Rumble 1 User Guide

**Version 1 May 2010**

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2 Overview

The Rumble 1 is a small self contained circuit board that plays sound clips from internal data memory. It is intended to be included within a model railway layout and used to provide background sounds, greatly increasing the realism of the layout.

The unit is self contained requiring only power to operate and includes a loudspeaker, an in-built optical sensor and connections to allow the unit to be triggered from switch closures.

The unit has been designed using modern technology, allowing benefits over competing systems. Multiple sounds can be stored. The sound clips are downloaded using the supplied PC control software. The sound clips are prepared from the sound files using the popular wav file format and as such may be created/compiled by the user. Within the layout, an in-built optical sensor and switch closures can be used to trigger a sound clip as well as being played at random. The triggers are fully configurable from the supplied PC control software.

3 Features

- Self contained circuit board requiring only power to operate.
- In-built loudspeaker
- Connection point for external 8R/16R loudspeaker (external loudspeaker not included)
- Configured using simple to use software running on a PC and communicating via a USB link
- Can store multiple sounds
- Sounds downloadable from PC software. Sounds must be prepared as wav files
- Total play time between 1 minute and 4 minutes depending on sound quality
- In-built optical trigger, operating distance up to 1"
- Provision for three external switch closure triggers
- Triggers fully configurable. All four triggers may be active at the same time.
- Compatible with DC and AC (DCC) systems
- Wide power range
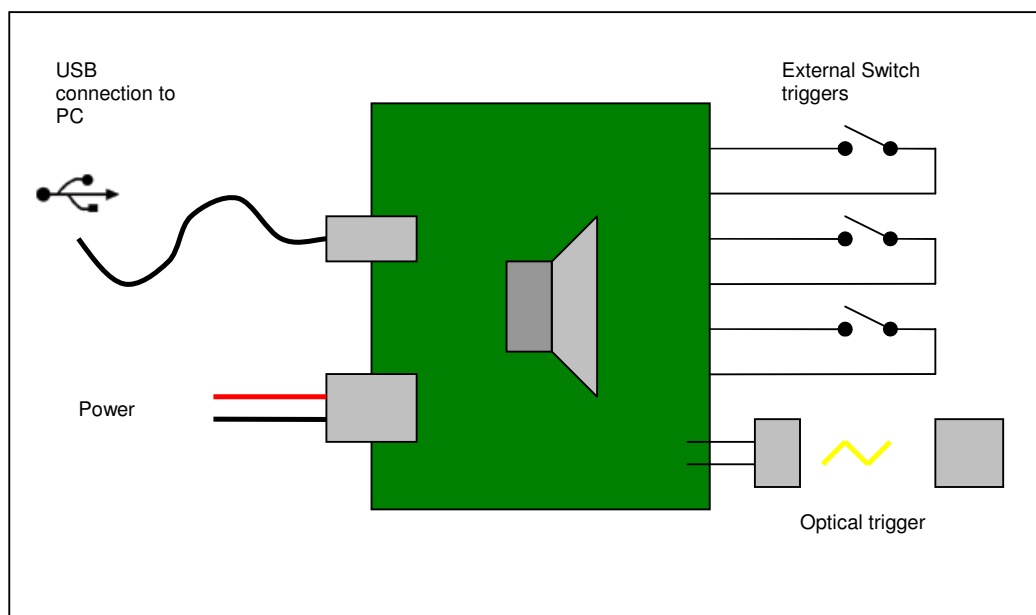
4 Specification

4.1 Maximum ratings

Power Input	+16V peak to peak
Switch input	No more than 1V above or below power input voltage

4.2 Normal operating specification

|	
Size	Approx. 55x40mm
Power	DC or AC +6V to +16V peak to peak. Connected via screw terminals
Power consumption	20mA typical
DCC compatible	Yes. The unit can be powered from a DCC system. The unit does not respond to DCC commands.
Optical sensor	One. Senses presence of external object up to approximately 1" away.
Switch closure sensor	Three. Senses switch closure. Connected via PCB solder pads.
Sound output	Basic loudspeaker supplied, mounted on PCB. PCB solder pad allows connection to external 8R/16R loudspeaker and can drive up to 400mW.
Sound clip capacity	Up to 254 sound clips may be stored. The total play time must not exceed 1 min at high quality, 2 minutes at medium quality and 4 minutes at low quality.
Configuration	Via Windows based PC using USB 1.0/2.0 compatible connection. Configuration software is supplied on disc. The USB connection is only for configuration and does **not** have to be present during normal operation. The unit can be powered by the USB connection alone.
Configuration capabilities	The number and content of sound clips may be set by the user. The triggers, optical and switch closure, may be individually enabled or disabled and individually set to play a given sound clip with a choice of trigger conditions.
Stand Alone mode	The unit is shipped with a mechanism to change the sound clips without having to connect to a PC

5 Circuit Board Installation and Wiring

5.1 Circuit board protection

The circuit board is provided 'bare' to reduce costs. Please take care when handling the board and take note of the following requirements...

- Do **not** handle the board in areas of static electricity.
- Do **not** allow any materials, especially liquids or metal, to fall onto the board.
- Do **not** allow the circuit board to come into contact with any other electrically live circuit.
- Do **not** allow any conductive object to touch the board whilst powered.
- Do **not** expose the circuit board to voltages higher than those indicated.

