



The World's Ultimate RC Sound Systems

ShockWave® 3 Sound Module

Version **5.1.1** Hardware Reference Manual

For ShockWave 3 Rev. 08 boards

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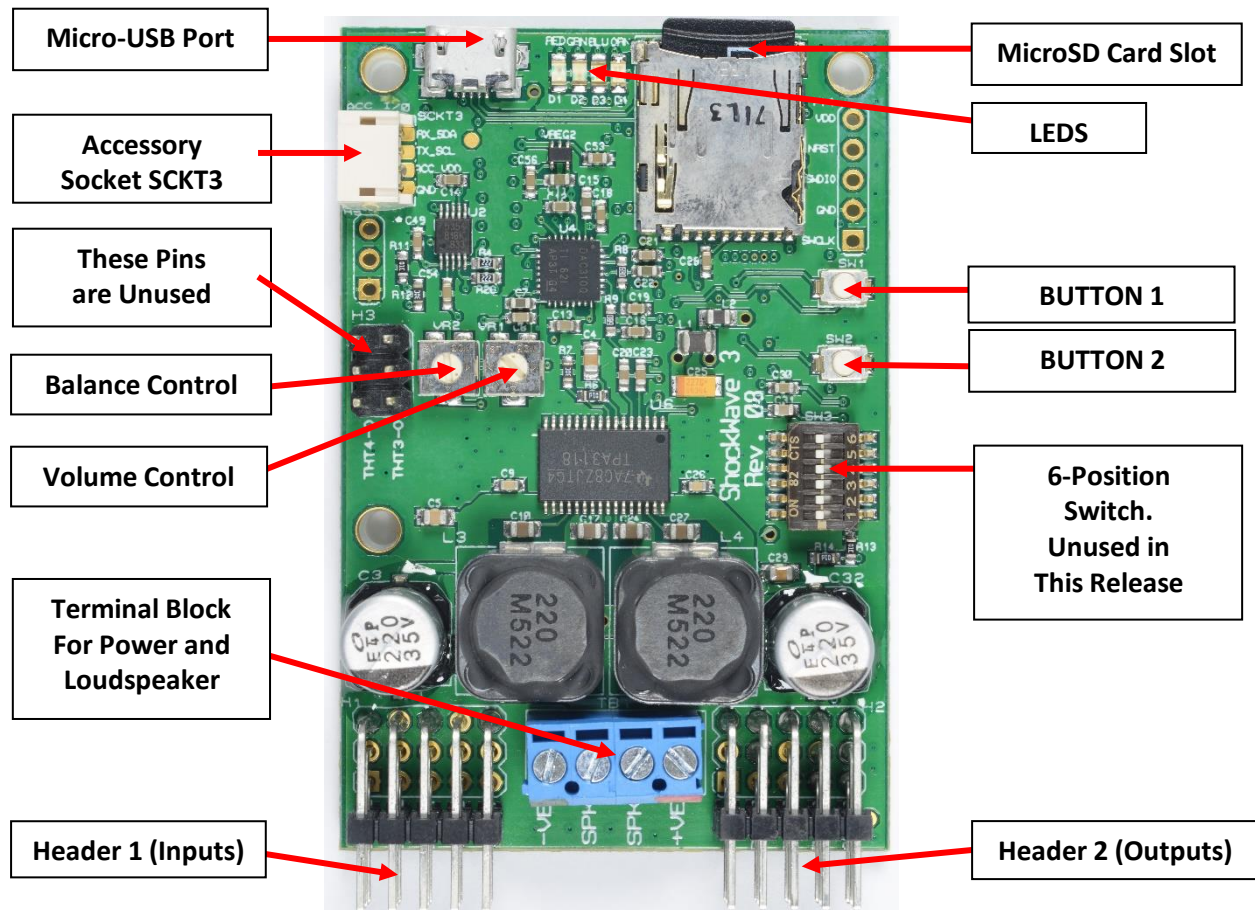
MAKE A BACKUP OF THE ENTIRE CONTENTS OF THE MICROSD CARD USING THE INCLUDED USB MICROSD CARD READER ON YOUR COMPUTER, BEFORE YOU DO ANYTHING ELSE!

MAKING A BACKUP SIMPLY MEANS COPYING ALL THE FILES AND FOLDERS ON THE MICROSD CARD TO PREFERABLY TWO STORAGE DEVICES, EITHER INTERNAL OR EXTERNAL.

REMEMBER WHERE YOU PUT THE BACKUPS!

CHAPTER 1 – THE BASICS – GETTING STARTED

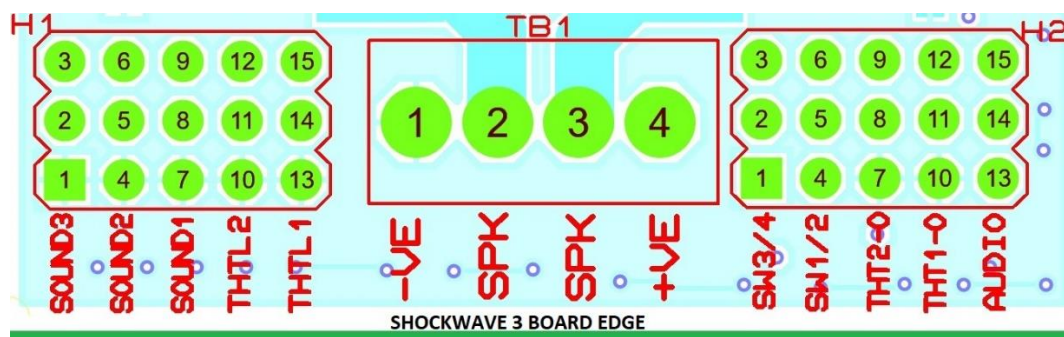
Figure 1: ShockWave 3 Rev. 08 Sound Module Layout



Power supply input and loudspeaker connections are made through the blue terminal block TB1. All RC receiver inputs for throttles and sound select are at Header 1. Switched Outputs, and audio line outputs are at Header 2. In order to hear sound from the loudspeaker, 4.5 – 26Volts power must be on the main terminal block terminals 1 and 4.

Recommended gauge for loudspeaker and battery wire is 22AWG solid core.

TERMINAL BLOCK AND CONNECTORS H1/H2 DETAIL



HEADER 1 Detail – Use Male-Male or Male-Male-Female Servo Leads

Pin Numbers	Board Legend	Function	Notes
1, 2, 3	SOUND3	Sound Select3 signal in from receiver. Pin 1 is GND, 2 is receiver power, 3 is Sound Select3 signal.	Receiver power is on pin 2
4, 5, 6	SOUND2	Sound Select2 signal in from receiver. Pin 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. Pin 7 is GND, 8 is receiver power, 9 is Sound Select1 signal.	Receiver power is on pin 8
10, 11, 12	THTTL2	Throttle2 signal input from receiver. Pin 10 is GND, 11 is receiver power, 12 is Throttle2 signal.	Receiver power is on pin 11
13, 14, 15	THTTL1	Throttle1 signal input from receiver. Pin 13 is GND, 14 is receiver power, 15 is Throttle1 signal.	Receiver power is on pin 14

Terminal Block TB1 Detail – Use 22AWG solid core wire

Pin Numbers	Board Legend	Function	Notes
1	--VE	Main Battery negative 4.5Volts – 26Volts	Do NOT reverse Battery leads!!
2,3	SPKR	Loudspeaker - Do NOT use less than 8 Ohms on voltages above 14.4Volts. 4 Ohms is OK on 4.5 - 14.4Volts.	Loudspeaker leads are reversible.
4	++VE	Main Battery positive 4.5Volts – 26Volts	Do NOT reverse Battery leads!!

HEADER 2 Detail

Pin Numbers	Board Legend	Function	Notes
1, 2, 3	SW 3/4	LED Switched Outputs 3/4. Pin 1 is SWITCH4, 2 is RECEIVER POWER , 3 is SWITCH3.	Receiver power is on pin 2.
4, 5, 6	SW 1/2	LED Switched Outputs 1/2. Pin 4 is SWITCH2, 5 is RECEIVER POWER , 6 is SWITCH1.	Receiver power is on pin 5.
7, 8, 9	THT2_O	Unused – reserved for future use. DO NOT CONNECT.	Receiver power is on pin 8. For Future Use.
10, 11, 12	THT1_O	Auxiliary Output Signal. Pin 10 is GND, Pin 11 is receiver power, Pin 12 is AUXOP.	Throttle Output for an afterburner LED controller. Receiver power is on pin 11.
13, 14, 15	AUDIO	Line level Audio Out signals – 1.0V RMS. 13 is GND, 14, is Left Signal, 15 is Right Signal.	Used to feed external amplifier(s).

NOTES :

1. LEDs for guns, afterburner lights or other switched loads can be connected between their Switch 1/2 terminals 4, 6 or Switch 3/4 terminals 1, 3 and **any external positive power supply up to a maximum of 30 Volts. DO NOT** exceed **1A** on each output or **4 Amps total** for all switched outputs.
2. The supplied male – male – female Y servo leads for Throttle and male – male Sound Select inputs are Futaba style colours (black, red, white), but with JR style male plugs for maximum flexibility.

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. The SPKR terminals **MUST NOT** be connected to anything other than the appropriate loudspeaker for the supply voltage used.
4. The ShockWave 3 sound module receives its power from the receiver battery through the **THHTL1/2** or **SOUND1/2/3** servo leads. The ESC(s) should be connected to the receiver throttle output(s) using the supplied male-male-female Y servo lead.

MOUNTING THE MODULE

Mount the module using screws through the three mounting holes and the attached spacers on the underside of the board. **Do not screw down the board if any of the three spacers are missing. There are parts underneath the boards and the board may crack if you apply screw pressure without the spacers present.**

Mount the module where good air circulation can take place, especially when operating it above 18Volts. The module will get warm on 12Volts / 3S and quite hot on 24Volts / 6S 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.

WHAT BATTERY CAPACITY DO I NEED?

The sound module will draw 1-2 Amps (2000mA) of current. Therefore, if using a separate sound system battery, a capacity of 1000mAH will suffice for at least a 30-60 minute run time.

If using the same battery as your motor(s) then use a slightly larger capacity battery to maintain the same run time.

APPLYING POWER TO THE SHOCKWAVE 3

The **ShockWave 3** module's low-level circuitry can be powered using two methods.

1. From the RC receiver through the THTTL1/2 or SOUND1/2/3 cables.
2. From the USB port when connected to a PC.

In addition, the audio power amplifier is powered 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 output signals are available through the line output pins on Header 2. However, if you want to hear sound from the sound module's internal power amplifier you must have power applied to the Blue terminal block as well as low-level power from methods 1 or 2.

If USB power is not connected, you must have receiver power applied through the THTTL1/2 or SOUND1/2/3 cables, in addition to power supplied to the Blue terminal block.

REMOVING POWER FROM THE SHOCKWAVE 3

Because of large storage capacitors on-board the **ShockWave 3** sound module, when power is removed from the blue terminal block it may take as long as 20 seconds for the voltage at the terminals to discharge to close to zero. Be careful not to short the power leads when they are disconnected from the battery.

SUPPLY VOLTAGE CONSIDERATIONS

The minimum supply voltage for the power amplifier is 4.5Volts although at such a low voltage it will not be very loud. The 26Volts maximum must not be exceeded. A 6S LiPo flight pack will give out a nominal voltage of $6 \times 3.7V = 22.2\text{Volts}$, but close to 26Volts 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 load. At lower supply voltages the volume control should be turned down to avoid distortion due to overdriving the audio amplifier.

The single channel audio amplifier to drive the loudspeaker is powered from the main terminal block terminals 1 and 4. It will play a mix of the left (gunfire or horns etc.) and right (engine sounds) audio channels.

BASIC HARDWARE SETTINGS

There are some Hardware Settings that control some basic operations of the sound module such as start-up delay time and others. These are stored in a [BasicHardwareSettings.txt](#) file on the microSD card and are [detailed later](#).

WHY DO I HAVE TO WAIT SO LONG FOR THE LEDS TO STOP FLASHING?

During the initialization period when the red/green LEDS are flashing rapidly alternately, the sound module is waiting for the receiver to stabilize and produce valid output signals. The default wait period is 6 seconds but can be set to between 3 and 20 seconds using the **ShockWave 3 PC Control Panel->Hardware Tab** or by manually editing the new [BasicHardwareSettings.txt](#) file. This is because some receivers can take a long time to stabilize. If your receiver stabilizes much faster, you can reduce this wait time down to as short as 3 seconds. Also, the wait period is to allow the accessory GNSS receiver supporting the DopplerFX feature, if used, to power up and start outputting valid signals.

