
7, 8, 9	SOUND1	Sound Select1 signal in from receiver. 7 is GND, 8 is receiver power, 9 is Sound Select1 signal.	Receiver power is on pin 8
10, 11, 12	THTTL2	Throttle2 signal in from receiver. 10 is GND, 11 is receiver power, 12 is Throttle2 signal.	Receiver power is on pin 11
13, 14, 15	THTTL1	Throttle1 signal in from receiver. 13 is GND, 14 is receiver power, 15 is Throttle1 signal.	Receiver power is on pin 14

Terminal Block Detail – Use 16-22AWG (18-24SWG) wire

Pin Numbers	Board Legend	Function	Notes
1, 4	SPKR	Loudspeaker - Do NOT use less than 8 Ohms on voltages above 12Volts. 4 Ohms is OK on 10-12Volts.	
2	++VE	Main Battery positive 10Volts – 26 volts	Do NOT reverse Battery leads!!
3	--VE	Main Battery negative 10Volts – 26 volts	Do NOT reverse Battery leads!!

HEADER 2 Detail

Pin Numbers	Board Legend	Function	Notes
1, 2, 3	SW 3/4	Switched Outputs 3/4. 1 is SWITCH4, 2 is MAIN POWER , 3 is SWITCH3.	Receiver power is on pin2. Can be used to feed ESC2
4, 5, 6	SW 1/2	Switched Outputs 1/2. 4 is SWITCH2, 5 is MAIN POWER , 6 is SWITCH1.	Receiver power is on pin 5. Can be used to feed ESC2
7, 8, 9	THTTL2	Throttle2 signal out to ESC1. 7 is GND, 8 is receiver power, 9 is THTTL2 signal.	Receiver power is on pin 8. Can be used to feed ESC2
10, 11, 12	THTTL1	Throttle1 signal out to ESC1.10 is GND, 11 is receiver power, 12 is THTTL1 signal.	Receiver power is on pin 11. Can be used to feed ESC1

13, 14, 15	AUDIO	Line level Audio Out signals – 1.0V R.M.S. 13 is GND, 14, is Left Signal, 15 is Right Signal.	Used to feed external amplifier(s).
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NOTES :

1. LEDs for guns etc. or other switched loads connect between their Switch 1/2 terminals 4, 6 or Switch 3/4 terminals 1, 3 and a positive supply voltage which can be the same supply as the receiver supply on pins 2/5. **DO NOT connect its +VE supply to any pin on the sound module. DO NOT exceed 5A on each output or 10 Amps total for all switched outputs.**
2. The servo leads for Throttle and Sound Select inputs are Futaba style (black, red, white). **The black wire is always the GND, 0V or –VE connection and should always be inserted towards the outside of the receiver case and towards the board of the sound module.**
3. Exercise great caution when using older Airtronics receivers and leads as their power leads are reversed to the normal Futaba style. Do not plug in an unmodified Airtronics lead.
4. A **3A** quick blow fuse should be included in the battery +VE power line to the module. This helps to protect your wiring. Fuses do not cut fast enough to protect the SFX7 module against reverse battery connections.
5. The SPKR terminals **MUST NOT** be connected to GND or 0V.

WIRING FOR ONE THROTTLE – WITH RECEIVER BATTERY

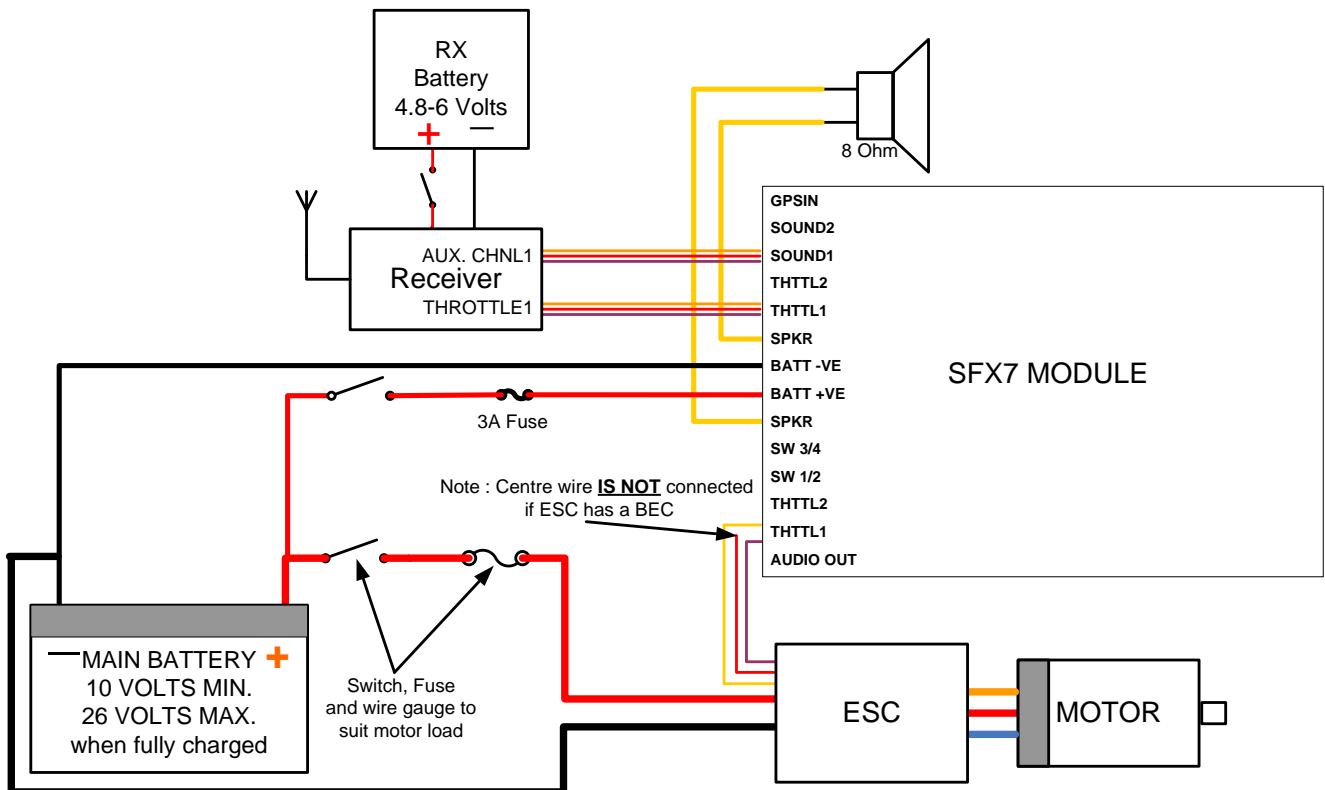
Although some modellers favour using their ESC BEC (**Battery Eliminator Circuit**) to power their receiver, we do not recommend that set-up. Depending upon the wiring, currents involved, and the quality of the ESC BEC, it can introduce radio interference on the receiver power leads. For this reason we recommend using a separate battery to power the receiver, as shown in the next diagram.

