

ReaMix: Breaking the Barriers with REAPER

Unlock REAPER and add new dimensions to your mixes

By Geoffrey Francis

Author of ***Up And Running: A REAPER User Guide***

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Preamble

This Mixing Primer is intended to guide you towards getting the best out of mixing your projects in REAPER. It is designed to help you to produce great mixes that will be ready for mastering.

It is not really suitable for the complete novice to REAPER (nor to digital audio) as it assumes a certain basic level of prior knowledge. This includes:

- An understanding of basic audio concepts and terminology.
- A reasonable level of competence at recording and editing with REAPER.
- A reasonable degree of understanding of and competence at navigating within the REAPER environment.

If you do not already have a copy of *Up and Running: A REAPER User Guide*, it is strongly recommended that you get hold of one and read through it before you embark on this primer.

A PDF version of the User Guide publication and a printed hard copy are available for download. You should find a link at:

<http://www.lulu.com/content/1295509>

Check it out, then check out the *Dos and Don'ts* list below.

Dos and Don'ts

Do be prepared to read this primer thoroughly.

Do be prepared to go over some of the examples as many times as it takes to understand them. Some of them are quite simple. Some are rather complex. Most fall somewhere in between. You cannot expect to be able to learn and understand all that these examples have to reveal in a few minutes.

Do get ready to all but wear out the Toggle Global FX Bypass feature of REAPER. Use it frequently when you are working through the examples. It will help you identify how the various actions that you take are helping to shape the sound that you are producing.

Do expect to begin seeing results and benefits quite quickly, but also understand that this primer aims to start you off on a journey. It is not the destination.

Do expect to spend a lot of time if you want to get the best results. Some of the finest albums ever have taken over a year in the making. Some of the most memorable of hit singles have taken months. Rome wasn't built in a day and neither will a top quality mix be.

Do follow up what you learn here by pursuing other avenues – such as user forums, web sites, and the experience of others.

Do be prepared to use the right tools for the job. If you're serious about recording, you'll need reasonably good mics, good studio monitors, a PC with enough grunt, a good set of headphones and dual monitors (screens). If your setup lacks any of these, fine, but don't expect to get the same results.

Do be prepared to analyze what you are doing and to learn by doing. Experiment, investigate and make mistakes. Be prepared to learn from those mistakes.

Do be patient and expect to grow and improve steadily and gradually through time.

Don't expect overnight miracles. Any art, skill or craft worthy of its name takes years to master. You won't become the next Phil Spector, Todd Rundgren or George Martin overnight. Neither did they.

Don't be afraid to push the boundaries or to bend or break the rules. There's only really one rule anyway: if it sounds right, it is right.

Disclaimers, Excuses and Grovelling Apologies

Mixing is a multi-disciplinary activity that involves getting on top of a huge number of issues. These issues interact with each other and don't belong in watertight compartments.

For the purposes of learning, however, you will come across a number of places in this book where topics appear to be being examined in isolation from the other aspects of mixing. Likewise you will come across other sections where the boundaries between different topics may appear somewhat blurred. That's all part of the learning process. Hopefully, the latter stages of this primer will tie all the loose ends and odds and bits together for you.

Finally, remember that mixing is not an exact science. It's part science to be sure, but there is also a huge subjective element to it. If you don't agree with everything said in this primer, that's fine – in fact, it's better that you don't. The most important thing is that you will learn from putting it to the test.

The Sample Projects

There are three core projects which are used in this primer. Each has a dozen or so variations. All are recordings of acoustic music. There are two reasons for this:

- The need to include examples using only plug-ins that are either supplied with REAPER, or are easily (and legally!) available as freeware. This rules out most popular synthesizers.
- It is the style of music with which I am personally most familiar and with which I have most experience.

This does *not* mean, however, that this is only, or even primarily, a book about how to mix acoustic music. Not even for one minute. The aim is to help you to understand and develop confidence and competence in two main areas:

- The principles of sound and acoustics, and especially how sound behaves, and can be made to behave, in the four dimensions of space that make up mixing. Those principles are exactly the same when applied to any genre of music, be it classical, acoustic, electronic, or any other form. All that will vary is the application of those principles – which is where your specialist knowledge of your music comes in.
- The very special features of REAPER that offer you mixing opportunities that (at time of writing) are just not obtainable with other DAWs, at least none that I have ever encountered. These features, of course, are there for your use regardless of the musical genres within which you are working.

You can download the sample project files here:

<http://www.cockos.com/~glazfolk/Pelverata.zip>

<http://www.cockos.com/~glazfolk/RosesBloom.zip>

<http://www.cockos.com/~glazfolk/Waiting.zip>

In addition to this, there are a handful of customised JS Plug-ins that are used in some of the examples. If you wish, you can create these yourself, but you might find it easier to use this pack. It contains five plug-ins which are modifications of various JS plug-ins originally developed by IX and LOSER.

<http://www.cockos.com/~glazfolk/CustomPlugins.zip>

You will need to unzip them into your Reaper program directory, so that they will reside in the following directory:

C:\Program Files\REAPER\Effects\NICHOLAS

For some of the examples, it is also recommended that you download some of the Reverb Impulse files from:

<http://stash.reaper.fm/tag/Reverb-Impulses>

In particular, look out for the Pipeline Audio Room, Plate, Hall and Ambience collections.

Once you have got them all, keep a safe copy somewhere before you begin working.

Acknowledgements

This mixing primer could never have been produced without the invaluable assistance of some wonderful people. In particular, I must single out:

Louise Bell, Peter Hicks and **Jeremy Sibson** for their generosity in lending me their musical and vocal skills for the sample recordings used throughout this primer.

Simon "Spike" Mullings for his extraordinary patience and diligence in proof reading, debugging and generating a number of constructive ideas and suggestions that have helped make this a significantly better and more useful book than it would otherwise have been.

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1 Before We Begin

1.1 Are You Ready To Mix?

That is, are you *really* ready to mix?

When you consider the many variables that go into creating a great mix it is extraordinary that so many mixes sound as good as they do. The amount of work and the range of skills that go in to getting a good mix really are extraordinary.

Mixing is one of the most multi-faceted challenges that you can ever undertake. At times it will seem as if you need not so much a left brain and a right brain as two brains (or more). The job requires scientific knowledge and artistic flair. It requires discipline and organization as well as spontaneity and inspiration. It is at times one of the most frustrating challenges that you could ever take on. It also has the potential to be one of the most satisfying and rewarding. And so ...

Your recording is all done. Finished! In the can. Now you're ready to mix. But where and how do you begin? Well, you could do a lot worse than by starting with this checklist ...

1.2 How Do Your Recordings Measure Up?

Before you even begin to think about mixing, you should check out your recordings, track by track, one at a time. Listen for any blemishes or errors that are likely to cause you problems when you come to mixing. It is usually better to spend a half hour re-recording a take or perhaps recording a small overdub than it is to try to waste hours of mixing time trying to cover up a multitude of sins.

You would be amazed to know how many people don't take this simple precaution.

Moreover, always remember this when you are recording: *never* let anybody get away with saying something like, "Oh, that doesn't matter. *We can cover it up in the mix.*"

Good mixing isn't about damage control, it's about bringing out the best from your recorded material. Anything else will detract from, not add to, the quality of your final product. And that's bad mixing. Please, please, please don't make the mistake of thinking that damage control can ever compensate for bad musicianship or bad recording.

That said, you might still encounter a situation where, for reasons beyond your control, you simply have to do the best you can with the recorded material that you have available. We'll address this issue later.

One other issue worth mentioning here is whether you are working with "discrete" or "non discrete" recordings. By "discrete" I mean a recording where each track has been recorded and layered separately, so that there will be no bleed. By "non discrete" I am referring to the situation where several tracks (instruments and/or vocals) have all been recorded together and there is bleed between the tracks.

It is perfectly possible to create a good mix in either of these situations. There are just some differences in the techniques that you may need to apply.

1.3 Have You Got the Gear?

You can't mix to your full potential if you're using rubbish equipment. Period. This doesn't mean that you need to have a six figure budget for your studio equipment, but it does mean that you should be sure to do your homework and spend wisely what money you do have. At the very least, you should get a good pair of well positioned nearfield monitors and a decent pair of headphones. Headphones? Mixing? Heresy?

Not really. Of course you'll primarily be using your speakers for mixing, but there will be times when headphones can help you, especially when you want to check panning, or when you are trying to identify quite subtle audio glitches.

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Assuming you have a pro sound card with multiple pairs of outputs, a budget price (and quality) set of speakers can also be handy. These will enable you to test your mixes (frequently and at all stages of development) on the type of speakers that most people will be using to listen to your final product. Happily, REAPER's Routing Matrix makes it easy to switch back and forth between different speakers.

If your budget will stretch to it, a pair of big wall speakers can also be handy, especially for judging the bass response.

In summary:

Item	Comment
A Pro Quality PCI, USB or Firewire Soundcard with multiple pairs of outlets	Essential to allow more than one set of monitors to be used when testing your mixes.
Good Quality Nearfield Monitors, correctly positioned	Essential to produce a good quality mix.
Additional Budget Nearfield Monitors	Will assist in testing how your mixes will sound on the kind of systems they are most likely to be heard on most often.
A Good Pair of Headphones	Assists in checking panning and identifying subtle audio glitches.
Plus ... Good wall mounted Speakers	If you can afford them!

I have deliberately refrained from mentioning or recommending any specific brand names. Do your research according to your own particular needs. Find out what other people are using and what they like and what they don't like, especially for your musical genre.

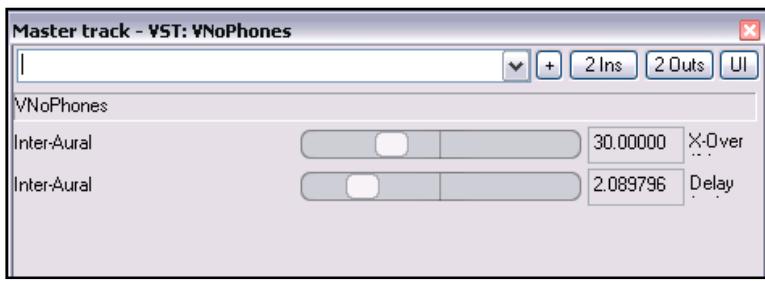
While we're talking about equipment, just one more word about headphones.

Mixing through headphones alone is not recommended for a number of reasons (not the least of which is potential damage to your ears). From a sound engineering point of view, headphones seriously distort the integrity of the mix.

This is because headphones will give you 100% separation between left and right ears. This of course is totally different from the effect that you get when listening through speakers. To make matters worse, the quality and dynamic characteristics of headphones vary so enormously from model to model that it is all but impossible to get a good representation of your sound.

If you absolutely have no choice other than to mix through headphones, then at least do what you can to maximise your chances of doing a half decent job. Two pieces of advice:

- Get a good pair which seem to give you as accurate a representation of your musical genre as you can find. This is one area where if you're going to skimp on cost you might as well just give up before you start.
- Insert a plug-in such as **VnoPhones** in your Master, at the end of the FX chain. This allows you to make adjustments so that the sound scape that you hear in your headphones will more closely resemble that which you would hear through speakers.



In the end, of course, you'll have to do the best you can with whatever you can afford. That's fine, so long as you don't expect to produce a million dollar mix using \$50 headphones or \$100 speakers alone.

1.4 Are You Sitting Comfortably?

Another issue often overlooked by the home recording enthusiast is a lack of attention to the immediate environment in which they are going to be mixing. Choose a part of the house where the acoustics are good, and where you can set up your equipment, including those vital speakers to be ... well, just so! Choose a comfortable chair.

Follow some basic common sense rules. Don't mix for hours and hours at a time, especially at first. Your ears will become fatigued, your judgement will become impaired and your mixes will get worse and worse. How many of us have turned in at night with a feeling of smug satisfaction, only to be overwhelmed by a sensation of utter horror the next day on hearing again what we did the night before?

Don't start mixing when you're tired. Mixing in the morning when you (and your ears) are fresh will yield better results than will mixing at night after a hard day's work.

OK, I know what you're saying right now. "It's OK for him to say that. But I don't have any choice. Because of my other commitments, I can only mix after 10:00pm. I have to use headphones all the time or I get complaints from the neighbours. Anyway, I don't have the money to afford good speakers. And the only place in my home where I can fit my equipment is the broom cupboard."

Fine. If you have to make compromises then you have to make compromises. That's life. But understand that the more such compromises you make, the more the quality of your mix will suffer. At the end of the day, you need to ask yourself what means more to you, success or excuses for failure.

1.5 Have You Done Your Homework?

This Mixing Primer assumes that you have a fairly good grounding in the essentials of working in the REAPER environment. In particular, you should obtain a copy of **Up and Running: A Basic REAPER User Guide**. This is available as a PDF download for \$5 or for around \$20 you can purchase a hard copy from

<http://www.lulu.com/content/1295509>

You should also familiarise yourself with REAPER's default keyboard shortcuts. These can make life easier for you and save you heaps of time. A summary guide is available from :

<http://www.cockos.com/~glazfolk/ReaperKeyboardShortcuts.pdf>

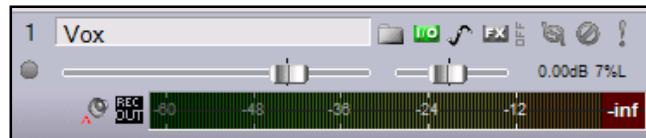
Spend some time – quite a bit of time in fact – making sure that you are familiar with those aspects of REAPER which will be most important to you when you're mixing. In particular:

- How well do you know the REAPER Track Control Panel – *really* know it, that is?
- How well do you know REAPER's editing techniques?
- How familiar are you with REAPER's Channel Splitting and Routing capabilities?
- Are you making use of REAPER's various views, such as the Routing Matrix and Mixer View?
- Are you comfortable using REAPER's automation techniques, such as envelopes?
- Are you on top of the various Preference Options that can be used to make mixing easier?
- Do you know how to create and use both Track Screen Sets and Windows Screen Sets?
- Have you assigned your own keyboard shortcuts to those tasks and actions that you will use most frequently when mixing?

Let's take a look at these items one by one.

1.5.1 The Track Control Panel

Amongst the features that you will need to use in your mixing are the **I/O** window (used for routing) and the Envelopes window (for automation).



Also used extensively in auditioning tracks are, of course, the **Volume** and **Pan** faders and the **Mute** and **Solo** buttons. REAPER gives you very flexible functionality by using modifier keys with these controls:

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Track Panel Controls

Volume Controls

Modifier Key	Effect
Click and Drag	Adjust volume level up or down for currently selected track(s).
Alt Click and Drag	When mouse is released, fader returns to its original position.
Ctrl Shift Click and Drag	When more than one track is selected, only the control for the current track is affected.
Ctrl Click and Drag	Allows for more precise control of fader level.

Pan Controls

Modifier Key	Effect
Click and Drag	Adjusts pan position to the left or right for selected track(s).
Alt Click and Drag	When mouse is released, fader returns to its original position.
Ctrl Shift Click and Drag	When more than one track is selected, only the control for the current track is affected.
Ctrl Click and Drag	Allows for more precise control of fader level.

Mute Controls

Modifier Key	Effect
Click	Toggles mute status for selected track whilst not changing the status of any other tracks already muted.
Shift Click	When more than one track is selected, only the current track is toggled.
Ctrl Click	Clears all mutes.
Alt Click	Unmutes selected track(s), mutes all others.
Ctrl Alt Click	Mutes selected track(s), unmutes all others.

Solo Controls

Modifier Key	Effect
Click	Solo in place selected tracks. "Solo In place" means that any output from this track routed through other tracks is also heard.
Shift Click	When more than one track is selected, only the current track is toggled.
Ctrl Click	Clears all solos.
Alt Click	Toggles solo status for selected track, without including any output from this track that is routed through other tracks.
Ctrl Alt Click	Solos selected track(s), unsolos all others.

1.5.2 Basic Editing Techniques

Basic Editing techniques that you will need to use from time to time when mixing include all of the following. Make sure that you are comfortable using all of these:

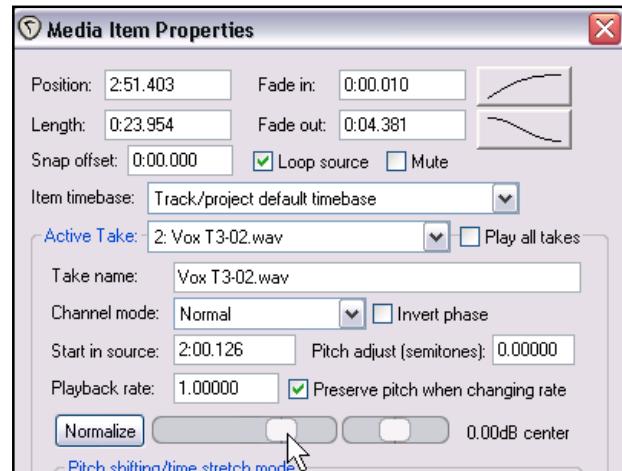
Creating Items

Often you will need to split a media item to create a separate item, for example to mute or lower the volume of part of a track. The simplest way to do this is:

- Select the existing media item.
- Use the **+** key to zoom in as appropriate.
- Along the timeline, select the required passage.
- Right click, choose **Split items at loop selection**.

Adjust the Volume of a Media Item

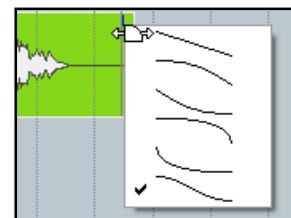
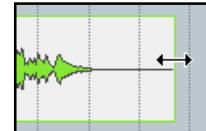
- Select the media item.
- Press **F2**.
- Adjust Normalize fader within the Item Properties window (see right).
- Click **OK**.



Slip Editing

Make sure you are fully on top of the use of slip editing for each of these purposes:

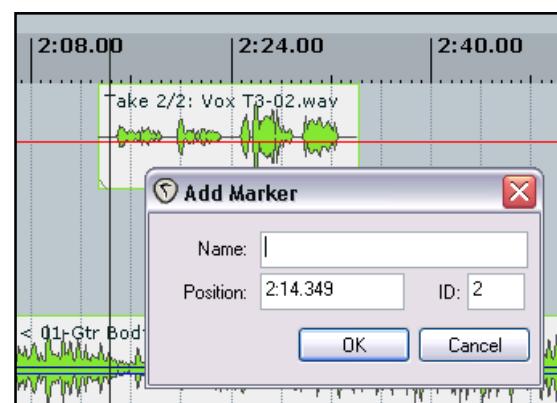
- Trimming an item, from its end (as shown, above right) or from its beginning. Hover the mouse over the edge of the item until a double-headed arrow is displayed as shown.
- Selecting your preferred fade in or fade out pattern. Hover the mouse where shown until a small fade marker is shown, then right click and make your selection. The illustration shows how to select your preferred curve for a fadeout.
- Fading an item in from its beginning or out to its end. Hover the mouse near the top of the edge of the item to display a fade marker, then click and drag to define the length of the fade. Click and drag right for a fade in, or left for a fadeout.



Creating and Using Markers

To create a marker, click at the required position on the timeline. Press **M** to automatically create an unnamed marker, or **Shift M** to create a named one.

Markers are especially useful when you find there is a particular point in a song to which you need to return frequently. Remember that you can use your number keys to jump between markers, and that you can delete individual markers when they are no longer required.



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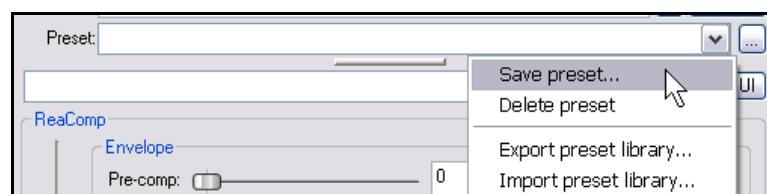
1.5.3 Understanding FX Basics

This mixing primer will generally assume that you have at least a very basic understanding of the role that plug-in effects can play in your mixes, as well as how to add a plug-in to a track's or item's FX chain.

You are not expected to have a detailed or in depth understanding of FX such as equalisers, compressors and reverb, just the very simplest appreciation of the concepts. In particular, if you are uncertain about any of the techniques listed here, spend some time going back over the relevant sections of the *REAPER User Guide* until you feel more confident.

Managing Track FX

If you want to do this then you need to do this
Display the FX Window for a track	Click on the track's FX button.
Display the FX Window for an individual item	Select item, press Shift E .
Add a plug-in to an FX chain	Click on the Add button, then double-click on any plug-in name.
Rename a plug-in instance	Right click over the plug-in name then choose Rename FX Instance from the menu.
Toggle a plug-in's bypass status	In the FX Window: click on the small box displayed to the left of the plug-in name. In Mixer View: hold the Shift key while clicking on the plug-in name.
Change the position of a plug-in in the FX chain.	Drag and drop up or down.
Remove a plug-in from the FX chain	In the FX Window: click on the plug-in name, then on the Remove button. In Mixer View: hold down the Alt key while clicking on the plug-in name.
Save an FX chain	Right click, choose Save FX chain .
Load an FX chain	Right click, choose Add FX chain .
Copy a plug-in from one track or item to another	Drag and drop.
Save plug-in settings as a preset	Click on the three dot button at the end of the Preset row, choose Save Preset .
Load a preset for a plug-in	Display Preset drop down list, click on required item in list.



1.5.4 Channel Splitting

How to Create Split Channels

Throughout this primer, we will be making extensive use of REAPER's channel splitting capabilities. If you haven't used channel splitting before, now is the time to get to grips with the basics.

You can define any track as comprising up to 64 channels, but in most cases it is unlikely that you will need that many. Let's take a more simple example, splitting a track into 8 channels (four stereo pairs).

Channels are created by defining the number that you require by clicking on the track's I/O button to open its Routing window (see above).



When you split a track into (say) eight channels, you immediately create four identical separate but (initially) identical parallel stereo streams for that track. These will be routed through Channels 1/2, Channels 3/4, Channels 5/6 and Channels 7/8. These four pairs are independently routed to the Master, but by default only the stream on Channels 1/2 are then routed to the Speakers (Hardware Output)

This concept is illustrated by the first of the flow chart diagrams on the right.

Using Parallel FX

Having created your four parallel streams, you can now route different streams through different FX or FX chains to create just the sound you want.

For example, you could use this technique to add some compression to, say, only the low frequencies on your track, and perhaps some reverb to the mid frequencies, then joining the four channels back together before sending the remixed track to the master.