CORRECT SWITCH-ON SEQUENCE FOR TRANSMITTER/RECEIVER/SOUND MODULE

The radio transmitter should **ALWAYS** be switched on before the receiver. 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.

CHAPTER 2 – RADIO COMPATIBILITY

USE RC INDUSTRY STANDARD PWM RECEIVERS

The **ShockWave 3** sound module is compatible with any radio control (RC) industry standard transmitter and receiver that outputs 1- 2ms PWM (Pulse Width Modulated) pulses with a frame rate (repetition rate) between 50 and 100 Hz. Any RC radio can be used on any transmission frequency. It cannot be used with proprietary serial bus signals such as Futaba S-Bus, Spektrum X-Bus , FlySky IBus etc.

TELEMETRY AND SOME GYRO STABILIZED RECEIVERS MAY CAUSE PROBLEMS

Telemetry equipped receivers can cause problems in two areas. Similar problems have also been found in Spektrum AS3X receivers.

1. The telemetry receiver is actually a transceiver (transmitter/receiver) which is receiving RC control signals part time and transmitting telemetry data back to the remote-control radio part time.

Because the ShockWave 3 sound module's RC inputs respond so fast they may be susceptible to picking up radio interference from the telemetry transceiver on the servo leads which can cause erratic control of the sounds.

This can generally be corrected by using our special Resistor-Capacitor filter servo leads which are available at extra cost from us. Please email us at contactus@modelsoundsinc.com for further details.

2. A further issue arises with some new so-called SMART ESCS/transceivers such as the Spektrum AR637T AS3X and the Spektrum Avian smart ESC. These go a step further and use "Single wire telemetry" which means the single ESC signal wire is time multiplexed between sending conventional ESC signals from the receiver to the ESC and the ESC sending telemetry data back to the transceiver, for transmission back to the remote control radio.

That multiplexed data line simply confuses the sound module as it doesn't know what to do with the telemetry data that is also present on that signal wire. These systems are incompatible with our ShockWave 3 sound module.

There are two workarounds if problems arise with a telemetry enabled ESC. The issue here is the ESC generating telemetry signals on the same wire that the receiver is sending throttle control signals to the sound module.

Possible solutions are:

1. Change the ESC for one that does not generate telemetry signals on its main signal wire.
2. Make a secondary throttle channel output on your receiver by making a mix on your radio to output the main throttle channel from an additional channel. Then use the main throttle channel to drive the ESC and the secondary throttle channel to drive the sound module. In this way the sound module is not receiving any telemetry information on its THTTL1/2 inputs to confuse it.

YOU MAY HAVE TO ADJUST THE STARTUP DELAY PERIOD

The **ShockWave 3** sound module must have stable RC inputs from the radio receiver before it can be used. To this end, there is an adjustable Startup Delay period that allows the **ShockWave 3** sound module to wait for the receiver to complete its own initialization and start outputting valid and stable RC pulses.

This delay period defaults to 6 seconds, as delivered from Model Sounds Inc. This is adequate for most receivers. However, some advanced receivers such as the gyro stabilized Spektrum AS3X series require considerably longer than this before it provides stable outputs.

If you experience unexpected startup behaviour of the sound module and non-sensical throttle controlled engine sounds, then a Startup Delay period that is too short may be the cause.

In that case, you need to increase the Startup Delay period by editing the [BasicHardwareSettings.txt](#) file on the microSD card of the **ShockWave 3** module. It has a minimum value of 3 seconds and a maximum value of 20 seconds.

PISTOL GRIP RADIOS ARE NOT SUPPORTED

We **DO NOT** support the use of pistol grip style radios which are popular with some model boaters. The extremely small range of throttle trigger movements on this type of radio makes it very difficult to start up and shutdown the engine sound unless you are using a separate switched radio channel for engine sound startup and shutdown.

If you want to use the throttle control to startup and shutdown the engine sound, you will have to use an airplane style stick radio instead.

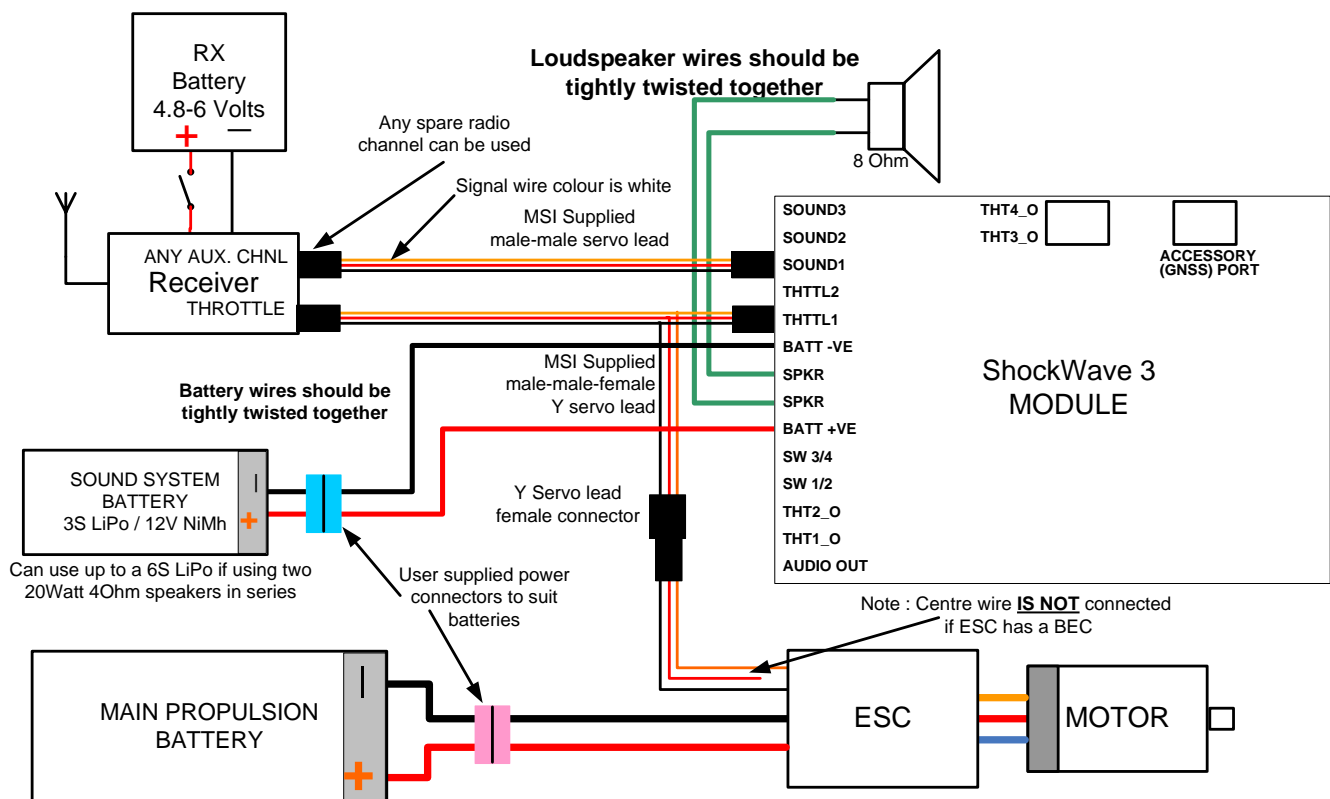
CHAPTER 3 – HOW TO WIRE THE SHOCKWAVE 3 MODULE

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 for high power systems. 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 receiver battery and the ESC BEC “fighting each other”, which will likely damage the ESC.

Figure 2: Wiring for Single Throttle with Separate Receiver Battery



Note: The simplest connections use a separate sound system battery, as above. You can use the same battery as the ESC/Motor but you'll need a Y Power splitter lead with suitable connectors to feed the one battery to both the ESC and the sound module.

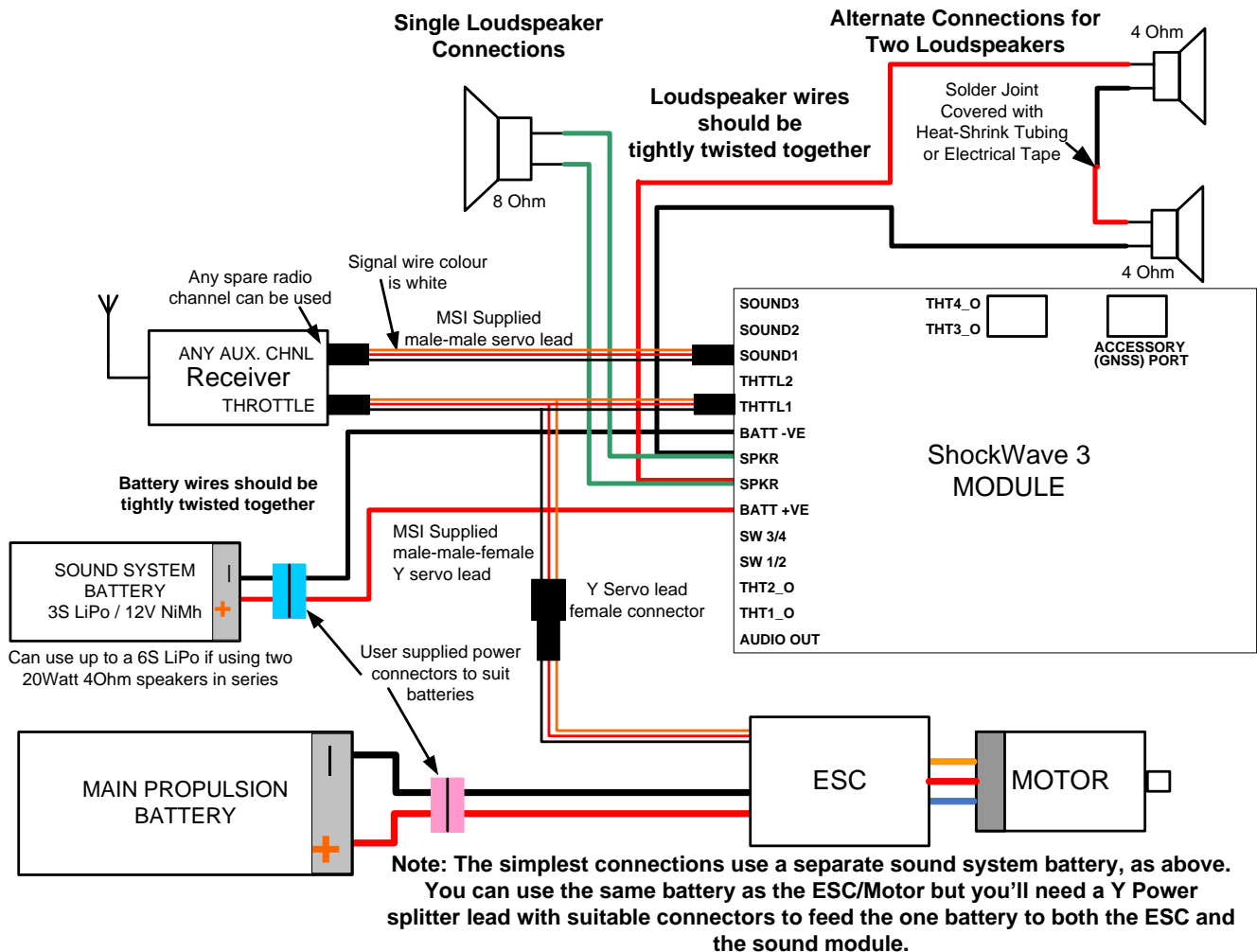
This arrangement is also recommended whenever the motor has a very high current draw so as to isolate the sound system from the spiky, interference prone, motor wiring.

See wiring diagram next for alternate loudspeaker wiring using two loudspeakers in series.