Note : When using a separate battery for the receiver, if the ESC has an active BEC (Battery Eliminator Circuit), the centre wire of the servo lead **MUST BE CUT**. This avoids the Rx. Battery and the ESC BEC “fighting each other”, which will likely damage the ESC.

When installing, be sure to run separate power lines to the battery just for your module. If the power lines are shared with motor or ESC lines, the electrical noise generated by them will almost certainly interfere with the sound module. **It is highly recommended to have a 3A quick-blow fuse or circuit breaker in the power line as well as a switch. This protects, to some degree, against wiring errors.**

Figure 3: Wiring for Single Throttle with Separate Receiver Battery

SINGLE THROTTLE WITH SEPARATE RX BATTERY (RECOMMENDED CONFIGURATION)

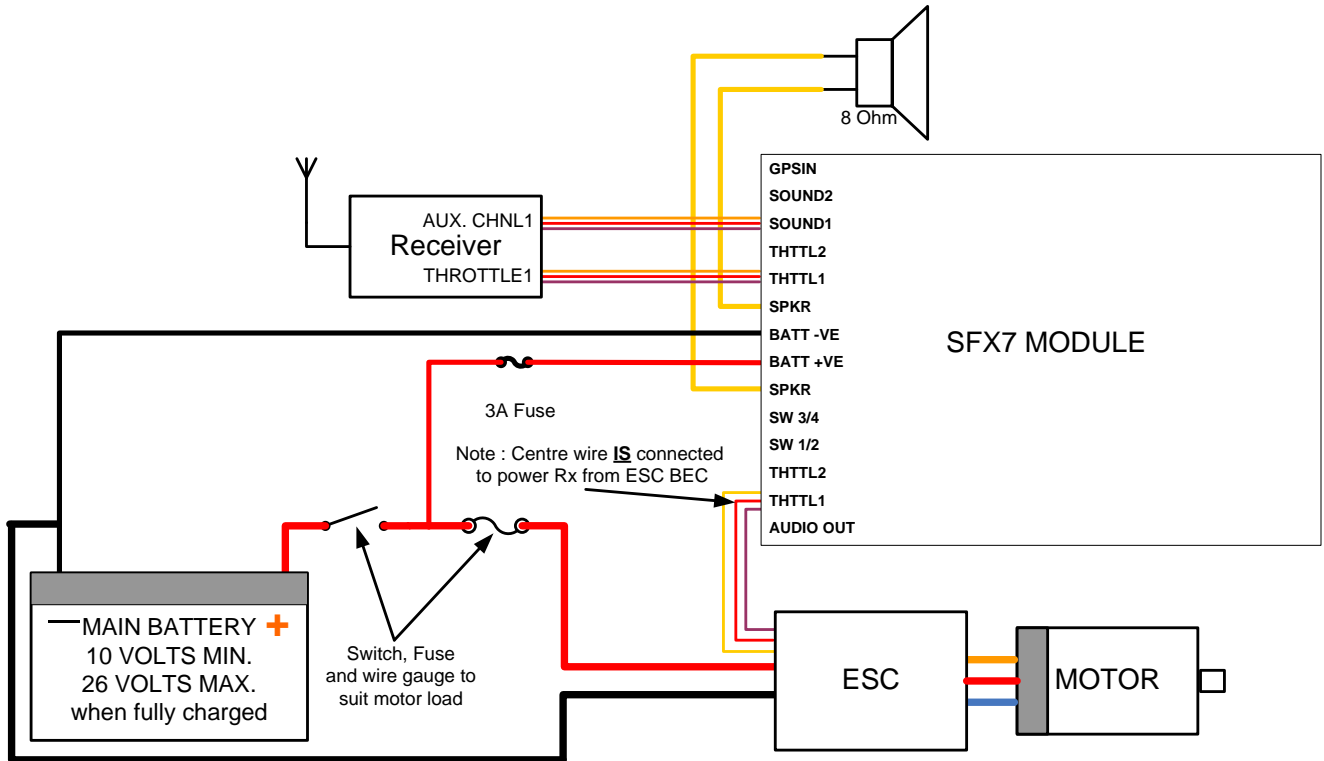


WIRING FOR ONE THROTTLE – WITHOUT RECEIVER BATTERY

If you must use the ESC BEC to power the receiver, then the wiring is as follows:

Figure 4: Wiring for Single Throttle Using ESC BEC

SINGLE THROTTLE USING ESC BEC
(Battery Eliminator Circuit)



