



Rapture3D User
v2.9.11

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1 Introducing Rapture3D

Thanks for using Rapture3D! Rapture3D works with computer games and ambisonic audio playback to give a full 3D surround sound experience.

This is help for the "User" edition of the software. It should be possible to make it work with quite a few OpenAL games, although some quite dangerous technical intervention can be required. There are "Game" and "Advanced" editions too, which also use OpenAL. The "Advanced" edition also supports professional studio use of the Rapture3D Higher Order Ambisonic decoder.

Please note that this OpenAL driver is not the same as the newer Rapture3D "Universal" audio engine. This interacts with games in a different way.

1.1 Getting Started

Generally, Rapture3D will just work with your [sound card](#) settings, so if sound is working on your PC then you're probably ready to go. That set, you might want to check your Windows "Advanced" sound card settings because Rapture3D works best when it knows exactly what kind of speaker layout (or headphones) you are using.

Once your sound card is set up, Rapture3D will choose sensible settings for your PC. But you may wish to use the [Rapture3D Speaker Layout tool](#) to tune things further so the sound is just as you'd like it.

1.2 The Rapture3D OpenAL Driver

For some games, the Rapture3D [OpenAL](#) driver can be used in place of the system OpenAL driver to take advantage of Rapture3D's sophisticated 3D audio rendering.

1.3 The Rapture3D Ambisonic Player

Rapture3D comes with a [player](#) for ambisonic sound files (typically .AMB files). Unlike standard "surround" mixes, these can reproduce full 3D audio.

2 Sound Card Set Up

Your [sound card](#) was probably set up when you bought it, although the settings may have changed depending on what you've connected to it since. If your computer can play music or films with sound, make telephone calls or even just play the Windows "welcome" jingle then you're probably ready to go.

You need a DirectSound-compatible sound card for this edition of Rapture3D to work properly. This is the normal type for Windows, so if other sounds are working then Rapture3D probably will too. If not, then it's probably best if you talk to the shop where you bought your computer (or a friendly expert) before continuing here. To avoid embarrassment, you might want to check you've connected up your speakers or headphones correctly (the instructions probably came in the box with your PC).

Rapture3D works best if it knows exactly how your speakers are set up. If you're feeling brave, you can "[Configure](#)" your [Windows sound card](#) to choose the layout you want. This is particularly important if you're using headphones or a "surround sound" system with more than two speakers. On some systems (but not all) you can also check and change these through the [Rapture3D Speaker Layout tool](#) using the [Layout tab](#).

2.1 What Is A Sound Card?

Once upon a time, a sound card used to be a computer expansion card (a circuit board) that was slotted into the back of a PC to produce sound. These days the electronics needed is often built into the main body of the PC or connected using USB, so there isn't really a "card" involved at all. But we often still call the electronics involved a "sound card" anyway.

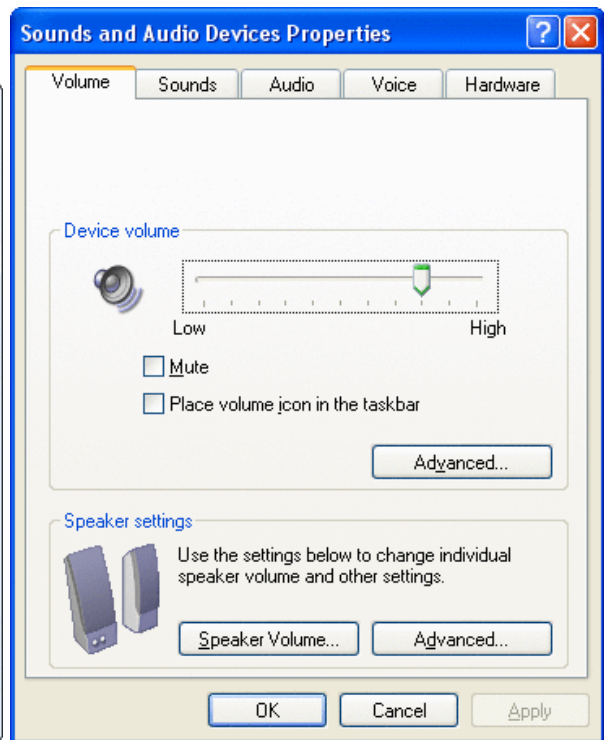
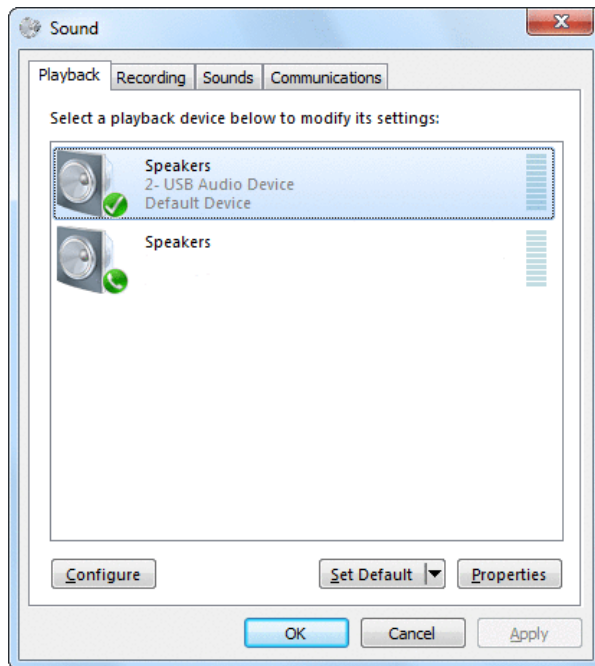
Sound cards typically have connectors to allow you to hook up speakers or headphones, although some work with internal speakers, particularly in laptops.

If your computer produces sounds at all, your sound card is probably ready to go, though if you want to use more than two speakers you should probably delve deeper...

2.2 Advanced Sound Card Set Up

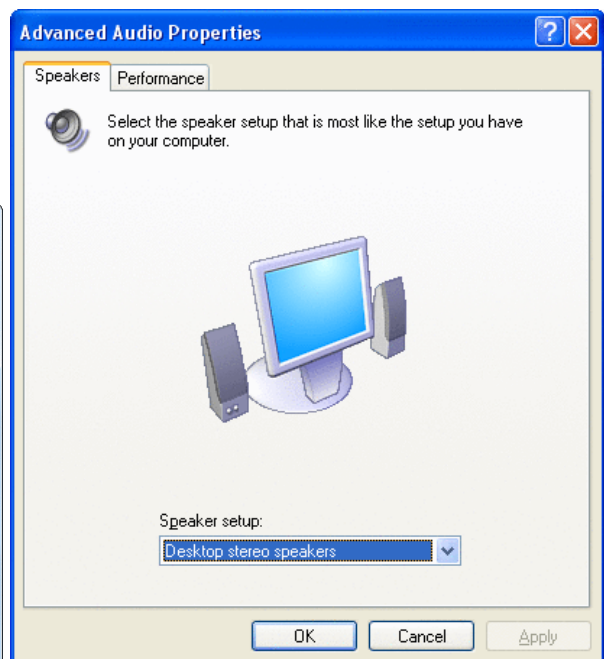
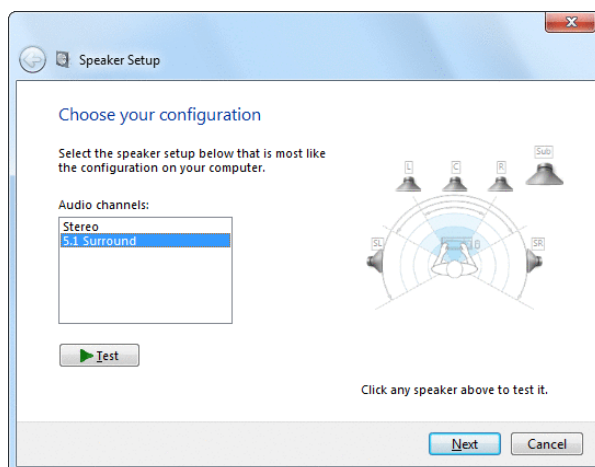
Windows "Control Panel" is normally available from your Windows "Start" menu. Within this, depending on how you have it set up and your operating system, you will see a section with a names like "Sound", "Sounds, Speech, and Audio Devices" "Sounds and Audio Devices" or "Hardware and Sound".