This concept is illustrated by the second of the flow chart diagrams on the right.

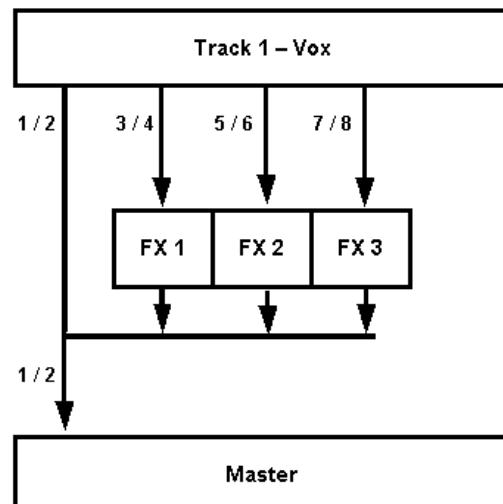
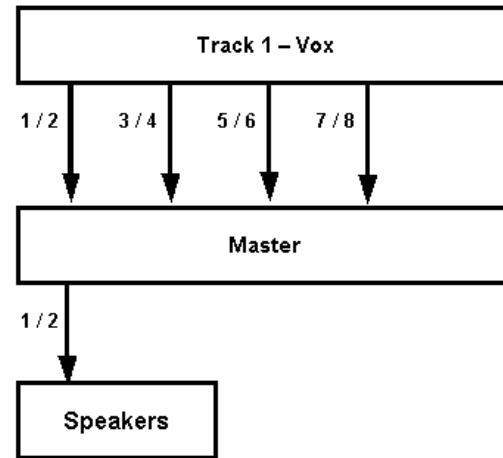
Channel Splitting and Routing

Another benefit of Channel Splitting is that it can be used in conjunction with Routing.

Here is an example:

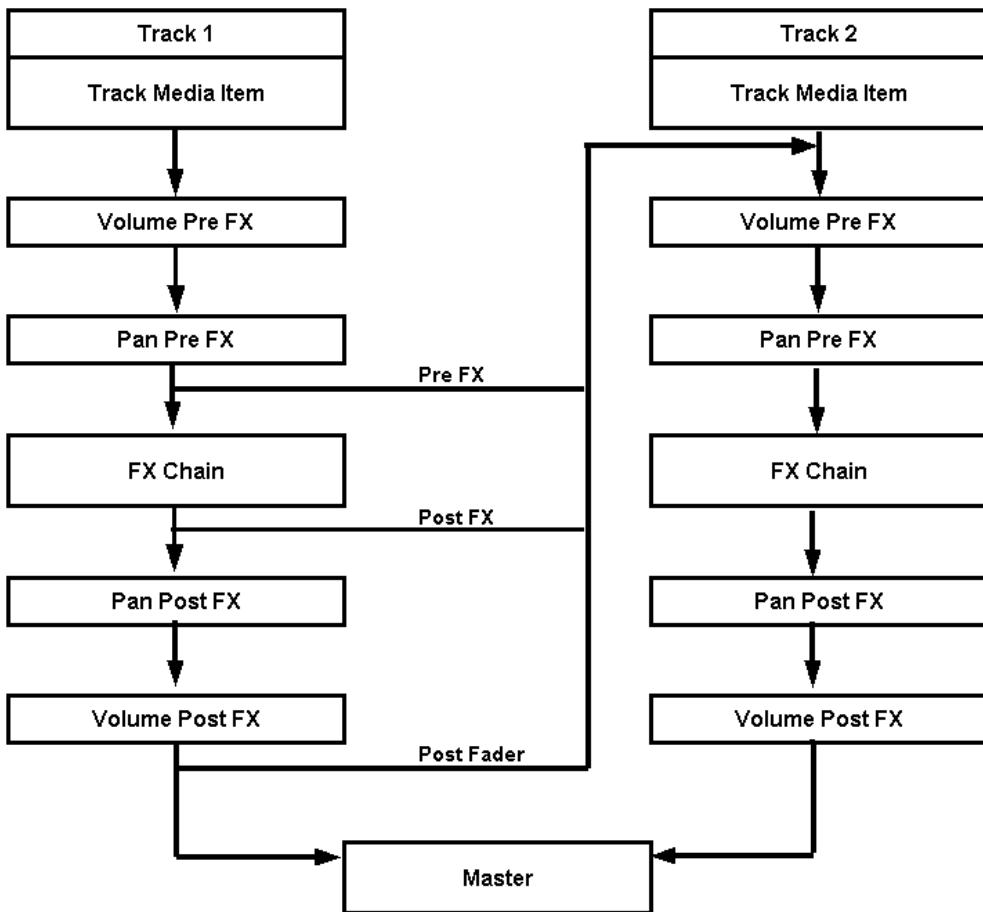
After you have defined a track as consisting of more than two channels, you can bring in an audio signal from another track on one pair of channels, process it independently and as required, then finally blend it in with the material originally recorded on that track.

You will encounter practical examples of these techniques in action throughout this Mixing Primer.



1.5.5 Routing: Sends and Receives

Sends and receives are very important elements of mixing in REAPER. The diagram below indicates how REAPER manages sends and receives between tracks. In this example, the source track for our send is Track 1, and the destination track is Track 2. To be able to use sends and receives effectively, it is essential that you understand how the various send parameters are controlled.



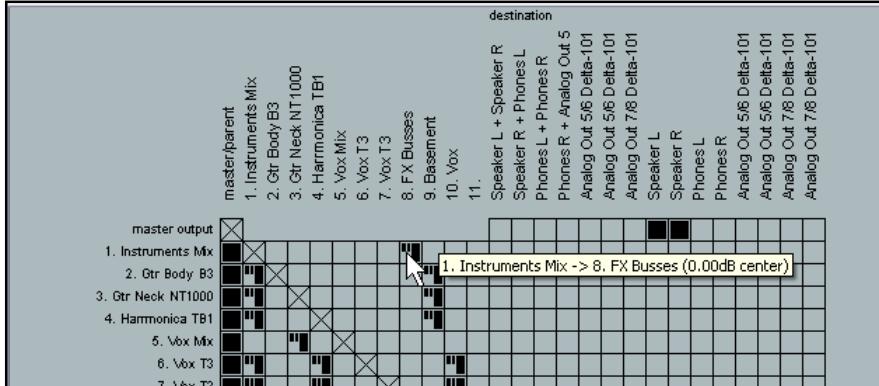
Notice in particular:

- The volume level and panning settings of the signal sent are affected not only by the levels set within the I/O box (or by Send Envelopes) but also by the Volume Pre FX and Pan Pre FX controls for the source track. For example, if the Pan Pre FX setting for Track 1 is set at 40% left and the Pan parameter for the Send itself is set at 40% right, then the net effect is that the signal will be sent dead centre.
- Signals that are sent in this way are received into the destination track before that track's Volume Pre FX or Pan Pre FX settings are applied. For example, if the Volume parameter for the send is set to 0 dB and the Volume Pre FX parameter for the destination track is set tight down to – Infinity, then no volume will be heard from the send.

You can see that one consequence of this is that you will need to be careful when using any of the Pre FX track controls with tracks that use either sends or receives.

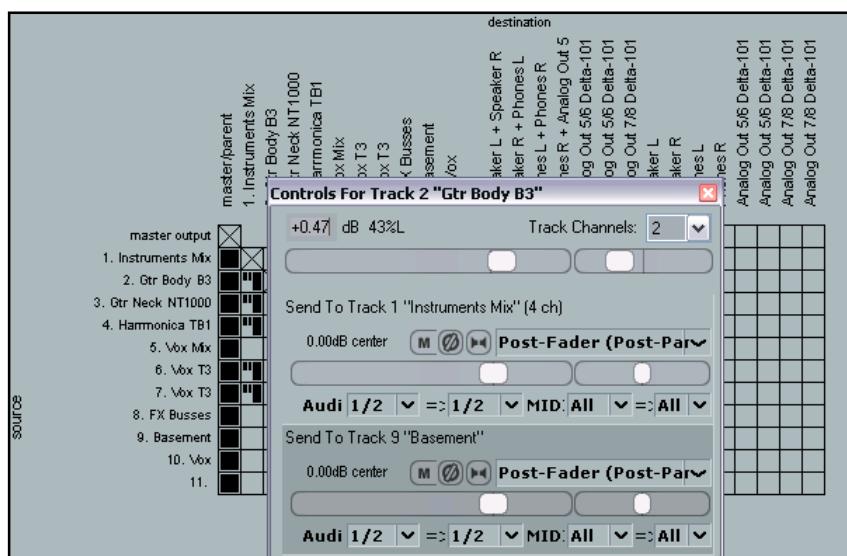
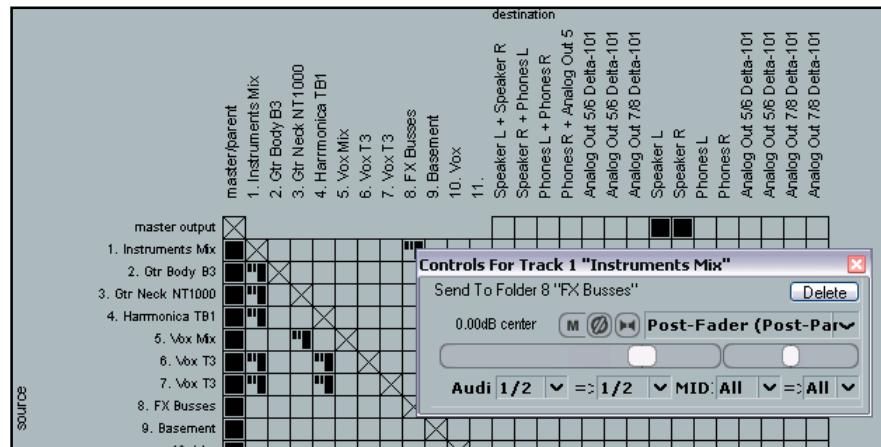
1.5.6 The Routing Matrix

Get to know the Routing Matrix inside out, upside down and back to front. This will save you so much time and give you so much control when using REAPER's very powerful and flexible routing system. In particular, make sure that you are familiar with the following.



Left click over any intersection on the grid to create a send from the item listed in the column of track names (left of matrix) to the item listed in the row of track names (above the matrix).

Right click over any existing send that is displayed within the Routing Matrix to open a window to adjust the controls for that particular send.



Right click over the name of any track along the top or on the left of the matrix to open the Track faders (Volume and Pan), Track Channels Drop Down List and all Sends and Receives for that Track.

In many cases, this will avoid the need to keep jumping back and forth to and from the Track View window.

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1.5.7 Envelopes and Automation

At various stages in the mixing process, you will need to work with REAPER's automation envelopes.

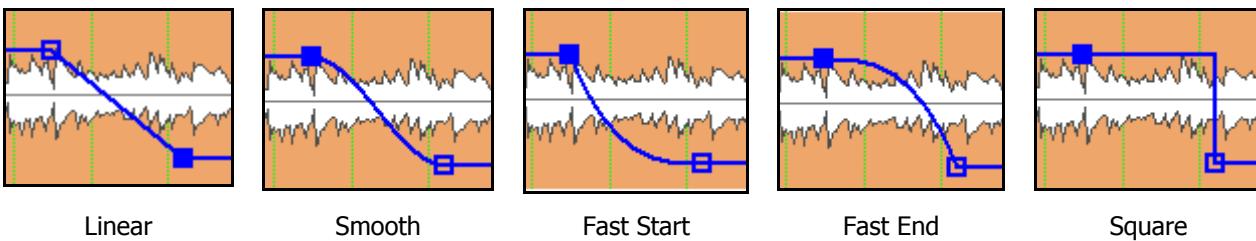
Some of the most important aspects of REAPER's automation features are summarised on this page, but this is not comprehensive. If you are unsure of any of these aspects, it might be a good idea for you to check out the chapter in the User Guide called "Reaper Automation".

Automation Modes

Automation Mode	Description
Trim/Read	Any existing envelopes are applied, but the controls do not move.
Read	Applies envelopes and moves controls for armed items, but does not write or remember any changes that you make to them.
Touch	This is similar to Latch, but stops making changes to envelope points when you stop adjusting them.
Latch	Writes and remembers any changes that you make to settings, and creates new points to track envelopes. Changes commence when you first adjust a setting, and continue to be remembered until playback stops.
Write	Writes and remembers current settings as edit points along with any changes that you make to settings for armed items as soon as playback starts. <i>In this mode, previously written envelopes for armed items will be overwritten.</i>

Whether you prefer to use **Write** mode to create your envelopes, automatically recording parameter adjustments as you go, or whether you prefer to use the **Track Envelopes Window** to create your envelopes and add your points manually is entirely a matter of preference. Most people find themselves using some combination of these methods.

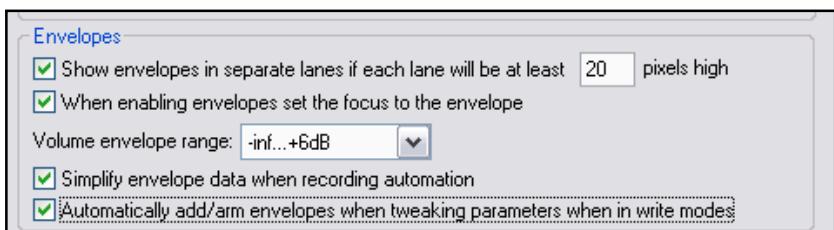
Automation Shapes



Automation Preferences

There are several settings under **Options, Preferences** which will have an impact on how you use automation. Notice in particular those shown here (under **Editing Behavior**).

In particular, notice that you can select the option to



Automatically add/arm envelopes when tweaking parameters in write mode.

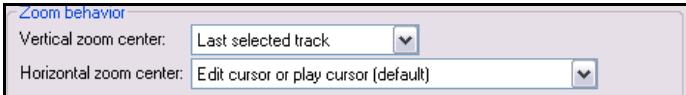
1.5.8 Mixing Preference Options

“Preferences” are just that – individual preferences. There’s no “one size fits all” set of preference settings. That said, there are some options which can be especially useful when mixing. You should at least be aware of these. Please refer to the summary table below.

Category	Group/Option(s)	Comments
General	Undo Settings	<p>The Undo Settings are a uniquely powerful feature of REAPER, and one that you should take full advantage of. In particular:</p> <ul style="list-style-type: none"> Assuming that you have plenty of available RAM set the maximum undo memory to 50 megabytes or more. Disabling the option to Create undo points for item/track selection can keep your Undo History less cluttered and easier to manage. Enabling the option to Save undo history with project files will enable you to recover an earlier mix state, even if that state last existed in a previous work session, perhaps on a previous day. Enabling the option to Store multiple redo paths will offer you greater flexibility in testing different scenarios when you are mixing.
Project	Project saving	You can use the Save to timestamped file in project directory option if you want your work automatically saved at regular intervals (as specified in the Every __ minutes option).
Project Defaults	Items	<p>Under Items you can:</p> <ul style="list-style-type: none"> Select the default fade/crossfade shape. <p>Select the option to crossfade when splitting. This can be useful in dealing with many audio glitches.</p>
Audio Device	Audio Device Settings	<p>Make sure that ASIO is selected as your Audio system (if your sound card supports it).</p> <p>If you have multiple output devices make sure that they are all enabled.</p> <p>As a rule, low rates of latency are not essential when mixing. Increasing latency can free up CPU, thereby enabling you to run more tracks and more plug-ins and FX in real time.</p> <p>To adjust latency for ASIO systems, click on the Audio Configuration button and change the buffer size. Be aware that there will be an optimal setting for smooth mixing. Too large a buffer size can be just as bad as too low.</p> <p>For systems other than ASIO, just change your Buffer samples values. You may need to experiment to get the best results.</p>
Audio Playback	Playback settings	<p>These settings largely determine REAPER’s playback behaviour, such as how playback behaves when you are working with loop selections.</p> <p>Choose the permutation of settings that suits you best.</p>

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Category	Group/Option(s)	Comments
Appearance	Background	<p>For mixing you should consider enabling both the options Set track label background to custom track colors and Tint track background panels.</p> <p>These options, combined with the judicious use of setting custom track colours, allow you to use colour coding to readily identify tracks and groups of tracks, especially in Mixer View.</p>
	Meters	<p>Monitoring your VU meters is an important aspect of mixing. Make sure that you are comfortable with the various meter settings, including Update frequency, Meter decay, and the meter rand (Minimum value and Maximum value).</p> <p>Turning on the option to use Sticky clip indicators will ensure that when clipping occurs, the clip indicator will continue to be shown on the meter until you double-click to remove it. This might appear irritating at times, but it will help ensure that clipping is avoided.</p> <p>Also consider whether you wish to Reset meter indicators on play/seek.</p>
Appearance Media	Media item appearance	<p>Consider turning on the option Don't display peaks for tracks that are not selected. The result may look rather strange at first, but if you use envelopes extensively this might help you keep track of your envelopes.</p> <p>Consider enabling the option to Tint media item peaks to custom track colors. In track view, this can make it easier for you to use colour coding for readier identification of tracks and groups of tracks.</p>
Appearance Color Theme	Theme color/font controls	<p>Colour schemes that are bright and loud might create a stunning visual impact, but they can prove harsh when you are working for long periods at a time. As a general rule, you are likely to find that those schemes that are easier on the eye work better in the long term.</p> <p>Try to find two or three colour schemes that suit you, and rotate between them from time to time. This helps to keep your REAPER environment visually stimulating and interesting.</p> <p>Colour coding can be helpful. Consider using these:</p> <ul style="list-style-type: none"> • A single colour for all Media Item Peaks. • Subtle and gentle custom colours for individual tracks and groups of tracks. • Enabling the option to Tint track panel backgrounds instead of Set track label background to custom track colors. <p>Pay special attention also to your Media item background and various Envelope colours. You will want to ensure that your envelopes are clearly visible against the track backgrounds.</p>

Category	Group/Option(s)	Comments
Editing Behavior	Edit cursor behavior Zoom behavior	<p>These five options together determine such factors as whether the edit cursor is moved when you click on a media item or define a new loop selection.</p> <p>This is definitely an area where there is no “one size fits all” best permutation of options. You should experiment with these settings to determine a solution that best suits your own requirements.</p> <p>These options determine what stays in the centre of the screen when you zoom in to your project vertically and horizontally. Make sure that you understand what the different options are and choose the combination that suits you best.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;">  </div>
Editing Behavior	Envelopes	<p>It's usually a good idea to enable the option to Show envelopes in separate lanes, especially if some individual tracks are likely to contain more than one envelope each.</p> <p>If you use the recording method to create your envelopes, you should probably turn on the option to Simplify envelope data when recording automation.</p> <p>The option to Automatically add/arm envelopes when tweaking parameters in write mode can be useful if you intend to create envelopes for FX parameters by recording them.</p>
Editing Behavior Mouse	Mouse Editing Behavior Mousewheel modifier keys	<p>In particular, you will need to decide which settings you would like for Mouse clicking on volume/pan faders and track buttons change track selection and Mouse clicks/edits in track view change track selection.</p> <p>This is where you specify which modifier keys (Ctrl, Alt, Shift, etc) you wish to combine with your mousewheel to use it for different actions, i.e.:</p> <ul style="list-style-type: none"> Horizontal zoom Horizontal scroll Vertical zoom Vertical scroll

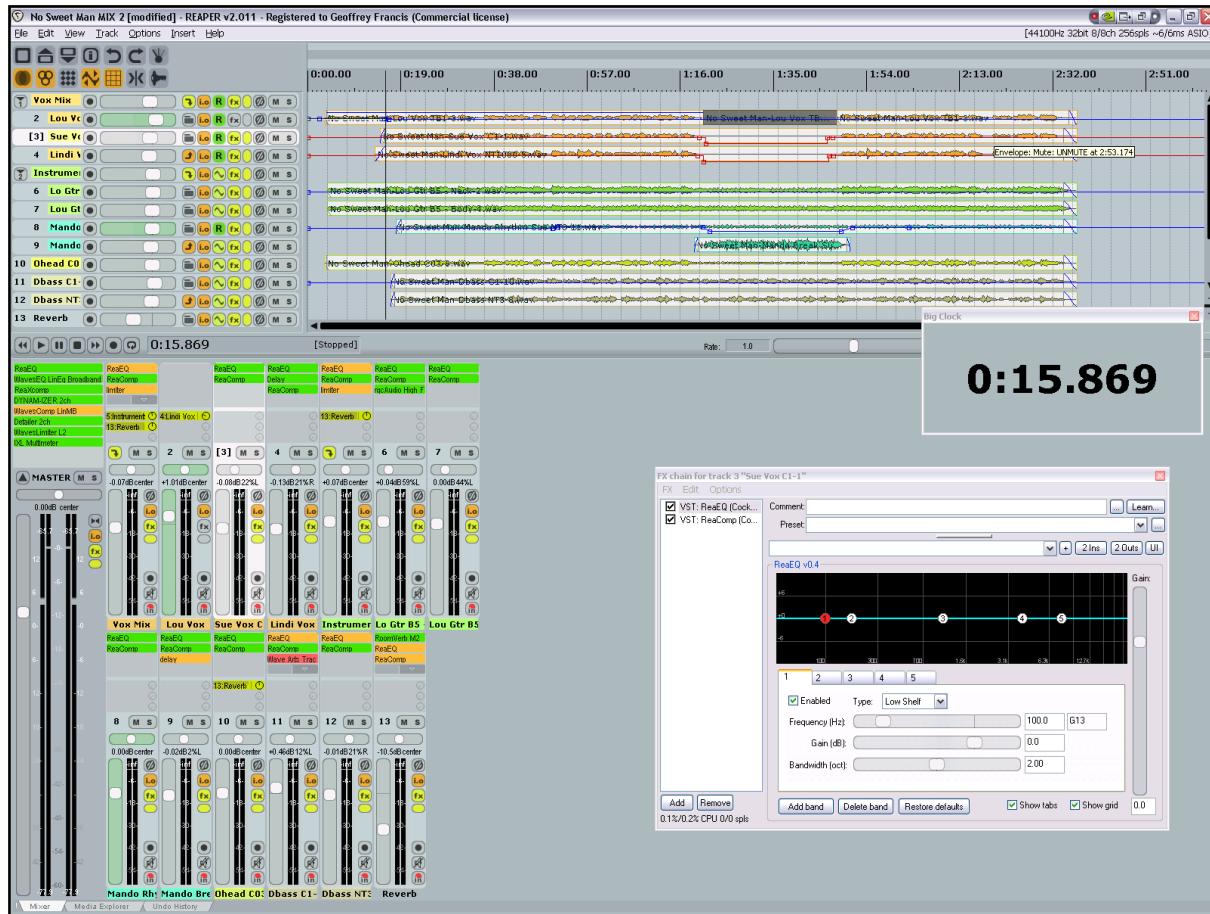
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Category	Group/Option(s)	Comments
Plug-ins	Plug-ins	<p>This is one of the most important pages of preference settings that you will need to consider when it comes to mixing. When mixing you will be frequently switching between different FX windows for various plug-ins within the same track, and also between the FX windows for plug-ins in different tracks. Get to know these options well. You will need to work out what suits you best.</p> <p>Automatically resize VST/DX config windows. Try turning this feature on for both Up and Down and see if you like it.</p> <p>Try also enabling the following:</p> <p>Set foreground to floating window when selected</p> <p>Only allow one FX chain open at a time</p> <p>Open track FX window on track selection change</p> <p>Only if a FX window is open</p> <p>These last three ensure that if you open the FX Window for any track, as you change your track selection the FX Window for that track will automatically be displayed instead.</p>
VST		<p>VST plug-ins and compatibility settings should be optimised to deal with any known issues involving any VST plug-ins that you regularly use.</p> <p>If you search the REAPER forums, you can find much useful information on various plug-ins and how to get the best results from them in REAPER.</p> <p>In particular, at time of writing, this thread in particular contains a mine of useful information:</p> <p>http://www.cockos.com/forum/forumdisplay.php?f=20</p>
Project Settings	Not under Options, Preferences but File, Project Settings	<p>Project Settings Tab</p> <p>Use the Automatically mute Master if volume exceeds ... option. +6dB is a sensible setting. It might just save your sound card from getting fried.</p> <p>Audio Settings Tab</p> <p>Especially if you will be using REAPER's time and/or Pitch Shifting features a lot, select the default pitch shift mode that is most appropriate for your work. For example, elastique 2 SOLOIST is good for vocals.</p>

1.5.9 Track and Windows Screen Sets

Screen Sets are an extremely efficient way of changing from one screen layout to another when mixing. In each case, you can switch from one view to another just by using a single function key. Consider the very simplest of examples. In the three illustrations that follow we have two Track View Screen Sets (one zooming full to a single track, one showing all tracks) and two Windows Screen Sets. Notice how easy it is to switch between the different permutations of these two views when we are mixing.