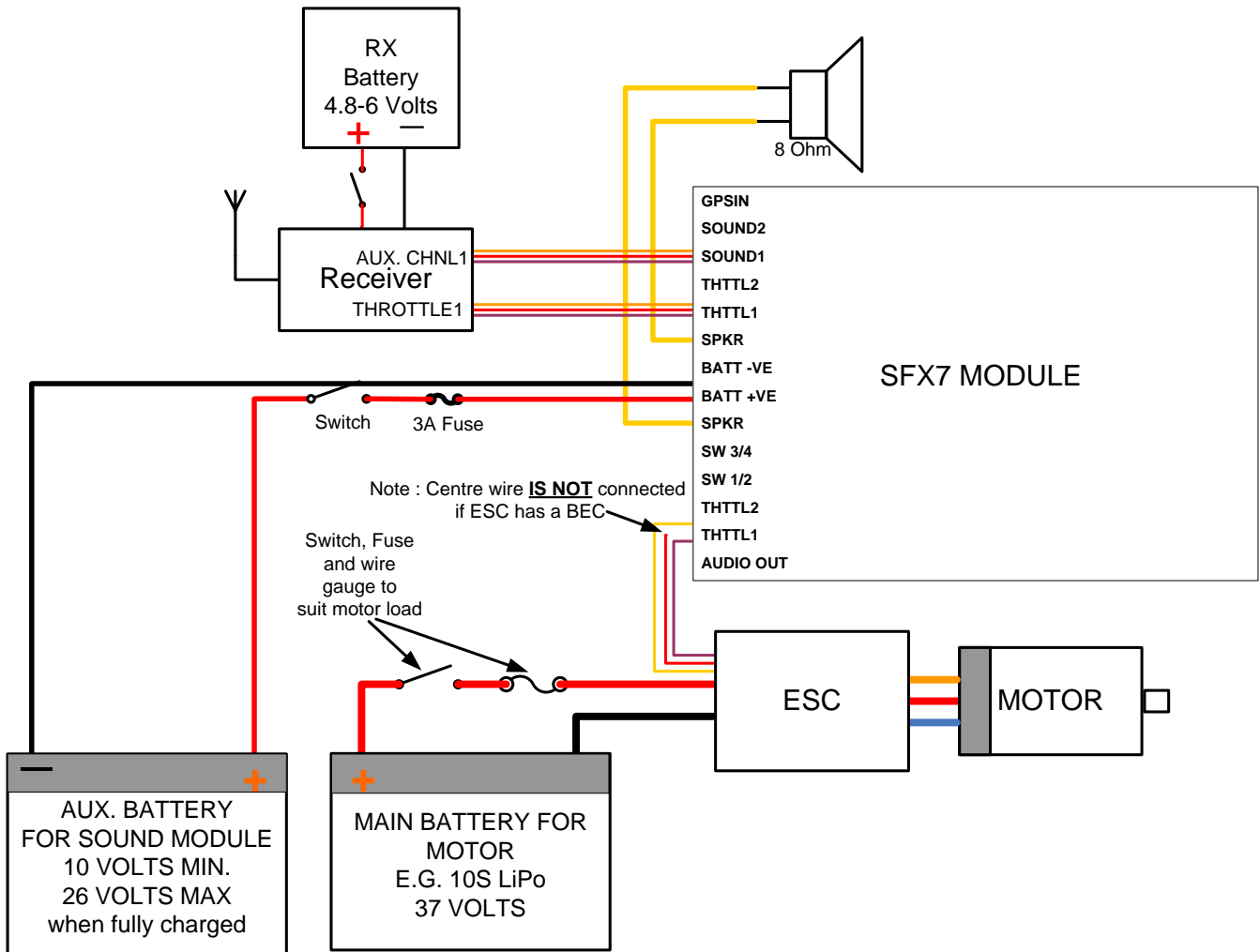
WIRING FOR ONE THROTTLE – WITH AUXILIARY BATTERY FOR SOUND MODULE

If your main battery, e.g. your flight pack, exceeds 26Volts then you are recommended to use a separate battery for the sound module. A small 6S LiPo 1000mAH pack would serve well. You could use a voltage regulator to drop the flight pack voltage down to 26Volts, but these are generally inefficient and may require heatsinking. The wiring for a separate auxiliary battery is shown here. Usually high voltage, high current ESCs don't have BECs, but if it does, cut the servo lead centre wire, as before.

Wiring diagram on next page ...

Figure 5: Wiring for Separate Receiver Battery and Separate Sound Module Battery

SINGLE THROTTLE WITH SEPARATE RX BATTERY AND SEPARATE SOUND MODULE BATTERY



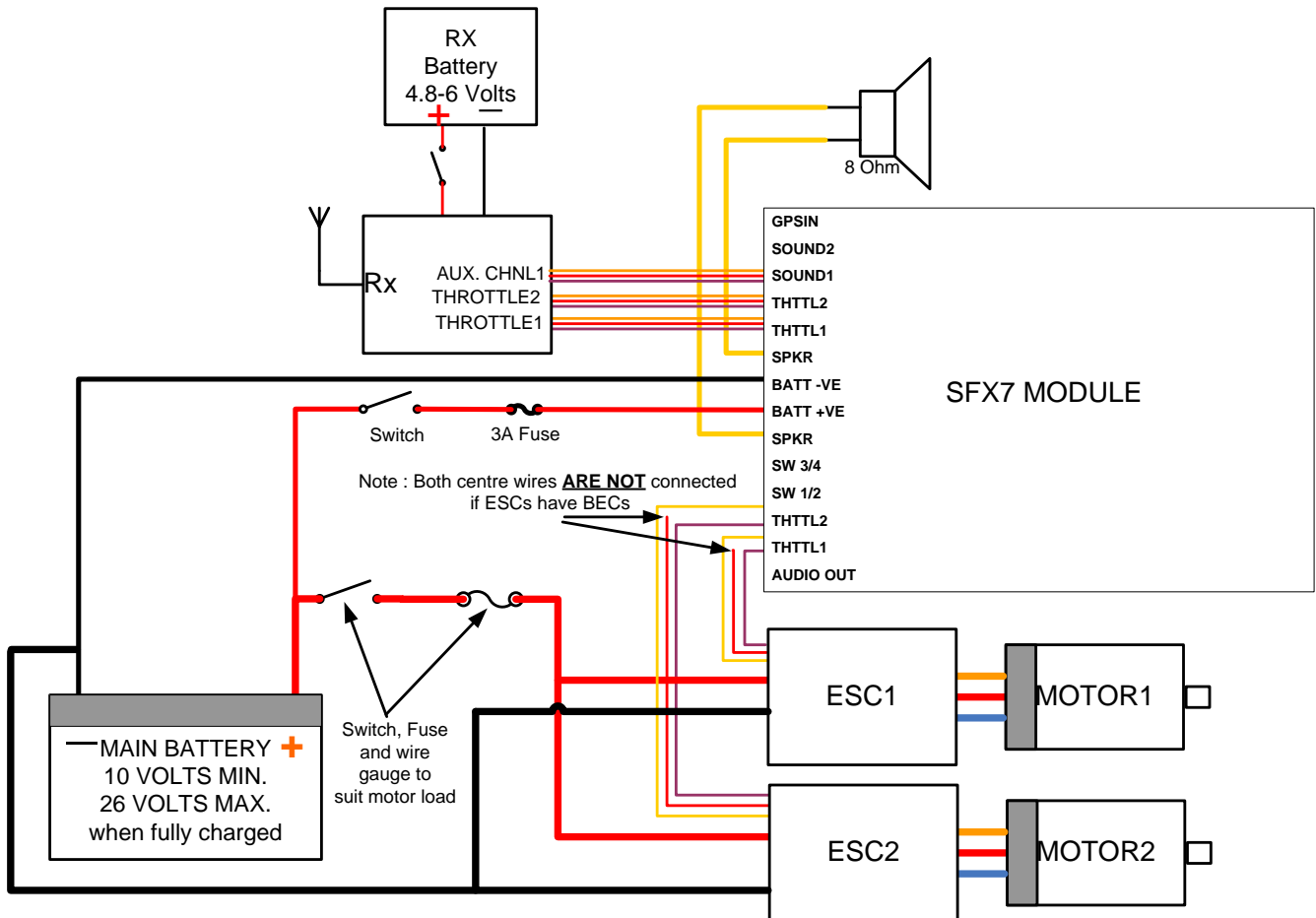
In this diagram you have the main motor battery feeding the **ESC ONLY** and the separate sound module battery feeding the **SOUND MODULE ONLY**, through a switch and fuse.