5.2 PCB supports and orientation

Obviously the circuit board can be mounted how ever you wish, but note that the board does have 3.2mm two fixing holes that may be used. *Please take care that any fixings do not touch or disturb the circuit board components*.
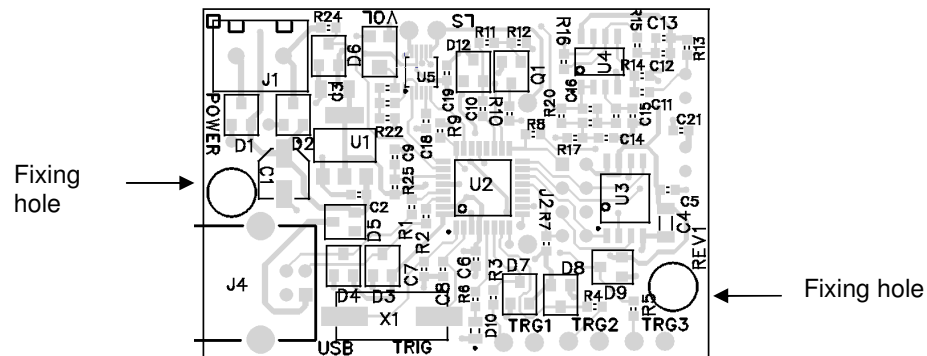
The loudspeaker is the large black round component on the *rear* of the board and normally the circuit board would be arranged so that the loudspeaker is projecting sound into the users model.

5.3   Power

Power is applied using the screw terminal connector in the top left hand corner of the board. The input is insensitive to polarity – although one pin is shown red in the diagram, the positive supply can be applied to either pin.
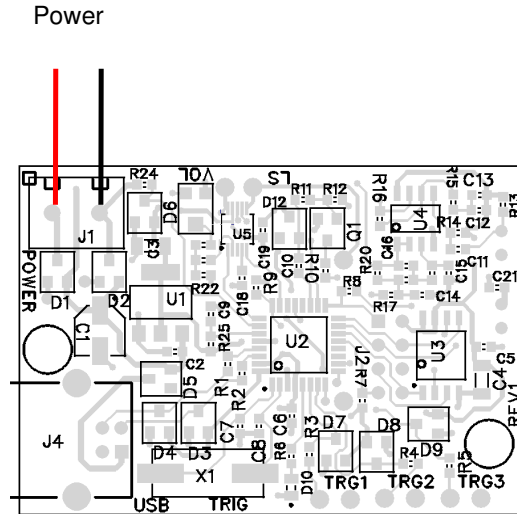
5.4   External switch trigger connection

The board can be connected to three external switches and can cause sound clips to be played. The switches can be simple push button switches or they could be, for example, reed-relays, triggered by a magnet attached to a moving object. For each switch the unit has two connections, a sense connection and a ground connection, normally wired to the two poles/ends of the switch. Each pair of connections comprise PCB holes that you must wire to.
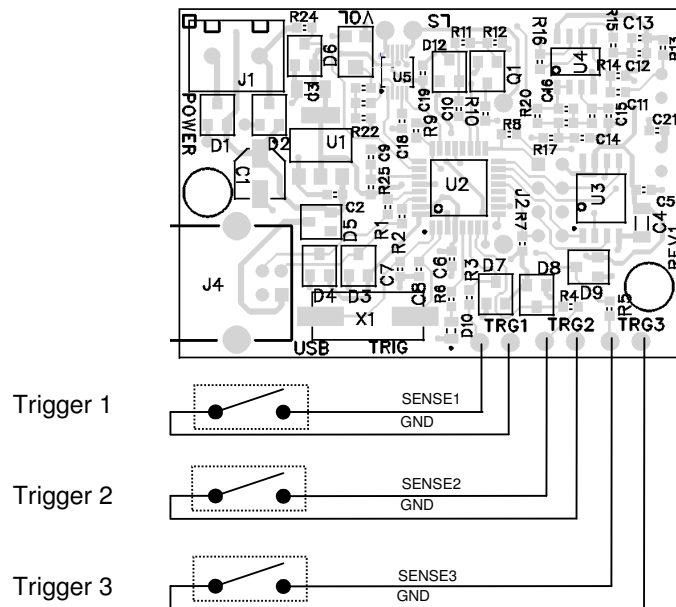
The ground pins are in fact common, so it is possible to use just one wire for the ground if this is more convenient…

Trigger 1
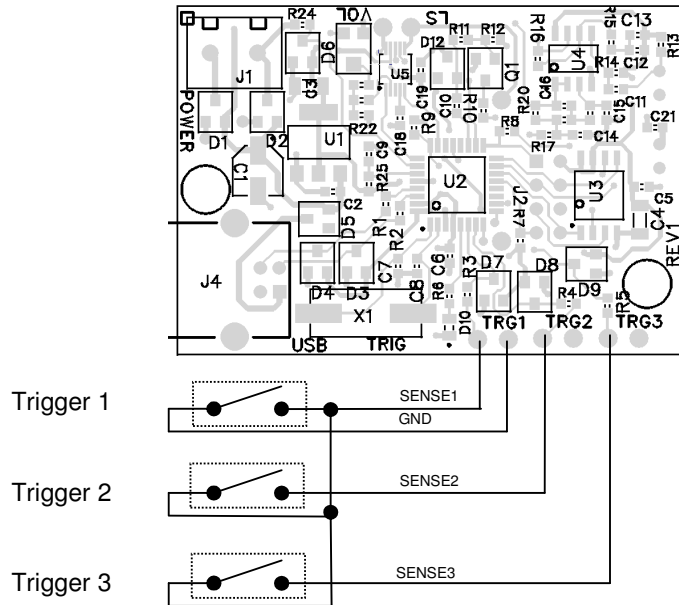
Trigger 2

Trigger 3

5.5 Optical trigger

The optical sensor comprises two elements – a transmitter and a receiver. The transmitter sends out pulse of infra-red light and the receiver will detect this when it bounces off a remote object. These two elements are situated on the right hand side of the board