When this is selected, you should see something like one of these:



If you click through the tabs, you should see the audio settings you're using for other audio playback. If they don't look right, change them if you're sure you know what you're doing, or find an expert to help.

Once you're done, click on the "Configure..." button if it's enabled (or "Advanced..." on older versions of Windows). This should bring up another window as below. If it doesn't, or if the button isn't enabled, it's probably just that your sound card is stereo only but doesn't understand that there are different types of stereo. You can configure this more precisely in the [Rapture3D Speaker Layout tool](#) by using a Stereo Compatibility ("Compat.") mode on the [Layout tab](#). There is a similar compatibility mode for ITU 5.1, primarily for use on older versions of Windows.

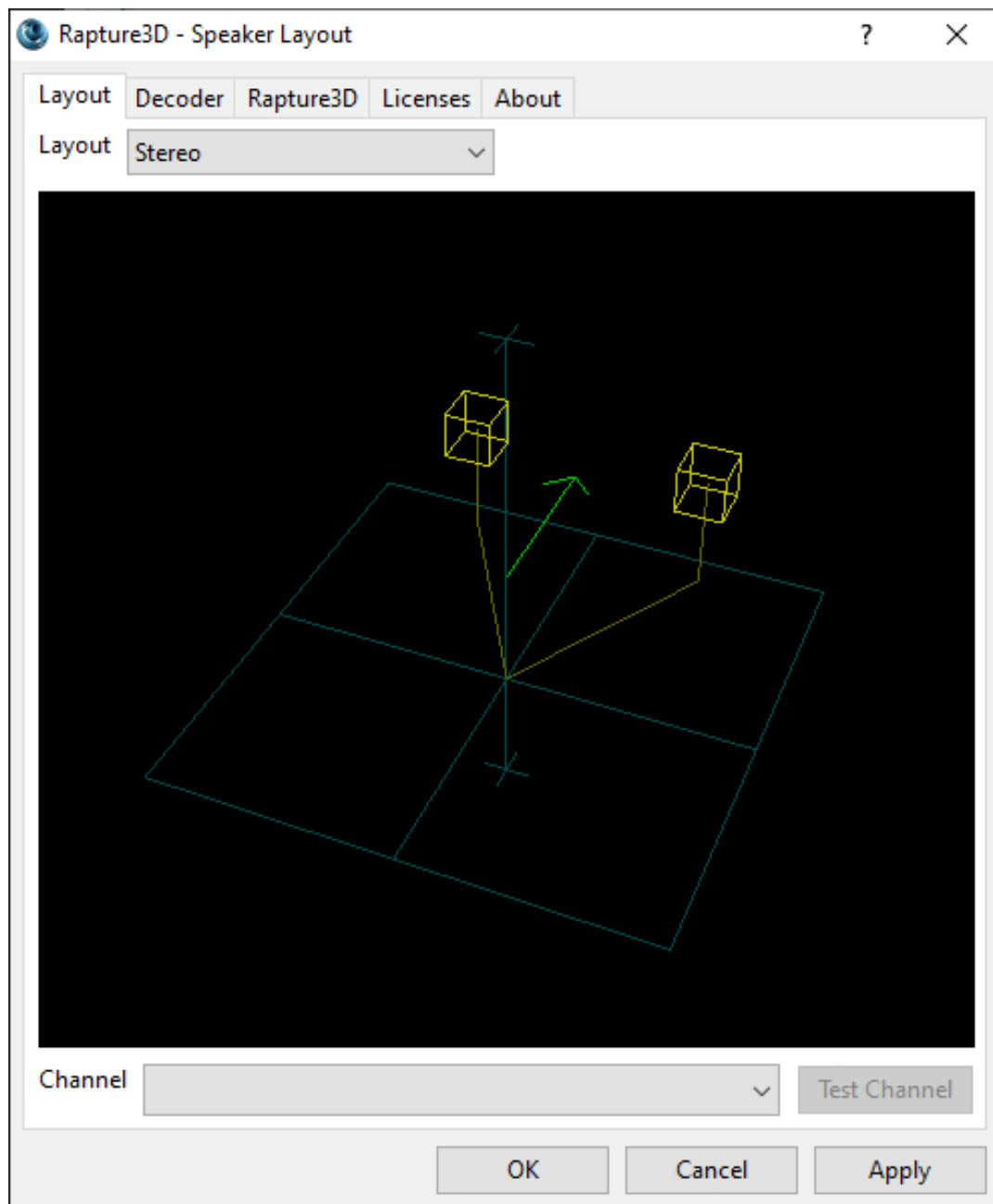


The important thing here is the "Audio channels" setting, or the "Speaker setup" choice on older versions of Windows. This should be set as close as possible to the actual layout of the speakers you're using. Again, if you don't have the right stereo options available you may want to use a Stereo Compatibility ("Compat.") mode on the [Layout tab](#).

Click on "OK" when you've finished making changes, or "Cancel" if you want to leave things as they were.

3 Rapture3D Speaker Layout

Once you're happy that your [sound card is set up correctly](#) you might want to fine-tune the settings using the Rapture3D Speaker Layout tool. Normally this appears under "Blue Ripple Sound" on your Windows "Start" menu.



Set up is done in stages, each with its own tab:

1. On the [Layout tab](#), check your sound card has been set up correctly and that the speaker (or headphone) layout is correct.
2. The [Decoder tab](#) can be used to select the decoder that will be used for the layout chosen on the previous tab.
3. On the [Rapture3D tab](#), you can choose the settings that will be used when a game is running.