This arrangement is also recommended whenever the motor has a very high current draw so as to isolate the sound system from the spiky, interference prone motor wiring.

WIRING FOR TWO THROTTLES AND TWO ENGINE SOUNDS

Figure 6: Wiring for Dual Motors/ESCs/Throttles with Separate Receiver Battery

DUAL MOTORS/ESCs/THROTTLES



Wiring for dual throttles as above is self-explanatory.

If either of the ESCs above have an active **BEC** (Battery Eliminator Circuit), then **BOTH** of their receiver power leads (the red, or centre, lead) **MUST BE DISCONNECTED**. Failure to do so could severely damage the ESCs!!

If you don't want to use a separate receiver battery (we recommend that a separate receiver battery is always used), then **ONE AND ONLY ONE** of the ESC receiver power leads may be connected to power the receiver. Never connect two ESCs with active BECs to the same receiver.

CONNECTING TO EXTERNAL AMPLIFIERS

The **SFX7** module has “Line-Out” Audio outputs that permit one or two external audio power amplifiers to be connected. This would allow a low power, low voltage amplifier to be used on say, 6 Volts, or a high voltage, high power amplifier to be used. The line output signal is approximately 1.0Volts RMS at maximum volume. In order to preserve low frequency response the Audio Line Outputs should not be loaded with less than 10KOhms.

The setup and assignment of sounds to the left and right channels is done using the SFXPC4.0.0 SW application.

VOLUME CONTROL, BALANCE AND SIGNAL LEVELS

The audio volume can be set using the rotary volume control. When playing two or more sounds simultaneously you may have to reduce the volume control to avoid overload and/or distortion if both signals peak at the same time. The signal levels are such that, at full volume setting, full power output can be obtained when powered at 26Volts. The actual volume setting can be seen in the SFXPC4 Main Window. The volume control also changes the signal levels at the Audio Line Outputs.

When powered at lower voltages, e.g. 12V, you should reduce the volume control to avoid overdriving the amplifier and causing distortion. When powered at the highest voltage (26 Volts) you can increase the volume control to its maximum setting, but the speaker must then be able to handle 40 Watts. If your speaker can handle only 20Watts proceed as follows.

1. Reduce the volume to a very low level.
2. Gradually increase the volume to the point at which the speaker starts to sound distorted.
3. Back off the volume until the distortion stops.

Line Audio Signal Levels

The left/right audio output signals on Header2 pins 14/15 is 1.0VRMS at maximum volume setting for sounds which are stored at their maximum amplitude. These audio outputs should not be loaded with less than 10KOhms in order to preserve good low frequency response.

BALANCE CONTROL

The balance control adjusts the ratio of left/right audio signals. At the centre position, both channels are delivering their maximum signal levels. If the balance control is turned towards the left, it cannot increase the left signal any further, so it reduces the right signal. Conversely, turning the control to the right will reduce the left signal.

CONTROLLING “REGULAR” (NON-ENGINE) SOUNDS

There are several ways of controlling the Regular (non-engine) sounds. The default method is to use a single on/off switch on the transmitter to control the sounds – this is called “**Switched R/C 1 x N**” mode since a single Transmitter switch is used to control many (N) sounds. A spring loaded switch is preferred, if it is available.

Alternatively, if you have a four channel transmitter and are controlling a land based vehicle, or a model boat, you can use one of the unused proportional stick channels to simulate a switch.

The different modes are selected in the **SFXPC4 Control Panel->Hardware Tab** and work like this :

“Switched R/C 1 x N” Mode : One transmitter ON/OFF channel is used to switch N sounds

1. Toggle Sound Select 1 **from OFF to ON and back to OFF N times** quickly to select sound **N**. After a timeout of about 1 second (adjustable), Sound N will start playing. This is “**Latched**” action. Repeat to switch Sound N Off.

OR

2. Toggle Sound Select 1 **from off to ON and back to OFF N-1 times** and then move to on position **and hold it there** – Sound **N** will play for as long as the switch is in that **ON** position. Release the switch to the **OFF** position to switch Sound **N** Off. This is “**Momentary**” action.