WIRING FOR ONE THROTTLE WITHOUT RECEIVER BATTERY

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

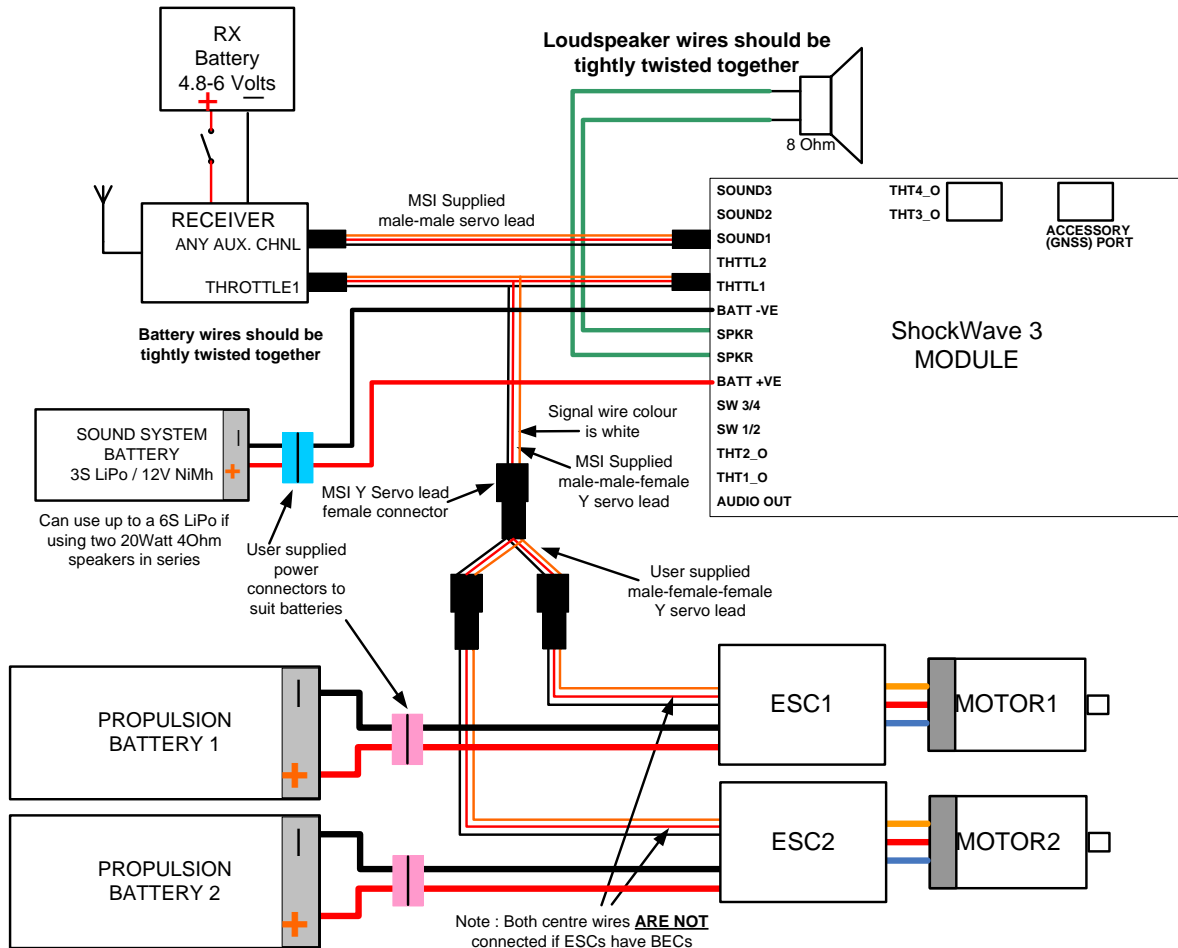
Figure 3: Wiring for Single Throttle Using ESC BEC





WIRING FOR TWIN MOTORS/ESCS WITH ONE THROTTLE CHANNEL

Figure 4: Wiring for Twin Motors/ESCs With One Throttle Channel



The wiring shown here is where you have one throttle-controlled radio channel on your receiver, as you will for model airplanes and helicopters.

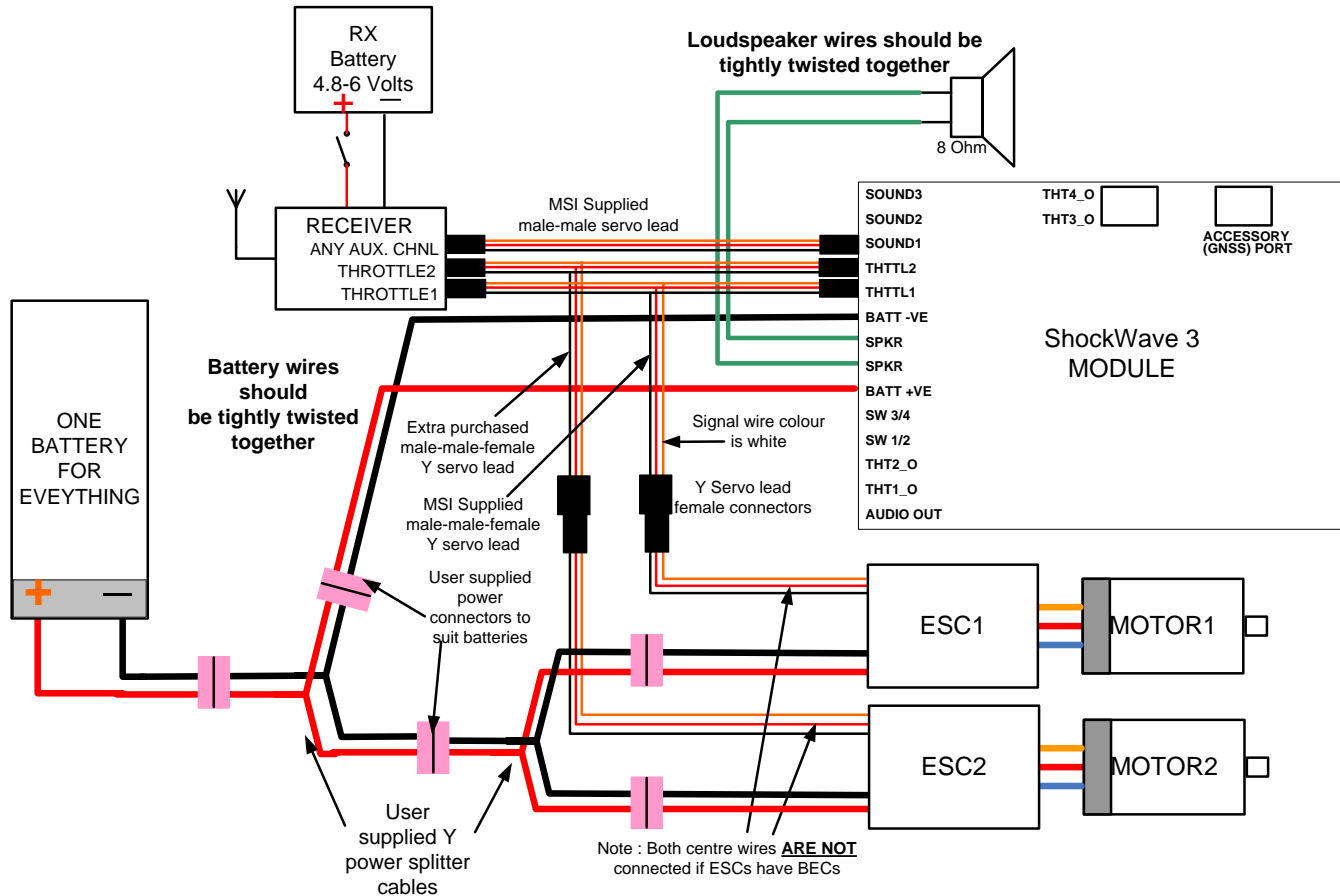
You will require an additional normal male-female-female Y servo lead which can be purchased from your usual RC hobby supplier.

This wiring scheme shows separate batteries for the motors and the sound module and is the recommended configuration.



WIRING FOR TWIN MOTORS/ESCS WITH TWO THROTTLE CHANNELS

Figure 5: Wiring for Twin Motors/ESCs With Two Throttle Channels



The wiring shown here is where you have two throttle-controlled radio channels on your receiver, as you might for some twin motored model boats and tanks.

This wiring for two motors is very similar to that for one motor, just duplicated.

You will require a second custom male-male-female Y servo lead which can be purchased from Model Sounds Inc.

This wiring scheme illustrates the possibility of using one battery to power everything. However, this does require the use of two Y power splitter cables and is not recommended.

Usually, multi-motor setups have a separate battery for each motor. In that case a third battery for the sound module would also be optimum.

CHAPTER 4 – HOW TO SELECT THE SOUND SET FOR YOUR OWN MODEL

THE SHOCKWAVE 3 SOUND MODULE'S MICROSD CARD

The **ShockWave 3** microSD Card is used to store our collection of sound sets, as appropriate to your model type, e.g. airplane, helicopter, boat or tank, important configuration, settings and support files. It is therefore very easy to add or change the sounds on a **ShockWave 3** sound module by simply plugging in a different microSD Card with new files. It also contains our Manuals and Instructions in PDF format and a collection of RC related articles written by our co-owner and engineer, David Harrison.

The **ShockWave 3** microSD Card connector is a push-push type - you push the card in to insert and lock it and push it again to release the card for removal. When inserting the microSD 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.

When the **ShockWave 3** sound module has its microSD Card inserted and it is connected to a Windows PC through its USB port, it will appear as a removable “external drive” in Windows Explorer. The name of this drive, or its disk label, is **ALWAYS SHOCKWAVE3**. **DO NOT** re-label the **ShockWave 3** microSD Card as any other name. This specific disk label is searched for by the **ShockWave 3 PC** Software to detect the necessary files on the module.

However, it is highly recommended to connect the **ShockWave 3** sound module to the PC without its microSD Card inside, but instead inserted into an SD card reader on the PC. When launching the **ShockWave 3 PC** Software, if the microSD Card is missing, you will get a warning dialogue box, but this is for information only. The dialogue box can be closed and the **ShockWave 3** sound module will still be detected. However, the Red LED will flash quickly to indicate the microSD Card is missing.

WHAT IS A SOUND SET (.SFX8) FILE?

The **ShockWave 3** sound module uses files on its microSD card with a **.sfx8** file extension. Some users may not see any file extension as Microsoft, in their infinite wisdom, have deemed that ordinary users do not need to see file extensions as a default setting in Windows Explorer. You can see file extensions by changing the Folder View settings in Windows Explorer.

A **.sfx8** file is a composite sound file containing all of the sound clips for a particular model plus important configuration and addressing data to enable the sound module to correctly access each individual sound clip. Therefore, a **.sfx8** file is sometimes called a **sound set** file. The **.sfx8** sound set files are usually stored in a folder called **ShockWaveSoundSets** in either an Airplane, Helicopters, Boats or Tanks sub-folder.

SELECTING THE SOUND SET FOR YOUR MODEL

There are three ways to select the sound set for your particular model:

1. Manually, by editing the **SELECT_YOUR_SOUNDSET_HERE.txt** file on your computer using a simple Windows text editor such as Notepad.
2. By locally scrolling through a set of .sfx8 sound set files using **BUTTON1** and **BUTTON2** on your sound module. This method could be used either on the bench or once the sound system is installed inside your model, only if there is easy access to the buttons inside the model.
3. By remotely scrolling through a set of .sfx8 sound set files using a Switched RC channel on your radio. This method could be used either on the bench or once the sound system is installed inside your model.

The files on the **ShockWave 3** microSD Card must be in a certain format and folder structure.

In the microSD Card Root Folder there is the following file : **SELECT_YOUR_SOUNDSET_HERE.txt**.

This file must contain at least one line as follows:

First line naming the **folder** containing the .sfx8 file(s) you wish to use.

Example:

ShockWaveSoundSets\Airplanes

Selecting a Sound Set by Editing the SELECT_YOUR_SOUNDSET_HERE.txt File

It can optionally contain a **Second line** naming the specific .sfx8 file in that folder that you want the **ShockWave 3** sound module to use.

Example:

SpitfireMerlinSoundSet.sfx8

If this second line is present, the .sfx8 file named there will **ALWAYS** be used when the ShockWave 3 module is powered up. In this case, Scroll Through Mode is disabled.

If this second line is blank, the **Scroll Through Mode** is enabled and you can scroll through the available .sfx8 files either locally using **BUTTON1** or **BUTTON2** or remotely using a switched RC Channel connected to the **SOUND1** input.

Further lines may appear in the file after the first two lines, but these additional lines will be ignored by the sound module.



Introducing Scroll Through Mode to Select Your Sound Set

There are two **Scroll Through** methods that do not involve any manual editing of that file to select a new sound set.

Scroll Through Mode works best if the sound set folder contains 10 or less .sfx8 sound set files. Whilst it can still work with a very large number, e.g. over 100 sound set files, it quickly becomes laborious and time consuming to scroll through a very large number to find the one you want.