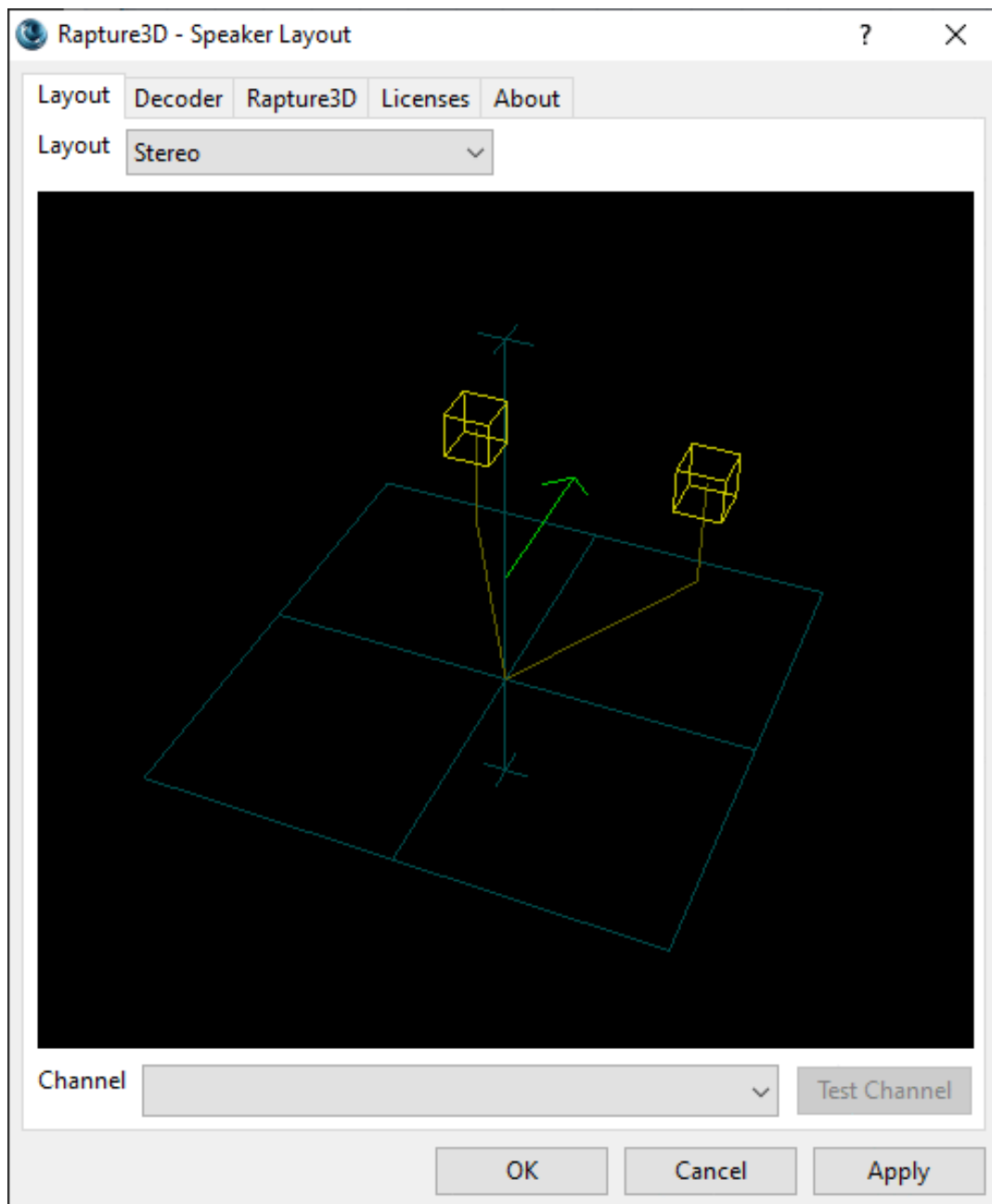
Normally license set-up happens automatically, but if it didn't or if you want to move a license to another machine, you can use the [Licenses tab](#) to manage your Blue Ripple Sound licenses.

Click on "Apply" or "OK" when you're happy with your changes, or "Cancel" if you want to leave things as they were. Note that if there is a game running when you do this, Rapture3D will attempt to restart itself, so make sure you save your place first as some games may not like this.

If your Windows sound card settings are correct then Rapture3D generally will choose sensible settings for your machine, so none of this is *necessary*. But we think the flexibility this program provides is useful and interesting!

The About tab has information about us ([Blue Ripple Sound](#)), the edition of the software you're using and other third-party software we've used, plus some legal stuff. Please read!

3.1 The Layout Tab



As you can see above, most of this page is taken up with a graphical representation of the speaker layout you're using. You can click and drag to rotate the graphical view (this doesn't affect the sound).

The speaker layout displayed should correspond to your Windows settings. If you change the layout on this page using the "Layout" drop-down at the top, you may also need to change your Windows settings. We'll try to change them for you automatically, but often this isn't possible, so you (or a friendly expert) might need to use Windows "Control Panel" to change some [soundcard settings](#).

3.1.1 Layouts

Rapture3D comes with support for the following layouts:

Format	Description
Stereo	This is a straightforward layout using two speakers.
Headphone Stereo	This is what should be selected if you're using a set of headphones. If you've connected headphones but Windows won't let you select this then take a look at the Compatibility Modes below.
Mono	Just one speaker is available. Obviously there's not much we can do in 3D here!
Quad	Four speakers at the corners of a square.
Surround 5.1	This is an arrangement with front left, right and centre speakers and two "surround" speakers at the side or back. There's a subwoofer too, which can go anywhere in the room. This layout assumes that the four corner speakers are set out roughly in a square, which is slightly different to the "standard" ITU layout below. We find that many gamers and sound positioning systems use this.
Surround 5.1 (ITU)	This is a version of the "Surround 5.1" layout that you may well have set up if you're following cinema conventions rather than gaming ones. This layout has larger gaps between speakers to the side and rear, as recommended by the ITU (International Telecommunication Union). Specifically, your front left and right speakers are expected to be 30 degrees from front centre and the "side" speakers at 110 degrees. Anyway, try changing the Layout drop-down between the options and see which one looks most like the actual layout you're using. Don't worry about the location of the large "subwoofer" in the picture - this can go anywhere in the room.
Surround 7.1	This adds two more speakers beyond Surround 5.1, so there are two side and two back speakers.
Surround 7.1 (Wide)	This is a widescreen speaker layout used in some cinemas, where placement of sounds across the screen for many viewers is prioritised over immersion and front/rear balance.
Surround 3D7.1	This layout takes a bit of effort to set up, but is well worth the effort as it allows sounds to be placed above and below! (It works fine for stereo and 5.1 films too.) For this to work, you need your computer set up to use 7.1 surround speakers, but you don't put the 7.1 speakers in their normal places.
Surround 5.1.2	This is an eight-channel layout formed from a 5.1 layout with two additional ceiling speakers, to the left and right above the listener. The corner speakers of the 5.1 are assumed to be set out roughly in a square. To use this layout, you will need to set your computer's audio output to 7.1, but the output from the 7.1 "rear" channels should be sent to the ceiling speakers. The side channels remain side channels.
Surround 5.1.2 (ITU)	This is an eight-channel layout formed from a 5.1 ITU layout with two additional ceiling speakers, to the left and right above the listener. The corner speakers of the 5.1 are assumed to be at standard ITU angles. To use this layout, you will need to set your computer's audio output to 7.1, but the output from the 7.1 "rear" channels should be sent to the ceiling speakers. The side channels remain side channels.