Transmitter

Receiver

Side view

Reflective object
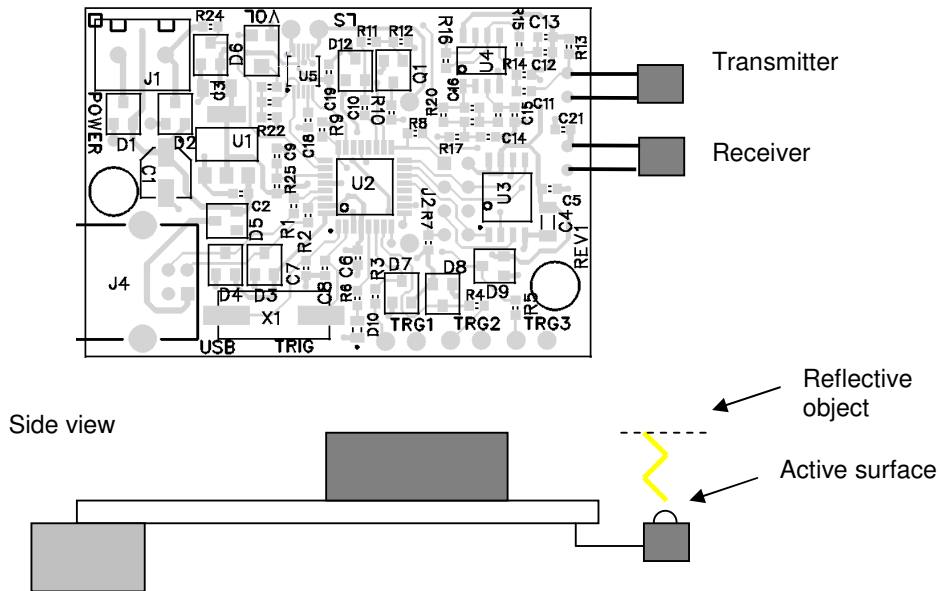
Active surface

The diagram shows that the active surface points out of the back of the board and any object to be sensed should be placed above that. The sensing elements can be bent, within reason to position them as required. Please note that a light shield will probably need to be added directly between the two elements as otherwise sufficient light can pass from the side of the transmitting element to the side of the receiving element and cause it to permanently trigger 'on'.

5.6   Volume

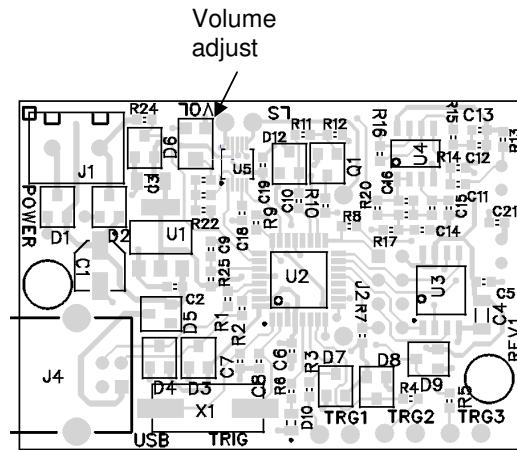The unit has a loudspeaker volume adjustment. This will normally be supplied set to full volume. This may be adjusted if required. Yes the adjustment is very small. If adjusting with the power applied, use only an insulated adjuster. Rotating clockwise increases the volume.

5.7   External loudspeaker

An external loudspeaker may be attached to the unit, significantly improving the loudness and sound quality. The two connection points are shown in the diagram. Wire the two points direct to the two terminals of the loudspeaker and nowhere else. Do **not** connect either side of the loudspeaker to any other signal, **nor** system ground, **nor** system power. The loudspeaker can be 8R or 16R impedance.
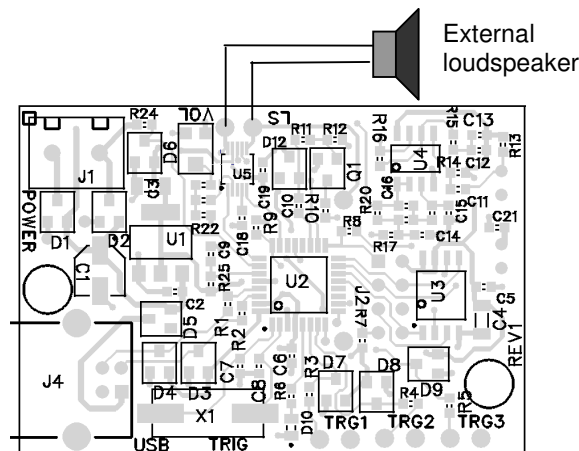
5.8   Monitoring LED

An on board LED is available which may be used to confirm that the triggers are working correctly.

Monitoring
LED
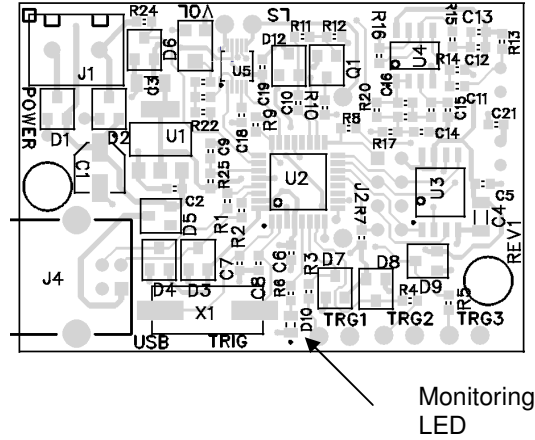
The LED can be configured (using the PC software) to light whenever a trigger is active. The sole purpose of this is to confirm a given trigger input is connected and working as expected.