Example 1



This combination of views is useful when we want to focus primarily on the Mixer View, but with an eye still on the project overview.

Notice how easy it is in Mixer View to jump from track to track, and from FX Window to FX Window. Under Options, Preferences, Plug-Ins we have enabled the following three settings:

Only allow one FX chain open at a time

Open track FX window on track selection change

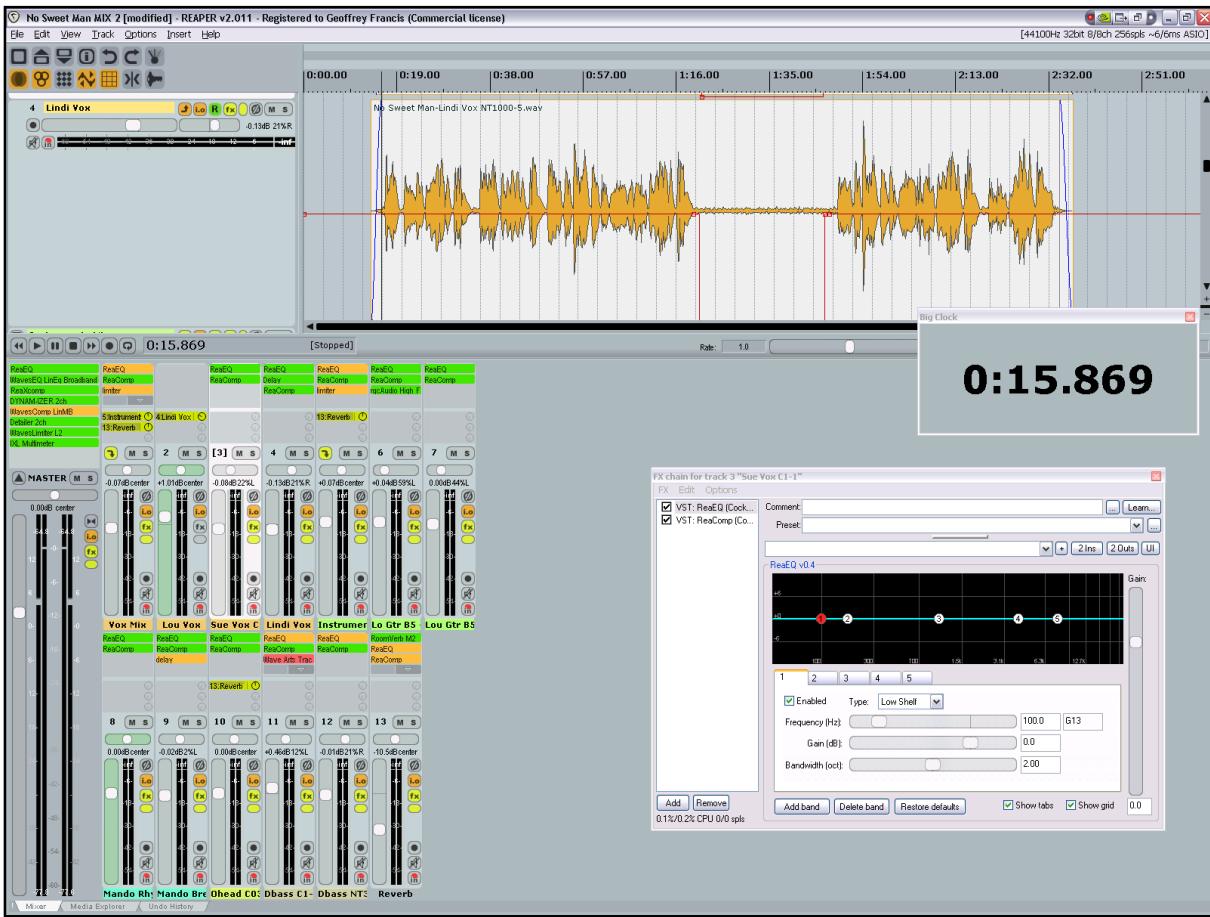
Only if a FX window is open

This means that as we scroll from track to track the FX Window for whichever track is currently selected is automatically displayed in conjunction with Mixer View.

The Big Clock is also displayed in this view. This is an invaluable aid to knowing exactly where in the song you are.

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Example 2



This example uses the same Windows Screen Set, but a different Track View Screen Set. The use of this combination of Screen Sets lets you still focus on the Mixer View, but also to zoom in on one particular track. Of course, by using your Up and Down arrows with this view, or by clicking with your mouse on any Track Panel in the Mixer View, you can select a different track to be displayed in detail.

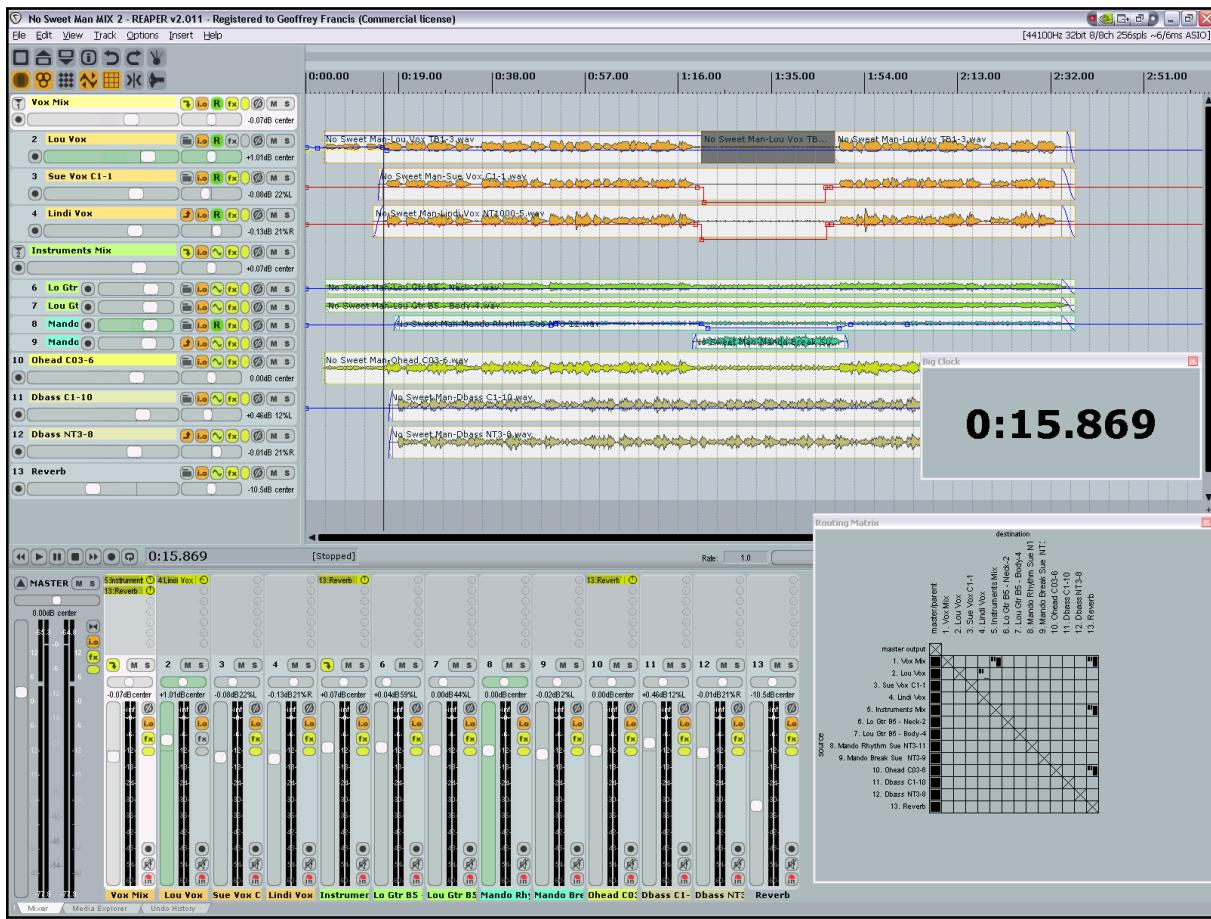
This is something you might like to do, for example, when you are working with automation envelopes.

Both of these examples also illustrate how important it is to get to know and understand the various Mixer View display options. These are accessed by right-clicking over the background area of the mixer. In this case, notice that the following options have been selected:

- Show folders**
- Show normal top level tracks**
- Show tracks that are in folders**
- Show tracks that have receives**
- Show multiple rows of tracks where size permits**
- Show maximum rows even where tracks would fit in less rows**
- Show pan controls at top**
- Show FX inserts when size permits**
- Show sends when size permits**
- Dock mixer in docker**

The option (Option, Preferences, Appearance) to **Set track label background to custom colors** has also been enabled.

Example 3



This example uses a different Windows Screen Set, in combination with the original Track View Screen Set.

Notice also that it displays the Routing Matrix rather than the FX Windows, and that the Mixer View no longer displays the FX inserts, focussing instead on the Sends.

This combination has been primarily set up for use when we are creating (and defining) Sends and Receives. By holding the Ctrl key while dragging and dropping from one track to another in the Mixer we can create sends and display the Controls window for that send.

Notice that of course this Windows Screen Set can also be used in conjunction with the Track View Screen Set shown in the previous example, that is, to zoom in to a single track. It would take only one keystroke to switch between the two.

Of course these are only examples. Take some time to experiment and work out which Track View and Windows Screen Sets will be most useful to you, and how you can use them in various permutations.

Making the most of Screen Sets in this way will really open the door to huge workflow and productivity benefits when you are mixing.

Finally, notice that not all Screen Sets have keyboard shortcuts automatically assigned to them. This should not be a problem, as you can click on the **Edit Shortcuts** button and create your own.

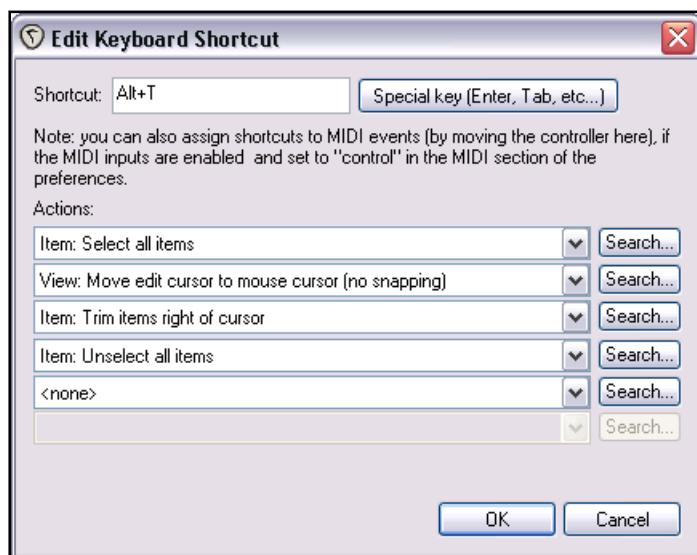
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1.5.10 Keyboard Shortcuts and Macros

It is almost impossible to overstate the time saved by using keyboard shortcuts and macros when you are mixing. Any sequence of tasks that you use regularly can be assigned to a keyboard shortcut. It is well worth spending some time figuring out where keyboard macros can be of use to you. The topic is covered extensively in the REAPER User Guide, but to start you off here are a few simple suggestions that will make your life a whole lot easier.

Trim and Fadeout Macros

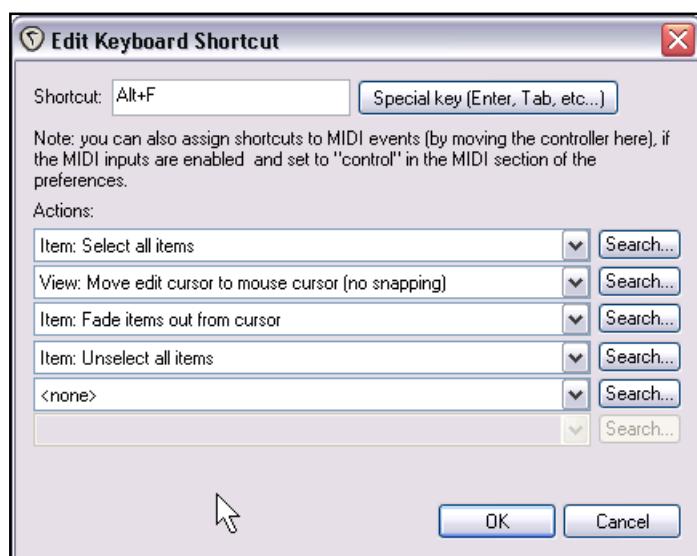
Everybody when they record records a few seconds of silence at the end of their tracks. Then when it comes to mixing, you find you need to slip edit each and every track down to the required length, then manually add a fadeout to them.



These two macros should be taken together, they make up a pair. Of course, you can assign any keyboard shortcuts that you wish, but for convenience they are labelled here as **Alt T** and **Alt F** respectively.

Trim Macro: Alt T

The first of these macros will allow you to first hover your mouse over *any* track and press **Alt T** to have all tracks trimmed to that position.



Fade Macro: Alt F

After running the Trim Macro, hover your mouse at a new position over any track and, press **Alt F** to have all tracks faded out from that position.

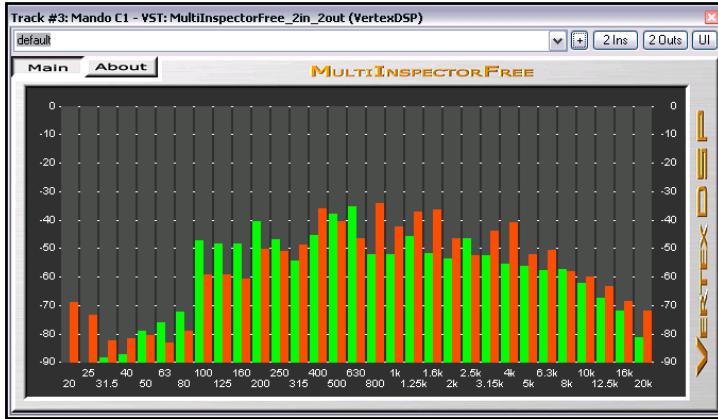
What this demonstrates is that creating macros is not difficult, nor is it time consuming. Whenever you find that there is a task – and more especially a sequence of tasks – that you perform regularly, then it's time to *think macros!*

1.5.11 What Other Tools Do You Need?

It's likely that you'll find that you have a use for plug-ins other than those supplied with REAPER. In this primer, however, we will only be using FX and plug-ins that are either supplied with REAPER or available as Freeware.

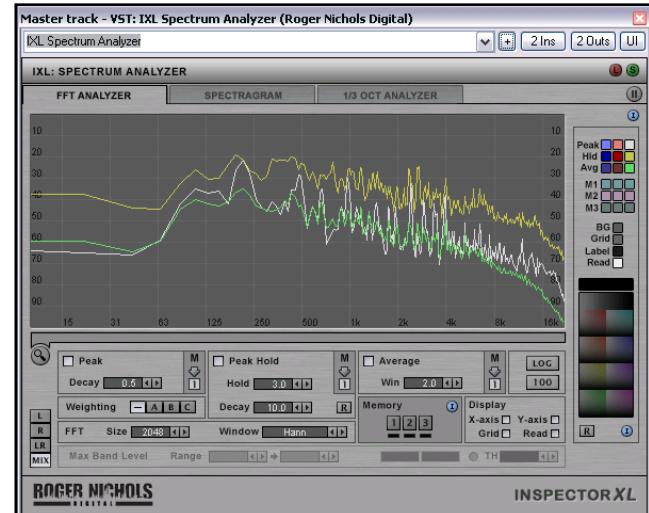
In particular, it will definitely be worth your while to get hold of the plug-ins detailed below.

There are a number of sites on the Internet from which these items can be (legally) downloaded free of charge. Use a search engine such as Google to find a site most appropriate for you.



Multi-Inspector Free.

This very useful plug-in makes it easier for you to compare the frequency range through time of up to four different tracks at the same time.



Roger Nicholls IXL Spectrum Analyzer

Placed at the end of the FX Chain for your Master, this helps you keep tabs on the overall shape of your mix.

You can use REAPER's **JS:Analysis/gfxanalyser** for this if you prefer, though this does not display quite as much information.



Panning Tools

There are a number of free VST plug-ins available that handle simple panning tasks, including **RS Pan Pro** and **RS Balance Pro**.

Shown on the left is **Panature**. This is a very simple and easy to use plug-in that will enable you to adjust the panning for individual mono channels and paired stereo channels within your tracks.

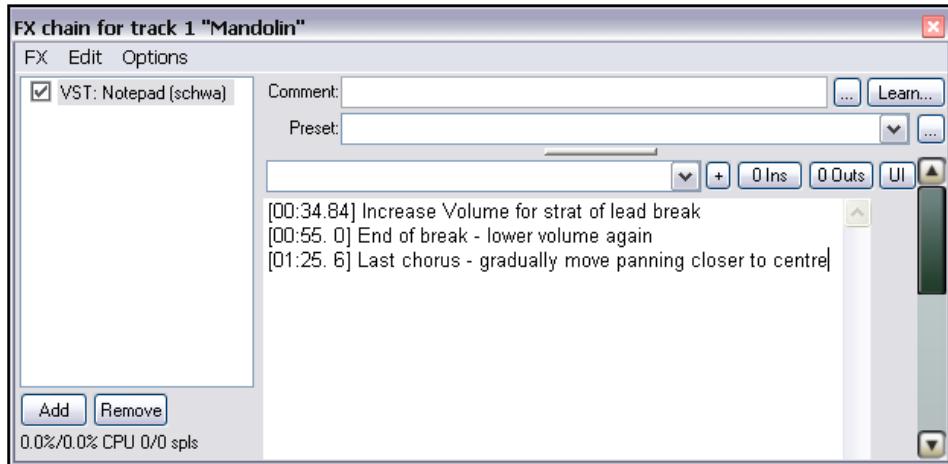
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Schwa's Track Notepad

Inserted into the FX Chain for any of your tracks, you can use this handy little plug-in to record notes or comments about what you have done.

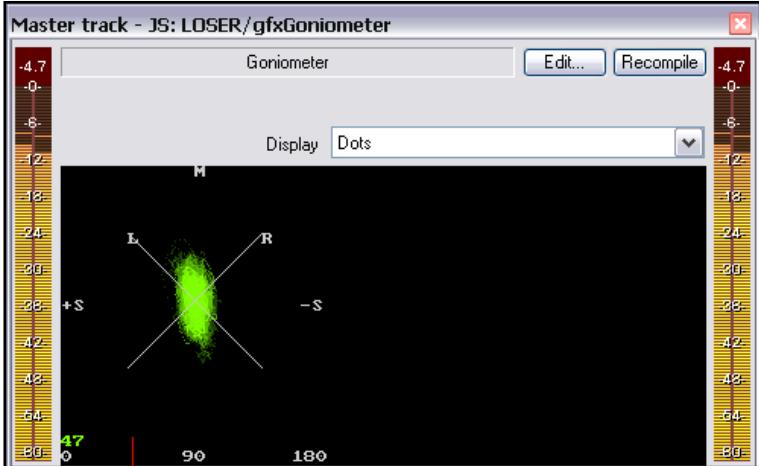
One especially nice feature of this plug-in is that if you enter comments while the track is playing, the position along the timeline where the comment is entered is

automatically recorded along with the comments. You can even automate the scroll bar so that what you have written appears at the corresponding time as you play the track!



JS Analysis Tools

The JS plug-ins supplied with REAPER include a number of visual analysis tools. Many people like to use these for visual confirmation of how the sound of an instrument, a submix or a whole project is being shaped. Others prefer to trust their ears alone. It's your choice.



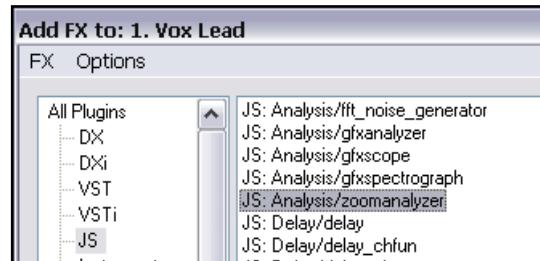
LOSER's GfxGoniometer

This plug-in gives a visual indication of how "fat" or "full" your mix is, as well as how this changes dynamically as the song is played.