Format	Description
Surround Stereo	It's possible you have your computer set up using stereo (i.e. two channels) but you're feeding the audio to another box with a "surround decoder" which will do some clever stuff and then feed to more than two speakers. "Dolby Pro Logic" is an example of this. If you select this option in Rapture3D we'll try to generate a compatible signal (make sure you select the right "Method" on the "Decoder" tab though). These systems typically don't work as well as feeding the surround speakers directly, but they aren't bad.
Compatibility ("Compat.") Modes	Some Windows sound cards don't know the difference between different types of stereo (ordinary Stereo, Headphone Stereo and Surround Stereo). This is because the difference doesn't really matter to them - they just output two channels of audio and call this "Stereo". However, this matters to us. So if you've connected up headphones and your sound card lets you select "Stereo" but not "Headphone Stereo", select "Headphone Stereo (Compat.)" instead. This will tell your sound card that you're using Stereo, but Rapture3D will know the difference. There is a similar compatibility mode for ITU 5.1, primarily for use on older versions of Windows.

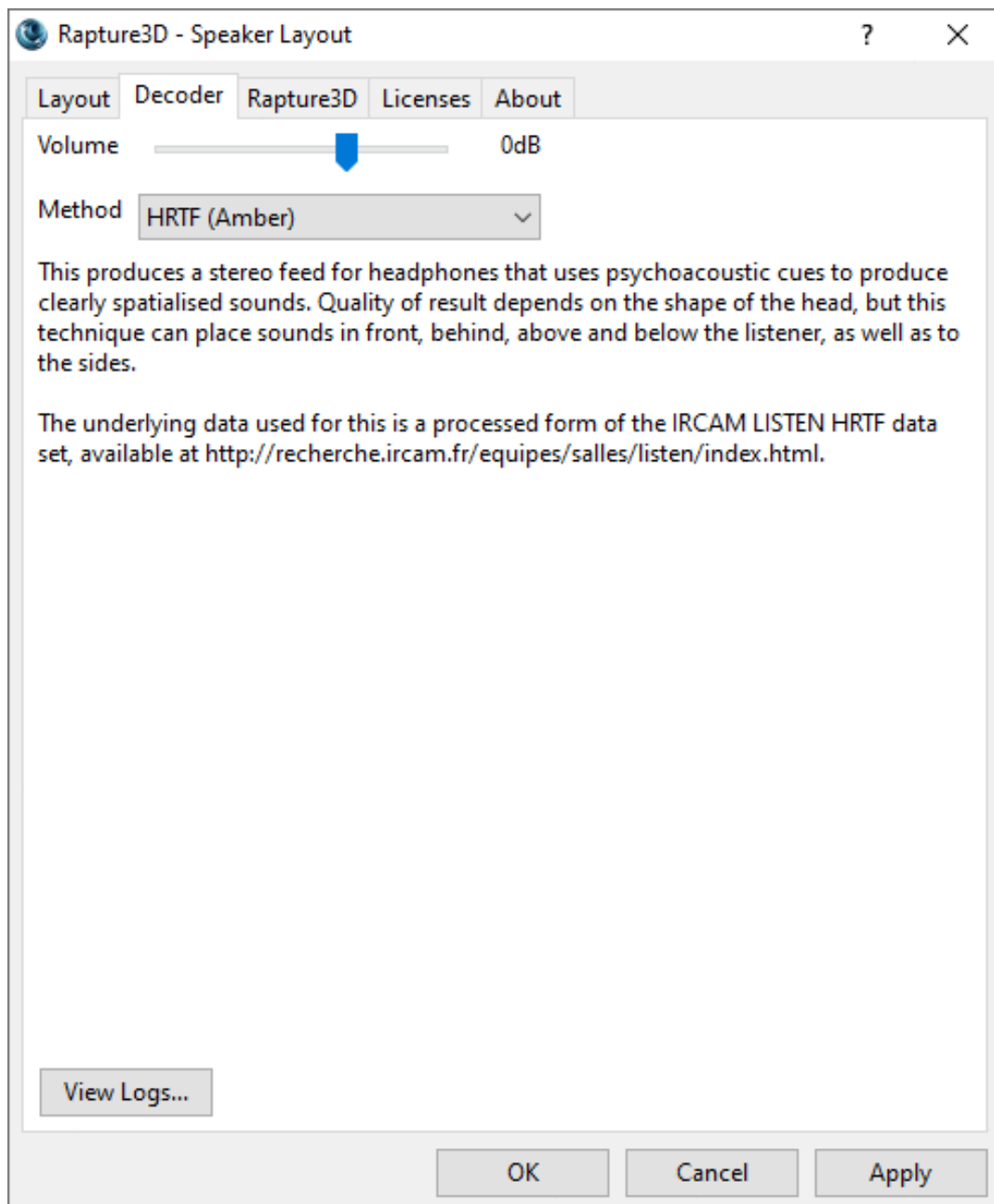
3.1.2 Checking Things Out

Once you've selected the correct layout, it's worth checking to see if sounds are really coming out of the correct speakers. To do this, select the channel you want to test using the "Channel" drop-down (the relevant speaker will light up in the picture), check the volume levels on any external amplifiers or suchlike - and click on "Test Channel". You should hear a "bing" noise from the correct speaker.

Sounds should be roughly at the same level from all speakers, so if you have any external amplifiers you might want to tune them.

If everything looks okay on the Layout tab, you're probably good to go. But you might want to proceed to the [Decoder tab](#) for more control over how things sound.

3.2 The Decoder Tab



Things start to get a bit more technical here, but bear with us and it'll hopefully be worthwhile.

To start with, there's a volume slider at the top of this screen. This slider sets the overall level used by Rapture3D when it's started up. Note that this is an *additional* control - it's separate from the main Windows volume setting, any volume controls in the game you want to play and any settings on external amplifiers etc. In general, you should just leave this control alone (at 0dB) and use the other ones.

There's also a "View Logs..." button at the bottom of the screen. Don't worry about this unless you need to troubleshoot. (It provides technical details about things that happened when Rapture3D was last used.)

Then there's the "Method" drop-down. The exact list of items available here depends on what you selected on the [Layout tab](#). For instance, the "Reconstruction" option in the picture above is available for multi speaker arrangements (e.g. Surround 5.1) but not for Stereo or Headphone Stereo, which have some thoroughly different options. Whichever option you select, the text below the drop-down describes how this method will work. Try flipping through the options to see what you're choosing from. Some of these options make quite noticeable differences to how things will sound when you actually start a game up that's using Rapture3D.

3.2.1 Decoder Methods

Since you can flip through the decoder methods anyway, we'll just describe some of the concepts here so they make a bit more sense. Decoder methods have a variety of pros and cons. Some of them use more or less CPU power, some of them are more or less sensitive to how accurately you've set your speakers up and some of them actually will work better for people with differently shaped heads! The best thing to do is to try some and listen...

3.2.1.1 Headphone Stereo Methods and Binaural

Several of the headphone decoders use HRTFs. HRTFs tell us how sound travels past a human head and into the ear and provide a great way to provide a realistic sound image over headphones, often known as Binaural stereo. However, human heads are not all the same shape. We provide six main "colours" of HRTF - you might like to try these out to find the one that works best for you. At best HRTFs can place sounds anywhere, including behind and above. However, if they don't really match your head shape you may find "confusion" occurring, with sounds that should be behind appearing to be above etc. If you find this happening, try a different HRTF.