6 Stand Alone Mode

6.1 Features

The unit is shipped in Stand Alone mode. This allows users without access to a PC to have limited control of the unit. The key features of this mode are…

- The optical trigger and external triggers 1 and 2 are enabled
- Each trigger will activate when the stimulus goes from off to on
- Trigger 3 does not operate as a normal trigger. Instead whenever it is activated, the sound clip for the last used trigger will advance to the next sound. The sound will be played to remind the user which sound it is. This feature allows the user to set the sound associated with each trigger. Bear in mind that as well as the list of stored sounds, the random option can also be selected.
- USB control is still possible although the stand alone mode will be cancelled.
- This mode is cancelled whenever the unit is connected to a PC and trigger 3 will be free to be used as a normal trigger input
- The stand alone mode can be re-enabled by the software, but make sure you do not issue any additional software commands afterwards otherwise it will be cancelled again

6.2 Example

Assuming the unit has never been connected to a PC, or the stand alone mode has been re-enabled, here is how to set the sound for trigger 2…

1. Power the unit
2. Momentarily activate trigger 2, e.g. by closing and opening a switch connected to trigger 2
3. Momentarily active trigger 3, e.g. by closing and opening a switch connected to trigger 3. You will hear a new sound. Repeat this until you hear your desired sound.
4. All done. Do not touch trigger 3 again. Activating trigger 2 will cause the new sound to be played.
5. Bear in mind the last sound clip of the sequence of sound clips is the random option, for which you will hear one of the sounds played.

7 Software Installation

7.1 Requirements

- PC with 200MHz Pentium minimum
- Windows XP, Vista or Windows 7 operating system
- 64MB RAM minimum
- Hard disc space 10MB minimum
- CD-ROM drive
- USB 1.0 or 2.0 port

7.2 Installation

The software is supplied on CD-ROM. This will be shipped with the product. If this is missing please contact Shrew Technology – see the contact information on the Support page. Insert the CD-ROM in the CD-ROM drive. After a few seconds the installation should automatically start.

The installation is very straightforward. You will be presented with a number of screens which will give you the opportunity to enter the destination directory and your user details. You should accept the default destination directory unless you have any reason to change it. If you do change the default destination, please make a note of it as it may be needed for the driver installation. Press the bottom left Next button to step through each screen of the installation. At the end of the process the program will be installed and you can quit the install application using the Finish button and remove the CD-ROM.
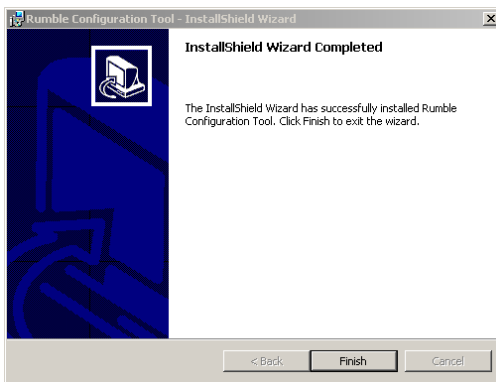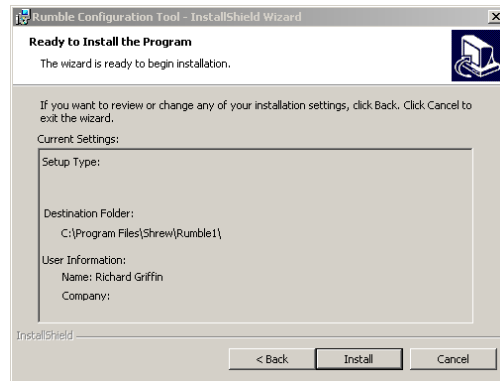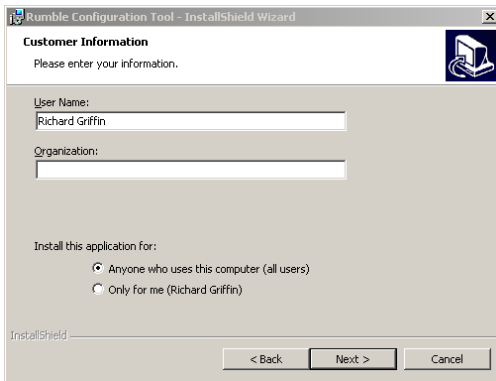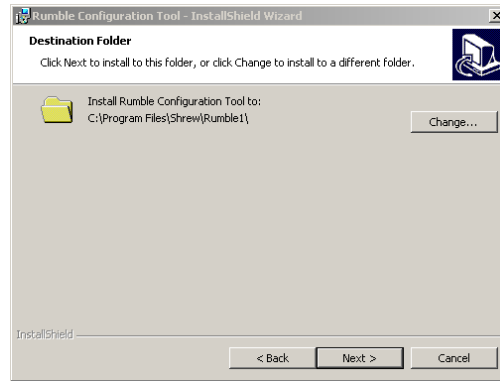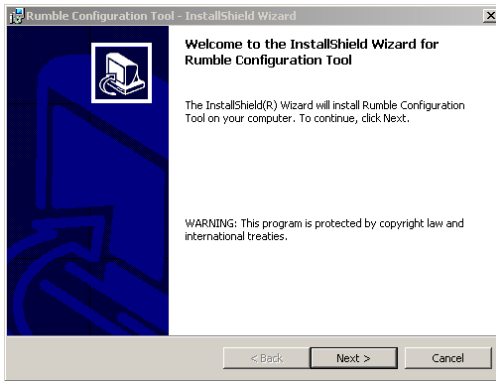
8   USB drivers

Although the unit connects to the PC over USB, the unit will work without the need for additional drivers. It will be possible to plug the unit in and for the PC to detect and use the unit without needing to install additional drivers. If there is any problem with this please contact Shrew using the details on the Support page.

9 Software Operation

9.1 Starting

Locate the Rumble Configuration Software and click on the icon to run it. The software should be available in the Start | Programs menu.