Therefore, it is best to pre-plan which sub-set of all the available sound set files in the Airplanes, Helicopter, Boats or Tanks folder you may wish to scroll through in the future. Then you can create a new folder called "MySounds", for example, and copy those sound set files into that new folder. The **SELECT_YOUR_SOUNDSET_HERE.txt** should be modified appropriately to name that new folder on the first line.

The general Scroll Through process is as follows:

1. For Remote Scroll Through Mode only, make sure the BasicHardwareSettings.txt file on the microSD card has its **RemoteConfigurationTimeout** field set to a usable value such as 10 seconds. If this is too short, you will not be able to enter **Scroll Through Mode** quickly enough.
2. Power up the ShockWave 3 sound module and allow it to reach its playback ready state (i.e. after the red/green LEDs have stopped flashing alternately). You will hear a voice announcement indicating the current sound set or it may announce the sound system is ready.
3. Enter **Scroll Through Mode** using either **BUTTON2** or a remote RC switched channel on the SOUND1 input (described in detail later).
4. Scroll down or up using **BUTTON1** and **BUTTON2** or the remote RC switched channel.
5. After each **Scroll Down** or **Scroll Up** action the sound module will self-announce the next (or previous) sound set in the sound set folder.
6. Once you have reached the desired new sound set, you exit **Scroll Through Mode** using the **BUTTON2** or the remote RC channel.
7. At this point the **ShockWave3** sound module will store the selected new filename in a memory chip on the board. Thereafter, every time the **ShockWave 3** is powered up it will use the new file referred to in that memory chip.



How to Use On-Board Button Operated Scroll through Mode

1. To enter **Scroll Through Mode**, press and release **BUTTON2** quickly within 1.5 seconds. The module will announce **"SCROLL THROUGH MODE BEGIN"**.
2. Then to Scroll down through the list of available sounds, press and release **BUTTON1** quickly within 1.5 seconds. The next sound set in the list will self-announce.
3. To Scroll up through the list of available sounds, press and release **BUTTON2** quickly within 1.5 seconds. The previous sound set in the list will self-announce.
4. To exit **Scroll Through Mode**, press and hold **BUTTON2** quickly for **longer than 1.5 seconds**. When **BUTTON2** is released the module will announce **"SCROLL THROUGH MODE END"**.

How to Use RC Remote Scroll Through Mode

Using an RC channel on your radio to enter/leave and navigate **Scroll Through Mode** means that the **SOUND1** input is activated for this purpose during the **"RemoteConfigurationTimeout"** period after the sound system is ready for playback.

The **SOUND1** input is usually used for many different purposes – e.g. firing weapons sounds, sounding a bell or horn, or starting up the ENGINE sound associated with the THTTL1 throttle input.

However, if the **SOUND1** input is connected to a switched 2-position radio channel, **AND** if it is activated during the **"RemoteConfigurationTimeout"** (default value is 10 seconds) after playback is ready, that switched channel can be used for remote control of the **Scroll Through Mode** as follows:

5. To enter **Scroll Through Mode**, toggle the remote switch **ONCE** – i.e. from **OFF-ON-OFF** quickly within 1.5 seconds. The module will announce **"SCROLL THROUGH MODE BEGIN"**.
6. Then to Scroll down through the list of available sounds, toggle the remote switch **ONCE** – i.e. from **OFF-ON-OFF**. The next sound set in the list will self-announce.
7. To Scroll up through the list of available sound, toggle the remote switch **TWICE** – i.e. from **OFF-ON-OFF-ON-OFF** quickly within 1.5 seconds. The previous sound set in the list will self-announce.
8. To exit **Scroll Through Mode**, flip the remote switch **ONCE** – i.e. from **OFF-ON** and leave it in the **ON** position for longer than 1.5 seconds. The module will announce **"SCROLL THROUGH MODE END"**. Now return the switch to its off position and the sound module will then restart.

CHAPTER 5 – SYSTEM SOUNDS

System sounds are those sounds used by the **ShockWave 3** sound module itself as prompts, status announcements or for voice guided instructions.

SWITCHING THE INITIAL VOICE ANNOUNCEMENT ON AND OFF

The initial **Voice Announcement** of the configured sound set is enabled by default when the module is delivered. To switch it off, once the red/green LEDs have stopped flashing, press and release **BUTTON 1** quickly within 1.5 seconds. To switch it on again, press and hold down **BUTTON 1** for longer than 1.5 seconds.

CHAPTER 6 – HOW TO CONFIGURE YOUR SOUND MODULE REMOTELY

The ShockWave 3 sound module supports making some configuration settings using the two on-board push buttons. When mounted inside a model these buttons are likely inaccessible, so some configuration options can be set remotely from your radio transmitter.

In order to support this, the SOUND1 input is co-opted to have a different function than it is regularly programmed for during a selected timeout period following initial sound module power up.

It works like this:

INITIATING REMOTE CONFIGURATION MODE

The [BasicHardwareSettings.txt](#) file on the microSD card contains a field called **RemoteConfigurationTimeout**. It can have an integer value between 0 and 20 (seconds). Its default value is 0 which disables the Remote Configuration feature as it is not needed very often. If you wish to use this feature, then set this value to something like 15 (seconds).

This value defines a timeout period that starts after the sound module has completed its initialization and made any system sound announcements. During the timeout period, the radio switch corresponding to the SOUND1 input can be toggled a number of times from its initial OFF position to enter or control certain configuration settings.

After the RemoteConfigurationTimeout time has expired, the SOUND1 input will return to its normal programmed function.

The module will announce the start of the RemoteConfigurationTimeout period, and, if nothing has been done during this time, will announce the end of the RemoteConfigurationTimeout period. After this, normal operations using the SOUND1 input can resume.

REMOTE SCROLL THROUGH MODE

If, during the RemoteConfigurationTimeout period, you toggle the SOUND1 switch quickly once, within 1.5 seconds, from OFF-ON-OFF, the module will enter the [Scroll Through Mode](#).

See the [Scroll Through Mode](#) section in this manual for further details.

REMOTE E-Z-SYNC

If, during the RemoteConfigurationTimeout period, you toggle the SOUND1 switch quickly twice, within 1.5 seconds, from OFF-ON-OFF-ON-OFF, the module will enter the Remote [E-Z-Sync Mode](#).

See the [E-Z-Sync Mode](#) section in this manual for further details.



CHAPTER 7 – CONNECTING THE SHOCKWAVE 3 MODULE TO YOUR PC

You **DO NOT** need to connect the **ShockWave 3** 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 optional **ShockWave 3 PC** Windows software application. Alternatively, you can simply plug in another microSD Card that you purchase from us with the new sounds and configuration settings already installed.

When connected to a PC USB port, the blue LED will flash whenever there is USB bus activity. The Windows operating system will issue a request once per second to query the status of the USB mass storage device to see if it is still ready or has been disconnected. Therefore, the blue LED will flash on and off at least once per second.

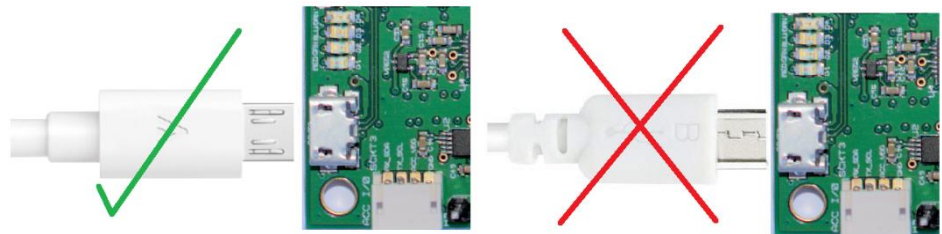
The **ShockWave 3** USB interface requires no special USB drivers – the USB drivers it requires are already part of any Windows 10, Windows 8/8.1, or Windows 7 Operating System. When you connect the **ShockWave 3** sound module to the PC for the first time, you will see a message indicating that the required USB drivers are being installed. Shortly afterwards it will say “Your New Hardware is ready to use”.

The **ShockWave 3 PC** Windows software application is available as a separate purchase for download only. The manual for the Software Application is in the Manuals folder in the ZIP file that is downloaded. The software can be ordered on-line from our web site.

HOW TO CORRECTLY INSERT THE MICRO-USB PLUG INTO THE MICRO-USB CONNECTOR

The USB connector on the **ShockWave 3** sound module is a micro-USB 2.0 type, which is common on older cell-phones and other mobile devices, so you may already have a micro-USB 2.0 to standard USB A-type cable. USB A-type is the end of the cable that plugs into a USB port on your computer. The micro-USB plug on the cable is also compatible with the micro-USB 2.0 portion of a micro-USB 3.0 connector.

The correct orientation of the micro-USB plug on the cable is with the curved corners of the plug facing downwards as shown here:



USB-C connectors are not used here as they are considerably larger and take up more room on the board and are more expensive.

POWER UP THE TRANSMITTER AND RECEIVER FIRST

Whilst the module will connect to the PC and be powered by the USB connection without the transmitter and receiver being connected and powered on, you will not be able to perform any RC related activity in the **ShockWave 3 PC** application.

The **ShockWave 3** sound module waits for a 1 to 20 second initialization period when in both regular and USB modes.

This is to make sure the sound module has stored the correct values for the various RC pulse widths whichever mode it is in. Therefore, please make sure your **transmitter is switched on before the receiver is powered up** when it is connected to the sound module.

If you use a **throttle cut-off switch** that changes the throttle pulse width once it is armed, then that switch must be armed **BEFORE** the sound module's initialization period is complete. Otherwise, if it is armed afterwards, the sound module will think there is a step change in the throttle pulse width and will likely immediately play the engine sound at full speed as a result.

TRANSFERRING FILES BETWEEN THE PC AND THE SHOCKWAVE 3 SOUND MODULE

If you want to transfer files and configuration data between the PC and the **ShockWave 3** module, it is necessary to remove the microSD Card from the **ShockWave 3** module and insert it into the supplied microSD/SD USB card reader and insert that into a USB slot on your computer.

Be careful not to lose the microSD Card!!

The **ShockWave 3** module conforms to the USB 2.0 Full Speed (12MBits/sec) specification. If you save files to the microSD Card whilst it is in the **ShockWave 3** module, it will be much slower than when the microSD Card is in the USB card reader which conforms to USB 2.0 High Speed (480MBits/sec) specification which is 40 times faster than USB 2.0 Full Speed.

Launch the **ShockWave 3 PC** application **AFTER** the microSD/SD Card reader has been plugged in.

The **ShockWave 3 PC** application will search all disk drives, internal and external, for one that has the disk label "**SHOCKWAVE3**".

CHAPTER 8 – VOLUME/BALANCE CONTROLS AND EXTERNAL AMPLIFIERS

VOLUME CONTROL

The audio volume can be set using the on-board rotary volume control, turning it using a small flat-bladed screwdriver. The signal levels are such that, at full volume setting, full power output can be obtained when powered at 26Volts. The actual volume and balance settings can be seen in the **ShockWave 3 PC** Main Window. The volume and balance controls also change the signal levels at the Audio Line Outputs.

When powered at lower voltages, e.g. 5-12V, you should reduce the volume control to avoid overdriving the amplifier and causing distortion. When powered at the highest voltage (26Volts) you can increase the volume control to its maximum setting, but the speaker must then be able to handle 40Watts. 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.

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.

REMOTE VOLUME CONTROL – RC OR WIRED

Using the **ShockWave 3 PC Control Panel->Hardware Tab**, it is possible to configure the **SOUND1** input as an **RC Remote Volume** control or the **SOUND2** input as a **Wired Remote Volume** control.

The RC Remote Volume mode will make the volume minimum with a 1ms pulse input and maximum with a 2ms pulse input on the **SOUND1** Input pins.

If you want to use an external volume control on the model itself, **SOUND2** input should be configured for **Wired Remote Volume**. This mode requires a variable input voltage on the **SOUND2** signal pins from 0 to +3.3Volts. You can connect an external potentiometer to the **SOUND2** signal pins to supply a variable 0 to +3.3Volts with respect to GND or the –VE battery connection.

CONNECTING TO AN EXTERNAL AMPLIFIER

The **ShockWave 3** module has “Line-Out” Audio outputs that permit an external two channel audio power amplifier to be connected. This would allow a high voltage, high power, amplifier to be used.

The left/right line audio output signals on Header 2 pins 14/15 are 1.0Volts RMS 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.

The setup and assignment of sounds to the left and right channels is done using the **ShockWave 3 PC software** application.