It is best to not use the **Latched** mode unless you really need to. That mode is meant for long playing sounds such as sonar pings, music etc. where you would not want to hold the switch/stick in the on position for too long. But for all other sounds such as guns, horns, Morse code etc. it is best to use the momentary mode by holding the switch in the on position for as long as you want that sound to play. That way you will be sure that when you release the switch/stick to the off position, that sound will stop playing. Then you won't have to worry about counting the correct number of times to switch it off again and possibly using the incorrect number which then starts playing a different sound instead of switching the first one off!!

“Switched R/C 1 x 1” Mode : One transmitter ON/OFF channel is used to switch 1 sound

If you need only one other non-engine sound such as a single gunfire or horn sound, you can configure the module to simply use one on/off Switch to switch that one sound. I.E. move the switch from its **OFF** to **ON** position to switch sound N On. Move it back to its **OFF** position to switch sound N Off. You set which sound is assigned to that switch using the SFXPC4 Control Panel->Hardware Tab – see the SW manual.

In the “Switched R/C 1 x 1” Mode, you can also set the related sound clip to "Play Once" in the SFXPC4 application. In that case you can simply toggle the transmitter switch used for this channel and the

sound will continue to play when the switch is released back to its **OFF** position. When the sound clip reaches its end, it will switch off. This is useful for model tanks where the transmitter switch may be a simple push button and the same radio channel is also used to operate a recoil solenoid for the main gun barrel. The transmitter button may be pushed briefly to both initiate the barrel recoil and play the gun sound, to its end.

For either of the Switched R/C “**1 x N**” or “**1 x 1**” modes, you can also use 2.7 – 12Volt logic levels or mechanical switches to create logic levels instead of R/C signals. This is also setup in the SFXPC4 Control Panel->Hardware Tab – see the SW manual. This is useful for static displays that do not have radio control equipment.

“Proportional R/C Mode” : One proportional channel is used to switch four sounds on/off

1. Move Tx stick half-forward for more than 1 second = Sound 1 Turns ON;
2. Move stick quickly full forward = Sound 2 ON;
3. Move Tx stick half-backwards for more than 1 second = Sound 3 ON;
4. Move stick quickly full backwards = Sound 4 ON;

USING MECHANICAL SWITCHES OR LOGIC LEVEL VOLTAGE INPUTS

When in any of the R/C modes, the SOUND1 and SOUND2 inputs are expected to be from a standard R/C receiver output.

When in Logic Level mode, the SOUND1 input is expected to be either a switch connected from the signal terminals (12 for SOUND1) to the **receiver battery (NOT the main battery)** +VE or a positive voltage with respect to battery –VE that is close to 0Volts (OFF) or between +2.7Volts and +12.0Volts (ON).

You can use a mechanical switch, relay or a logic level voltage input for the Sound Select inputs SOUND1/SOUND2. These modes are selected by software using the **SFXPC4 Control Panel->Hardware Tab**. See the SW manual for details.

THROTTLE CONTROLS

The **SFX7** module can be used with either a forward only throttle (for model airplanes) or a forward and reverse throttle (for model boats, tanks and trains). This mode is automatically selected and stored during the **Throttle1/2 Setup** phase (see later). The sound playback circuit is powered by the receiver through the throttle or Sound Select cables or the USB port. The audio amplifier to drive the loudspeaker is powered from the main terminal block terminals 2 and 3.

THROTTLE1 AND THROTTLE2 SETUP

The engine sounds are linked to the receiver throttle outputs. For most engine sounds, there are separate engine start-up and shutdown sounds. All these sounds are controlled by the position of the throttle controls.

The throttle neutral or off and maximum forwards and reverse (if applicable) throttle settings for your specific transmitter and receiver have to be stored in the module. This procedure also stores the neutral/off pulse information for the two **Sound Select** inputs.

As of release 3.1.1 the setup for this throttle information is completely automatic (by default). For the vast majority of cases, there is no throttle setup procedure required.

Simply wire up the module and start using it. You must ensure that your transmitter is switched on with the throttle sticks in their centre position (for forwards and reverse throttles) or in the OFF position (for forwards only throttles) BEFORE you switch on the receiver and sound module. The red/green LEDs will flash alternately quickly for about 6 seconds. During this time the module is setting itself up. At this end of this period, when you want to move the throttle stick, it **MUST** be moved in the forwards direction first. This tells the module which direction is forwards and which is reverse for forwards and reverse throttles.

The only exceptions to the Auto Setup method are :

1. If you want absolute precision over the throttle range selection mechanism right after power up or
2. If you are using the second engine sound as a gun turret turning sound, as in a model tank or a large warship.

If either of these two conditions apply then you have to setup the module to **NOT** use the Auto Setup feature. This is done using the SFXPC4 Windows Application **Control Panel->Hardware Tab** as detailed in the SFXPC4SWManual.pdf document in the Manuals folder on the SFXPC4.0.0 micro-SD Card. Then you follow the Button Throttle Setup procedure as detailed in the SFX7HWManual.pdf document in the Manuals folder on the micro-SD Card.

MANUAL BUTTON THROTTLE SETUP PROCEDURE

Progress is indicated by the LEDs.

To setup the Throttle Settings manually using the Setup Button, follow these steps :

- 1) Switch on your transmitter with the throttle controls in their **NEUTRAL positions** for model boats or tanks **or OFF positions** for model aircraft, **then** switch on your receiver and sound module. The red and green LEDs should flash alternately for about six seconds.
- 2) While the red and green LEDs are flashing alternately, push the **SETUP BUTTON** once and release it quickly. This enters the **THROTTLE1 SETUP** mode. The red LED will glow steadily and the green LED will flash **ONCE** - this indicates the Throttle1 and the Sound Select inputs neutral position has been captured.
- 3) Move the transmitter Throttle1 control **FIRST** to the maximum forward position, then back to the neutral or off position. The green LED will go out and the red LED will come on to indicate the maximum forwards value has been captured.
- 4) If the Throttle1 has a reverse mode (model boats or tanks), move the Throttle1 control to the maximum reverse position and back to neutral again. The red LED will go out and the green LED will start flashing to indicate the maximum reverse value has been captured and the Throttle1 calibration is complete. The green LED flashes briefly every few seconds to indicate that the signals are OK. If the Throttle1 or Sound1 signals are not present, or not valid, the red LED will flash every few seconds instead.
- 5) If the Throttle1 is forwards only mode (model aircraft), the red LED will go out after a period of about 1 second by itself and the green LED will start flashing to indicate the Throttle1 calibration is complete. The green LED flashes for three times to indicate it is forwards only. The green LED continues to flash briefly every few seconds to indicate that the signals are OK. If the Throttle1 or Sound1 signals are not present, or not valid, the red LED will flash every few seconds.
- 6) If you are using a second throttle input (optional), then repeat steps 2-5 but use **SETUP BUTTON2** and the transmitter Throttle2 stick instead. The green LED will flash **TWICE** to indicate that Throttle2 neutral or OFF position has been captured.