HRTF	HRTF-based headphone decoders using psychoacoustic cues to present sounds in full 3D. Amber is often a good choice.
Simplified HRTF (Amber)	Version of the Amber HRTF, massively simplified so it is not frequency-dependent. This places relatively light load on your CPU.
Panner	This splits sounds between the left and right ears using carefully optimised panning functions. This places relatively light load on your CPU.

The HRTFs provided are based on academic data sets available on the Internet - thanks to all involved! They've been processed for use with Rapture3D, so any problems are entirely our responsibility. We've given the data sets colour names like "HRTF (Red)" for simplicity, but you can see where the HRTF actually came from in the text shown on this tab.

If you don't want to use an HRTF data set you can just select "Panner". This will provide a perfectly serviceable plain stereo image. You can save a few CPU cycles this way too, although the Simplified HRTF is no more expensive.

3.2.1.2 Stereo Speaker Methods

If you're just using a normal stereo system then "Panner" is probably what you want here.

Panner	This splits sounds between the left and right speakers using carefully optimised panning functions. This places relatively light load on your CPU.
HCTC Stereo	HRTF-based Cross-Talk Cancellation. Requires accurate speaker set up at an angle of 50 degrees.
HCTC Stereo (Narrow)	HRTF-based Cross-Talk Cancellation. Requires accurate speaker set up at an angle of 20 degrees. Amber only.

The HCTC Stereo options can work well if your speakers are set up very accurately and if you don't move your head much. They're not suited for use with multiple listeners. They're also dependent on you finding an HRTF data set that works okay for you (the same problems apply as described for HRTF headphone stereo above). But they're well worth a try, particularly if you're using desktop or laptop speakers.

But - why only two speakers? To get the best out of Rapture3D you could try using a sound card that lets you connect more...

3.2.1.3 Multi Speaker Methods

If you're using proper surround sound systems with four or more speakers (e.g. 5.1, 7.1 or [3D7.1](#)) or a custom layout for which you've computed your own decoders then these options are available:

Basic	This method produces a resilient decoding which should play well on a range of speaker systems including large venues. It should be used if your speakers are only roughly in the right places or if your CPU is struggling to keep up.
Reconstruction	This is the default setting. It produces a solid image and uses a sensible amount of CPU power. It relies on the speaker layout being set up accurately and is optimised for a domestic or studio listening environment.
Tinted Reconstruction	This is a more expensive option in CPU terms, but performs HRTF-based tinting on the audio stream to strengthen the spatial image. For some people, this can even give a sense of sounds being above and below when all speakers are all at the same height!

For some layouts with a front centre speaker, there are variants of the methods above. This is because, for compatibility with speaker sets with a special dialogue front centre speaker, the front centre speaker may be used usually for dialogue only.

Basic (Front Pan) Reconstruction (Front Pan) Tinted Reconstruction (Front Pan)	As above, but use the front centre speaker for panning as well as dialogue. Use this if you are confident that your front centre speaker has the same response as the others.
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For 5.1 and 7.1 preset layouts, a "Pro Logic IIz" method is also available.

Pro Logic IIz	This uses phase to encode additional spatial information into 5.1 or 7.1 output which can be decoded to additional upper-front speakers by compatible receivers. These methods use the front centre speaker for panning as well as dialogue.
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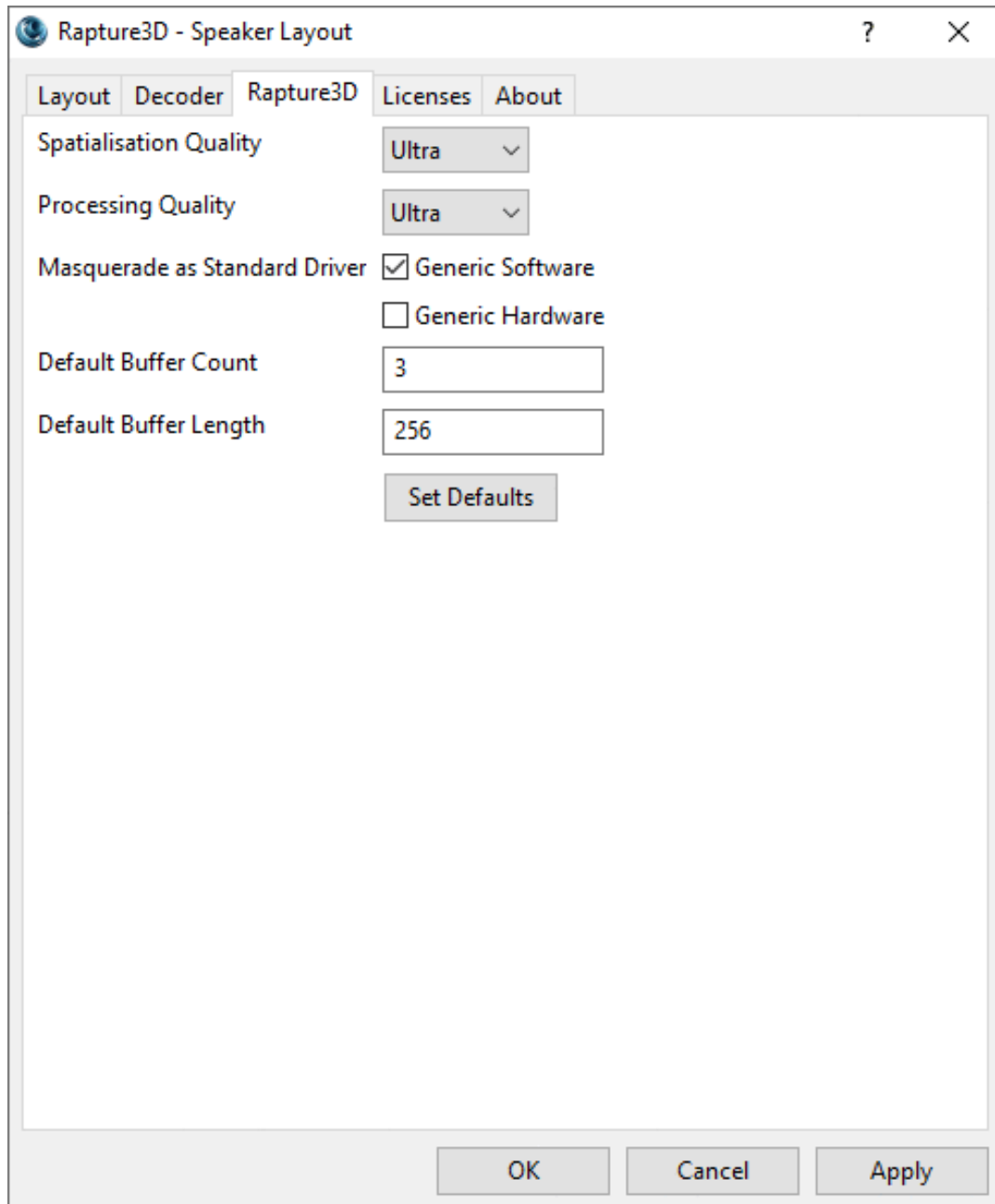
3.2.1.4 Surround Stereo Methods

These are offered if you selected "Surround Stereo" or "Surround Stereo (Compat.)" options on the [Layout tab](#). Just select the method that matches the surround decoder you are using. If none match, you probably want to switch your layout back to ordinary Stereo.