Something you have to watch for, and take care of, when using an external amplifier is the overall phasing of the external amplifier's stereo channels, and its loudspeakers, compared to that of the **ShockWave 3** module and its loudspeakers. This means that you need all four loudspeakers to be pushing or pulling air at the same time. It would not help if the **ShockWave 3** speakers (or exciters) were pushing air while the external amplifier speakers were pulling air, as they would be fighting against each other to produce the sound.

The easiest way to test this is to experiment with reversing the polarity of the loudspeaker connections on the **ShockWave 3** blue terminal block and see if it makes any difference to the overall sound output when you are using an external amplifier.

It is possible, using the **ShockWave 3 PC** Windows software, to assign any sound to both the left and right channels. The two channels are mixed internally using subtraction in the differential inputs of the single channel on-board audio power amplifier. They are not additive. This is of no consequence for unrelated sounds such as an engine sound and a weapons firing sound, but you if you attempt to use identical sounds on both left and right channels and play them simultaneously they will subtract, not add, thus cancelling each other out.

The ability to have a single sound played on left and right channels is only applicable when you are using an external two channel audio power amplifier instead of the internal one.



CHAPTER 9 – CALIBRATING THE SHOCKWAVE 3 THROTTLE INPUTS

AUTOMATIC THROTTLE SETUP

In order to startup, shutdown and increase and decrease the engine sound speed, the **ShockWave 3** module must know what the corresponding throttle channel pulse widths are at its OFF, maximum forwards and maximum reverse throttle stick positions.

The **ShockWave 3** module makes this job easy for the average user by measuring the incoming throttle pulse width at the time the red/green LEDs stop flashing and using that as the neutral or OFF throttle pulse. It then assumes the maximum forward and reverse pulse width deviations are 1000µs/0µs for a forwards only control or +/-500µs for forwards and reverse throttle controls.

For most users these assumptions are adequate. However, if you want precision control over the full range of sounds and the full throttle stick range, you should consider using the [“Voice Assisted Precision Button Throttle Setup”](#) described next.

The [BasicHardwareSettings.txt file on the microSD card](#) is used to set whether the module uses the Automatic or Precision Manual throttle setup modes.

VOICE ASSISTED PRECISION MANUAL BUTTON THROTTLE SETUP

More precise control over throttle ranges and which engine sounds are selected at each throttle position, and other advanced throttle dependent features, rely on the sound module accurately knowing what the minimum, maximum and neutral/off throttle pulse widths are.

This can be achieved using the optional voice assisted precision button setup procedure. You only need do this once for each transmitter/receiver and throttle settings such as mixes, trim tabs etc. If you subsequently alter any throttle setting or change throttle channels, transmitter or receiver, you should repeat this process. Progress is indicated by the red and green LEDs and by voice announcements.

To setup the Throttle Settings using the Setup Buttons, follow these steps for the **THHTL1** input:

- 1) With power OFF, remove the microSD card and insert it into an SD card reader on your computer. Edit the **BasicHardwareSettings.txt** file on the microSD card and change the ThrottleSetupMode data value to **MANUAL**. Save that file, then reinsert the microSD card into the sound module.
- 2) Switch on your transmitter with the throttle controls in their **OFF positions** for model aircraft and helicopters **or NEUTRAL positions** for model boats or tanks, **then** switch on your receiver and sound module.

- 3) The red and green LEDs should flash alternately for about six seconds, or whatever initial delay period has been configured in the **BasicHardwareSetting.txt** file.
- 4) While the red and green LEDs are flashing alternately, push **BUTTON 1** once and release it quickly. This enters the **THROTTLE1 SETUP** mode. The **RED LED will light for about 1 second** until it captures a valid Throttle1 RC signal and the **GREEN LED then stays on** - this indicates the Throttle1 and the Sound Select inputs **neutral or off positions** have been captured.
- 5) After the appropriate voice announcement, move the transmitter **THHTL1** 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.
- 6) If the **Throttle1** has a reverse mode (model boats or tanks), **without delay**, 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 **THHTL1** or **SOUND1** signals are not present, or not valid, the **RED LED** will flash every few seconds instead.
- 7) If the **THHTL1** is forwards only mode (model aircraft or helicopters), 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 **THHTL1** 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 **THHTL1** or **SOUND1** signals are not present, or not valid, the **RED LED** will flash every few seconds.
- 8) If you are using a second **THHTL2** throttle input (optional), then repeat steps 2-6 but use **BUTTON 2** and the transmitter **THHTL2** stick instead. The **GREEN LED** will flash **TWICE** to indicate that **THHTL2** neutral or OFF position has been captured.
- 9) Appropriate voice announcements will be made at the start, throughout this procedure and at the end to indicate what to do next or what its status is.

CHAPTER 10 – HOW TO CONTROL THE SOUNDS

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 16 steps of increasing pitch. These sound steps are usually generated automatically by the **ShockWave 3 PC** software.

With some models, e.g. model tanks and some model aircraft and 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 **ShockWave 3 PC Control Panel->Hardware Tab**. Then, typically, you would add an EMPTY sound clip to be associated with the engine sound.

Then, when that EMPTY sound clip is switched on, the engine start-up sound will play and continue to idle and when that EMPTY sound clip is switched off, the engine shut-down sound (if any) will play, then stop. In this case, you usually make the EMPTY sound clip the first one in the Regular Sounds (i.e. sound clip #1).

The sound module has five RC inputs - two THRTL1/2 and three SOUND1/2/3 inputs. The THRTL1/2 inputs are used to control the speed of the Engine1/Engine2 sounds respectively and may also be used to initiate the start-up and shut-down sounds. The SOUND1/2/3 inputs are used to control the sounds in the Regular Sound Clip List **ONLY**, i.e. non-engine sounds. There are also many different possible control modes used for the SOUND1/2/3 inputs.

If you want to use a switched RC channel to start-up and shut-down the engine sounds, then that receiver channel must be connected to any of the SOUND1/2/3 inputs and thereby control one of the sounds in the regular sound clip list. Then, in the **ShockWave 3 PC Control Panel->Hardware Tab**, you select the Engine1 mode to be "Switched As Sound Clip # xx" where xx is selected in the adjacent spin number box. When this mode is selected, when the Regular Sound Clip # xx is selected using any of the SOUND1/2/3 inputs the corresponding engine start-up or shut-down is played **INSTEAD** of the EMPTY sound clip.

The EMPTY sound clip does not have to be at position 1 in the Regular Sound Clip List as long as the Engine1/2 mode "Switched As sound Clip # xx" xx is the same as its actual position. But to keep things simple it is usually placed at position # 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 speed.

For Forwards/Reverse throttles, always nudge the throttle stick forwards **FIRST**. This teaches the module which is forwards and reverse.

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 **ShockWave 3 PC 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.

CHANGING ENGINE SOUND VOLUME WITH THROTTLE POSITION

On some models such as model boats that are run fairly close to the operator, it may be desirable to have the volume of the engine sound start off quietly as the engine is started up and idling, but then gradually increase in volume, as well as speed, as the throttle position is increased.

This can be achieved by editing the [BasicHardwareSettings.txt file](#) and changing the Eng1MaxMinSPLRatiodB field value for Engine1 or the Eng2MaxMinSPLRatiodB value for Engine2. These values represent the ratio of the maximum volume of the engine sound at maximum throttle position compared to its volume at the minimum throttle position or idle sound. The units are decibels (dB). A value of 0dB means a value of 1.0, so there is no change in volume over the range of throttle settings. A value of between 10 and 20 (dB) is usually sufficient for model boats.

For model airplanes and helicopters, you generally want the maximum engine sound available at all times, so this feature should not be used for those types of models.

CONTROLLING ENGINE SOUNDS WITH AN ANALOG INPUT

Sometimes it is more appropriate to control the engine sounds using an Analog voltage input instead of an RC receiver pulse. In this case, the Throttle Input Mode for THTTL1 or THTTL2 can be set to "Analog" using the **ShockWave 3 PC Control Panel->Hardware Tab** (see the Software Manual). The Analog input voltage should be between 0 and + 3.3Volts relative to GND, or battery negative.

The Analog input is connected between pins 9 or 6 for Throttle1 and Throttle2 respectively and their ground pins 7 and 4.

When the sound module is first switched on, the Analog input voltage must be at its "neutral or OFF equivalent" level. That is, if the Analog voltage represents a forwards only type of throttle, the voltage should be at 0Volts.

If the Analog 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.

During the "[Precision Button Throttle Setup Procedure](#)", 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.

The Analog input voltage should not exceed 3.3V as that voltage is mapped to an "equivalent maximum pulse width" of 2000μs.

STARTING UP JET/TURBOFAN/TURBOPROP/HELICOPTER SOUNDS

All our jet, turbo-prop and helicopter sound sets are configured by default to operate differently from the default piston engine sound sets such as the Spitfire. For all jets and other engines that have long turbine spool-up and spool down times, we configure them to use a separate switched RC channel connected to the SOUND1 input to startup and shutdown the engine sound.

This is so that you can use a switch to startup the turbine sound while leaving the throttle stick in the off position so that the EDF unit does not startup before the turbine sound blends into the jet exhaust idle sound.

Similarly, on shutdown - the throttle stick can be returned to its off position to make the plane stationary and have the jet turbine sound still idling until you throw the switch back again, whereupon the turbine spool down sound starts, plays once, then stops.

CONTROLLING “REGULAR” (NON-ENGINE) SOUNDS

There are several ways of controlling the Regular (non-engine) sounds. The default method is to use a single two position switch on the transmitter to control the sounds – this is called “**Switched RC 1xN**” mode since **ONE** 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, or to select four sounds based on its stick position.

3-Position switches are also supported.

The different modes are selected in the **ShockWave 3 PC Control Panel->Hardware Tab** and work like this:

“Switched RC 1xN” Mode: One transmitter ON/OFF channel is used to switch N sounds

1. Toggle the switch for the SOUND1 input **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 the switch for the SOUND1 input **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 RC 1x1" 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 clip N On. Move it back to its **OFF** position to switch sound clip N OFF. You set which sound is assigned to that switch using the **ShockWave 3 PC Control Panel->Hardware Tab** – see the Software manual.

In the "**Switched RC 1 x 1**" Mode you can also set the related sound clip to "**Play Once**" in the **ShockWave 3 PC** 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.

"Proportional RC" Mode: One proportional channel is used to switch four sounds on/off"

This sound selection mode is for use with a centre off spring loaded proportional transmitter stick.

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;
5. Which specific sounds are played for Sound 1/2/3/4 is programmable using **ShockWave 3 PC** Software.
6. Proportional RC mode can have either latched or momentary action as follows:

For Latched Mode : Once the selected sound has started playing, immediately return the stick to its centre position. The sound will stay on until the same action is used to switch it off again.

For Momentary Mode : Once the selected sound has started playing, hold the stick in that position. Once the stick is returned to its centre off position, the sound will switch off.

7. Depending on the particular radio channel you use, the stick may be a left/right channel. instead of a forward/backwards channel.

3-Position Switch

A 3-position switch should be in its centre OFF position when the transmitter and receiver are switched on. The sound module detects the resulting RC channel's pulse width and uses that as a centre OFF reference value. You move the switch in one direction to switch on one sound clip and in the opposite direction to switch on another sound clip. Returning the switch to its centre OFF position will switch the selected sound off.

Which particular sound clips are selected by the 3-position switch is set using the **ShockWave 3 PC Control Panel->Hardware Tab**.

Using SOUND1/2/3 Inputs and The Offset

The SOUND1, SOUND2 or SOUND3 inputs can be used to switch regular sounds using the methods above.

All sound select inputs have an offset number associated with them. The default value for SOUND1 input is Offset = 0, default for SOUND2 input is Offset = 2, default for SOUND3 input is Offset = 4. The Offset # is added to the number of toggles when these inputs are used in **Switched RC 1xN** or **Logic Level 1xN** modes. This means that if you toggle SOUND1 input once you get sound clip # 1. If you toggle SOUND2 input once you get sound clip # 3 (if there is one) etc. These offset numbers are adjustable up or down using the **ShockWave 3 PC Control Panel->Hardware Tab**.

If using **Switched RC 1x1** or **Logic Level 1x1** modes, the offset determines which sound is played when the switch is moved to its ON position in a similar manner, so for SOUND1, by default Sound Clip # 1 will play, for SOUND2 input Sound Clip # 3 (if any) will play.

USING MECHANICAL SWITCHES OR LOGIC LEVEL VOLTAGE INPUTS

When in any of the RC modes, the SOUND1, SOUND2 and SOUND3 inputs are expected to be from a standard RC receiver output.