The fuller the mix, the fatter the shaded area. The purpose of this tool will make more sense to you after we have examined the dimensions of sound (Section 3 and beyond).

You can also check out the other **JS Analysis** tools that are supplied with REAPER if you like.

While more advanced, and not essential for the beginner, they can be helpful. If you don't understand what they do just yet, don't worry about it.



1.6 Sort Out Your Takes

If there are any tracks where you have recorded more than one take, get all your take edits organised before you start mixing.



Make sure that you understand fully how to manage and work with multiple takes. In particular, you should be able to use the various commands on the Takes context menu, including **Explode all takes to new tracks**, **Implode selected items across tracks into takes**, **Implode selected items on same track into takes** and **Paste to takes in selected tracks**.

Next take	T
Previous take	Shift+T
Delete active take	
Crop to active take	Alt+Shift+T
Explode all takes to new tracks	
Implode selected items across tracks into takes	
Implode selected items on same track into takes	
Paste to takes in selected items	

Remember also that the **Item Properties** dialog box includes an option to **Play all takes** if you wish.

When you have finished organising your takes and are ready to start mixing, you'll probably find it easier to work if you turn off the option to **Show all takes in lanes**. This has the effect of presenting a track which has been sliced together from various takes in the manner shown below.



For further information about working with takes, you should consult the REAPER User guide.

1.7 The Sample Project and Resource Files

This mixing primer makes extensive use of practical examples, demonstrations, exercises and case studies. You will need to download, unzip and install each of the following, which contain the source material:

<http://www.cockos.com/~glazfolk/Pelverata.zip>

<http://www.cockos.com/~glazfolk/RosesBloom.zip>

<http://www.cockos.com/~glazfolk/Waiting.zip>

In addition to this, there are a handful of customised JS Plug-ins that are used in some of the examples. If you wish, you can create these yourself, but you might find it easier to use this pack. It contains five plug-ins which are modifications of various JS plug-ins originally developed by IX and LOSER.

<http://www.cockos.com/~glazfolk/CustomPlugins.zip>

You will need to unzip them into your Reaper program directory, so that they will reside in the following directory:

C:\Program Files\REAPER\Effects\NICHOLAS

1.8 Develop a Mixing Strategy

The goal of mixing, put at its simplest, is to make your recording sound as good as possible. Sounds straightforward enough, doesn't it? However, anyone who has ever tried it will tell you that it can be quite a daunting task. One of the most common causes of bad, uninteresting or mediocre mixing is a failure to take a thorough and methodical approach.

There's no single model that suits everybody, no system to which the entire world must slavishly adhere. However, you are strongly advised to find a system that suits you, and then stick to it. Mixing requires a large amount of discipline and you are unlikely to obtain the best results by jumping randomly hither and thither without a plan. You can think of mixing as being a four step process. These are:

1.8.1 Corrective Action

Start by identifying and fixing any problems in your recording. The guitar is too muddy. The vocalist's breath sounds are too loud. There's some background hiss on one of the tracks. There's a clunk somewhere. The cleaner your recordings are, the better you will be able to go on to the next step. The time to identify and resolve these issues is at the beginning of the mixing process, not the end.

1.8.2 Spatial Mixing

Work out your desired sound stage. Use the various tools at your disposal (we'll see what these are shortly) to position every instrument pretty much as you want it to be in your final mix.

1.8.3 Artistic Mixing

This is for many the most interesting and enjoyable aspect of mixing, which is why too often you might be tempted to jump over steps 1 and 2 and start right here. Don't! This is where, for example, you set about building your song and creating its structure, highlighting a particular instrument here or there, adding some clever effects at certain passages, and so on.

1.8.4 The Final Touches

The very last stage in the mixing process is mastering. Mastering consists of bringing your mix up to a standard appropriate for final distribution. Some people choose to do their own mastering, others are happy to work within their limitations and stick with pre-mastering. Pre-mastering consists of taking the necessary action to make your mix ready for mastering by a professional mastering engineer.

In this primer, we will examine the issues involved in pre-mastering and look at the tools that REAPER makes available for you to do this. However, the topic of mastering is a huge one, worthy of a book in its own right (indeed, many excellent ones have already been written). It is beyond the scope of this primer to go into the science and art of mastering.

I recognise, however, that this can create something of a dilemma, especially for less experienced users. What do you do if you don't have enough money to pay for a professional mastering engineer, don't have enough experience to master to a professional standard yourself, but need to produce, say, a demo recording?

In an attempt to provide a stop-gap solution, I've included a section at the end on **Pseudo Mastering**. This, I fear, will cause more than a few eyebrows to be raised. In this section, you will be shown a few relatively straightforward techniques that should be able to at least improve the overall sound of your final mix. *This pseudo mastering is not intended to serve in any way as a substitute for proper mastering.* Pseudo mastering is only recommended if circumstances really leave you no alternative, and then only as a short term solution.

Notes

2 Pre Mix Fix: Corrective Action

2.1 What Is Corrective Action?

Before you go about commencing your “real” mix, listen to each track individually to see if any require corrective action. Corrective action may need to be applied if there are blemishes or other problems in your recorded material and for some reason these blemishes cannot be corrected by overdubbing or re-recording.

Examples of instances where this may be necessary might include:

- A guitar track that sounds too boomy.
- A piano track that sounds too honky.
- Hi-Hats that sound muddy.
- Small glitches that need removing.
- Vocal issues, such as “popping” or “gasping”.
- Minimising the impact of “bleed” on non discrete recordings.
- Removing unwanted background noise

Corrective mixing should be treated as a separate and distinct task in its own right. Make your recordings as clean and right as they should be before you go on to create your mix.

2.2 Corrective Action Tools

It’s one of the great mysteries of recording. Wherever did that click or crackle come from? How did it get on to my otherwise pristine track? In any event you will want to remove it.

REAPER offers you at least nine tools for dealing with unwanted sounds on your tracks. Which is the most appropriate in any particular circumstance will depend on factors such as the nature and context of the sound. For example, is it present in an otherwise silent passage all by itself, or does it occur at the same time as other recorded material that you wish to keep? In overview, the nine methods are:

- Use EQ.
- Create separate items and mute them.
- Create items and use crossfades.
- Use a mute envelope.
- Use a volume envelope.
- Use a Noise Gate.
- Using ReaFir.
- Use a Multiband Compressor.
- Use Spectro.

We’ll be looking at each of these methods in turn, with examples of the kind of situation in which they might be applicable. In doing so, we will be assuming that you are already familiar with REAPER’s mechanics, such as how to split an item, how to add fades and crossfades, how to create and use envelopes, and so on.

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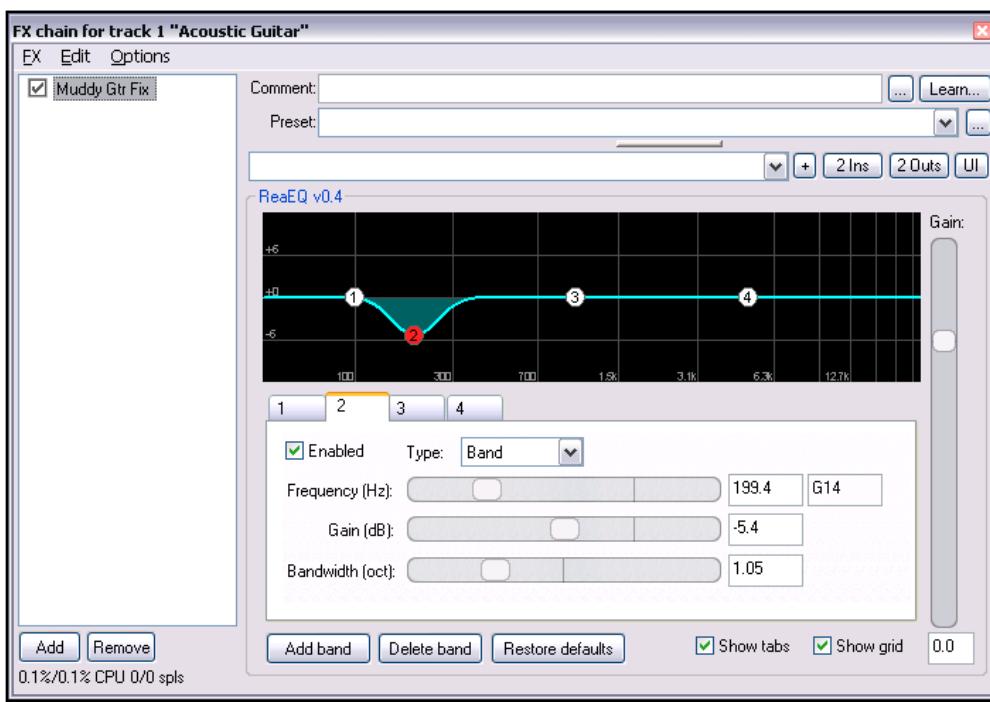
2.3 Corrective EQ

The following table shows some examples where this might occur, together with suggested possible remedies. The remedies are suggested for guidance only, not blind obedience.

Typical Corrective Mixing Issues	
Issue	Comments
Boominess	If an instrument sounds too "boomy", take off a few decibels around 200 Hz.
Muddiness	If an instrument sounds muddy, try cutting the level around 300 Hz.
Irritation	Especially with percussive instruments, where this occurs try cutting around the 2000 Hz to 4000 Hz range.
Twanginess	This can occur especially with plucked instruments. Cut volume around 1000 Hz to 4000 Hz.
Thinness	Where an instrument sounds too thin, try reducing volume around 5000 Hz to 8000 Hz.
Hiss	If an instrument sounds "hissy", try rolling off above the 8000 Hz mark.

Notice that in every single one of these examples, the suggested remedy involves *subtractive mixing*. This means that rather than add gain at any point, you should lower the gain fader at or around the critical frequency in order to achieve your objectives.

You can see that corrective mixing as likely as not will involve the application of some EQ. As a rule, you should use a separate renamed instance of your EQ plug-in specifically for this task, as shown on the right. This instance should normally be the very first plug-in in the track's FX chain. You should then consider that particular instance of the plug-in to



be locked.

If you later wish to make further changes to the EQ any track, add a separate instance lower down the chain and use that. This approach has several advantages.

For example:

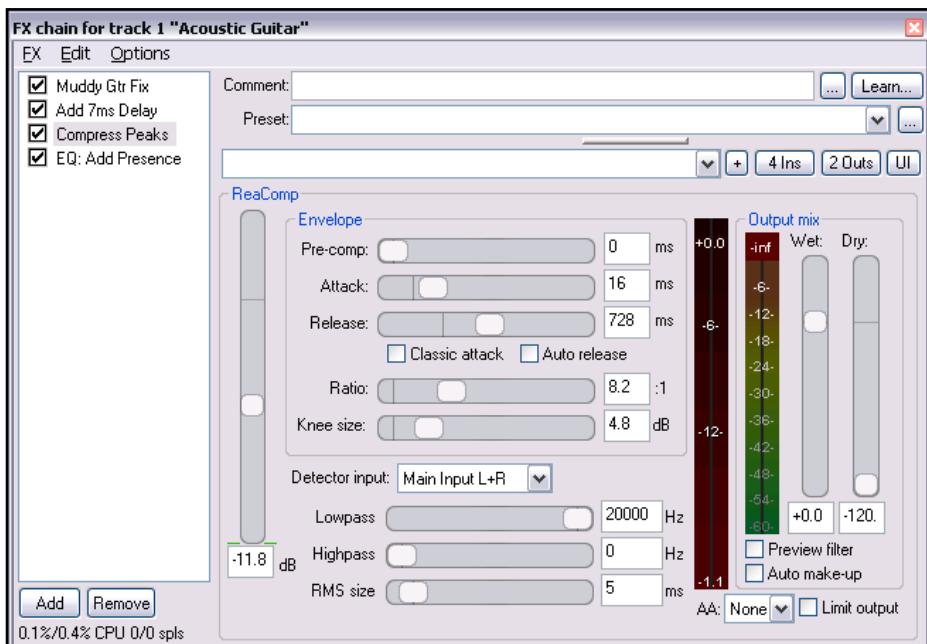
- It is safe and methodical. You are unlikely to accidentally undo your good work later if it is locked away in a specific plug-in of its own.
- It is more flexible. You may well want to apply further EQ to the track later, but you may also wish to apply other FX, such as perhaps delay or compression. The additional EQ that is required might be best placed further down the FX chain.

Remember that the ability to rename individual plug-in instances is an extremely useful feature of REAPER. Just right click over the name of the FX in the FX Window or Mixer View) and choose **Rename FX Instance** from the context menu.

By doing this, you can create an audit trail of your work as you go along.

Take a look at the example shown on the right. How much more useful is it to view a chain such as that

shown above right than just a list of plug-in names?



2.4 EQ: Bandwidth and Type

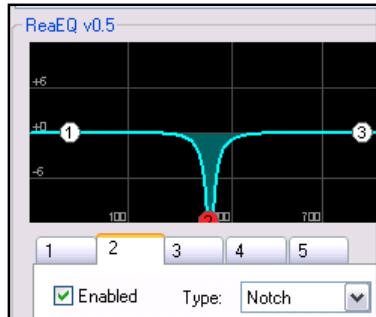
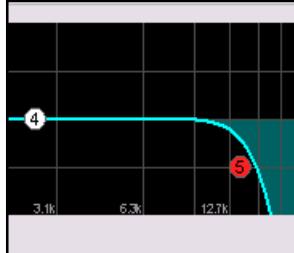
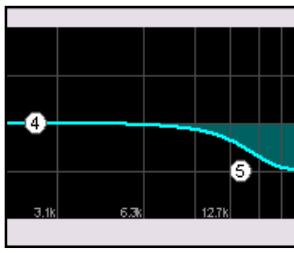
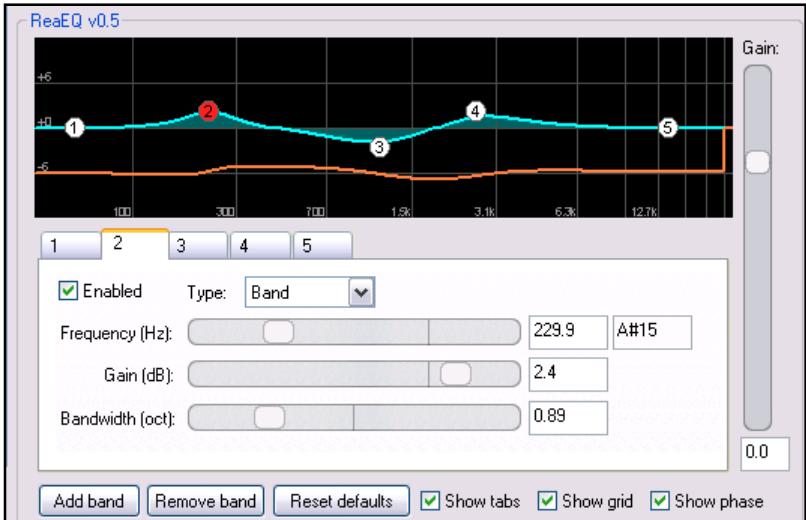
EQ is probably the one type of plug-in that you will use more than any other. Throughout this Mixing Primer, we will primarily be using the plug-in ReaEQ, the parametric EQ plug-in that is supplied with REAPER. Happily, it has only a small number of parameters, at least compared with other types of plug-in. It's worth taking time to make sure that you are comfortable with each of these parameters.

Parameter	Comments
Add Band	By default, the ReaEQ screen displays four bands, but you can add more if you wish.
Delete Band	Deletes the currently selected band.
Enabled	This is a toggle that enables or disables the currently selected band. Useful when you are testing the effect of your settings.
Frequency	Determines the frequency at which the Gain and Bandwidth settings for the currently selected band will be applied.

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Parameter	Comments
Gain	Determines the value of decibels by which the volume at the currently selected frequency will be increased or decreased.
Bandwidth	Determines the number of octaves across which the gain will be applied. The normal range is between 0 and 4.
Band Type	Determines the type of band. The options are explained below.
	<p>High Pass Allows only frequencies above that specified to pass through the filter and be heard.</p> <p>Low Shelf Similar to a High Pass filter but more gradual in its effect.</p> <p>Band Determines the central frequency at which the gain or reduction is applied. The bandwidth setting determines the range that will be affected. The type Band (deprecated) is similar to Band, and reflects the way earlier versions of ReaEQ behaved.</p> <p>Bandpass Allows only that range of frequencies centred on the frequency to pass through the filter and be heard. Can be useful when sweeping a track seeking to identify problem frequencies or key frequencies.</p>

2 – Pre Mix Fix: Corrective Action

Parameter	Comments
	<p>Notch A special kind of Band filter, used for applying a sharp reduction in volume at a highly targeted frequency.</p> 
	<p>Low Pass The opposite of a High Pass Filter. Allows only frequencies below the specified frequency to be heard.</p> 
	<p>High Shelf Similar to Low Pass but creates a more gradual transition.</p> 
Show Phase	 <p>Enables you to check the phase shift implications of your EQ settings. Let your ears be your best judge!</p>
Gain	<p>The gain fader can be used to adjust the overall signal level (increase or decrease) after the effects of your EQ settings have been applied.</p>

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2.5 The Grey Area

The boundaries at which corrective EQing ends and spatial EQing starts can get a little blurred, simply because of the very nature of the recording process itself. No matter how careful you are with microphone selection and placement, you are never going to be able to reproduce with 100% fidelity a true representation of that live sound. This is such a common issue that it becomes a bit of a grey area, but it makes sense to address it before we move on to the next section. As a rule it pays to be wary of any suggestions to *always* EQ an instrument in this way or that way. Nevertheless, listen carefully to your instruments and see whether the following suggestions make sense. Notice, by the way, how much of the subtractive EQing in these tables takes place within that frequency range that we will later be describing as *The War Zone*.

If you wish to experiment with any of the settings on this page, insert a separate instance of your EQ plug-in in your track's FX chain. This should be placed after any Corrective EQ plug-in. You should normally also use this second instance of your EQ for any further EQ that you may wish to apply to the track at a later stage in the mixing process.

The Drum Kit

If your recorded drum kit in its dry state sounds perhaps a little dull or ordinary, you could experiment with some of these:

Instrument	40 to 60 Hz	200 to 400 Hz	1000 to 3000 Hz	5000 to 8000 Hz	10000 to 12000 Hz
Kick	+2 dB	- 8 dB		+ 6dB	
Toms		- 5dB		+ 5dB	
Snare				+ 7dB	
Hi Hat		- 7 dB			+ 3 dB
Overheads		- 5 dB			+ 3 dB

Some Other Common Instruments

See whether these fairly minor tweaks bring your instruments and vocals alive a little:

Instrument	40 to 60 Hz	200 to 400 Hz	1000 to 3000 Hz	5000 to 8000 Hz	10000 to 12000 Hz
Bass Guitar	+ 2 dB	- 4 dB			
Acoustic Guitar		- 5 dB		+ 3 dB	+ 2 dB
Electric Guitar			+ 3 dB		
Female Vocals		+ 2 dB		+ 2 dB	
Male Vocals		+ 3 dB			

2.6 Correcting Vocal Problems

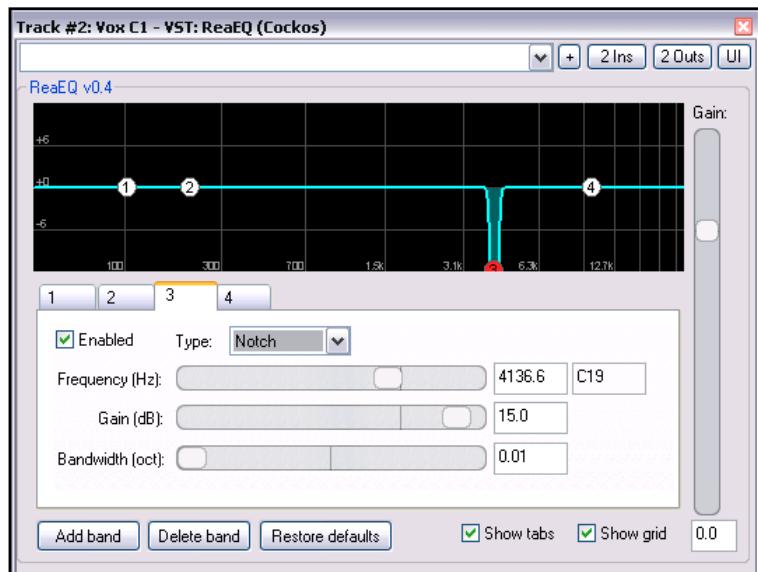
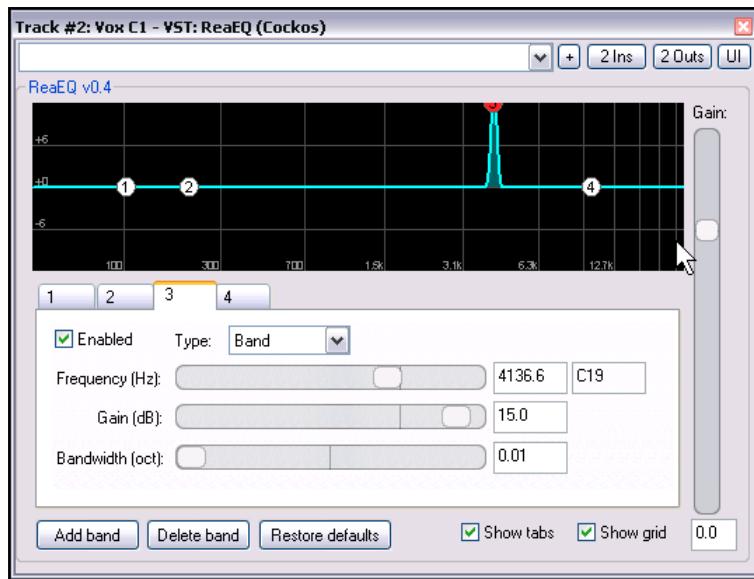
2.6.1 Sibilance

Sibilance is the term used to describe that hissing sound that can sometimes occur when an “ss” sound is recorded. It is most easily tamed with the use of a de-esser. Third party de-esser plug-ins can be purchased, or you can make your own, using an Analyser, EQ and a Multiband Compressor.