Dolby Pro Logic	This is compatible with Dolby Pro Logic decoders. Your decoder may be able to make use of a centre speaker and one or two surround speakers at the back of the room.
Dolby Pro Logic II	This is compatible with Dolby Pro Logic II decoders. Your decoder may be able to make use of a centre speaker and two surround speakers at the back of the room.
Dolby Stereo	This is compatible with Dolby Surround decoders. Your decoder may be able to make use of a centre speaker and one or two surround speakers at the back of the room.
Matrix QS	This is compatible with Matrix-QS decoders. These are fairly rare.
Matrix SQ	This is compatible with Matrix-SQ decoders. These are fairly rare.
UHJ Stereo	This is compatible with ambisonic UHJ Stereo decoders. These are fairly rare. A "short" version of this is available, with lower latency and quality.

Note that the encoders used here aren't all "official" ones. However, they should be compatible.

3.3 The Rapture3D Tab



Here's where gaming settings are selected. You can tune these to make the best use of the hardware you have available. If in doubt, just press the "Set Defaults" button to choose settings that make sense. If quality settings are too high, you may find that audio "skips" or other parts of the game such as the graphics engine struggle to keep up and become jumpy.

3.3.1 Spatialisation Quality

This determines the quality of spatial rendering (3D sound) used by Rapture3D. Note that this control works in conjunction with the actual decoder method chosen on the Decoder tab.

3.3.2 Processing Quality

This determines the quality of effects processing and sample rate conversion used by Rapture3D.

3.3.3 Masquerade as Standard Driver

These options allow Rapture3D to "pretend" to be the Generic Software or Generic Hardware OpenAL drivers. This is quite technical and dangerous and should only be enabled if you're really sure you know what you're doing.

The reason that using these switches is dangerous is because, to make them useful, you also need to remove other OpenAL drivers, which have names of form *_oal.dll, from your Windows system and game directories. These include the real Generic Software and Hardware drivers (typically provided by wrap_oal.dll). The idea here is that you can remove all other OpenAL drivers from your system so that Rapture3D (provided by rapture3d_oal.dll) is the only OpenAL driver present. You can then tell Rapture3D to masquerade as the Generic Software driver so that games will not be aware that they are using a new driver. This allows Rapture3D to run with quite a few OpenAL games that predate it and which don't have an option to select which OpenAL driver should be used.

Bear in mind that some game installers will reinstall the DLLs you deleted so it's worth checking after an installation to ensure they haven't crept back.

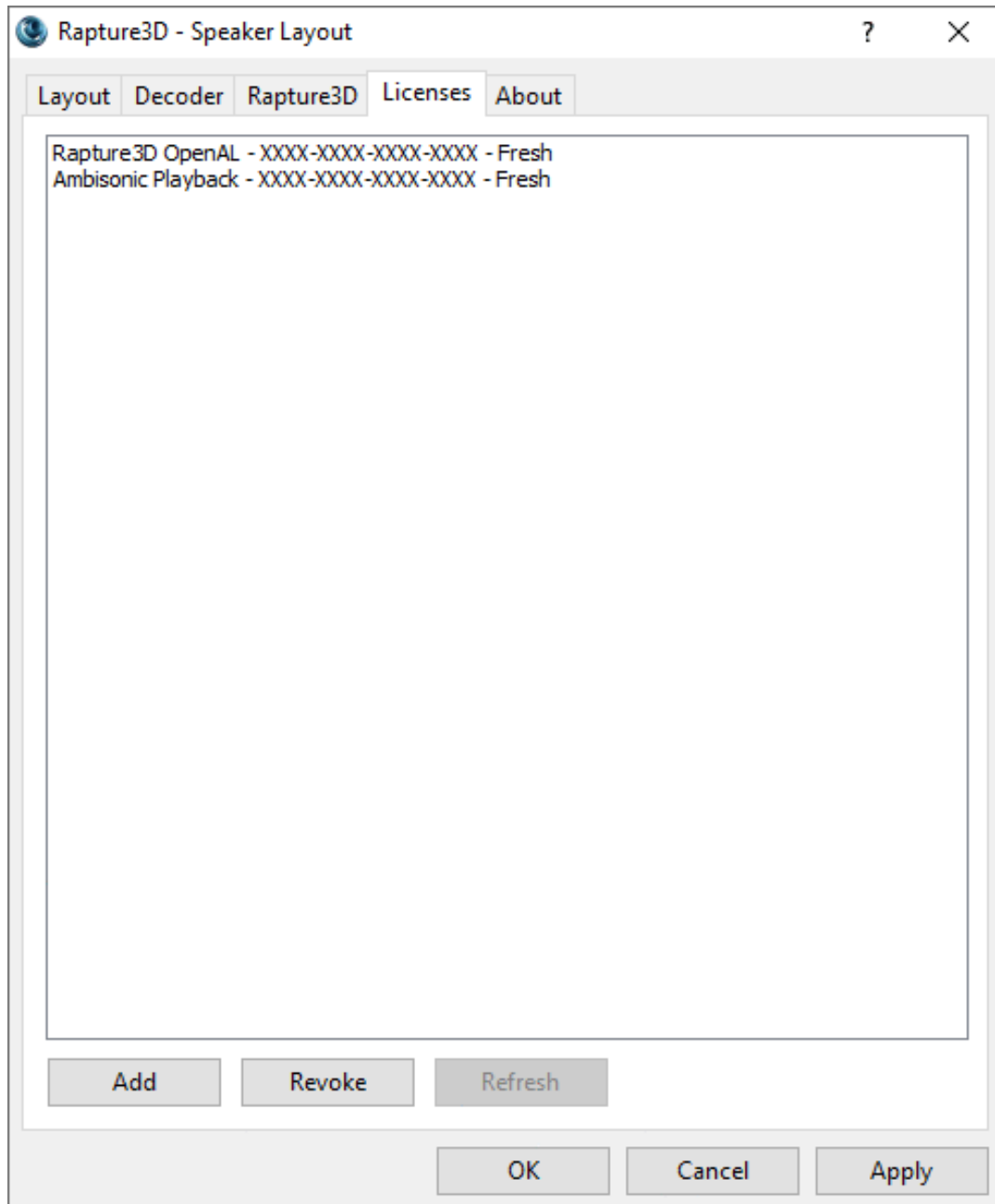
As mentioned before, this approach is quite dangerous. It doesn't work with all OpenAL games (particularly those that require EAX, which is deprecated and not supported by Rapture3D). You may break your game installation which would require a reinstall. Also, in principle deleting the wrong files from Windows system directories can destabilise your entire system, so you might need to reinstall the whole of Windows, which is something we can't help you with! So be really careful and *only do this sort of thing if you're sure you're comfortable with the risks.*

3.3.4 Buffer Configuration

The default buffer count and length can be set. A default buffer length of 256 is generally recommended, though you may find that a length of 512, 1024 or 2048 helps if you experience stuttering. Generally, lower buffer counts lower latency, but setting the count too low for your hardware can cause stuttering. If in doubt, just use the defaults.