You should be presented with the following view.
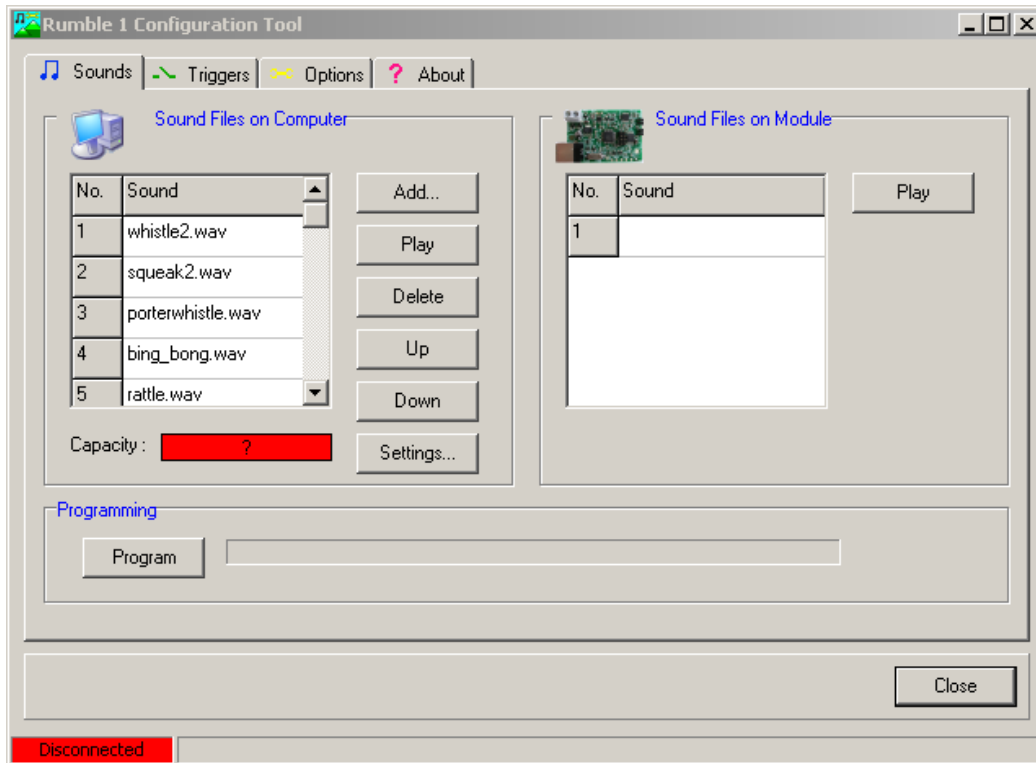
If the unit is already connected to the PC then the screen may appear slightly differently.

9.2 Main Controls

In the bottom right corner there is a Close button used to quit the application
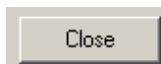
In the bottom left hand corner, there is a flag to indicate whether the unit is connected or not. It will be green when connected, red when not. Obviously communication with the unit will not be allowed when the unit is disconnected

Near the top of the screen there are four tabs, Sounds, Triggers, Options and About. Clicking any of these selects the main screens of the application. The Sound Files tab allows the user to manipulate the sound files and download them to the unit. The Triggers tab allows the user to set how the optical and external triggers play a sound clip. The About tab provides program information.

9.3   Sounds Tab

Press the Sound Files Tab to select the sound files screen.
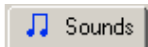
This screen allows the user to prepare the sound clips to be sent to the unit and then program them into the unit. The current sound clips that the unit contains are also presented.

9.3.1   Sound Files on Module
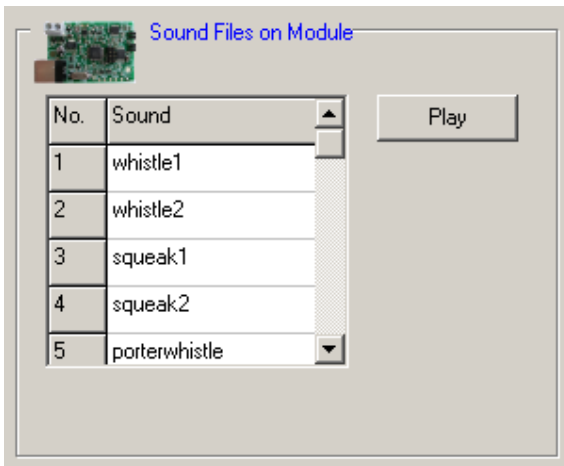
The right-hand side of screen shows a list of the sounds currently contained in the unit. This list will be blank if the unit is not connected and will automatically update as soon as the unit is connected or the sounds are (re-)programmed. It is not possible to delete sounds using this list, that can only be done by re-programming – see below. Primarily for test purposes, it is possible to play a sound – click on the sound in the list and press Play. Note that if more one sound is available then two additional 'sound's are available, -random- and –cycle-.

–random- chooses a sound at random – select this, click on Play and you will see. This random option can be used as a sound source when configuring the triggers – see below.

–cycle- advances to the next sound each time the trigger is activated.

9.3.2 Sound Files on Computer
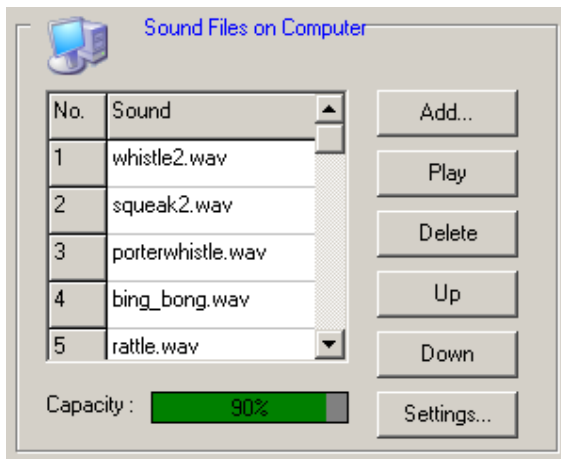
The left-hand side of the screen allows you to prepare a list of files to be sent to the unit. The current list is displayed and remembered between software sessions. Note that the list may not necessarily reflect the sounds currently stored in the unit – view the right hand 'Sound Files on Module' panel to see that. Altering the list of sounds files does **not** automatically update the sound clips in the unit – you can only update the unit using the Program button.