Any Spectral Analysis tool (including those mentioned earlier in this primer) can be used to help identify the approximate region where the offending frequency can be found. For male vocals, this is likely to be somewhere in the range 4,500 to 5,000 Hz, for female vocals 6,500 to 7,000 Hz. Once this has been identified, a technique known as *sweeping* can help you to home in on the exact frequency.

This requires you to create a notch filter. In order to do this:

- Choose one of your EQ bands, set it at approximately the required frequency and define the EQ type as band.
- Raise the Gain by about 15 dB for that band.
- Narrow the bandwidth for that band to 0.01 (see picture above).
- Now play the track. As you do so, carefully and slowly drag the frequency slider right or left until you identify the spot at which the sibilance is the worst.
- Now change the filter type to notch, as shown on the right.
- Play your track. You should notice some improvement in the sibilance.



Unfortunately, in solving one problem we have most probably created another. This is because as things stand, our notch filter will be applied all the time, even where there is no sibilance. This could seriously affect the vocal track, for example by adding something of a lisp to otherwise clean sounds.

You might think of using an envelope to enable and disable this filter as required, but this would be a lot of work. A better solution would be to apply what you have learnt to a multiband compressor.

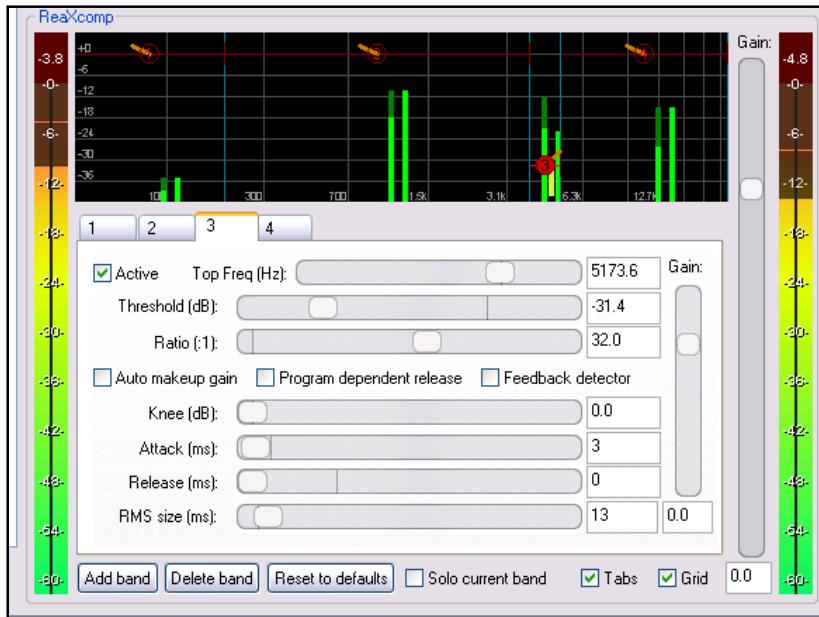
We can therefore now bypass our EQ (or disable the notch filter band) and insert into our FX chain a multiband compressor such as ReaXComp. This allows us to apply compression to selected frequencies only, and only

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when the volume at that specific frequency goes above a certain level. This plug-in could have been tailor made for de-essing!

Notice the settings shown on the right. In particular:

- Only Band 3 is made active.
- Automake up gain is disabled.
- The range for this band is set to about 3865 Hz to 5174 Hz. This is quite narrow, but wide enough to capture the sibilance.
- The ratio setting is quite high to ensure that the volume is severely reduced when the compressor kicks in.
- The threshold is set by trial and error so as to activate the compressor only when sibilance occurs.
- The other settings (knee, attack, release, etc) are all very low. This ensures that the compressor, when required, will kick in quickly and just as quickly kick out again.



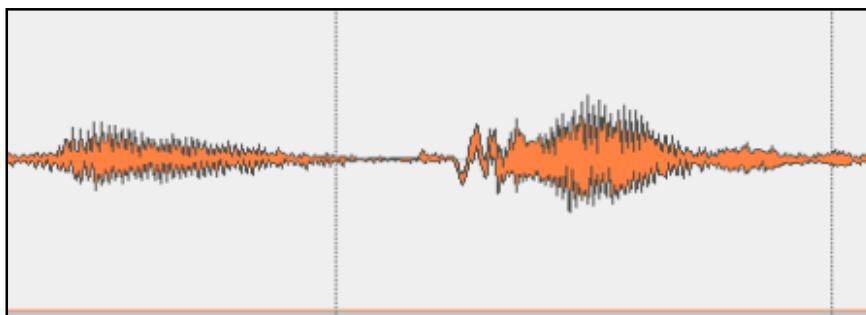
Remember that once you have experimented with your settings and created those that suit your particular needs, you can save them as a preset. You will then have a de-esser that you can apply to other projects as well as the current one.

2.6.2 Plosives

Plosives consist of that popping sound that sometimes occurs with recorded "P" and "B" sounds. When you zoom in closely on a recorded audio item, it is usually quite easy to visually identify a plosive, from its jagged waveform pattern.

Observe the example shown on the right. It is part of a vocal recording. The first item shown is fine, but you can observe a sharp jagged pattern at the start of the second item.

This is where we have a word beginning with "P" and where a plosive sound has been made.



There are a number of techniques available for fixing them, some simpler than others. As a rule, try the simpler remedies first – you'd be surprised how often they work. Only if all else fails need you try the more complicated remedies.

First, let's just mention some that are generally **not** recommended:

Volume Envelope: You might be tempted to use the ordinary standard Volume envelope to fade your track down at the point of the plosive. However, the normal volume envelope is applied to your track *after* the FX Chain. Therefore, if you use a volume envelope to fade down the plosive, any other FX that you may have (such as EQ or delay) will be applied to that plosive before it receives its corrective treatment. This can actually make it harder to fix the problem.

Mute Envelope: Chances are that this might do the trick, but it can still be problematic. The biggest issue with using a Mute envelope for this purpose is that the Mute envelope cuts in and out severely and suddenly. It can sometimes appear to create a hole in your song.

Noise Gate: In theory, it may well be possible to use a Noise Gate to correct plosives, but it really is a bit like taking a sledgehammer to crack a nut. Unless the Noise Gate parameters are set correctly, the gate can open and close too sharply, in a way that can actually make unwanted sounds appear worse even than if they had just been left alone. This same issue arises – indeed more so – when you try to use a noise gate to eliminate unwanted breath sounds.

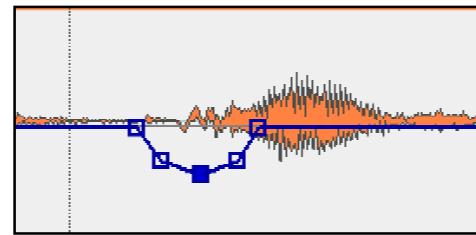
Moreover, if a vocalist is creating plosives, the chances are that there will be several throughout the song – and you can bet your last dollar that each one will require separate noise gate settings. You'll likely as not end up with three or four automation envelopes on your track, just to control plosives alone.

Let's then have a look at some of the tools at your disposal that you might wish to consider before you resort to any of the above.

The Volume (Pre FX) Envelope

Especially if the mix is a fairly busy one, you might get away with using the Pre FX Volume envelope (as shown below right) to simply fade down your track at the offending point.

However, if there are several plosives on the track it's likely that this simple remedy might not always be effective. On the other hand, if there are only one or two plosives, you may wish to consider whether you want the clutter of an entire envelope to address an issue that occurs only in a couple of places.



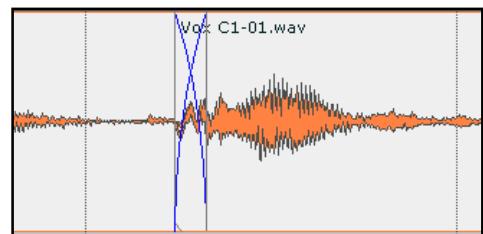
Splitting the Item

This solution is so simple it's almost ridiculous. Yet, often the simple split tool alone may be all that is required to fix the problem.

Observe the example below right. Simply by splitting the media item at the point of the plosive, and then adding crossfades, we lower the volume going into the plosive and raise it coming out of it.

REAPER's flexible editing facilities offer you several variations of this method. For example, you can use the split tool to isolate the plosive as a separate item, then mute that item, or lower its volume and fade in and out of it. This can help to make your edits appear more seamless.

Two variations on this concept are illustrated below.

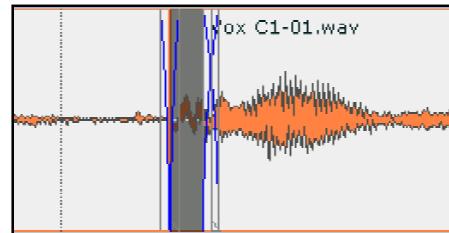
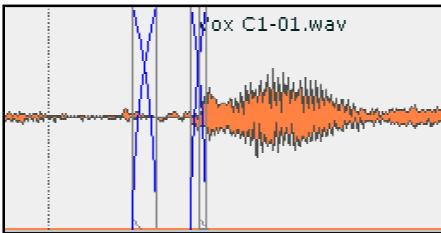


In the first example, the plosive has been isolated into a separate media item (by splitting), then the volume of that item (using the Item Properties settings) has been lowered to around -10dB. Crossfades into and out of the item have been added.

The second example differs in that instead of adjusting the volume of the isolated item, it has been muted.

The big advantage of using this method is that it enables you to address each individual plosive precisely according to its unique characteristics without cluttering your tracks with excess envelopes.

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Using EQ

Another method of taming plosives that you may wish to consider is to use EQ such as ReaEQ.. The idea of using EQ is that it effectively enables you to momentarily lower the volume at the exact frequency at which the unwanted sound is most prominent, rather than lowering the overall volume of the track as a whole. This lessens the possibility of appearing to create a hole in your mix.

One of the Spectral Analysis tools mentioned earlier in this primer can be used to help you identify the rogue frequency. Simply place it in the track's FX window and play the track. As it plays, look for any obvious change at the point where the plosive sound occurs. Remember that you can use the Playback Rate slider on the Transport Bar to slow down playback while you are searching for this.

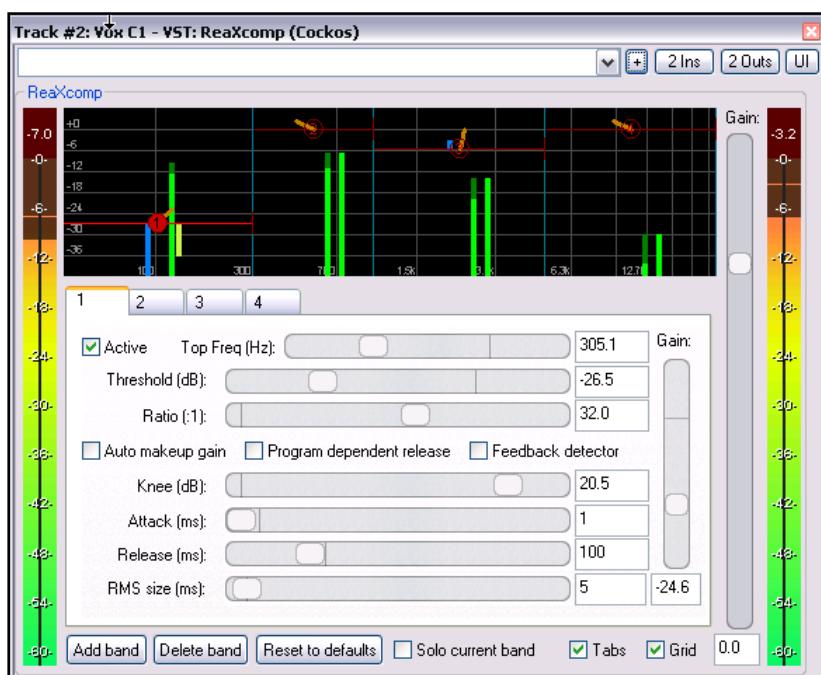
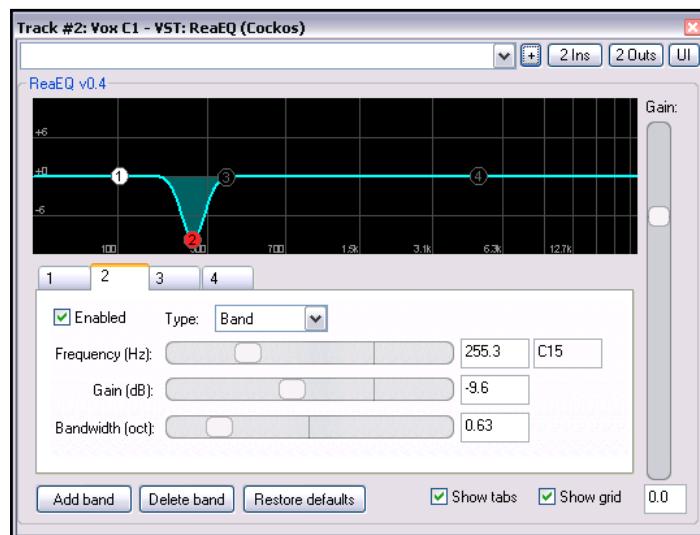
Alternatively, you can use the sweeping technique (described in detail in the section headed **Sibilance**). If you are having difficulty, use both methods and try to identify where both sets of findings converge.

Once you have identified the frequency, make the appropriate EQ adjustment (a possible example is shown below), then add an automation envelope to ensure that your change is only applied at that point.

Using a Multiband Compressor

The other main method of taming plosives that you will wish to consider is to use a multiband compressor such as ReaXComp.

This is a more sophisticated version of using EQ, but works on a similar principle. Instead of just lowering the volume at that



frequency, we squash it.

An example is shown above. Of course, as with the EQ example, it is only an example. You will need to determine for yourself in each case which actual settings and values are required. However, the following guidelines should be helpful:

- Make only one band active, the band that you are using.
- Set a Top Frequency somewhat higher than that at which the plosive seems to be at its worst. If in doubt, start with a setting around 500 Hz.
- Set a high ratio, around 30:1 or more.
- Adjust the Threshold according to that track's volume, so that the Compressor really kicks in at the point of the plosive.
- Attack and Release settings should normally be quite low for this kind of action.
- Make sure that Auto makeup gain is turned off.

If you wish, you can use a bypass automation envelope to ensure that the compression is only applied where and when it is required, not for the whole track.

2.6.3 Breath Noises

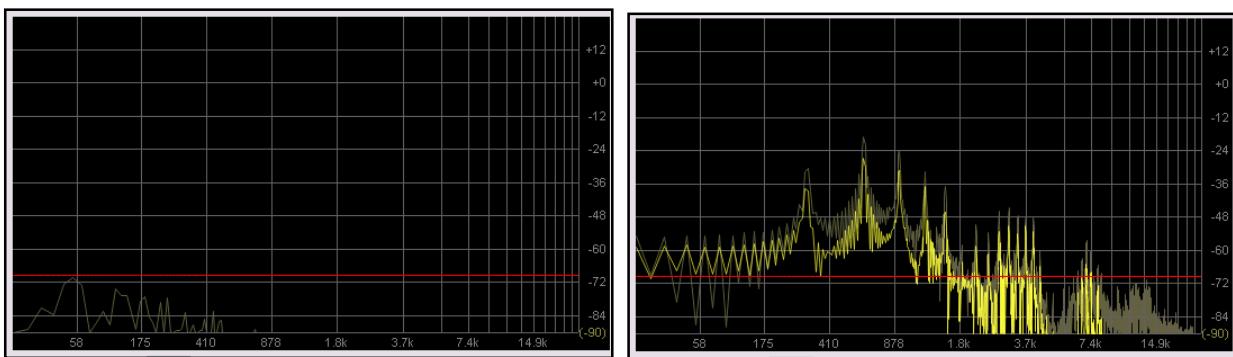
Breath noises often pose a special problem of their own, often because the sound of the breath can sometimes seem to just hang on into the beginning of the singing. You will have to decide to what extent these are a problem. You may wish to remove them altogether, or you may prefer simply to lower them, especially if you feel that the presence of some breathing sounds adds atmosphere or reality to a recording.

That said, often the solution of **Splitting the Item** already discussed above can also be used for reducing or removing unwanted breath sounds. In addition, there are three other possibilities that you might wish to consider – using a **Noise Gate**, **Auto Trim/Split** or **Spectro**.

Using a Noise Gate

It is quite likely that you will find that ReaGate can be used to eliminate breathing sounds. The trick is to get the settings right so that the gate closes when the volume drops below the audible level of the vocal recording, staying closed to eliminate sounds such as breathing, but also reopening in time not to miss any of the vocal when it comes in.

The two illustrations below illustrate this concept, using ReaFir. In the first illustration (left) if you look carefully you can see some low level noise below the horizontal line. This is shut out and does not get heard. The second illustration (right) shows a vocal passage that is powerful enough to break through the gate.



A closer look at the second picture, however, reveals a problem that can occur with noise gates. Notice that in this example the last fade of the vocal passage is shut out, because it falls below the threshold of the gate.

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This is why it is important that you get your Noise Gate settings right – and remember that you can use automation envelopes and/or per item FX to ensure that different settings are used for different parts of the song. If you are not sure about these settings, start with something similar to those shown (right) and make your adjustments accordingly.

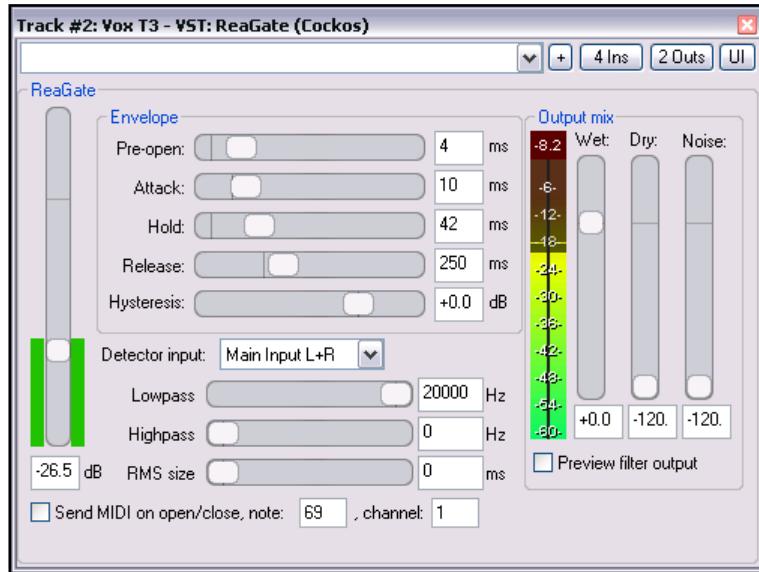
The **Threshold** determines the decibel level at which the gate will close and open.

The **Pre-open** setting ensures that ReaGate will look ahead and can anticipate when a change is coming.

The **Attack** setting determines how quickly the gate opens when the signal rises above the given threshold,

Release determines how quickly it closes how quickly when the signal again falls below that threshold. In addition, the **Hold** setting determines how long to wait after the volume falls below the threshold before beginning to close the gate.

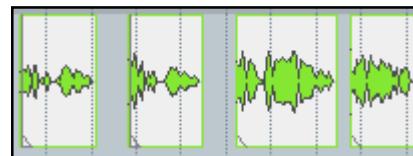
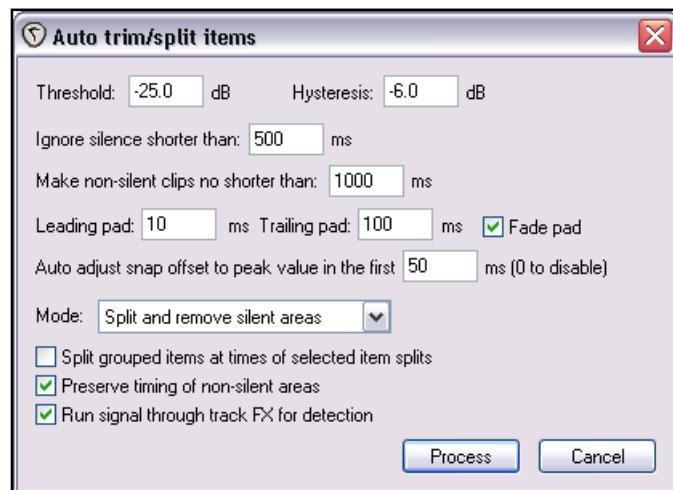
Think about this for a moment. Breath sounds usually occur after a pause (perhaps between verses) and usually occur after a significant period of silence. When the vocal starts (immediately after the breath) you want the gate to open quickly, with a short attack time. However, you don't want to chop off a fading vocal (as in the earlier example) at the end of (say) a line or a phrase, so it makes sense to use a relatively long hold and slow release time. This is not always the case with noise gates. As you will see later, noise gate settings for percussive instruments are likely to be very different from those required for dealing with vocals.



Using AutoTrim/Split

The AutoTrim/Split method works on a similar principle to a Noise Gate, splitting your track according to the Threshold and other parameters, then removing from the track all of the passages that match your specified criteria. The big advantage of this method is that it unlike a Noise Gate it is not applied in real time, and therefore places no burden on the CPU when the track is played. It can, however, appear to be a bit of a “sledgehammer” approach. Nevertheless, it is non destructive and you can manually slip-edit any places where your parameters don't quite produce exactly what you were expecting.

The settings shown above right are fairly conservative and make a reasonable starting point. The 100ms trailing pad ensures that fading vocals aren't lost and the setting to ignore silence shorter than 500 ms should ensure that the track is not chopped up into too many ridiculously small slices. An example of applying these settings to one vocal clip is shown (right).



Using Spectro

Generally speaking, the use of a Noise Gate specifically to control breath sounds is a more practical option with discrete recordings than it is with non discrete ones. This is because the presence of the bleed makes it difficult to identify and appropriate levels for your settings, especially for the threshold.

You will see shortly how a noise gate can sometimes be used to reduce bleed, but this is not always appropriate. Consider the situation where you have recorded a band or perhaps just a duo or trio live with just two or three microphones. This might not be an ideal way of making a recording, but circumstances can dictate that this happens. You still want to do the best with what you've got.

You play your tracks back and notice from time to time on one particular track there is a breathing sound, as one of the singers draws breath before each line. You can't use a noise gate, because at the same time, on the same track there are other sounds that you want to keep.