Note: The engine sounds can be used without a SOUND1 or SOUND2 R/C input present, but if those inputs are defined as R/C inputs, and are not present, the red LED will continue to flash to indicate that those signals are not valid. Similarly, the “**Regular**” sounds can still be used without a Throttle1 input signal, but the flashing red LED will then indicate an absence of the Throttle1 R/C input. You can also set its mode to “**Logic Level**”, using the SFXPC4 SW, in which case its absence will not cause the red LED to flash.

USING AN ANALOGUE INPUT TO CONTROL THE ENGINE SOUNDS

Sometimes it is more appropriate to control the engine sounds using an analogue voltage input instead of an R/C receiver pulse. In this case, the Throttle Input Mode for Throttle1 or Throttle2 can be set to "Analogue" using the SFXPC4 **Control Panel->Hardware Tab** (see the SFXPC4 SW Manual). The analogue input voltage must be between 0 and + 3.3Volts relative to GND, or battery negative.

The analogue input is connected between pins 9 or 6 for Throttle1 and Throttle2 respectively and their ground pins 7 and 4. **When using this mode, the throttle inputs must be set up in the same way as above using Manual Button Setup (Throttle1 and Throttle2 Setup) EXCEPT that instead of using the transmitter throttle control, you change the analogue input voltage.**

When the sound module is first switched on, the analogue input voltage must be at its "neutral equivalent" level. I.E. if the analogue voltage represents a forwards only type of throttle, the voltage should be at 0 volts and, after pressing the setup button, it should be moved all the way to +3.3Volts and then all the way back to 0Volts again.

If the analogue voltage represents a forwards/reverse throttle, the voltage should be at the mid-level value of approximately 1.65Volts when entering the throttle setup sequence. This represents the Neutral throttle setting. Then the voltage should be increased to 3.3Volts for maximum forwards, then reduced to 0Volts (for maximum reverse), and then back to 1.65Volts, for neutral, to indicate it is a forwards/reverse type of throttle.

Once setup correctly as above, the changing voltage level can be used to switch the engine sound on/off and vary its speed, as though it were a regular throttle control. The varying equivalent throttle number and equivalent "Pulse Width" are also displayed in the "Throttles" tab of the SFXPC4 Control Panel. **Note:** There is no pulse width in this case, but an equivalent pulse width value is created to make the analogue input work the same way as a conventional R/C pulse input.

The analogue input voltage can exceed 3.3V, and can accept up to +12Volts relative to GND, but only the first 3.3V portion will be of use, as that voltage is mapped to an "equivalent maximum pulse width" of 2000 μ s.

CONTROLLING THE ENGINE SOUNDS

By default, the Engine Sounds are switched on and off by the throttle controls only. The engine sound increases in up to 32 steps of increasing pitch. These sounds can be recorded by you and added manually or, more usually, they can be generated automatically by the SFXPC4 software. You can choose 8, 16 or 32 steps.

With some models, e.g. model tanks and some model aircraft and most helicopters, it is preferable to control the engine start-up and shutdown sounds using a switch instead of the throttle position. To do this, the Engine Sound Mode has to be set to "**Switched with Sound Clip #**" in the SFXPC4 **Control Panel->Hardware Tab**. Then, typically, you would add a NULL (empty) sound clip to be associated with the engine sound. Then when that sound is switched on, the engine start-up sound will play and continue to idle and when that sound is switched off, the engine shut-down sound (if any) will play, then stop. In this case, you usually make the NULL sound clip the first one in the Regular Sounds (i.e. sound clip #1).

In either mode the engine sound increases in pitch, from neutral to maximum forwards and from neutral to maximum reverse (if there is a reverse). If the throttle is forwards only, different behaviour is required since there is no reverse.

For both types of throttle (forwards or forwards/reverse), nudge the throttle control forwards a little (to step 1) and the corresponding engine sound will start playing. If there is a separate engine start-up sound, that sound will play and then continue to loop from its loop point. As you move the throttle stick forwards the engine sound will increase in pitch.

Stopping The Engine Sounds

By default, for Forwards Only throttles, as the throttle is brought back towards neutral (off) and from step 1 to OFF, if there is an engine shutdown sound, it will play once, then stop.

By default, for Forwards/Reverse throttles, if the throttle is moved back to the neutral position the engine sound will continue to play in idle indefinitely. This is good for model boats and tanks. To switch off the engine sound, nudge it into reverse very slightly and **hold it there for about 1.5 seconds**. If you move it too far, the engine sound will continue to play with its increasing speed. If there is a separate engine shutdown sound, it will play then stop. If there is not a separate engine shutdown sound, the engine sound will stop after the 1.5 second delay.

If you do not want this default behaviour, you can set an "Idle Off Delay" time in the SFXPC4 **Control Panel->Hardware Tab**. If this time is set to anything greater than zero, the engine sound will idle for the stated delay time, and then the engine shutdown sound will play once, then stop.

This is great for model airplanes when, sometimes, the throttle stick has to be returned to full off in flight in order to allow the motor to idle and then quickly moved to a higher setting. It is also useful for an automatic shutoff for model boats and tanks when, after the set time delay, the engine idle sound will stop, then the engine will shut down without further attention from the operator.