To add a sound, press the Add… button and browse to and select the required wav file. The new file will appear at the bottom of this list. To aid management, if you hover over a file in the list the full directory path will pop up so you can be clear where the file is located on disc. Sounds clips can also be added by dragging and dropping from Windows Explorer.

A basic selection of sounds is provided in the Sounds directory, located wherever the software is installed.

To hear the sound played on the computer (not on the module), highlight a sound and press the Play button.

Any file can be deleted by selecting the file in the list and pressing the Delete button; please note this deletes the file from the list, not the file itself!

The order of the files can be changed by selecting any file and pressing the Up or Down buttons; the order is not that important.

Whenever a file is added, deleted, or the quality is changed (see below), the amount of storage required is re-computed and presented as a percentage below the file list.
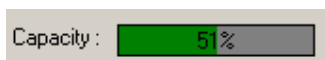
If the total capacity required exceeds 100% this value will turn red and you will not be allowed to program the unit. Generally, medium quality is fine for most sound clips, low quality can start to sound a little unnatural. The capacity will also turn red if there is an error with one or more files – typically if a file can no longer be found. Hover over the capacity bar to get more information.

The properties of the individual sound files can be changed by double clicking on the sound file or highlighting the file name and then pressing the Settings… button

Settings...

You will be presented with the following screen…
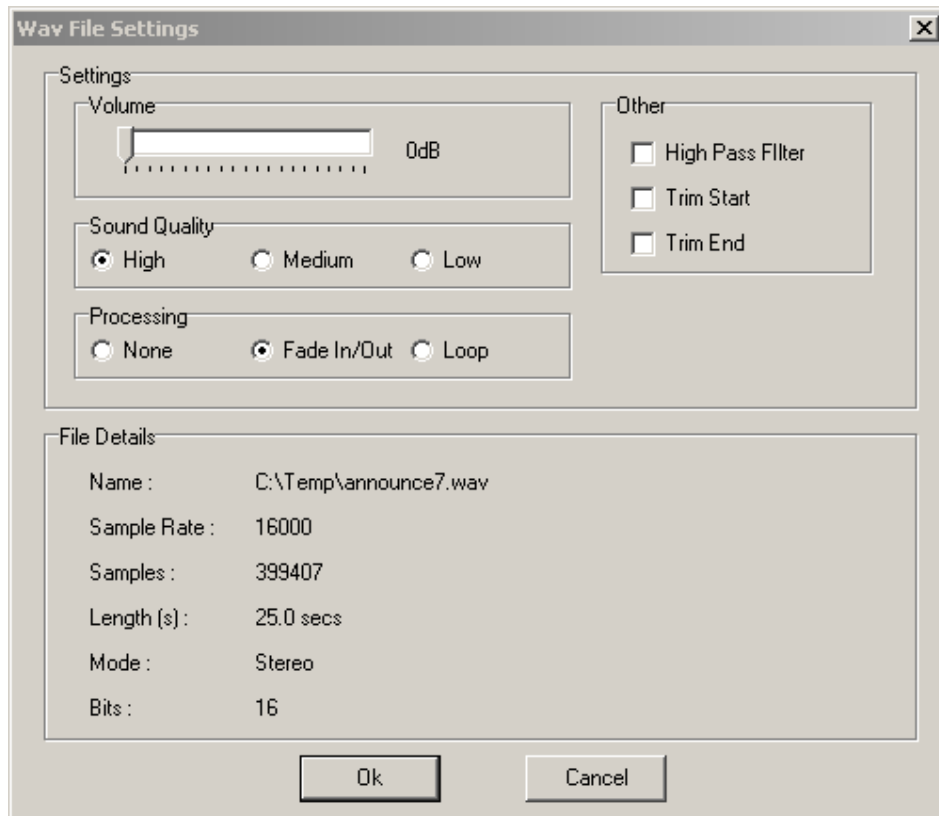
The bottom half of the window shows details of the wav file and may be useful for checking the length and type of file.

The top half of the window provides a number of settings that influence the playback of the sound file. Note that these settings only affect the sound data stored on the Rumble unit, it will not change the original sound file. The settings are as follows…

Volume

The software will normally adjust the level of each sound so that the peak level of the sound is played at peak level. Sometimes you may wish one more sounds to be played at a lower level. Drag the volume slider to reduce the level of the sound. 0dB means maximum output; the larger the negative value, the lower the level the sound is played at.

If you have no use for this control, set it to 0dB.

Sound Quality

The sound quality of a given file can be changed between High, Medium and Low. The purpose of this is to allow the user to trade sound quality against the size needed to store the sound clip in the unit. The lower the quality, the less space is required and so the more files (or longer files) that can be stored. The trade off is as follows…

- If all the files are high quality, the total combined play time of all the files must be less than approximately 1 minute.
- If all the files are medium quality, the total combined play time of all the files must be less than approximately 2 minutes.
- If all the files are low quality, the total combined play time of all the files must be less than approximately 4 minutes.

Processing

The processing mode can be set as follows…

- None. No processing is performed
- Fade In/Out. The start and end of the sound are faded up and down respectively. This may be used to provide a cleaner start and end to the sound
- Loop. If the sound is to be played continuously, enabling Loop will blend the end of the file with the start, reducing the hiccup when the sound reaches its end and starts again.