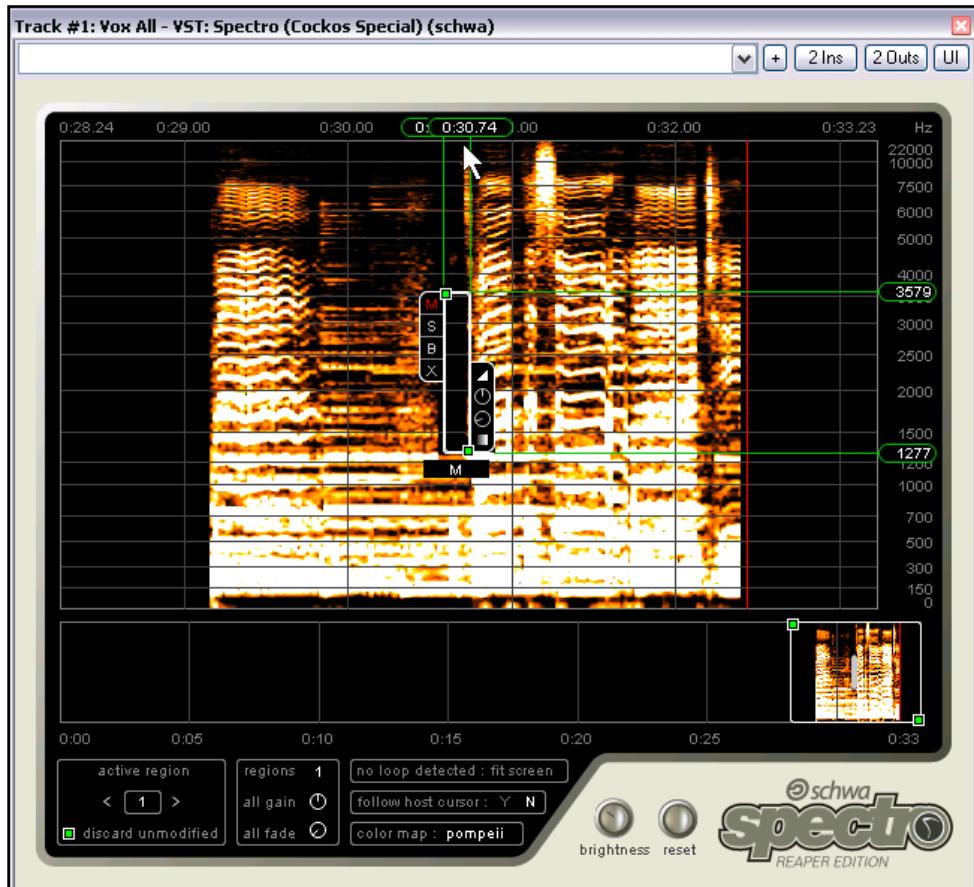
This could be a case for Spectro, with its real time spectral editing capabilities. Check out the manual that comes with Spectro for full information about how to use this wonderful plug-in. If you don't have it, you can download this manual from their web site at <http://www.stillwellaudio.com>.

Meanwhile, an example is shown on the right.

In this case, we have identified the unwanted breath sound, isolated it by drawing a rectangle around it, then muted that area. Notice that the other sounds (below 1277 Hz and above 3579 Hz) are still heard.

It is possible when you use Spectro in this way that when the track is played on its own there may appear to be a noticeable hole between these frequencies. You might find, however, that when you play all of the tracks together this is not discernible. If it is, you have at least two remedies at your fingertips. You can try both to see which works best:

- Try using EQ to add some gain in this frequency range on one or more of the other tracks. You may also need to adjust the panning at this point. You can use envelopes for this.
- Try using a send to send a signal from one or more of the other tracks to this track, just for the duration of the hole. Again, use envelopes to do this.

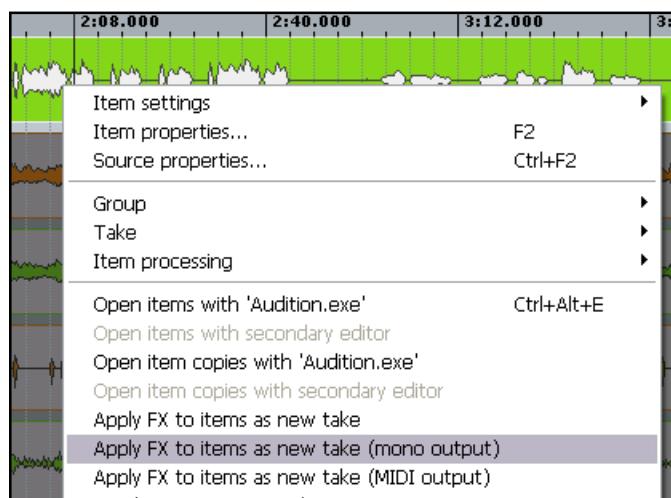


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2.6.4 Pitch Correction

Pitch problems can be corrected using **ReaTune**. The best way to do this is to use the ReaTune plug-in to fix individual pitching errors, then to apply the FX to the media item as a new take. The procedure for doing this is outlined below.

- Solo the track.
- Set any existing plug-ins in the FX Chain for that track to **Bypass**.
- Set the volume fader to Zero and the Pan fader to Centre.
- Insert **ReaTune** into the FX Chain for the track.
- Display the **Correction** settings page. Select the algorithm **elastique SOLOIST** and parameter **Monophonic**. This is generally regarded as the preferred algorithm for fixing vocal pitching issues.
- Select Manual Correction mode, display the **Manual Correction** page and enable the various options.
- Play the song, using your mouse to make the various corrections that are required. An example is shown above.
- When you have finished, right click over the media item and choose **Apply FX to items as new take** or **Apply FX to items as new take (mono output)** as appropriate.
- Make your new take the active take for this track.
- In the FX Chain, set **ReaTune** to bypass. This is usually a better option than deleting it. If you later find you have missed any pitch errors, you can restore your original take as the active take, make your further changes with ReaTune and apply as new take again.
- Save the file of course when finished.

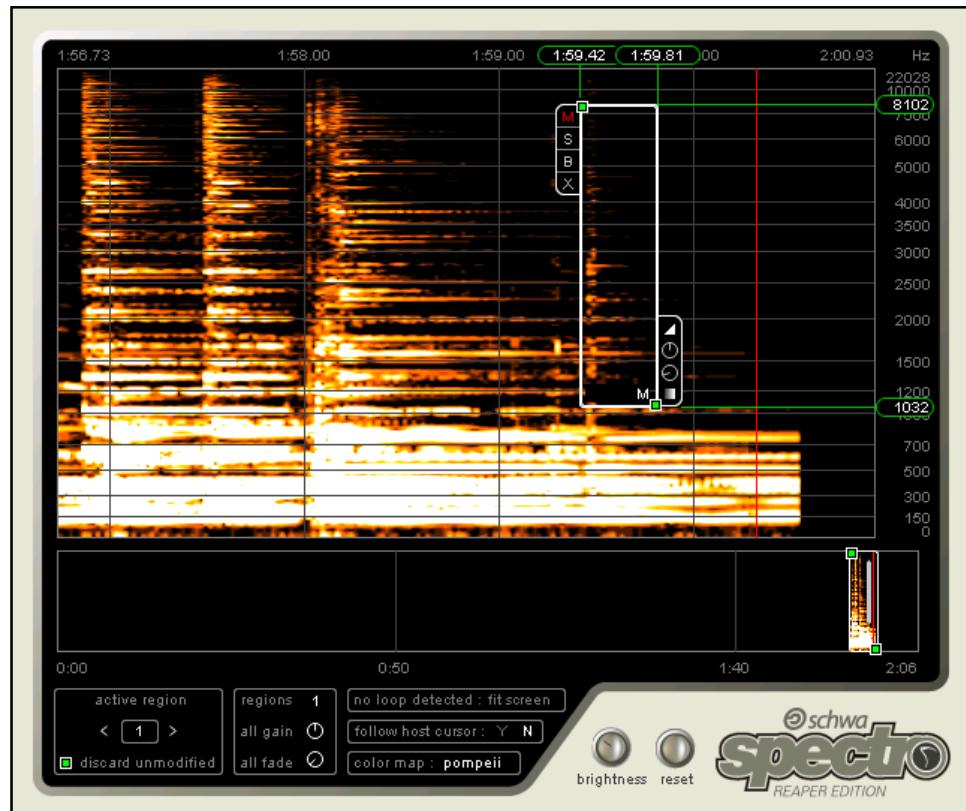


2.6.5 Clunks and Clicks

This category embraces a multitude of sins. It's the sort of thing that can arise, for example, when during an otherwise quiet passage (such as the decay of an instrument) a guitarist accidentally taps on his guitar, or a vocalist knocks her music stand.

If you notice this at the time, it's often best to record the part again. Where this isn't possible, you need to do whatever you can to fix it. Sometimes an accelerated fadeout will help, sometimes splitting and trimming can help, but very often the best solution here will be to use **Spectro**.

In the example shown on the right, you can see a sudden spike in the spectral pattern where a musician has accidentally created a clicking sound immediately after the end of the tune. This could be caused, for example, by accidentally catching a finger on the instrument as he removes it from the string.



In this example, Spectro has been used to isolate and mute the offending noise.

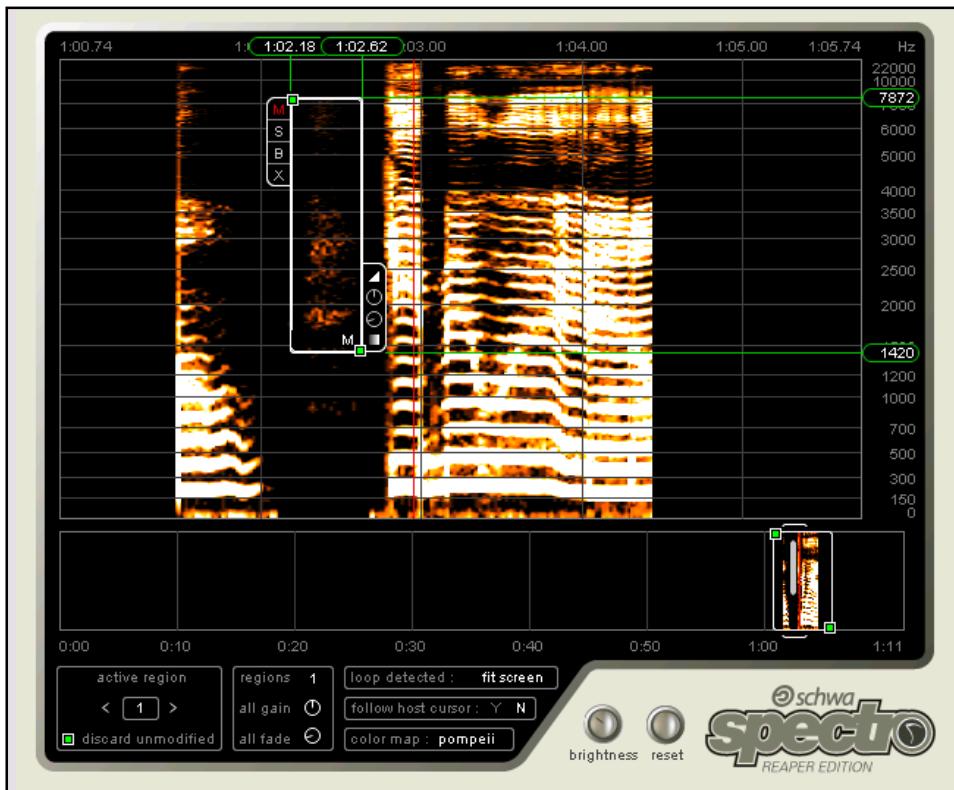
Example

This first example will illustrate the use of **Spectro** to eliminate unwanted background sounds.

1. Open the file **Don't Keep Me Waiting** and immediately save it as **Don't Keep Me Waiting SPECTRO**.
2. Select the **Vox** or **Vocal** track.
3. If there are any FX in the FX chain, set them to Bypass mode.
4. Set the Volume fader to Zero and the Pan fader to Centre.
5. Solo the Vox track.
6. Open the FX Window for this track and insert **Spectro** into the FX Chain. Set the option to **Follow host cursor to Y**.
7. Position the play cursor at the time **1:01.500**. You may need to zoom in to get to this exact position.

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8. Play the song. You will hear the singer drawing breath at about 1:02.500. This breath will be visible on the Spectro graph.

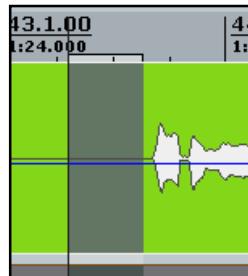


9. Use your mouse to "lasso" the breath sound as shown in the illustration on the right. Select the **M** (for Mute) button for that region.
10. Play the song again. The breath can no longer be heard.

11. Save the file.

This second example will use a different approach to a similar problem.

1. Position your play cursor at **1:24.000**. Select and solo the **Vox** track. Play it. You will notice a sound at about 1:25, just before the vocal comes back in.
2. Make sure that Snapping is disabled. Select the media item, then click and drag your mouse to select that part of the track which contains the sound (see right).
3. Right click over the area and choose **Split item at time selection**.
4. Right click over the selected item and choose **Item Settings, Mute**.
5. If you wish, use your mouse to draw a fade in and out from this section, as shown in the illustration below right.
6. Rather than have a track made up of what might become quite a large number of media items, it's worth considering whether after fixing these problems you might wish to double-click on the track in the Track Control Panel then right click over any part of the track itself and choose **Glue Selected Items**. This will bind them together as one.
7. Save the file.



2.7 Managing Bleed

Bleed is what happens when you record a number of tracks live at the same time. This could happen under any number of circumstances, varying, for example, from a solitary musician playing a guitar and singing at the same time to a whole band, complete with drum kit and all. In the first case, you might record with two microphones on the guitar and one vocal mic. In the second case, you might record using a dozen or so microphones when you record simultaneously. In both cases, the method of recording used means that you will not have discrete tracks for each voice or instrument.

Conventional wisdom says that recording with discrete tracks, layering one over the other, will be more likely to yield the best results. Don't be afraid to challenge conventional wisdom. Live recording can have certain advantages. For example:

- It may be much easier and less stressful for the musicians, thus ensuring better performance.
- It can capture a spontaneity that may be difficult to reproduce with layering.
- Your recording process can capture a natural reverb that may be difficult to recreate electronically.

However, we cannot ignore the fact that bleed can bring its own problems. In each case, you will have to assess the situation and make a judgement. Sometimes the best course of action may be to simply live with the spillage between instruments and do the best you can with it. Other times, you may wish to consider using any of a number of techniques to ameliorate it.

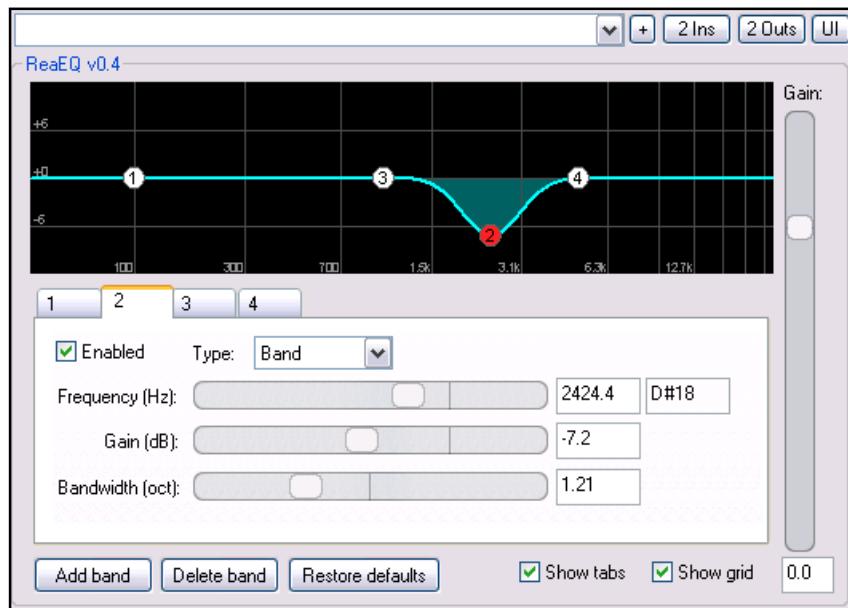
ReaEQ

There are certain circumstances in which you can try using EQ to minimize bleed. This is especially likely to be the case if there are just two or three items that have been recorded at the same time – for example, a guitar and a vocal.

The trick is to identify the different frequencies at which the main part being recorded and the intruding part are at their strongest and weakness. Section 3 of this primer includes a chart which you might find helpful, but the real trick is to sweep the EQ to find a frequency band where by lowering the gain you lower the effect of the bleed. Something like the settings shown on the right might be worth trying where you have a female vocal bleeding on to a guitar mic.

Remember that in shaping the sound in this way you will also be changing the timbre of the sound that you are aiming to improve. Depending on the circumstances, this might or might not matter. For example, the example shown above would have the effect of making the guitar sound a little less bright.

In some circumstances this might not be acceptable. In others it might be. This could be the case, for example, if because of the particular arrangement you are relying on the guitar to add some bottom end to your mix, or if you have also recorded the guitar in-line on another track. This technique might end up being felicitous in that by locating and reducing the vocal from the guitar track, you will at the same time create space in the overall mix for the vocal to sing through.



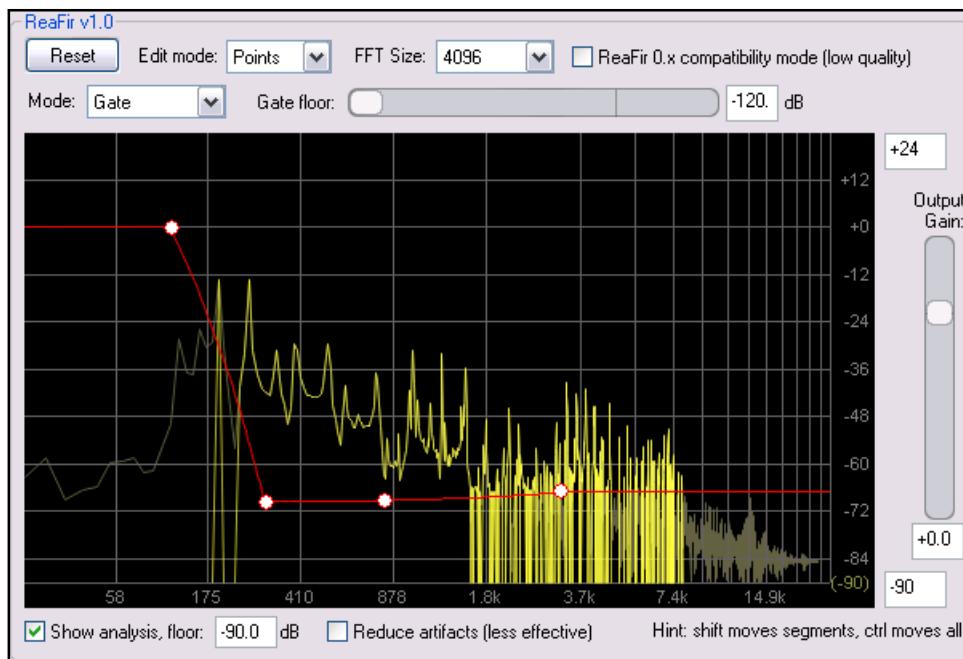
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ReaFir

A dynamics plug-in like ReaFir can also potentially help to reduce bleed by working on the frequencies at which the bleed is most prominent. ReaFir is a multipurpose dynamics plug-in that almost defies categorization or description. It can act as an EQ, Compressor, Noise Gate, and more.

The example on the right shows the opposite of the previous example. Here we have recorded a female vocal track which includes a lot of bleed from an acoustic guitar being played (and also recorded separately) at the same time. By using ReaFir to gate out some of the lower frequencies on the female vocal track we reduce substantially the impact of the bleed.

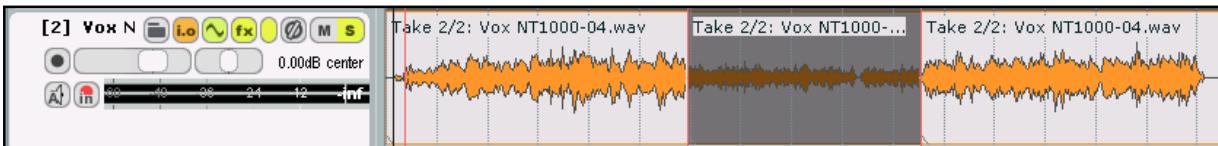
Of course, by doing this we also run the risk of removing some of the warmth from the vocal itself, and may also make the vocal appear a little thin. Possible techniques that you can use for fattening and warming up vocals include the careful use of channel splitting, reverb and delay. These are all discussed later in this primer.



Split and Mute, Lower Volume or Delete

This technique is most appropriate when you want to effectively eliminate a whole passage from a track. This might be the case, for example, when you have an instrumental break on a vocal track. You can simply split the media item and mute the unwanted passage. This may help to bring more clarity to the instrument or instruments that are to be featured during the break.

In the first of the examples shown below, the passage has been isolated and lowered in volume. In the second, the same passage has been muted.