For either of the **Logic Level "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 RC signals. This is also setup in the **ShockWave 3 PC Control Panel->Hardware Tab** – see the Software manual. This is useful for static displays that do not have radio control equipment.

When in Logic Level mode, the respective input is expected to be either a switch connected from the signal terminals (e.g. pin 12 for SOUND1) to the **receiver 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 also configure the Logic Level inputs for –VE Logic, I.E. the OFF Logic level is High and the ON Logic Level is low.

PLAYING MULTIPLE SOUNDS SIMULTANEOUSLY

Playing up to four sounds simultaneously is supported. Typically, this would mean one or two engine sounds and one or two non-engine sounds. However, only two sound clips can be played simultaneously on each of the two internal left and right channels. More than two would overload the internal data values and severe distortion or weird noises may result. In practice, this is not an issue since playing more than two of any non-related sounds at the same time usually results in a muddying of the sounds so that none of them can be heard clearly, so this is usually avoided.

CHAPTER 11 – SPECIAL PROVISIONS FOR MODEL TANKS AND HELICOPTERS

SPECIAL PROVISIONS FOR MODEL TANKS

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 RC 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.

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.

You do this using the **ShockWave 3 PC Control Panel->Hardware Tab** by checking the **"Force Forwards Only"** check box for the Engine2 sound.

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.

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, the engine sound set is usually setup such that the maximum speed to the idle speed ratio is relatively low e.g. 1.5 – 1.75. Also, since turbine helicopters have a very long engine spool-up time to full speed, the engine sounds are usually started up using a spare switch on the Transmitter instead of nudging the throttle stick forward a notch or two.

The **ShockWave 3 PC 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, an EMPTY 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 second delay, the engine start-up sound will begin and will spin up to idle power and continue looping at idle 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.

Potential Additional Helicopter Rotor Wash Sounds Using The Second Engine Sound

It is also potentially possible to add rotor wash sounds separately as the Engine2 sounds and use the collective radio channel to feed the THTTL2 input. In this way you would get extra rotor wash sound only when the helicopter is taking off, in flight and landing.

However, this depends upon the availability of obtaining a suitable rotor wash sound that is loud enough to mask the underlying engine sound so that the engine sound is not also added as well.

Such suitable rotor wash sound clips are very rarely obtainable so, in practice, this effect is not easily achievable.



CHAPTER 12 – SYNCING ENGINE STARTUP/SHUTDOWN SOUNDS TO PROPELLER ROTATION

E-Z-Sync™ is a new feature in **ShockWave 3** that allows easy setup and synchronization of the engine start-up and shutdown sounds with the propeller rotation on a model airplane. This feature is relevant only to propeller driven airplanes since jets, and model boats and tanks do not have visible propeller or rotating engine transmission parts. One exception to this is a model air-boat where the rear air pusher propeller is clearly visible.

There are two modes of operation for the E-Z-Sync feature:

1. **MODE 1** – synchronizing engine start-up sound to start of propeller rotation.
This is used where the engine sound is started up using the throttle stick only. It is used when the throttle stick movement causes the propeller to start turning and you want to synchronize the engine sound start-up to that throttle position.
2. **MODE 2** - synchronizing start of propeller rotation to engine start-up sound. This is the reverse to **MODE 1**. It is used when a separate switched radio channel is used to start-up the engine sound. In this case, the engine sound track starts first and then, at some later time, you want the propeller to start turning so you need to move the throttle stick to start that motor turning.

This is essentially a manual synchronization process because the RC operator moves the stick to start the motor at the desired time.

How to use E-Z-Sync MODE 1 (using throttle stick movement to start-up engine sound)

For Engine 1 and THTTL1 input:

1. Nudge the throttle stick whose radio channel is connected to the THTTL1 input forward until the propeller starts turning or until you want the engine sound to start playing.

You may possibly want the engine sound to start playing before the propeller starts turning if, for example, there are oil pump noises or starter cranking sounds before the motor starts turning the prop. There maybe other sound effects such as “Contact” or Mags are hot” that are in the engine sound track that appear before an actual engine turning over sound occurs.

2. Then **press and release BUTTON1** quickly, within 1.5 seconds. The engine sound will restart from that point and that setting will be stored in the currently active **.sfx8** file on the microSD card.
3. Move the throttle stick to the position where you want the engine shutdown sound to start playing.

4. Then **press and hold BUTTON1** down for longer than 1.5 seconds. The engine 1 shutdown sound plays from that point and that setting will be stored in the currently active **.sfx8** file on the microSD card.

For Engine 2 sound/THTTL2 input channel, perform the same steps as above but use THTTL2 instead of THTTL1, still using **BUTTON1**.

Any activities involving the pressing of the on-board buttons is much easier done on the bench **BEFORE** installing the sound module in any model, simply because of better physical access to the buttons.

REMOTE E-Z-SYNC MODE

Enter the remote E-Z-Sync mode by toggling the SOUND1 input switch twice quickly during the Remote Configuration timeout period.

Then you can use the SOUND1 input switch in the same manner as if it were BUTTON1, as described above.

How to use E-Z-Sync MODE 2 (using separate switched RC channel to start engine sound)

1. Flip the radio switch corresponding to the SOUND1 input, or whichever input you have configured to start-up the Engine1 sound track. The engine sound starts up. At the time in the sound track when you want the motor to start turning the propeller, move the throttle stick to start turning the motor to the speed you want.
2. Since this is a manual process every time you start-up the engine sound, there is nothing more to do.



CHAPTER 13 – WHICH LOUDSPEAKERS TO USE

LOUDSPEAKER SELECTION

An **80hm impedance loudspeaker or two x 40hm loudspeaker series pair should 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 40hm speaker – this will result in twice the output power being delivered to the loudspeaker – about 18Watts maximum on a 12Volt supply. Surplus loudspeakers may have unknown impedance, performance and power handling, so it is recommended to only use the loudspeakers we supply.

Failure of the module due to using a speaker less than **80hms, 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 unwanted rear sound pressure wave from cancelling out the wanted forward sound pressure wave, hence reducing the sensitivity and giving poor low frequency response.

However, be aware of making the speaker enclosure too small as the back pressure created when the speaker cone moves will decrease its sensitivity.

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 efficiently is important as it is needed to get maximum loudness since model airplanes are much further away than model boats. Also mount the speaker as close as possible to the airplane's centre of gravity. Again, be aware of making the enclosure too small. It is best to try it first without an internal enclosure and use the entire fuselage or wing as the enclosure.

It is permissible to use to **use two 40hm speakers in series only, not in parallel.** This will allow the **ShockWave 3** sound module to be used on a 6S LiPo where it will be able to deliver its maximum output power. In model aircraft where two 4 Ohm speakers are installed, you can try one in each wing.

CHAPTER 14 – HOW TO USE THE SWITCHED OUTPUTS

The **ShockWave 3** module has four switched outputs that can be used to flash LEDs in synchronization with any sound such as gunfire, engine sounds or a Morse code signal. They can also be configured to just be on with any sound clip (including an EMPTY sound clip) so they can be used to switch navigation lights etc., as well. These outputs behave as though they were a switch connected to ground – i.e. the negative battery terminal.

You connect the LED or other load to flash or switch on between a battery positive supply and the switched output pin, as shown below. The centre pins for the switched outputs on Header 2 pins 2 and 5 are internally connected to the **receiver battery supply** from Header 1 pins 2, 5, 8, 11 and 14. For low current LEDs, drawing less than 50mA, you can then use these centre pins (H2 2, 5) to supply power for the LEDs. If you do this, be aware of the additional current draw from the receiver battery while the LEDs are on.

The LEDs may be supplied by the same receiver power that supplies the **ShockWave 3** module, or another positive voltage up to the maximum 30 Volt rating. These switched outputs are rated at 1Amp maximum each or 4Amps for all switched outputs together.

Higher current LEDs should be powered by a separate battery to avoid voltage drop losses along the servo leads.

DO NOT SWITCH INDUCTIVE LOADS

The switched outputs are designed to switch LEDs 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.

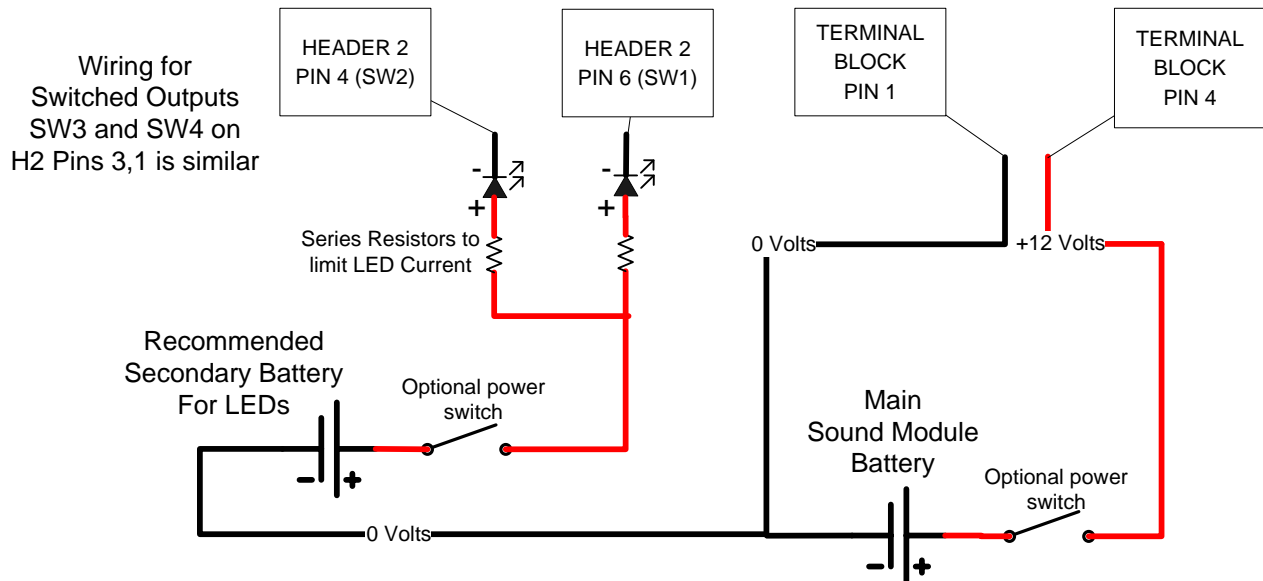
If you want to switch an inductive load using the **ShockWave 3** module, then you should use an external Power MOSFET transistor as described later –

see [“Use external transistors for INDUCTIVE LOADS OR high currents”](#).

CAUTION – Do Not Use These Outputs to Drive a Motor Directly!

RECOMMENDED SEPARATE BATTERY FOR HIGH CURRENT LEDS OR OTHER LOADS

Figure 6: Example Wiring for Switched Outputs



If using the same battery as the receiver to power the LEDs, connect the LED +VE leads, **with their series resistors**, to H2 pin 2 or 5 on the sound module which carries the receiver battery voltage. This is recommended **ONLY** for low current LEDs, i.e. 50mA current or less.

If you are using high power ultra-bright LEDs that draw higher than 50mA current, **DO NOT** use the receiver battery voltage on H2 pins 2 and 5 to power the LEDs. Those pins carry the receiver voltage as a convenience only for low current LED applications. If you attempt to use that voltage supply for high power LEDs, the wire resistance along the various servo leads from the battery, through the receiver and to the sound module can cause a large enough voltage drop such that the sound module and/or the receiver itself may lock up and crash.

When using high power LEDs, **ALWAYS** use a separate battery to power the LEDs, as shown above.

The LEDs MUST HAVE A SERIES RESISTOR (EACH) TO LIMIT THEIR CURRENT – see the article [ChoosingAndWiringLEDsForShockWave3.pdf](#) in the Articles folder on the **ShockWave 3** microSD Card. If using a separate battery, connect the LEDs and battery as above.

The sound clip that each LED Switched output flashes with, and the signal threshold level at which the LEDs switch on, is configurable in the **ShockWave 3 PC Control Panel->Switches Tab**. See the **ShockWave 3 PC** manual for details on how to configure them.

The defaults are **SW1** output flashes with sound clip 1, **SW2** output flashes with sound clip 2, **SW3** output flashes with sound clip 3, **SW4** output flashes with sound clip 4 and all threshold levels are set

to 50% of maximum amplitude. This has been found by experience to be optimum for many gunfire sounds.

If you wish to switch LEDs, but have no sound playing such as switching on navigation lights, you can install an **EMPTY (empty)** sound clip as one of the sounds.