Other

The Other controls provide additional settings as follows…

- High Pass Filter. Enabling this will reduce very low frequency sounds. This may be particularly valuable in reducing wind noise.
- Trim Start. Enabling this will remove the first 1 sec of the sound. This may be useful if, say, the sound contains a click as a result of the recording apparatus being turned on.
- Trim End. Enabling this will remove the last 1 sec of the sound. This may be useful if, say, the sound contains a click as a result of the recording apparatus being turned off.

9.3.3   Wav files

The wav file format (extension .wav) is the only type of sound clip format the program will accept. Wav files are widely used and seem to be the most common way of storing sound clips. The program cannot read mp3 files. Wav files in themselves can hold the sound in the number of different internal formats. The only internal format the program can read is 'linear PCM'. This format is the most common form of wav file format. If you are recording and generating sound clips for use with this program, make sure you are storing the files as wav files and that the internal wav file format is 'linear PCM'.

9.3.4   Programming
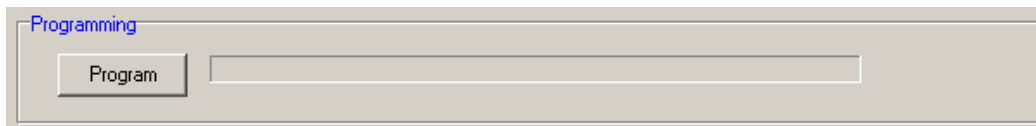
To program the unit with the sound clips listed in the Sound Files display, make sure the unit is connected, make sure the capacity does not exceed 100% and press the Program button. A progress bar will indicate the programming progress. The programming time will vary

depending on the number and length of the sound clips but will typically take from 5 to 20 seconds. Do not remove the unit whilst programming. After programming, the Module Sounds display will refresh to show the new set of sound clips stored and the unit is ready for use. Please note that when the sound clips have changed, the trigger settings may become out of date – go to the Triggers screen and check the set-up is as required.

9.4 Triggers Tab

Press the Triggers Tab to select the triggers screen.
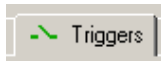
This screen allows the user to set how the triggers, the optical and external switch triggers, play a sound clip. Note that this screen always reflects the current unit setting. If the unit is not connected, the information will be cleared and you will not be able to change anything. You can only change the settings when you are connected to the unit, and the unit's state will be updated as soon as any change is made on the screen.

All four triggers, optical, external 1, 2 and 3 can be configured. The settings for each trigger is identical so only one will be illustrated…

9.4.1 Type

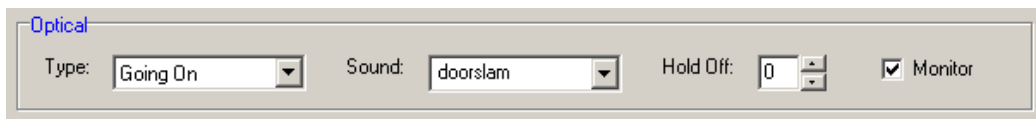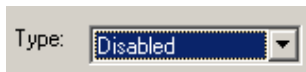To change the trigger type, use the Type drop down box and select one of the options. The trigger type describes under what conditions a sound clip is played. The choices are as follows…

Name	Description
Disabled	Trigger not used under any circumstance
Going On	Trigger plays sound clip only when transitioning from off to on, i.e. a switch closing. The sound clip can be interrupted by another trigger
Going Off	Trigger plays sound clip only when transitioning from on to off, i.e. a switch opening. The sound clip can be interrupted by another trigger
Going On or Off	Trigger plays sound clip when transitioning from off to on or on to off, i.e. a switch closing or opening. The sound clip can be interrupted by another trigger
Going On, Play All	Trigger plays sound clip only when transitioning from off to on, i.e. a switch closing.The sound clip can **not** be interrupted by another trigger and will play to its end
Going Off, Play All	Trigger plays sound clip only when transitioning from on to off, i.e. a switch opening. The sound clip can **not** be interrupted by another trigger and will play to its end
Going On or Off, Play All	Trigger plays sound clip when transitioning from off to on or on to off, i.e. a switch closing or opening. The sound clip can **not** be interrupted by another trigger and will play to its end
While On	Trigger plays sound clip whenever the trigger is on, i.e. a switch closed. When reached the end of the clip and the trigger is still on, the clip will play again
While Off	Trigger plays sound clip whenever the trigger is off, i.e. a switch opened. When reached the end of the clip and the trigger is still off, the clip will play again
Random Fast	The trigger is ignored but the sound clip will play at random intervals between approx. 5 and 30 seconds
Random Slow	The trigger is ignored but the sound clip will play at random intervals between approx. 5 seconds and 3 minutes

9.4.2 Sound

Sound: whistle1

The sound clip to be associated with the trigger is selected using the Sound drop down list. The drop down list will always be updated to reflect the list of sounds stored in the unit – note that this may not be the same as the list of sound files prepared in the Sound Files screen. Note that if more one sound is available an additional 'sound' is available, -random-. This chooses a sound at random – this may be considered as an additional sound clip. Thus if this option is selected and trigger occurs, one of the other sounds in the list will be chosen at random.

Although only one sound clip can be assigned per trigger, all triggers can be active, each with a different sound clip. Together with the random options this gives a wide range of possible sound clips that can be generated without the need to re-configure the unit.

9.4.3 Hold Off

Hold Off: 0

Hold off prevents a trigger from re-triggering for a set period of time. This might be useful if, for example, you intend to have a slow moving train passing the optical trigger – the hold off can be set to prevent each wagon from re-triggering the sound.

The hold off is set in seconds. For example, if a value of '5' is set, a trigger will not be not able to re-trigger a sound for 5 seconds after an initial trigger.

If you are not clear how to use this, or have no use for it, set the value to 0.

9.4.4 Monitor
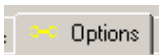
☑ Monitor

The Monitor checkbox can be set if you want the associated trigger to light the on board monitoring LED. Note this is a debugging feature to be used to confirm that any trigger wiring is correct.