If you're wondering what "latency" means, here this is essentially the time delay between initial audio processing and the sound being sent out of the back of your computer. We work hard to make this as quick as possible, but in the end latency is generally limited by the quality of your audio hardware and its driver. The "advanced" edition of Rapture3D supports ASIO-compatible studio kit which is often capable of extremely low latencies.

3.4 The Licenses Tab



This tab should list the licenses you have. Licenses can be added using the "Add" button, assuming you have an Internet connection. The license comes in the form of a hyphenated string of characters where the "XXXX-XXXX-XXXX-XXXX" is in the example above.

Licenses are available from [Blue Ripple Sound](#).

3.4.1 How Licenses Work

Once a day, when you use Rapture3D or a similarly licensed piece of Blue Ripple Sound software, the software "phones home" across the Internet to refresh the license. No personal information is transmitted and encryption is used. This tab will tell you if your licenses are fresh. If they aren't, the text here will change and eventually the software will stop working, typically a month after the last successful refresh. Some licenses (typically trial or beta testing licenses) expire automatically and permanently, so you'll need to get another one to keep using the software.

3.4.2 Hardware Changes

The license is stored with a short description of your machine. This means that if your machine changes, for instance if you upgrade the CPU or switch the network card, your machine may seem to be different and license checks may fail. The best thing to do if you're upgrading some hardware is to revoke the license before making the change and to add it back again afterwards.

If you run into trouble, please get in touch with Blue Ripple Sound from the email address you used when buying the software and hopefully we can sort things out.

3.4.3 Revoking Licenses

Licenses can only be used on one machine, so if you want to move your license from one machine to another you need to revoke it. This is done with the "Revoke" button. You'll also be asked if you want to do this if you uninstall Rapture3D. Note that this requires an Internet connection.

If you revoke your license *write it down somewhere* if you haven't kept your original documentation, so you have it to hand when you want to install Rapture3D somewhere else!

4 The Rapture3D OpenAL Driver

OpenAL allows games to make use of special OpenAL "drivers" which provide 3D audio algorithms. These algorithms may be provided in software or hardware.

Rapture3D includes a software OpenAL driver with some particularly interesting algorithms. Amongst other things, it uses Higher Order Ambisonics for superior 3D audio spatialisation.

4.1 Using The Driver On Windows

On Windows, the driver is a special file called `rapture3d_oal.dll`.

4.2 Using The Driver On macOS

On macOS, the Rapture3D driver is a special file called `libOpenAL.Rapture3D.dylib`. It is configured with the Games tab in the layout program.

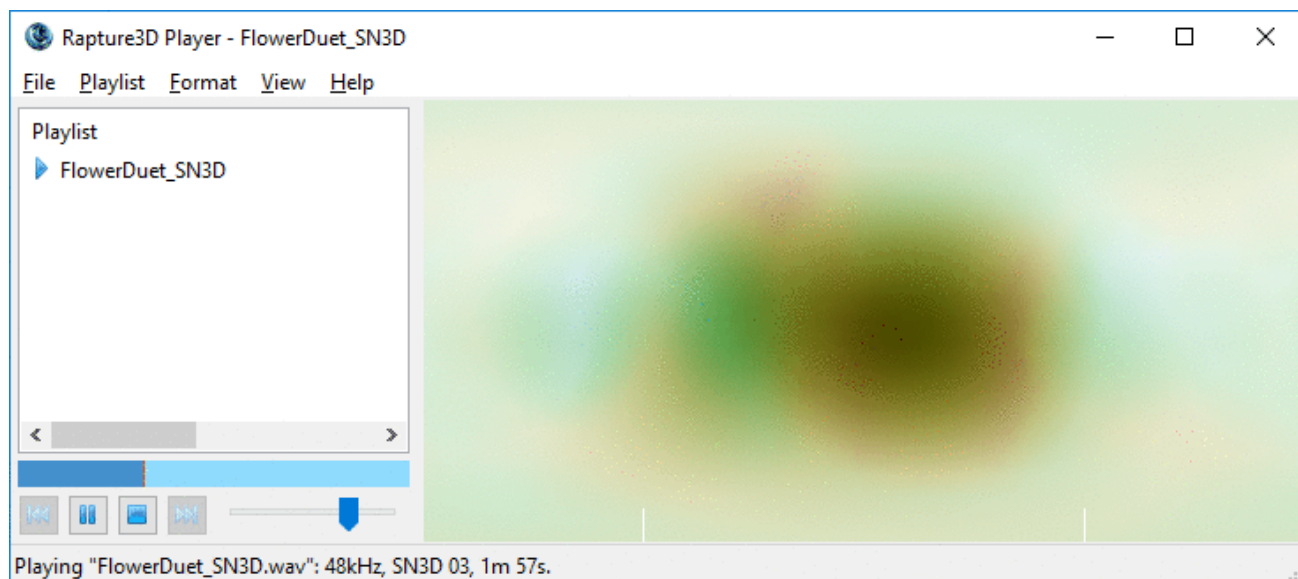
Unlike Windows, macOS does *not* have an OpenAL "router" driver to allow software to switch between alternative OpenAL implementations, so it is tricky to change the OpenAL driver away from the default Apple implementation without doing bad things to your system. Be careful!

4.3 Configuration

Ideally, the game will have been written to use this driver. When it hasn't, it may still be possible to make it work by switching to it using the game's configuration screens or by replacing the system's default OpenAL driver. However, this involves modification to system files so we cannot recommend this for ordinary users. If you do go ahead, ensure you keep a copy of the original driver so you can return your system to its original configuration.

The driver can be configured with the ["Games" tab](#).

5 Rapture3D Ambisonic Player



This edition of Rapture3D comes with an ambisonic sound file player. It uses the same layout and decoding [configuration](#) as the Rapture3D [OpenAL game engine](#). You'll need an "Ambisonic Playback" license, which should be listed on the [Licenses tab](#).

If you do have ambisonic sound files around in .AMB format then well done! Hopefully you can just double-click on them and they'll play in full 3D! The player can also handle ambisonic audio contained in a range of other file formats, including simple Ogg/Vorbis files (.OGG or .OGA), though you'll probably want to open these directly from the application. In these cases, channel counts are used to infer the ambisonic order.

5.1 Playlists

The left pane shows the list of files that the player is working with at the moment. You can add them with the "Open..." or "Add..." options on the File menu. Drag and drop files to change their place in the play order and double-click to play.

Playlists can be loaded and saved as text files using the "Playlist" menu.

5.2 Formats

The player can handle audio using either the FuMa convention (which is backwards-compatible with "classic" ambisonics) or SN3D (ACN) convention.

When a multichannel audio file is read, the player can sometimes identify whether FuMa or SN3D is in use automatically. Specifically, .AMB files also use FuMa. To handle other cases, the Format menu can be used to control how files will be interpreted.

Depending on the decoder, up to third order FuMa is supported and up to fourth order SN3D.

5.3 Controls

The bar below the playlist can be used to jump to particular locations in the audio that is currently selected.