Each switched output can switch 30Volts / 1Amp to the battery –VE terminal or 4Amps maximum for all switched outputs. **DO NOT EXCEED THESE RATINGS!!**

SWITCHED OUTPUTS FOR SMOKER FAN CONTROL

These same switched outputs can be used to generate a variable PULSE WIDTH MODULATED (PWM) Power drive for a smoker unit fan control. The fan motor **MUST** be switched using an external power transistor as shown in Figure 8 below. The PWM frequency is 31.25kHz and the width of the pulse varies and tracks with the throttle setting. Thus, as the motor is driven faster, more smoke will be blown out of the smoker unit by the fan. It is also possible to setup a burst of smoke at a higher level when the engine starts up, to produce a “belch” of smoke at the exhaust pipe/stack.



USE EXTERNAL TRANSISTORS FOR INDUCTIVE LOADS OR HIGH CURRENTS

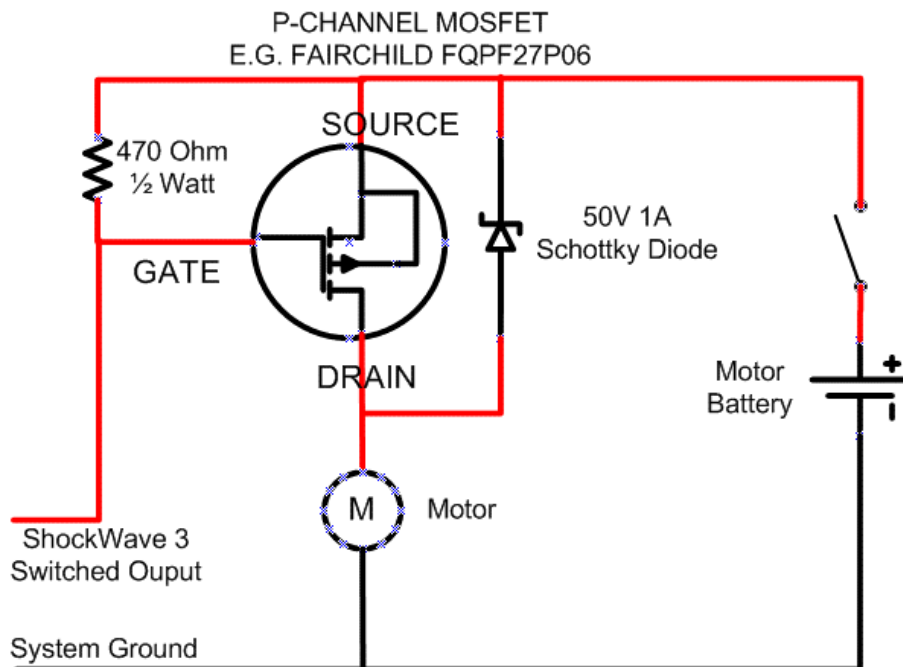
These outputs are controlled by tiny surface mount transistors which are not designed to switch heavy loads. In particular if an electric motor is used, the start-up current spike is many times greater than the rated running current. In these cases, the switched output MOSFET transistors on the sound module could be fried, causing them to become permanently short circuited.

Never connect a motor directly to the switched outputs. The warranty does not cover switched outputs that fail because of over-current in these circumstances.

If you need to switch motors of any size, you **MUST** use an external power MOSFET (Metal Oxide Semiconductor Field Effect Transistor) in a large package and use the sound module switched output to drive the gate (input) of that external MOSFET. The external MOSFET should be a P-channel type and have both a high voltage and a high current rating. They are available very inexpensively from many electronic component suppliers. E.G. device part number FQPF27P06FS-ND from Digikey.com is available at around USD\$2.00 each. It is rated at 60Volts and 17Amps and comes in an insulated TO220 package. A typical wiring diagram is shown next :-

Figure 7: External P-Channel MOSFET Transistor For Switching Inductive Loads Or High Currents

ShockWave 3 Wiring for External P-Channel MOSFET for switching heavy currents.



If using an external MOSFET such as this, **DO NOT** exceed the 30Volts maximum rating of the on-board switched output transistors. This means that the positive supply voltage shown here should not exceed 30Volts.

CHAPTER 15 – HOW TO USE AFTERBURNER LED LIGHT SETS WITH THE SHOCKWAVE 3

Most of our jet fighter airplane sound sets have an afterburner sound which kicks in usually at around 75% of full throttle throw. Often, modellers like to add afterburner light sets in their EDF exhausts to simulate full throttle afterburner effects.

The ShockWave3 sound module fully supports use of these LED arrays in a manner which automatically synchronizes them to the afterburner sound in the sound set.

There are two MODES of operation:

MODE 1 - Using an existing afterburner controller that comes with the LED light set.

MODE 2 - Using a built-in afterburner controller function in the ShockWave 3 firmware using the existing four LED switched outputs to drive the LED arrays directly without the need for the external controller.

MODE 1 is most suitable for beginners and requires the least effort and thought to make it work.

MODE 2 is most suitable for advanced modellers who like tinkering and could even be used with home-made LED light sets or afterburner rings that don't come with a controller.

Both methods will switch on the LED arrays and flicker them in sync. with the afterburner sound in the sound set. Using the **MODE 2** ShockWave 3 afterburner controller, the user can select his own flicker rate - the time period between brightness changes and flicker depth - the lower brightness level to which the LEDs may dim to.

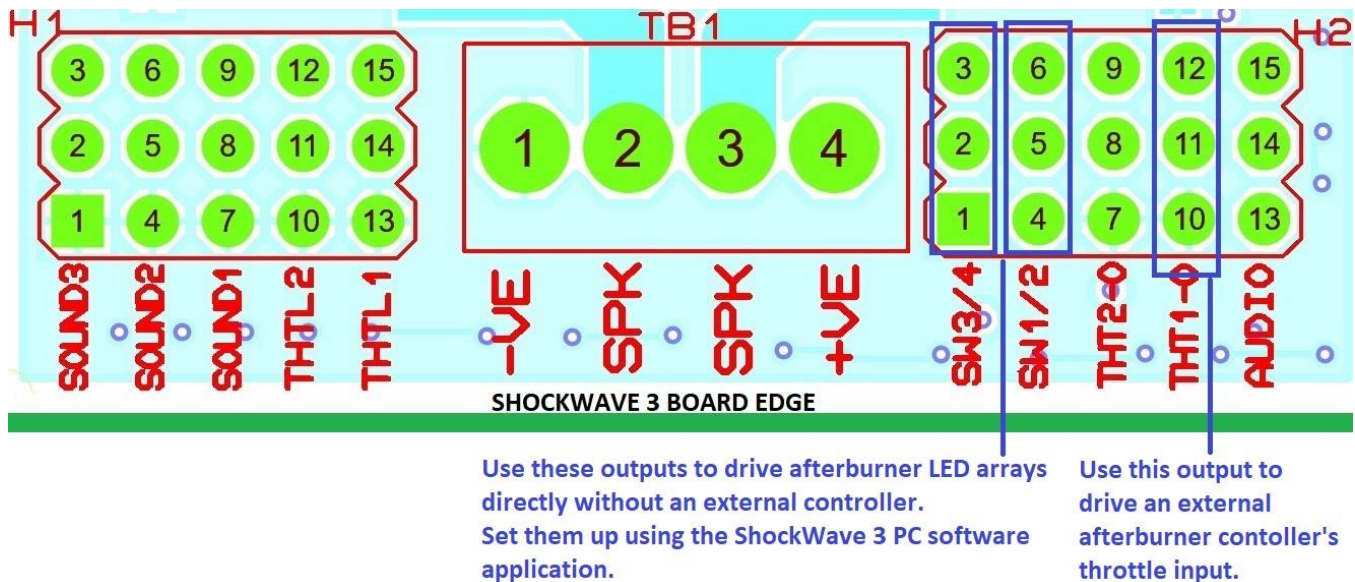
The setup of the **SW1/2/3/4** switched outputs for afterburner control is done using the **ShockWave 3 PC Application Software** in its **Control Panel->Switches Tab**.

Using the existing batch of ShockWave 3 Rev.08 boards, it is probably easier to use **MODE 1**, since **MODE 2** will require a custom wiring harness unless the receiver voltage and the LED voltage are exactly the same. The next production batch of boards, which will be Rev. 10, will have slightly different pin functions on header 2 and will allow a separate LED battery to be directly attached to the sound module. Then no additional wiring harness would be required.

Connections for both afterburner modes are shown on the next page ...



USE HEADER 2 (H2) FOR AFTERBURNER LED CONNECTIONS



MODE 1 connections on Header 2 pins are on pins 10, 11, 12 as shown above. Connect the external afterburner controller's throttle input to these pins with the brown or black -ve lead connected to pin 10.

MODE 2 connections on Header 2 pins are on pins 1, 3 and 4, 6 as shown above. In the current Rev.08 boards the centre pins are connected to the receiver power which, unless your receiver and all the servos are high voltage types, will usually be too low to drive the LED arrays.

Please refer to the section on [connecting LEDs using a separate battery here](#).

SETTING THE THROTTLE POSITION FOR AFTERBURNER SOUND

You can set the throttle position at which the afterburner sound starts to play, using push buttons on the board as follows:

1. With the Engine sound already playing, move the THTL1 (Engine1) throttle stick for that radio channel to the position where you want the afterburner sound to start.
2. Push and release **BUTTON2** quickly.
3. The afterburner sound will start and the new throttle position will be set into the Throttle Ranges section of the .sfx8 sound set file.
4. To set the afterburner sound for ENGINE2 (THTL2) move the throttle 2 stick and press **BUTTON2** quickly.

CHAPTER 16 – HOW TO USE THE TWO PUSH BUTTONS

The two push buttons have different functions depending on how they are used and in which context or state the sound module is in. The following table explains this:

Button1 Functions		
BUTTON1 Action	Sound Module Response	Notes
BUTTON1 pressed and released quickly while red/green LEDs flashing.	Sound module waits for THRTL1 throttle stick to be moved from off/neutral to full forward/full back and back to off/neutral again.	Only if Precision Manual Button Throttle procedure is selected in the BasicHardwareSettings.txt file.
BUTTON1 pressed and released quickly after red/green LEDs have finished flashing.	Switches OFF ShockWave3 Initial system sound announcement.	During normal playback mode after initialization has completed.
BUTTON1 pressed, held down and released after 1.5 seconds after red/green LEDs have finished flashing.	Switches ON ShockWave3 Initial system sound announcement.	During normal playback mode after initialization has completed.
BUTTON1 pressed and released quickly within 1.5 seconds <u>while Engine1 sound is playing.</u>	E-Z-Sync feature for Engine1 sound causes the Engine1 start-up sound to start playing at the current throttle stick position.	THRTL1 input throttle stick moved up to the required position for Engine1 start-up sound to start playing.
BUTTON1 pressed, held down and released after 1.5 seconds <u>while Engine1 sound is playing.</u>	E-Z-Sync feature for Engine1 sound causes the Engine1 shutdown sound to start playing at the current throttle stick position.	THRTL1 input throttle stick moved up or down to the required position for Engine1 shutdown sound to start playing.
BUTTON1 pressed and released quickly within 1.5 seconds <u>while Engine2 sound is playing.</u>	E-Z-Sync feature for Engine2 sound causes the Engine2 start-up sound to start playing at the current throttle stick position.	THRTL2 input throttle stick moved up to the required position for Engine2 start-up sound to start playing.
BUTTON1 pressed, held down and released after 1.5 seconds <u>while Engine2 sound is playing.</u>	E-Z-Sync feature for Engine2 sound causes the Engine2 shutdown sound to start playing at the current throttle stick position.	THRTL2 input throttle stick moved up or down to the required position for Engine2 shutdown sound to start playing.