SPECIAL PROVISIONS FOR MODEL TANKS

Proportional Gun Turret Turning Sounds

Most model tanks have gun turrets that can rotate via servo control, or other motorized mechanism, under control of a stick or knob on the R/C transmitter. In this case, instead of being an engine sound, the second "throttle" controlled sound can be turret turning sounds. In this case, what would normally be the engine 2 startup and idle sound, would be a turret start rotation sound and the engine 2 shutdown sound would be a turret stop rotation sound. Furthermore, if you set the loop start and loop stop times appropriately so as to exclude the turret start rotation segment, but include the remainder of the first turret sound, you can use the Engine Sound Control to generate 8 steps of increasing turret rotation pitch so that the further you move the turret control stick/knob, the faster the turret rotation sound will be. 8 steps is quite sufficient for this purpose and going higher than this may cause problems. Also, because the turret turning motor on real tanks does not vary much in speed, the maximum/base ratio for turret turning sounds is usually very low i.e. about 1.25 compared to the normal 2.0 – 3.0 used for proportional engine sounds.

The Auto Setup mechanism uses the initial throttle stick position to determine if the throttle is a forwards/reverse or forwards only throttle. If the stick is in a centre position, as would be the case for a turret turning stick, it assumes the throttle is forwards and reverse. Therefore if you want to use the turret turning feature you **MUST** use the [Manual Button Throttle Setup Procedure](#) detailed earlier in this manual. The first step is to unselect the Auto Setup mode in the SFXPC4 **Control Panel->Hardware Tab**. Then you perform the Manual Button Throttle Setup Procedure for the Throttle2 input using the Setup Button.

If you want to use the second engine channel in this way you should set it up as a "forwards only" channel when you do the throttle 2 setup procedure. This means that once the Setup Button has been pressed twice quickly, you move the turret control stick fully in one direction or the other (it doesn't matter which way) and then let the stick return to its centre position **and let it stay there**. This would ordinarily be the setup for model aircraft (forwards only). If this channel were setup as a forwards and reverse channel, then when the turret control stick was returned to the centre (off position), the turret turning sound would continue playing as the sound module would think that it is an engine idling sound. By making it a forwards only channel, when the turret control stick is returned to the centre position, the turret stop rotation sound will be played once and then stop.

Although designed primarily for model tanks, this feature could also be used on large model warships that have naval gun turrets.

SPECIAL PROVISIONS FOR MODEL HELICOPTERS

Helicopters (either real or model ones) do not generally change their engine speed much once they are in flight. Instead, other flight controls determine the speed of the aircraft. Therefore, when used in model helicopters, there is not much need to have a throttle controlled proportional speed sound set for the engine. Usually it is sufficient to have just an engine start-up and spin up to full take off power and have that sound loop at full power, and an engine shutdown sound. These sounds should be in the Engine1 Sound clip list, and the shutdown sound identified in the list as a Shutdown sound.

The SFXPC4 Control Panel->Hardware Tab is used to set the Engine1 Sound Mode to “Switched with Sound Clip # 1”. We set this up before we ship the sound module out to a model helicopter customer.

Then, a NULL sound clip should be used as regular sound clip # 1. Then the radio channel switch used for the regular sounds would operate as follows :

1. Flip the switch from its off position to on, and back to off again. After a short 1.5 second delay, the engine start-up sound will begin and will spin up to full power and continue looping at full power. The throttle stick can then be used independently of the engine sound to start the rotors turning at any suitable time during the engine spin-up time.
2. Flip the switch from its off position to on, and back to off again. After a short 1.5 second delay, the engine shutdown sound will play once only, and then stop. Again the throttle stick can be moved independently to shut down the model's rotors.

LOUDSPEAKER SELECTION

An **8 Ohm loudspeaker must be used** for safe operation of the module when operating it at or above 14.4Volts. If the supply voltage is less than 14.4Volts, you can safely use a 4 Ohm speaker – this will result in twice the output power being delivered to the loudspeaker – about 18Watts on a 12Volt supply. Surplus loudspeakers may have unknown impedance, performance and power handling, so it is recommended to use one of the loudspeakers we supply.

Failure of the module due to using a speaker other than **8 Ohms, on supply voltages of 14.4Volts or higher, voids the warranty.**

The biggest challenge in obtaining a realistic sound in models is the size, weight and location of the loudspeaker, and for model boats, a waterproof location. For best results, a speaker enclosure should be used to help reduce the rear sound pressure wave from cancelling out the forward sound pressure wave, hence reducing the sensitivity and giving poor low frequency response.

In model boats, mounting the speaker in the deck, which acts as a sound baffle, can be very effective. The water around the hull serves to dampen the hull sound vibrations, thus providing very good isolation between the front and rear sound pressure waves. Do not use the loudspeaker in a very small confined space, or one where the sound would be muffled by lack of venting to the outside - the results will be very disappointing.

In model aircraft, mounting the speaker in some sort of enclosure is very important as it is needed to get maximum loudness as model airplanes are much further away than model boats. Also mount the speaker as close as possible to the airplane's centre of gravity.

It is permissible to use to **use two 4 Ohm speakers in series only, not in parallel**. This may be preferable in model aircraft where two 4 Ohm speakers could be installed, one in each wing.

MULTI/SINGLE SOUND PLAYBACK

The **SFX7** module can be configured for either Multi (up to three) or Single sound playback. In single playback mode, if one sound is already playing when another is switched on, the first sound stops and the second one plays by itself. When the second sound is stopped, the first sound will resume from where it left off. This has the advantage that the sounds are not masked by each other so the sounds can be heard more clearly.

Refer to the SFXPC4 Software manual for details on how to change this in the **Control Panel->Hardware Tab**.