2.8 Removing Background Noise

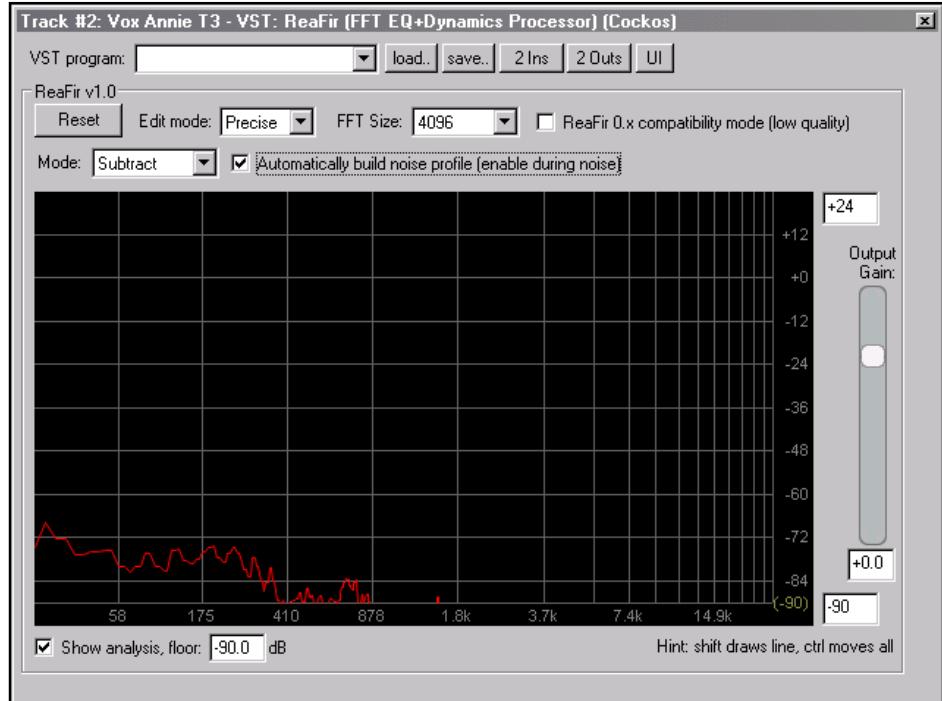
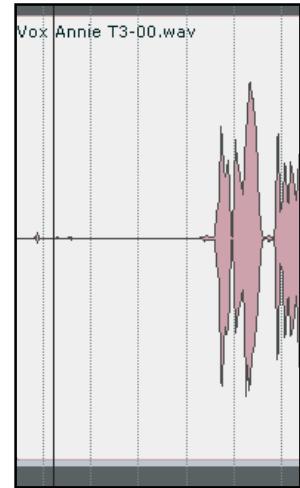
ReaFir is a multipurpose dynamics plug-in that almost defies categorisation or description. It can act as an EQ, a Compressor, a Noise Gate, and more. In this example, unlike the previous example using Spectro, noise is present throughout the entire track. You will see how **ReaFir** can be used for noise reduction. In this example (unlike the examples of using Spectro), the noise is present throughout the entire track.

The need for a noise reduction plug-in can arise when an otherwise good track has some unwanted background noise on it. This might, for example, be hiss or rumble, or the sound of an air conditioner. ReaFir can be used to remove such sounds from your tracks in real time. In order to do this, you must first identify a passage on the track (perhaps a second or two) where you have recorded the unwanted noise by itself. This is likely to be at the very beginning of the track.

Procedure

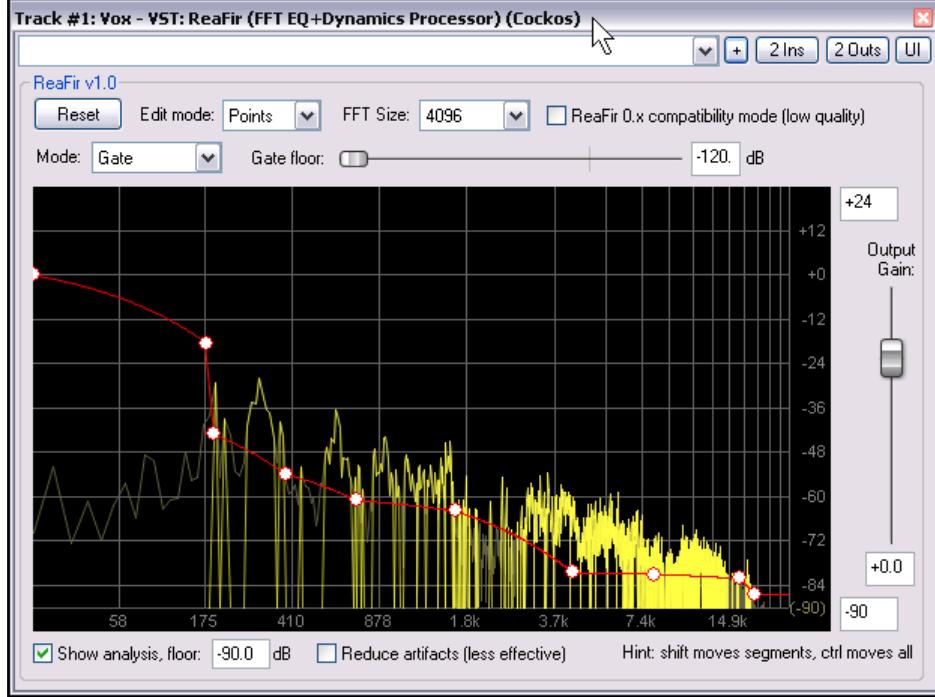
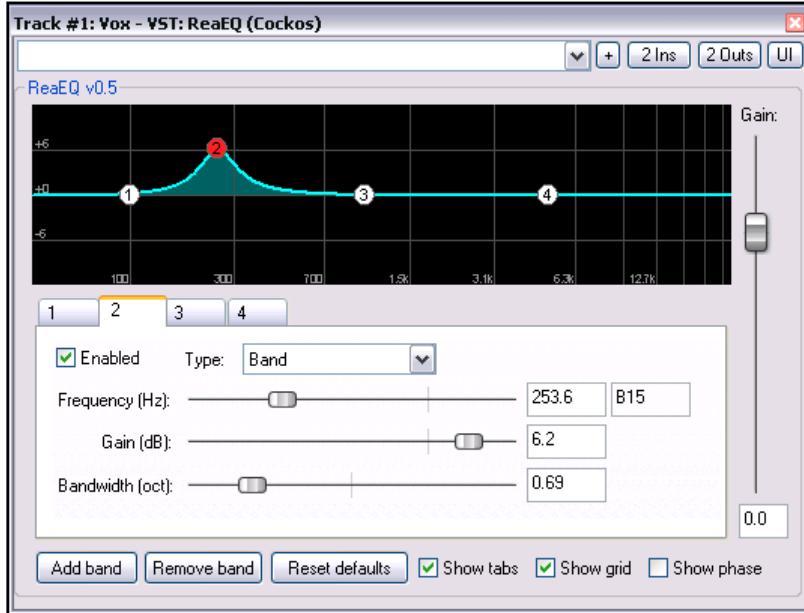
In overview, the procedure is this:

- Insert **ReaFir** in the FX window of the track containing the recorded items with the unwanted noise.
- Position the play cursor at the start of a passage containing just the unwanted noise (see illustration right).
- Set **ReaFir** to **Subtract** mode.
- Set Edit Mode to **Precise**.
- Select the Option to **Automatically build noise profile**.
- Play the track only for the duration of the passage containing the noise, then stop the playback.
- You should see that **ReaFir** has built a profile of the unwanted noise. This will be marked with a red line (see below right).
- Now uncheck the box labelled **Automatically build noise profile**.
- Return the play cursor to the start of the song and play it.
- You should now find that as the song plays, the noise that you profiled by following steps 1. to 5. is now removed.



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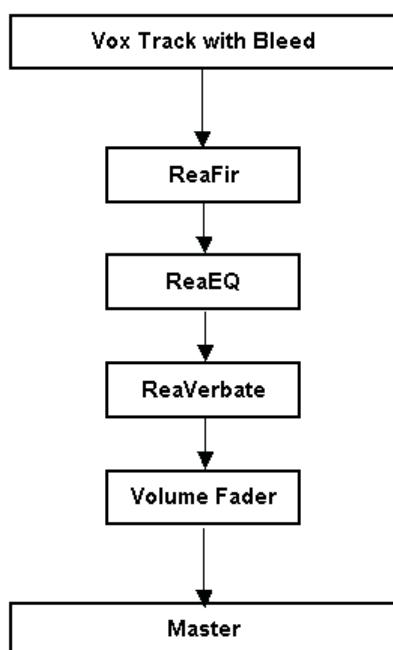
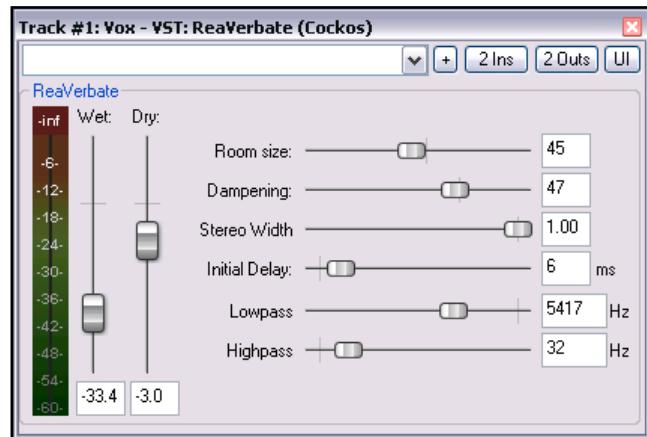
Example

1. Open the project file **RosesBloomAll.rpp**, or better still use a project of your own where you have a female vocal track which also contains instrument bleed. Select this track and solo it.
 2. Immediately save the file as **RosesBloom GATE.rpp**
 3. Play the song.
 4. Insert **ReaFir** into the FX Window. Select Gate mode and lower the red line sufficiently for the track to be heard normally.
 5. Observe the wave pattern. You should see that somewhere close to 180 Hz the density of the waves thins out quite noticeably. This is the frequency below which you only hear the guitar is present, not the vocal.
- 
- The screenshot shows the ReaFir v1.0 interface. The top bar indicates "Track #1: Vox - VST: ReaFir (FFT EQ+Dynamics Processor) (Cockos)". The main area displays a spectrogram with a red line representing the gate threshold. The x-axis is labeled with frequencies: 58, 175, 410, 878, 1.8k, 3.7k, 7.4k, 14.9k. The y-axis shows dB levels from +24 down to -90. A vertical output gain slider is set to +0.0. There are checkboxes for "Show analysis, floor: -90.0 dB" and "Reduce artifacts (less effective)". A hint at the bottom right says "Hint: shift moves segments, ctrl moves all".
6. By manipulating the ReaFir settings (see above), you should be able to significantly remove this range from your track whilst still allowing the vocal to be clearly heard. *The settings shown are only an example. Be prepared to experiment to get it right.*
 7. You may find that this has the effect of making the vocal now sound a little thinner or tinny. Play back the whole mix and listen carefully. It may be that the bleed of the vocal on to the guitar track will be sufficient to compensate for this.
 8. If it isn't, try adding **ReaEQ** or **ReaVerbate** or both to the vocal track FX window, as shown here. Notice that you should feed into the track only a small amount of the wet signal. Use just enough to make the vocal a little warmer and fuller, not so that the reverb can actually be heard.
- 
- The screenshot shows the ReaEQ v0.5 interface. The top bar indicates "Track #1: Vox - VST: ReaEQ (Cockos)". The main area displays a graphic equalizer with four bands. Band 1 is at 253.6 Hz with a gain of 6.2 dB and a bandwidth of 0.69 octaves. Band 2 is at 253.6 Hz with a gain of 6.2 dB and a bandwidth of 0.69 octaves. Band 3 is at 253.6 Hz with a gain of 6.2 dB and a bandwidth of 0.69 octaves. Band 4 is at 253.6 Hz with a gain of 6.2 dB and a bandwidth of 0.69 octaves. A vertical gain slider is set to 0.0. At the bottom are buttons for "Add band", "Remove band", "Reset defaults", and checkboxes for "Show tabs", "Show grid", and "Show phase".

2 – Pre Mix Fix: Corrective Action

9. A sample file, **RosesBloom GATE A**, is included with this primer. If you like, open it and examine it. This file is not meant to represent anything like a final mix for this song, only to illustrate some of the techniques that you can use to reduce the impact of bleed if you need to.
10. Play the song with and without the FX set to bypass. You should notice that with the FX chain engaged the vocal can be heard more distinctly.

The flow chart shown below represents the flow of the audio signal on the Vocal track which contains the guitar bleed.

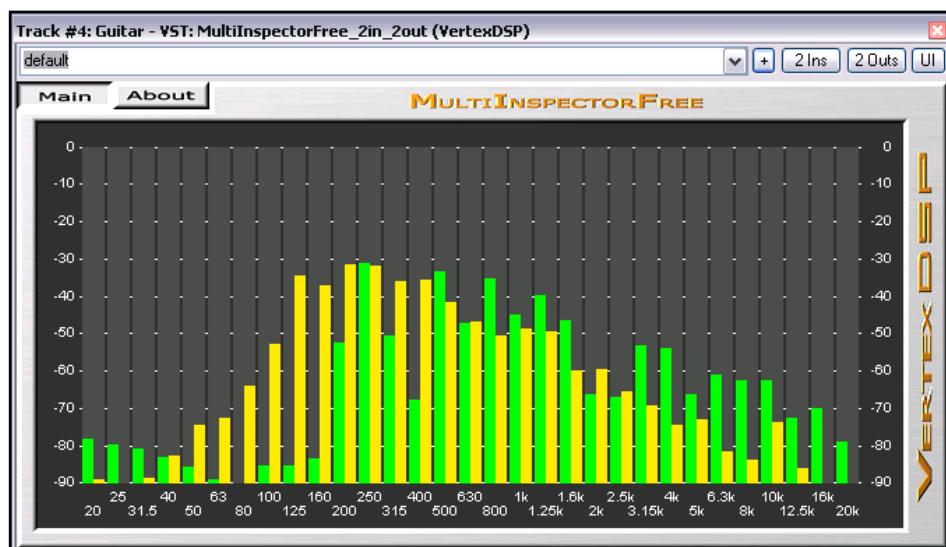


Tip:

In situations such as this it shouldn't be very difficult to work out whether or not you can use a plug-in such as **ReaFir** to help reduce the impact of bleed. Using a Spectral Analyser such as Multi-Inspector, or even ReaFir itself, you just need to play the track (soloed).

You can use any freeware screen capture program such as **EasyCapture** to capture images of the spectral analysis at different times. For example, you might have one which captures the image for guitar only, another for guitar and voice together, and a third for voice only. If necessary, you might be able to use different discrete samples of the same vocalist and/or instrument to do this. It should give you a reasonably accurate picture. By comparing the different images, you should be able to get a reasonably accurate idea of where you should at least start to make your modifications.

The example below shows **Multi Inspector** (freeware version) being used to compare the output from two tracks.



2.9 Setting Levels

Once you've resolved all of the issues that we have discussed in this section, you're finally ready to go about the real business of mixing.

Again, this is not an area in which we can lay down hard and fast rules as to exactly which method you should use to go about this next step. However, it is important that you develop a methodology and stick with it. The suggestion here is one that works well for me. The following summary table outlines this method. The main objective is to make our project settings as neutral as possible before we begin the real job of mixing. As with many of the other tables in this book, you may wish to consider photocopying the page for easy reference.

Action	Reason
Unsolo any soloed tracks Unmute any muted tracks (unless these are muted because you think you are unlikely to need them in your mix)	You will need to hear all of the tracks that are intended to be part of your production in order to prepare your project for mixing.
Pan all of your tracks dead centre and set the Master Output to mono	In the course of recording, seeking out and correcting glitches, etc, it is possible that you may have panned certain tracks in ways that may be different from those that are appropriate for your mix. You will be wanting to start your mixing from as neutral a situation as possible.
Play your project	In this next stage you will be aiming to get the sound levels for all tracks approximately right. You will need to take a flexible and common sense approach here. For example, it is likely that in the final mix some instruments will need to be faded up and down at certain points. Don't concern yourself with this just yet. Right now, you are aiming to get an approximate balance.
Adjust the sound levels for individual tracks up or down until the overall balance sounds about right	Do not use the track volume faders or envelopes for this purpose. There are two reasons for this: <ol style="list-style-type: none">1. The track volume fader and default volume envelope both apply Post FX. You want to get your audio signal set to the approximate required level before your FX chain, not after it.2. We are aiming to get to the position where everything is as neutral as possible before we start. You will no doubt find plenty of uses for track faders and volume envelopes later. Instead, use the Item Properties window (seen below) for your various media items, adjusting the Normalize fader to suit. The main exception would be where a track is made up of a really large number of individual items (perhaps after applying Auto Trim/Split), in which case it would be easier to use a Pre FX Volume envelope. If you do this, the best idea is probably to display it, make the adjustment (to the whole envelope), then hide it.
Set the Master Output back to Stereo	You'd be surprised how easy it is to forget this!
Save the project file to a new name	This ensures that you will keep an accurate copy of your project in its premix state, should you need to go back to it.

Notes

3 Spatial Mixing

3.1 Spatial Mixing Concepts

Have you ever listened to a CD and found that despite it being perhaps a complex arrangement you can hear each and every instrument and voice quite clearly and distinctly, yet with everything also blended in nicely with the overall total production? Have you then listened to another CD with perhaps a similar arrangement and found that it's actually quite difficult to figure out exactly what's going on?

The reasons for this are all about *space*. Mixing requires that every part in the production – *every part* – has to be given its own space. Without this, it doesn't matter how creative you are in working with the dynamics and artistry of your recordings, you simply will not end up with a good mix.

Arguably, many amateur (and alas some professional) mixes are spoilt by a failure to give adequate attention to the issues of space than by anything else. That's why we'll be spending a little time examining some of the theories and concepts involved before going on to work through our first practical case study.

The first mistake that some (indeed, too many) make is to think of space in a mix as consisting of width alone, and that this is simply determined by panning.

Of course panning is important, but panning affects one dimension only – the placing of an instrument on a horizontal scale somewhere between 100% left and 100% right. But width alone is not enough to create a true sense of space in your mix. There are in all not one but four dimensions, all of them important.

The Dimensions of Sound	
Item	Comments
Width (between the speakers)	This is generally represented as being anything between 100% left and 100% right. Most commonly, the left-right placement issues are controlled by Panning. Later in this section, you will see how REAPER's routing capabilities in particular open up interesting exciting possibilities for left-right panning that are not easily possible with other DAWs.
Height (frequency)	The frequency range of instruments and their harmonics spans a range of approx 20 Hz to 16,000 Hz (and above). This determines another spatial dimension of our mix, which we can think of as being height. The role and importance this dimension can play in adding colour to your mix is too often overlooked. This is the aspect of mixing that people are often talking about when they refer to <i>acoustic space</i> .
Depth	As your music plays back through the speakers, some voices and instruments will appear to be closer to you than others. If you like, you can think of this illusion of depth as being conceptually similar to the illusion of depth that will be created by a landscape painter.
Time	Like height, time is a dimension to which sufficient attention is often not given. Your mix should not resemble a static snapshot, but should behave dynamically through time.

As you begin to understand that sound operates across these four dimensions, you will grow to appreciate why each of these is important, and why the manner of combination of these different dimensions matters.

3.2 Designing a Virtual Stage

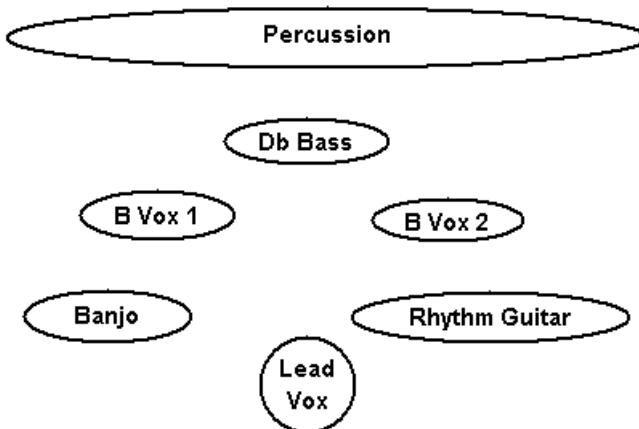
It isn't necessarily true that great minds think alike. Sometimes equally gifted people will approach the same task with completely different systems and methodology. The best approach is that which works for you. Some sound engineers insist that you should always mix only with your ears, and ignore all other sensory input. Others, myself included, would say that if you think that making use of other senses (such as visual senses) can help you then you'd be best advised to use them.

Some people like to sketch out a virtual sound stage before they begin their mixing. It gives them a starting point when it comes to positioning the different instruments in the mix. Others see no point in it but prefer to simply play it by ear. Ultimately you'll have to decide for yourself whether you like this idea, but you should certainly give it some consideration.

Try sketching out an overhead view of the stage layout that you are aiming to create with your mix. A couple of examples are shown below:

Consider the two illustrations below.

The first is for a song that features a lead vocalist, two backing vocalists, a rhythm guitar, banjo, acoustic bass and drum kit. We might have it in mind to create a sound stage like that shown below (as viewed from above), where front of stage is at the bottom of the diagram.

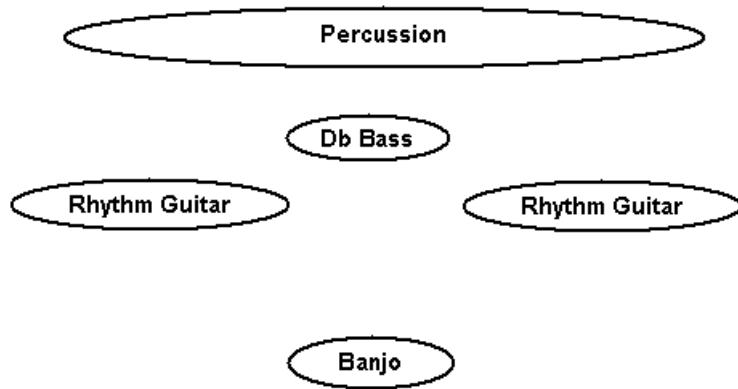


This helps us decide not only how best to pan our instruments, but as you will shortly see, also where we will wish to use other techniques (such as the use of EQ and/or Reverb) to make instruments appear further forward or back in the mix,

Now consider the second picture (below).

Suppose this song includes a break in which we wish to feature the banjo. This leaves us with what might be a rather thin mix. We might decide that whilst bringing the banjo right up front and centre stage, we might also wish to not only push the rhythm guitar further back, but also somehow to spread it out so that it appears to fill most of the space behind the featured instrument.

During this chapter of this book, you will be shown how to create effects like this.



3.3 A Guide to Some Mixing Tools and FX

The table below serves as a guide to how some of the many tools and techniques used in mixing contribute to creating your overall sound canvas. When it comes to artistic mixing, the trick is to be able use the right tools for the right job together and in combination, not to regard each on its own or in isolation. The chart below shows the *primary* functions of some of the tools at your disposal.

Tool	Width	Depth	Height	Time
Panning	✓			
Volume		✓		
Channel Splitting	✓	✓	✓	✓
Routing	✓	✓	✓	✓
EQ		✓	✓	
Compression		✓		✓
Delay		✓		✓
Chorus	✓	✓		✓
Reverb		✓		✓
Other FX (variously)	✓	✓	✓	✓

Let's take a simple example of how you can interpret this chart. Notice that you can create a feeling of width in your mix by the way in which you pan your various instruments. But if as well as width you wish to add more depth to a particular instrument you may also need to use some EQ on that instrument to bring it more forward or further back in your mix. And if you also wish to control the way the instrument responds to time, you might also wish to consider adding a touch of delay.