Below that you'll find standard player controls. These are:

- Skip to previous track
- Play/pause
- Stop
- Skip to next track
- Volume

5.4 Status Bar

At the very bottom of the window is the status bar. This will tell you the details of the current audio that is playing and anything else you might need to know if there's a problem.

5.5 Visualisation

On the right hand of the player is a visualisation area. This will light up in different areas, depending on where sounds are coming from.

In case you're interested, the visualisation is actually based on the 3D information in the stream, using a projection similar to that used in maps of the world. Sounds playing above appear at the top in the image, sounds below appear at the bottom, sounds at the front appear in the middle, sounds to the left of that appear to the left of centre and so on. Sounds visualised on the left and right edges of the image are behind (the image "wraps around" at the back, again as in a map of the world). Note that typical real recordings produce extremely complex visualisations due to acoustic reflections.

The "View" menu gives some options to control the visualisation, including control of the quality used. Higher quality settings put more load on your CPU.

5.6 Command-Line (Windows Only)

For those of you that use the command-line, it's worth noting that on 32bit Windows (but not 64bit Windows or macOS), Rapture3D supports some command-line options, including a full-screen mode. Run it as "Rapture3dPlayer.exe -h" to find out more...

6 Technical Notes

6.1 3D7.1

3D7.1 is a variant of the 7.1 surround speaker arrangement. The original 7.1 surround speaker arrangement typically places three speakers at the front of the room, two at the sides and two at the back. Further, a subwoofer (the ".1" in the name) is placed somewhere in the room (it doesn't matter too much where). Quite a few computers come with 7.1 surround sound these days and there are packages for sale that allow it to be added if not. The arrangement of the main seven speakers here puts all speakers at the same height, which is a bit of a shame when using games where things are happening above and below!

The 3D7.1 speaker arrangement (invented by Simon N. Goodwin) is designed so that usually it can be used with existing 7.1 sound hardware. All you have to do is *change where you put your speakers*. It's also designed so that stereo material or 5.1 material will still play back well. The advantage is that games or other 3D audio software that can handle this speaker arrangement (e.g. via Rapture3D) can produce sound in proper *full 3D!*

6.1.1 Speaker Locations

Speakers should be placed as follows:

Original 7.1 Speaker Location	3D7.1 Speaker Location
Front Left	Upper Front Left
Front Right	Upper Front Right
Front Centre	Front Centre
Subwoofer	Subwoofer
Back Left	Upper Back Centre
Back Right	Lower Front Centre
Side Left	Lower Back Left
Side Right	Lower Back Right

More mathematically, six of the speakers (ignoring the front centre and subwoofer) should form a regular octahedron aligned so front and back faces are vertical.

6.1.2 Configuration

Once you have your speakers set up correctly, select "Surround 3D7.1" in the [Layout tab](#) and check the speakers are wired up correctly. You may also need to [set your Windows "Advanced" sound card settings](#) to the "7.1 home theatre speakers" arrangement (don't use the "7.1 wide configuration speakers" setting here). You'll probably want to use the test tones to check the speakers are in the right order after all that work!

After this you can [select a Decoder](#) as usual.

6.2 OpenAL Developer Notes

Here are some technical notes for developers who might be interested in tuning their games to get the best out of Rapture3D.

The Rapture3D OpenAL driver is built in software and so consists primarily of a driver dynamic library and a configuration tool. It comes in a number of editions with different licensing schemes and features. The "Game" edition is restricted to work only with the games it ships with.

6.2.1 OpenAL Specification

Rapture3D meets the full OpenAL 1.1 specification, including full support for `alSuspendContext()` and `alProcessContext()` to give much better control over scene content than many drivers.

All filters support high-pass as well as low-pass options as documented in the specification.

6.2.2 Ambisonics

Rapture3D's heart is a studio-grade 3D rendering core based on Higher Order Ambisonics. This allows great flexibility when the audio is "decoded" for an actual speaker arrangement, or headphones.

6.2.3 OpenAL Extensions

Rapture3D supports the following OpenAL extensions:

- `ALC_ENUMERATE_ALL_EXT`
- `ALC_ENUMERATION_EXT`
- `ALC_EXT_CAPTURE`
- `ALC_EXT_DEDICATED`
- `ALC_EXT_EFX`
- `ALC_EXT_STATIC_BUFFER`
- `AL_EXT_BFORMAT`
- `AL_EXT_EXPONENT_DISTANCE`
- `AL_EXT_FLOAT32`
- `AL_EXT_FOLDBACK`
- `AL_EXT_IMA4`
- `AL_EXT_LINEAR_DISTANCE`
- `AL_EXT_MCFORMATS`
- `AL_EXT_MULAW`
- `AL_EXT_MULAW_BFORMAT`
- `AL_EXT_MULAW_MCFORMATS`
- `AL_EXT_OFFSET`
- `AL_EXT_STEREO_ANGLES`
- `AL_EXT_SOURCE_RADIUS`

`ALC_EXT_CAPTURE` is only supported in the sense that the extension is present as required by the OpenAL specification. No capture device is provided.

`ALC_EXT_DEDICATED` allows sounds to be sent directly to a dialogue speaker or subwoofer if one is present.

`ALC_EXT_FOLDBACK` is a new extension that allows the game to capture mono or stereo downmixes of the game output, e.g. for movie clip recording.

AL_EXT_BFORMAT allows ambisonic B-Format material (WXYZ or WXY) to be used directly as game audio assets. Such material can contain a complete pre-rendered "soundscape" that can rotate with the orientation of the listener.

AL_EXT_STEREO_ANGLES allows stereo assets to be panned horizontally.

AL_EXT_SOURCE_RADIUS allows mono sources to change size.

6.2.4 Scalability and CPU Load

Rapture3D has configuration options to scale CPU load to meet the hardware available. Default settings choose sensible options if the user does not select them explicitly. The code has been tuned heavily for CPU load.

Rapture3D does not place any limits on how many sources, buffers, filters, effects or aux sends are used. The only limit is the CPU power available on the machine used.

6.2.5 Audio Quality

All internal processing is performed using 32bit floating point operations. Sample rate conversion options include linear and sinc interpolation. A lot of attention has gone into ensuring that control changes result in smooth audio flow.

6.2.6 Effects

Rapture3D supports the EFX interface for effects. The deprecated EAX interfaces are not supported. The following effects are available:

- AL_EFFECT_CHORUS
- AL_EFFECT_COMPRESSOR
- AL_EFFECT_DEDICATED_DIALOGUE
- AL_EFFECT_DEDICATED_LOW_FREQUENCY_EFFECT
- AL_EFFECT_DISTORTION
- AL_EFFECT_EAXREVERB
- AL_EFFECT_ECHO
- AL_EFFECT_EQUALIZER
- AL_EFFECT_FLANGER
- AL_EFFECT_REVERB
- AL_EFFECT_RING_MODULATOR

Note that the same reverb algorithm is used for AL_EFFECT_REVERB and AL_EFFECT_EAXREVERB although different parameters are exposed. All the available parameters are used, including the directional reverb controls. The algorithm is an optimised high-quality ambisonic reverb, producing B-Format output directly.