OPTIONAL SWITCHED OUTPUTS

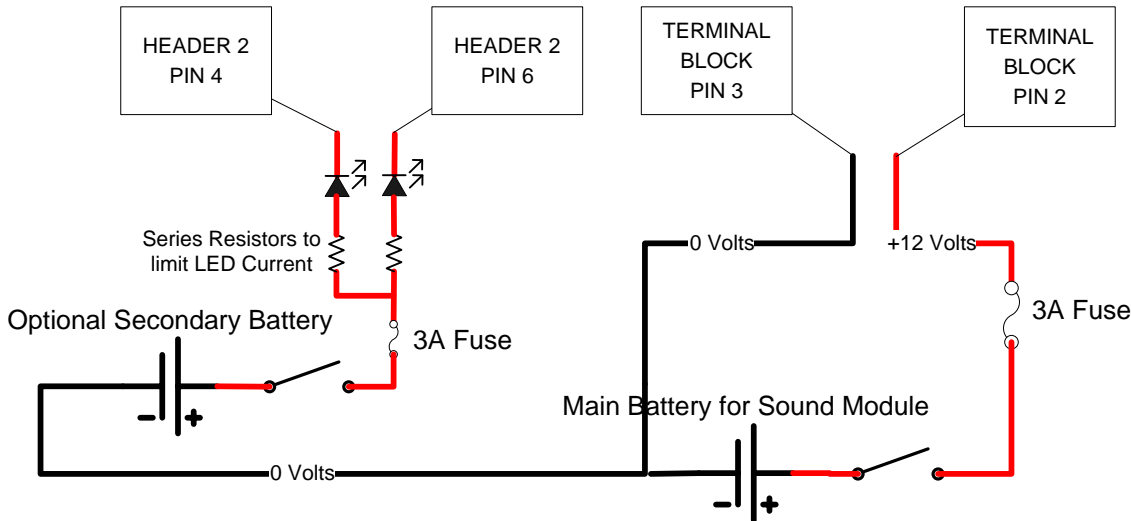
The **SFX7** module can be ordered with optional switched outputs enabled that can flash LEDs in synchronization with any sound such as gunfire or a Morse code signal. The LEDs may be supplied by the same receiver power that supplies the **SFX7** module, or another positive voltage up to the maximum 30V rating. The optional switched outputs can also be used to switch auxiliary circuits such as LEDs, lamps or small motors, relays etc. These switched outputs are rated at 5Amps each.

Note: If you use these outputs to switch inductive loads, then snubber diodes are required – see [“SWITCHING INDUCTIVE LOADS AND SNUBBERS”](#) later.

OPTIONAL SEPARATE BATTERY SWITCHED LOAD/LED CONNECTIONS

Figure 7: Example Wiring for Optional Switched Outputs or LEDs

SFX7 Wiring for LEDs



NOTE: Fuses protect the wiring from wiring errors.

If using the same battery, connect the switched loads or LEDs to H2 pin 2 or 5 on the module which carries the receiver battery voltage. **The LEDs MUST HAVE A SERIES RESISTOR (EACH) TO LIMIT THEIR CURRENT** – see the article [LEDSeriesResistors.pdf](#) in the Articles folder on the SFX7 micro-SD Card. If using a separate battery, connect the LEDs and battery as above.

The sound clip each Switched output flashes with, and the signal threshold level at which the LEDs come on is configurable in the SFXPC4 **Control Panel->Switches Tab**. See the SFXPC4 manual for details on how to configure them. The defaults are Switched OP 1 output flashes with sound clip1, Switched OP 2 output flashes with sound clip2 and both threshold levels are set to 30% of maximum amplitude. This has been found by experience to be optimum for many gunfire sounds.

If you wish to switch circuits, and have no sound playing, you can install a **NULL (empty)** sound clip as one of the sounds. A NULL sound clip is provided on the micro-SD Card in the **“Sample Sound Files”** folder.

Each LED and switched circuit can switch 30Volts / 5AMPS to the battery –VE terminal.

DO NOT EXCEED THESE RATINGS!!

SWITCHING INDUCTIVE LOADS AND SNUBBERS

The switched outputs are designed to switch LEDs, lamps or other electronic circuits, not inductive loads. An inductive load is anything that contains a coil of wire such as a motor, relay, solenoid, or “electronic” valve – which usually contains a small solenoid.

The switched outputs are not designed to switch inductive loads without some form of “inductive kick snubber” - see <http://en.wikipedia.org/wiki/Snubber>. In simple terms this means that the inductive load will produce a reverse voltage kick when its current is interrupted and may cause temporary or permanent malfunction of the sound module. Failure of the module due to not using snubbers when required is **NOT** covered under warranty.

You must use either a capacitor or a reverse diode across the inductive load to dissipate the inductive kick. A 22uF electrolytic or non-polarized capacitor has been shown to work well with small electric motors taking up to 2A at 12V. When wiring an electrolytic capacitor, make sure its positive lead (usually the longer one if they haven't been cut) is connected to the positive load supply and its negative lead is connected to the switched output driving it.

We can also supply 1Amp fast acting Schottky diodes for use with relays or small motors.

KNOWN ISSUES

1. Keypad/Rotary Encoder input is not supported in this release.

APPENDIX A – USB DEVICE CLASSES USED BY SFX7

USB communications are used between a USB **host** (such as your PC) and a USB **device** such as a mouse, keyboard, external hard drive, flash drive or SFX7 sound module. USB Devices fall into a number of different classes such as HID (Human Interface Device), MSD (Mass Storage Device – e.g. a flash drive) etc. The USB device drivers (small software programs that run on the USB host) for many USB classes are already built into most operating systems. Other, device specific, USB drivers have to be installed from software provided with the USB device. This was the case with the previous SFX4, SFX5 and SFX6 sound modules.

However, the SFX7 sound module uses three classes already built into the OS - namely the Composite USB device class, the HID class and MSD classes. The Composite device class is a “parent” USB class that “contains” more than one device class. Although the HID (Human Interface Device) class was originally designed for devices such as mice, keyboards and game controller sticks, its communications protocol can also be used to transfer generic data between the USB host and device. Also the MSD class (Mass Storage Device) is used to present external storage devices to the host as though they are external hard drives, no matter what the actual storage media is.

By using these three USB classes, which are already part of the OS, the SFX7 sound module does not require any custom USB drivers to be installed. You simply plug it into a USB port on the PC and, for the first time, the required drivers are automatically installed by the OS. A short while later you will see a message similar to “Your new hardware has been successfully installed and is ready to use”.

The MSD device class is especially useful as the files on the micro-SD card are visible as files on the PC and can be manipulated almost as though they are files on the local hard drive. It also means that the micro-SD Card can be removed and inserted into a USB micro-SD card reader for much faster access to those files directly by the PC.

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