9.5 Options Tab

Press the Options Tab to select the options screen.

⚒ Options

This screen allows the user to control assorted options.

9.5.1 Stand Alone Mode
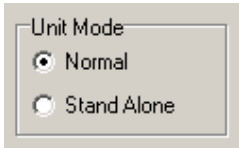
This control allows the user to revert the unit to Stand Alone mode where trigger 3 is used to select the sounds of the other triggers. See section 6 for more details.

Whenever the unit is reconnected to this software application, the mode will revert to Normal, so it is recommended that the unit is disconnected from the PC as soon as the Stand Alone command has been issued.

Normally there should be no reason to change this control to Stand Alone, except perhaps if the user anticipates not being near a PC and yet will still want to change the sound associated with a trigger.

10 FAQ

10.1 Why is the optical sensor not working?

The optical sensor comprises an infra-red transmitter and receiver. The transmitter sends out pulse of infra-red light and the receiver will detect this when it bounces off a remote object. However, with the transmitter and receiver arranged side by side, sufficient light will cross the direct path from transmitter to receiver to cause a trigger and appear to be permanently 'on'. The solution is to place some form of shield in the direct path between the transmitter and receiver. Do not use thin paper as this will not be sufficient to stop the rays. To test this, use the configuration software to enable the Monitor Led for the optical sensor only. The Monitor Led will then light whenever the sensor is triggered and the user can experiment how best to arrange the shield.

10.2 Where can I find sound files?

Sound files must be in the popular "wav" file format. This means files ending with the .wav extension. Rumble cannot currently read mp3 files. Searching the net for, for example, "train sound wav" will produce many relevant results. One of several useful sites is http://www.freesound.org/ ; the sounds are free although you do have to sign up. Generally if you find a link to a wav file, hover over the link, right-click and select Save Target As… - you will then be prompted to select a directory on your PC where you will save the file.

In due course, the Shrew Technology website will host a collection of sounds at the following address…

http://www.shrewtech.plus.com/rumble/sounds

It should be reminded that the legality of any sound clips used is solely the responsibility of the end user and Shrew Technology does not condone nor encourage the use of pirated or illegal sound clips.

A basic selection of sounds is provided with the software. The selection includes station announcements, trains passing, whistles, etc… These are in the Sounds directory, located wherever the software is installed.

10.3 Can I use mp3 files?

No. Only wav files are supported. Wav files are sound files with the .wav extension.

10.4 Why can some wav files not be read?

The wav file format permits the audio data that it contains to be formatted in a number of different ways. The configuration software only supports the so-called 'linear PCM' format. Most wav files use this format, but it has been observed that some wav files, often sourced from commercial recordings, may use a different format and it may not be possible to read these. It may be possible to convert to the standard 'linear PCM' format using third party software; for example, Audacity (http://audacity.sourceforge.net/) is an effective freeware audio editing software and may be of use. Shrew Technology will not provide support for any third party software. It should be reminded that the legality of any sound clips used is solely the responsibility of the end user and Shrew Technology does not condone nor encourage the use of pirated or illegal sound clips.

10.5 I can't hear anything

Has the volume control been turned all the way down? See section 5.6 to adjust this

10.6 The loudspeaker is too quiet

First, check that the board volume control is turned up fully – see section 5.6.

This unit has been conceived as providing localised sounds to a model, rather than broadcasting over a large area; moreover the loudspeaker supplied on board is a basic loudspeaker. If this is not satisfactory, an external loudspeaker (not supplied) can be attached – see section 5.7. An external loudspeaker will provide a substantial improvement over the on-board loudspeaker. If you use an external loudspeaker, try to make sure there is a baffle between the front and back of the loudspeaker – this will make a significant improvement.

10.7 The sound is still very quiet

When RumbleConf prepares the sound clip, the level of the clip is adjusted so that the loudest sound within the clip will be heard at peak level from the loudspeaker. If the loudest sound is not your intended sound, it may dwarf the intended sound, making it much quieter. For example thumps, rustles and clicks when the recording equipment is turned on or off, may all substantially supersede the level of the intended sound. In addition, wind noise, although barely audible, can also substantially affect the recording. The best solution is to eliminate all these factors by recording carefully and/or processing the sound clip in some audio editor. Rumbleconf can do two things to assist. Firstly, a high pass filter can be enabled which should remove most wind noise and other low frequency rumbles. Secondly, the start and end of the sound clip can be deleted, hopefully removing the on and off clicks of the recording equipment. Use the Settings… button to control these features.

10.8 My trigger isn't triggering

Enable the monitoring LED for that trigger only (see section 8.4.3). The LED reflects the current state of the trigger. Activate the trigger (switch, relay etc) – if the LED does not come on (or not go off) then there is a fault with the trigger wiring.

Have you got a hold off set (see section 9.4.3.)? If in doubt set all the hold-offs to 0.

10.9 Trigger 3 is behaving oddly

If trigger 3 is behaving oddly, this could be because the unit is in Stand Alone mode. See section 6 for more details of this. If Stand Alone is not what is wanted, then connect the unit to a PC and either send any command or select Normal using the Options | Mode control.

10.10 The sound keeps restarting because the trigger is jittery

Select the "Going On, Play All" trigger mode. Once the trigger has occurred this mode will play the entire sound before being re-triggered

11 Support

If you think you have a faulty product then you can e-mail support@shrewtech.plus.com , or contact us at the address below, and we will be pleased to assist. We will endeavour to help with more general issues, and you can use the same contact details, but please be aware we reserve the right not to respond to such enquiries.

When contacting us, please indicate the product and provide as much information as possible about the problem.

Please note that Shrew Technology will **not** provide support on any third party software or equipment.

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