Button2 Functions

<u>BUTTON2 Action</u>	<u>Sound Module Response</u>	<u>Notes</u>
BUTTON2 pressed and released quickly while red/green LEDs flashing.	Sound module waits for THRTL2 throttle stick to be moved from off/neutral to full forward/full back and back to off/neutral again.	Only if Precision Manual Button Throttle procedure is selected in the BasicHardwareSettings.txt file.
BUTTON2 pressed and released quickly <u>while Engine1 sound is playing</u> .	Afterburner-Sync feature to set Engine1 throttle position for afterburner sound.	THRTL1 input throttle stick moved up to the required position for Engine1 afterburner sound to start playing.
BUTTON2 pressed and released quickly <u>while Engine2 sound is playing</u> .	Afterburner-Sync feature to set Engine2 throttle position for afterburner sound.	THRTL2 input throttle stick moved up to the required position for Engine2 afterburner sound to start playing.
BUTTON2 pressed while BUTTON1 is also held down first.	Plays 1KHz tone for test purposes.	Repeat the action to switch the tone off.
BUTTON2 held down while low level power is applied.	<p><u>ONLY PERFORM THIS FUNCTION IF INSTRUCTED TO BY MODEL SOUNDS INC.</u></p> <p>Enters firmware flashing mode. The ShockWave module re-programs itself from the provided ShockWave3Firmware.hex file on the microSD card.</p>	See separate PDF file called " UpdatingShockWave3FirmwareUsingMicroSD.pdf " found in the Manuals-Instructions folder of the microSD card in the ShockWave 3 module.



CHAPTER 17 – THE DOPPLERFX FEATURE

The **DopplerFX**® enhanced Doppler shift feature is enabled when an external Model Sounds Inc. **DopplerFX** accessory board is connected to the Accessory Port (SCKT3). The accessory board contains a **GNSS (Global Navigation Satellite System)** receiver.

Because this feature is so extensive, it warrants a reference manual all its own. That document is called **DopplerFXReferenceManual.pdf** and is located in the Manuals-Instructions folder of the microSD card.

ORIENTATION OF THE 4-WIRE CABLE CONNECTOR ON SHOCKWAVE 3 BOARD

The **DopplerFX** board comes pre-mounted inside a plastic case with its 4-wire connecting cable already inserted. The other end of that cable should be firmly inserted into SCKT3 of the **ShockWave 3** sound module

Correct Orientation of 4-Wire Connector On ShockWave 3



Incorrect Orientation of 4-Wire Connector



When connecting the 4-wire accessory cable to the **DopplerFX** board, make sure the connector on the cable is inserted into the board connector the right way up. The white wire always goes to the top edge of the board connector as shown here. The connector is quite stiff, so make sure it is inserted all the way in.

If you need to remove it, do so very carefully by teasing the plug from its socket with a finger or thumbnail. Do not pull on the wires to remove it as they will be pulled out of the plug.

THE DOPPLERFXSETTINGS.TXT FILE ON THE MICROSD CARD

Important settings for the DopplerFX feature are contained in a DopplerFXSettings.txt text file on the microSD card. This file is mandatory. If it is missing, the ShockWave 3 sound module will create one with default values as below:

DopplerFXSettings.txt File Default Contents

The DopplerFXSettings.txt File default content looks like this:

```
**** DopplerFXSettings.txt ****
```

```
// SatelliteConstellations: can be one of GPS_ONLY, GPS_PLUS_GLONASS, GPS_PLUS GALILEO,  
GPS_PLUS BEIDOU
```

```
SatelliteConstellations: GPS_ONLY
```

```
// DopplerFXSpeedMultiplier: can be one of 1, 3, 5 or 7
```

```
DopplerFXSpeedMultiplier: 7
```

```
// The following can all have values of yes or no.
```

```
// If the OnceOnly settings are yes, that means the sound is played only the first time that event occurs.
```

```
// If the OnceOnly settings are no, that means the sound is played every time that event occurs.
```

```
PlaySatelliteFixAcquiredLostSounds: yes
```

```
PlaySatelliteFixAcquiredLostSoundsOnceOnly: no
```

```
PlayObserverPositionSetSounds: yes
```

```
PlayObserverPositionSetSoundsOnceOnly: no
```

```
PlayDopplerFXEnabledDisabledSounds: yes
```

```
PlayDopplerFXEnabledDisabledSoundsOnceOnly: no
```

The field names are mostly self-explanatory.

Field names must be EXACTLY as shown here and are case sensitive.

Data values can be yes or no and can be upper or lower case.

Comment lines start with //

CHAPTER 18 – HARDWARE SETTINGS

Hardware settings are those configurable settings that control how the **ShockWave 3** board behaves.

There are two types of Hardware Settings :

1. Hardware settings that have some relation to the sounds in the .sfx8 file :
 - a. Input modes for THTTL1, THTTL2, SOUND1, SOUND2 and SOUND3 inputs.
 - b. Idle Off Delay for THTTL1, THTTL2 inputs.
 - c. Offset # and Timeout for SOUND1/SOUND2/SOUND3 inputs.

These settings can be changed only using the ShockWave 3 PC Software application **Control Panel->Hardware Tab**. Therefore, the hardware settings travel along with the sounds. If you change the .sfx8 file, then those settings will not be carried forward and have to be reset in the new .sfx8 file.

2. Basic Hardware Settings that are completely independent of the sounds :
 - a. Startup Delay.
 - b. Remote Configuration Mode Timeout.
 - c. Throttle Setup Mode
 - d. Single/Multi Sound Mode.
 - e. Eng1MaxMinSPLRatiodB
 - f. Eng2MaxMinSPLRatiodB
 - g. Low Receiver Battery Voltage Alarm Settings.
 - h. Low Main Battery Voltage Alarm Settings.

These settings are stored in a separate file called **BasicHardwareSettings.txt** located in the root folder of the microSD card. This BasicHardwareSettings.txt file is human readable and can be edited using any simple text editor such as Windows Notepad. They can also be edited within the ShockWave 3 PC Software Control Panel->Hardware Tab.

Default contents of this file are shown overleaf ...



BASIC HARDWARE SETTINGS.TXT FILE DEFAULT CONTENTS

**** BasicHardwareSettings.txt ****

// StartupDelay: can be any integer between 3 and 20 (seconds)

StartupDelay: 6

// RemoteConfigTimeout: can be any integer between 0 and 20 (seconds)

// if 0, remote configuration options such as Scroll Through mode are disabled.

RemoteConfigTimeout: 0

// ThrottleSetupMode: can be one of AUTO or MANUAL (using the Buttons)

ThrottleSetupMode: AUTO

// SingleSoundMode: can be yes or no, if yes, then only one sound plays at a time,

// for example, if a gun sound is fired, the engine sound will temporarily stop,

// then resume when the gun sound stops.

SingleSoundMode: no

// Eng1/2MaxMinSPLRatio dB: can be up to 20dB and represents the SPL (volume)

// change between maximum throttle and minimum throttle positions.

// If you do not want the volume to change with throttle position, set this to 0 (0dB = 1.0 x).

Eng1MaxMinSPLRatio dB: 0.0

Eng2MaxMinSPLRatio dB: 0.0

// These low battery voltage limits are in Volts and can be used to trigger a

// system alarm sound when the battery voltage falls below this limit.

// The NumTimesAlarm sets the number of times that alarm announcement plays.

RxBattLowVoltageLimit: 4.0

RxBattNumTimesAlarm: 1

MainBattLowVoltageLimit: 4.5

MainBattNumTimesAlarm: 1

This format and spelling of the various data fields MUST be adhered to for the file to be read correctly. They are case sensitive. A single blank space after the : is also mandatory.

Editing the text in this file avoids having to use the **ShockWave 3 PC Software** application to change these basic settings.

CHAPTER 19 – MISCELLANEOUS

SETTING LOW BATTERY VOLTAGE ALARM SOUNDS

You can set low battery voltage alarms that trigger when the battery voltage for either the receiver or main battery voltage or both fall below set threshold values.

The sounds that play to announce low battery voltages are system sounds that are pre-set by Model Sounds Inc. These are played at any time the battery voltages fall below their low-level limit(s) specified in the **ShockWave 3 PC Control Panel->Hardware Tab**.

You can also edit these values directly since they are stored in the [BasicHardwareSettings.txt](#) file on the microSD Card.

You can set the number of times the alarm sound will play when first triggered by the low voltage condition. This allows a possibly annoying alarm sound to be played only a small number of times and then allows you to bring in the model to home quietly.

UPDATING THE FIRMWARE IN THE SHOCKWAVE 3 MODULE

Firmware is the program code that runs in the processor chip on the **ShockWave 3** module. The **ShockWave 3** module features a **microSD Card Bootloader** program that is a small program that runs in a separate area of the microcontroller's FLASH program memory. The latest firmware is always available for download from our web site in the **Support->Downloads** section. Users can update the firmware themselves by copying the downloaded **ShockWave3Firmware.hex** file to the **ShockWave 3** sound module's microSD card.

However, DO NOT DO THIS unless instructed to do so by Model Sounds Inc.

The instructions for performing a firmware upgrade are in a separate PDF file called **"UpdatingShockWave3FirmwareUsingMicroSD.pdf"** found in the **Manuals-Instructions** folder of the microSD card in the **ShockWave 3** module and also [available on our web site here](#).

WHAT DO THE LEDS MEAN?

The LEDs on the sound module will flash at various rates either separately, together or alternately to indicate what is going on inside the module as follows:

<u>Sound Module Mode</u>	<u>LEDs State</u>	<u>Meaning</u>
Initial Startup	Red, Green, Blue, Orange LEDs all on together for about 1 second	Basic initialization starting, testing the LEDs, and starting the RTOS task scheduler.
USB Mode	Blue Flashing about once per second	USB Mode Normal operation. When ShockWave 3 PC application is launched, blue LED starts flashing rapidly.
Any mode	Green on steady	Any sound is playing.
Any mode	Red/Green flashing rapidly alternately	The module is waiting for the receiver to establish valid RC signals during its initialization period.
Any Mode	Red Flashing rapidly	MicroSD card is not present in the sound module, or cannot be read.
Any mode	Red/Green Flashing together about once per second	MicroSD card file system cannot be mounted, or cannot be read.
Any mode	Blue/Green Flashing together about once per second	The SELECT_YOUR_SOUNDSET_HERE.txt file is missing, misspelled or cannot be read.
Any Mode	Red Flashing twice per second	Configuration data in .sxf8 file cannot be read.
Any mode	Orange/Blue Flashing together about twice per second	Problem reading or writing the hardware settings in the .sfx8 file.
Regular playback mode	Red flashing briefly once every 2 seconds	One of the THRTL1 or SOUND1 inputs is not valid or is not connected or the receiver is not switched on.
Regular playback mode	Green flashing briefly once every 2 seconds	The Throttle1 input is receiving a valid RC signal from the receiver. This is the normal operating condition.
Any mode	Red/Green/Blue/Orange flashing all together	The firmware has halted, i.e. has "crashed". The sound module is inoperable until re-powered up. May also mean low receiver battery voltage – check battery voltage.

CHAPTER 20 – TECHNICAL SPECIFICATIONS

Sound file format :	Uncompressed 16 bit signed/44100 samples/second.
Main Supply Voltage Range :	4.5Volts – 26Volts for the on-board Audio power amplifier.
Low-level : Supply Voltage Range	4.5Volts – 12Volts for the low-level system supply (this is usually the receiver supply).
Current Consumption:	200 mA from receiver or USB supply. 250 mA from receiver or USB supply when writing to microSD Card. Add 35 mA when DopplerFX Accessory board is connected. Note: Switched LED loads consume extra current. 2 Amps max. from main power supply of 26Volts when playing sounds.
Supplied microSD Card :	8 GB - may increase with time.
Loudspeaker Impedance :	4 or 8 Ohms – DO NOT use lower than 8 Ohms on voltages greater than 14.4Volts supply.
Power Output into 4 Ohms :	Maximum 20W/14.4V – higher voltages not permitted when using 4 Ohms.
Power Output into 8 Ohms :	Maximum 9 W/12V, 20W/18V, 40W/26Volts supply, depending on the individual sound playing.
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. Engine1 sounds are usually on the right channel, Regular sounds and Engine2 sounds are usually on the Left channel.
Audio Line Out Signal Level:	1.0V RMS – AC coupled into 10KOhms load minimum.
Switched Outputs:	1Amp maximum per output, 4Amps maximum with all four outputs together, 30Volts maximum switching.
Size :	46mm x 69mm x 14mm
Weight :	33 grams (1.2OZ)
Output is Short-Circuit, Overload and Thermally Protected,	<u>BUT IS NOT REVERSE BATTERY PROTECTED.</u>

TECHNICAL SPECIFICATIONS (CONTINUED)

Up to sixteen regular (non-engine) sounds + Two separate Engine sounds :

Four sounds can play simultaneously at 16 bits/44100 samples/second (DopplerFX feature not included).

Throttle1 input can be used as a fourth SOUND Select input if not needed for engine sound.

Throttle2 input can be used as a fifth SOUND Select input if not needed for second engine sound.

SOUND3 input defaults as control input for DopplerFX Feature (See separate DopplerFX manual document for details).

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