This leads us to an important observation. *There is no such thing as a standard or universal setting.* If you are a regular visitor to any audio forum, you will often come across questions like "How should I EQ my guitar (or vocal)" popping up with an astonishing regularity. The simple answer to these questions is that there is no simple answer. Even if we are talking about the same guitar, or the same voice, the number of factors which go into determining the optimum settings is such that the question almost has no meaning.

These factors include:

- The style of music. The same vocalist crooning on a ballad will require different treatment from that which would be needed if they were belting out a rock and roll number.
- The arrangement. For example, if your musical arrangement consists of acoustic guitar, violin and mandolin then you would expect to put more bottom end on the guitar than if the arrangement was, say, guitar, double bass and cello.
- The mood. What sort of message or feeling is the song intended to convey? A song intended to create a feeling of joy and happiness will require different treatment from a sad or mellow song.
- The context. An instrument might be playing quietly in the background for much of the song, but perhaps have twenty seconds or so of fame somewhere in the middle. It will likely require different EQ, volume, panning and compression settings at different times throughout the song.

All of this leads us to one inescapable conclusion. *You will never learn how to use FX properly as long as you depend on presets.* I really can't stress this too much. Let's try an analogy. Let us suppose that you have decided to open a restaurant. Maybe you've also decided to make soup – really good soup – your speciality. In that case, which approach would be more likely to yield the best results? Would you:

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- Tramp the aisles of every supermarket in town looking for the best instant dehydrated packet soups that you could find, or
- Learn to make the best fresh soup that you can using the finest fresh ingredients that you could find?

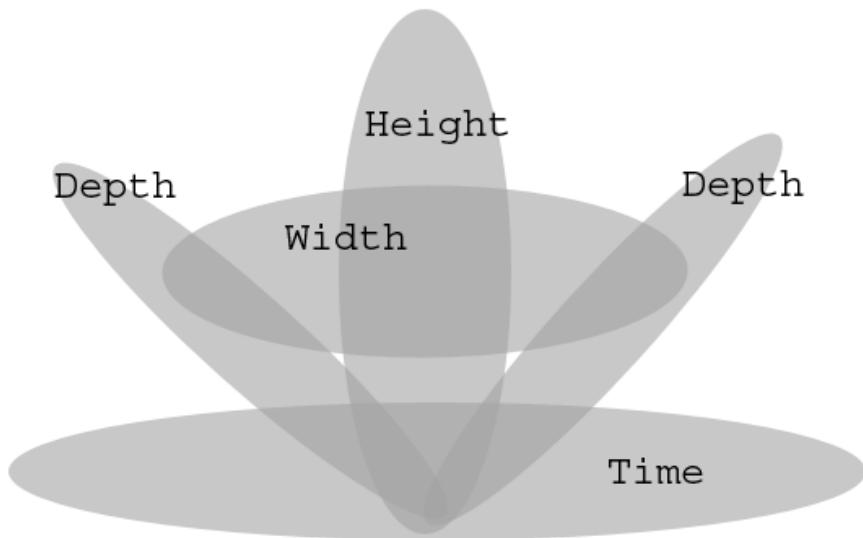
I rest my case!

There's one more thing that stands out from this chart. That is the importance of Channel Splitting and Routing when mixing in REAPER. It's no exaggeration to say that this functionality (when used in conjunction with the many other tools at your disposal) provide opportunities for quality mixing that just would never occur to you with most other DAWs.

One more point. The chart shows those aspects of mixing for which the various mixing tools are shown. This information should be taken as a starting point, not a limitation. As you will later see, the different spatial dimensions of sound do interact with each other.

For example, it is perfectly feasible to envisage circumstances when panning can help to create a feeling of more or less depth, or where the application of a touch of compression can affect the perceived width of an instrument. Mixing, thank goodness, isn't just about science and theory, it's every bit as much about imagination, experimentation and creativity.

The Spatial Dimensions of Sound



3.4 Channel Splitting or Multiple Tracks?

Many of the examples that follow will involve taking an audio signal (such as a recorded vocal track), splitting it into multiple channels or several tracks, treating the different tracks or channels in different ways, then at some stage joining them up again. For the most part, in these examples, you could achieve similar results using whichever of these two methods you prefer (or sometimes a combination of both). When deciding which you prefer, keep the following in mind:

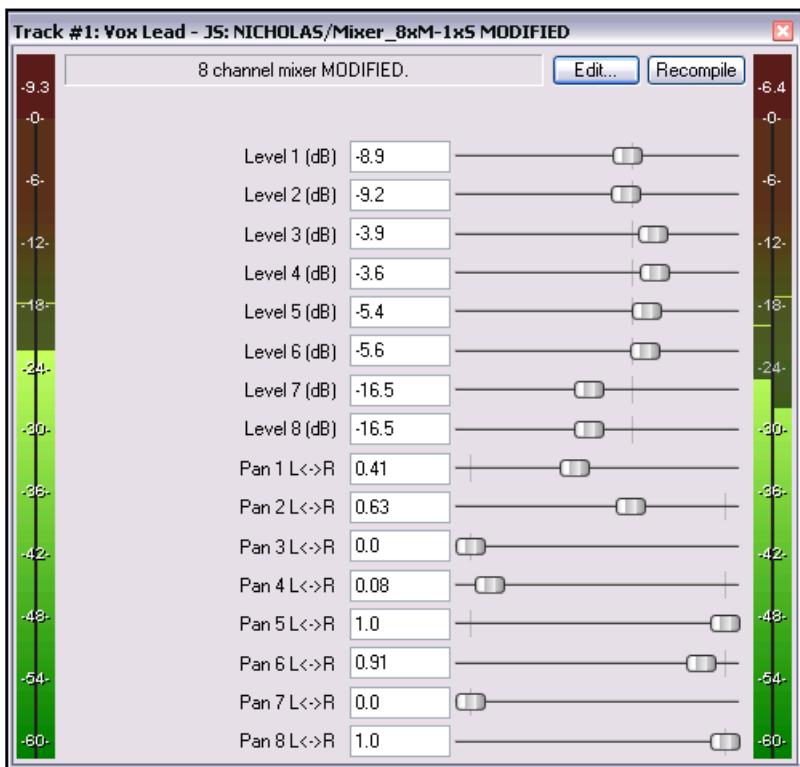
- Using multiple tracks makes it easier for you to adjust the volume and pan settings for each audio stream, as these can each be displayed independently in the mixer and track control panel. However, this does use up a fair amount of screen real estate.
- Using channel splitting saves on screen real estate (as it doesn't create extra tracks), but adjusting the parameters of the audio streams in your different channels becomes a little more fiddly.

3.5 Channel Splitting Concepts and Techniques

Many of the examples that follow throughout this primer make extensive use of channel splitting and joining. The basic idea is that by splitting a track into several channels and applying different FX to each channel before joining them up again, we can make some pretty impressive sounds.

Shown on the right is one of the mixing plug-ins that we use quite extensively in some of our examples.

The beauty of mixing tools like this one is that you have at your fingertips a very easy method of putting your track together. Each of the channels (in the example shown, there are eight channels) has its completely independent volume and pan controls. As you work through these examples, you will be very pleasantly surprised, if not astounded, the first time that you discover just how much creative control this puts at your fingertips.



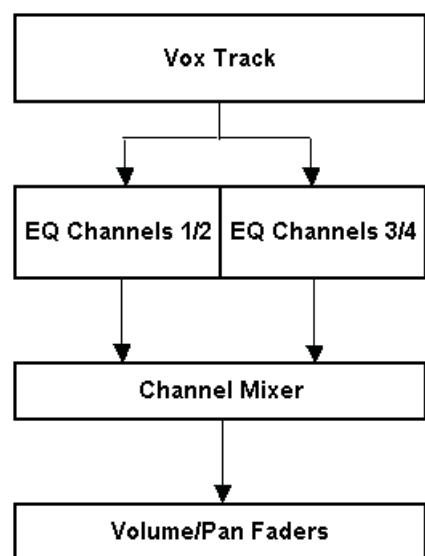
It's worth taking some time to understand this clearly before you continue. In some examples, we will be using special Channel Splitter plug-ins to do this. These are relatively straightforward. However, in many cases these channel splitter plug-ins are not capable of giving us the results that we want. This is when we have to use a different, more complicated method, splitting our tracks into channels in a way that may not be immediately obvious or intuitive.

Let's look in principle at an example of how this might be done. Suppose we were to split a Vocal Track into two pairs of channels. We could then, for example, apply separate EQ to each pair of channels (perhaps making one warmer and the other more present) and then use the Channel Mixer to pan them differently before joining them up to create a more interesting and varied vocal effect.

The diagram on the right illustrates how this might be done. The same original vocal track is passed into two separate instances of ReaEQ. Then, as the diagram shows, the output of each EQ instance is blended together using separate channel pairs in a channel mixer before being passed to the volume and pan faders.

How then is this done? The answer comes in two parts.

The first is that each track's I/O Window lets you determine how many channels (and hence channel pairs) a track shall have. The default is two, but this can be changed to any number up to 64. In the hypothetical example that we are considering here, a total of four channels is needed.



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The procedure for setting these up is shown on the right. You simply open the I/O window for the track and specify the number of channels required. In the example shown here, 4 Track Channels have been defined.

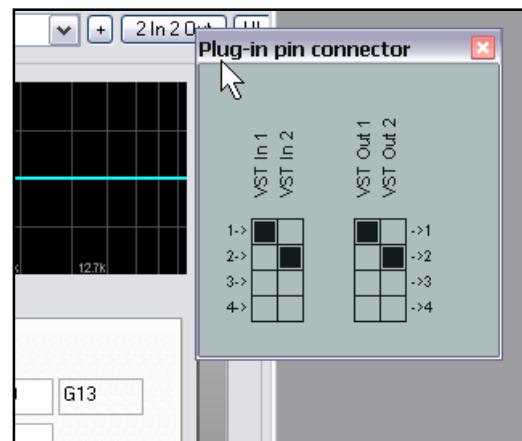
The second part of the answer is found in REAPER's VST Plug-In Interface. This allows you to specify which channels are to be used for the plug-in's inputs and outputs. In most cases, the default settings for both input and output are Channels 1 and 2.



These are illustrated below, using the **ReaEQ** plug-in as an example:

You can click on the **2 In 2 Out** button of the plug-in's **Plug-in pin connector** interface to display the Routing Matrix for that plug-in. Notice that:

- The number of channels available will be equal to the number of Track Channels that have been defined – in this example, four.
- By default, VST In 1 will be assigned to Channel 1 and VST In 2 will be assigned to Channel 2 (as shown). However, you can change this as you wish.
- By default, VST Out 1 will be also be assigned to Channel 1 and VST Out 2 will be assigned to Channel 2 (as shown). However, you can change this as you wish.

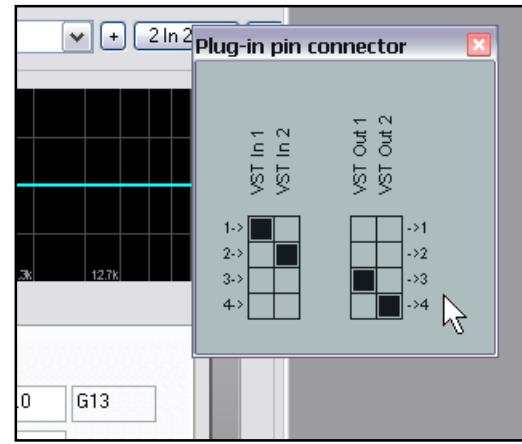


So, to return to the example in question.

The default input and output settings are just right for the first of our **ReaEQ** instances (image top right) – Channels 1 and 2 in, Channels 1 and 2 out. However, in the second instance (bottom right) we still will need to bring in the signal through Channels 1 and 2, but we need to send it out through Channels 3 and 4 – and *only* Channels 3 and 4.

We therefore require (in this example) a second instance of ReaEQ. For this second instance, you would change the settings on the **Plug-in pin connector** interface as shown here on the right. VST Out 1 has been set to Channel 3 and VST Out 2 has been set to Channel 4.

Thus, by adding an additional instance of ReaEQ and routing the output through the additional channel pair, we've created parallel EQ processing within a single track.



Especially if you have come to REAPER from another DAW, both this concept and its implementation may seem strange or even bewildering at first. This is because most probably the whole channel splitting concept simply did not exist with your previous DAW software (at least, not for audio). Be prepared to persevere. In time you will get used to it, and you will be surprised at how easy it becomes. Remember also that once you've set up a 4-channel track with parallel ReaEQ instances, you can save the track as a Track Template and quickly add parallel EQ to any project.

3.6 Width

OK, it's time now to start really getting to grips with these issues. Throughout this section (and those that follow) you will find a number of illustrative diagrams. *In most cases, their role is to help you to visually understand concepts which are often themselves quite complex and complicated.* Please therefore understand that these diagrams are there as illustrations only. Their content should not be taken too literally. In many cases, the visual metaphors have been exaggerated in order to illustrate an otherwise difficult point to depict.

3.6.1 Simple Panning

At its simplest, panning is all about crowd control. Before you commence panning, each track is pointed dead centre. This ensures that its output will occupy the entire space both left and right speakers. The trouble is, so does every other track. Everything is literally being piled on top of each other in an unholy scramble for domination of the same space.

The result is a sound that you might be tempted to describe as foggy.

Take a look at the illustration on the right. If you can't make out what it's about, that's because it's a mess.

Look at it carefully and you can see a mix made up of three instruments – a guitar, a mandolin and a banjo. Because nothing is panned, at most frequencies the three instruments are just fighting again each other.

The mandolin gets a bit of a break at the higher frequencies above about 1300 Hz (because neither of the other two instruments goes up that high), and similarly the guitar benefits from a little bit of space of its own at the lower end of the scale, below about 130 Hz. The poor old banjo, however, just doesn't stand a chance.

Now let's see what happens when we introduce a little panning, say around 50% left for the mandolin, 50% right for the banjo, with the guitar remaining in the centre.

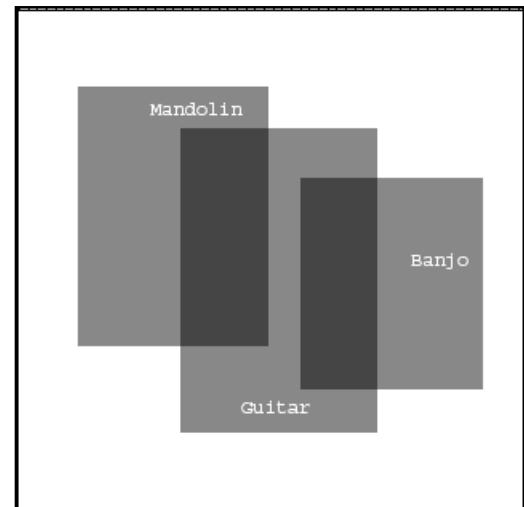
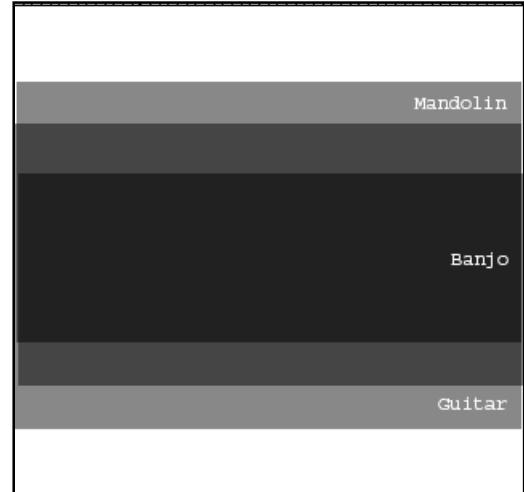
Straight away we can see a difference. This concept is illustrated by the second diagram (below right). Of course the instruments will still overlap, but each now has a definite area of space somewhere between the left and the right speaker that it can call its own. The most important advantage of this is that each individual instrument will now be heard more clearly.

In a moment, we'll work through an example that illustrates this, but before that, here's a question for you to consider.

Which of these two examples do you think represents the better example of panning?

If you picked the second example, you'd be right – at least, you'd be right most of the time. If you picked the first example, you'd be right ... well, some of the time. How can this be so?

Well, here is an important dictum. Don't forget it. **There are no rules to panning, only laws.** In other words, panning laws dictate that if you pan in a certain way, you will get certain predictable results. However, there are no rules which govern which results are desirable. That depends on a number of factors, including the style of music. Some types of music actually work better with the "wall of sound" type of outcome that our first example gave us.



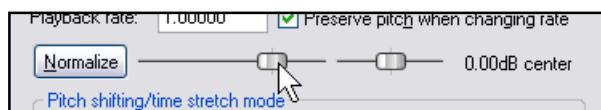
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Example

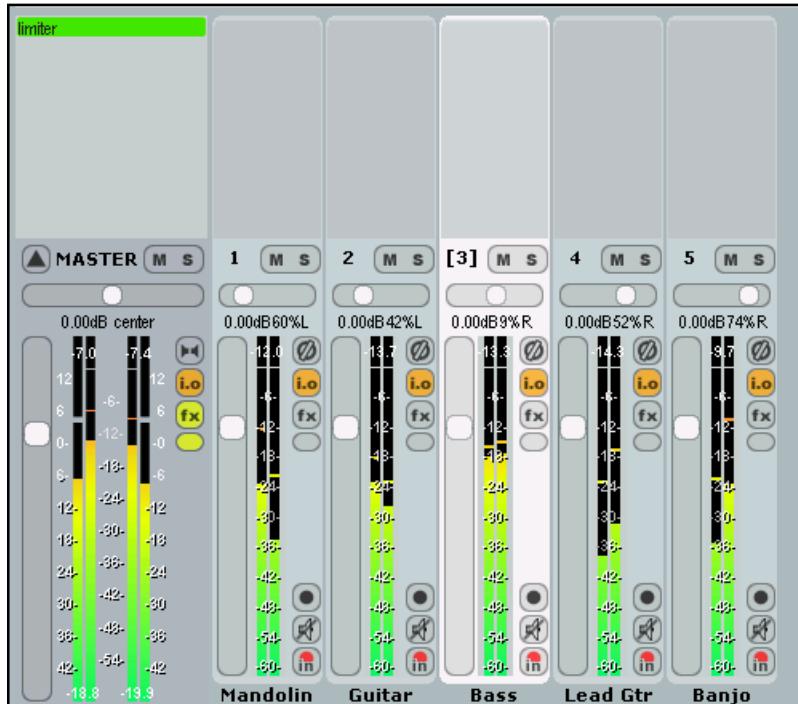
In this example, you will be working with a dry project file, using panning to separate and make space for a number of instruments that to a large extent share the same frequency range in common. We'll be engaging in a little crowd control.

Later, you'll be working some more on the same file, and exploring further techniques other than panning that can be used to create a better use of space and to increase separation.

1. Open the file **Pelverata Frost** and immediately save it as **Pelverata Frost PAN1**
2. Notice that this is an instrumental tune comprising Mandolin, Banjo, Rhythm Guitar, Lead Guitar, and Electric Bass. Currently everything is panned dead centre.
3. At this stage we are not concerned with all the elements of mixing, such as which instruments to feature at which point, or whether to use compression, EQ or reverb on any tracks. We are solely concerned about:
 - Ensuring that each track's volume is set so that its volume appears approximately right with its volume fader at 0. In order to do this, one track at a time, open the **Item Properties** dialog box, adjust the level of the **Normalize** fader, then click on **Apply**.
 - Panning our instruments across a left-right spectrum so that each instrument can be more distinctly heard.
4. There is no single solution to this exercise. The file **Pelverata Frost PAN1 A** contains one possible solution, which is shown below. It is perfectly possible that you might yourself come up with a different panning strategy that you like better. If so, please use it.
5. As you test your options, make use of the **Output: Mono/Stereo** button in the Mixer Master. By toggling between Mono and Stereo playback you can evaluate the effectiveness of your panning.



Possible Solution



In our possible solution, we have used the Item Properties dialog box for each track to raise its level by about 6 dB.

The panning is shown in the illustration (left). Notice that the Bass is placed at or near the centre. This is a fairly standard mixing technique.

Mandolin: 60% Left

Guitar: 42% Left

Bass: 9% Right

Lead Guitar: 52% Right

Banjo: 74% Right

We have, for convenience, also changed our track order so that the tracks in the mixer go left to right as shown.

By placing the Mandolin and Banjo just about as far away from each other as is reasonably possible we ensure that each can be heard more distinctly.

Be careful not to pan too aggressively – the instruments still need to blend together as an integrated mix.

3.6.2 Bookend Panning

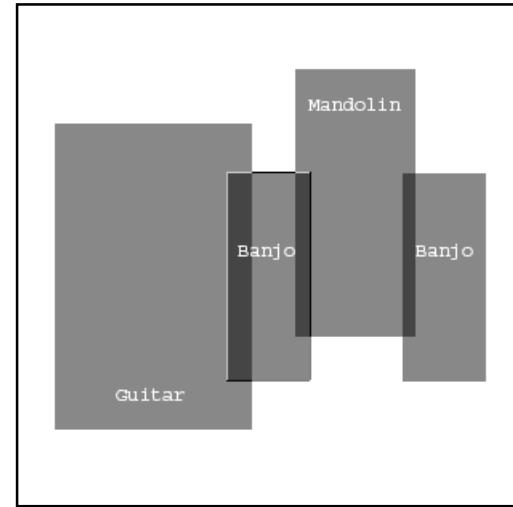
Bookend panning is not an easy concept to explain, but its application can be very effective.

It is especially useful when you want to create a spatial relationship between two instruments, but there arises a problem of one always tending to drown the other one out. This might be the case with our banjo and our mandolin. We may need for various reasons to place these two instruments close together in the panning spectrum. A problem may arise, however, because of these two instruments the mandolin is by far the more present. By this we mean that it resonates at those frequencies up above 1,000 Hz or so, where the banjo just does not go.

Often this issue can be resolved in REAPER by the careful use of bookend panning. Put quite simply, we position our instruments in such a way that the weaker instrument is able to wrap itself around (or bookend) the stronger instrument, thus preventing the stronger one from dominating the mix too much.

The illustration on the right demonstrates this concept. In this case, we have decided to pan our guitar to the left, our banjo more or less towards the centre, and our mandolin to the right. This might be the case, for example, if the banjo was the main rhythm instrument for this particular tune. Notice how by the use of bookend panning we have been able to contain the otherwise over-dominant strains of the mandolin.

Now that you understand the theory, let's see just how it is done.

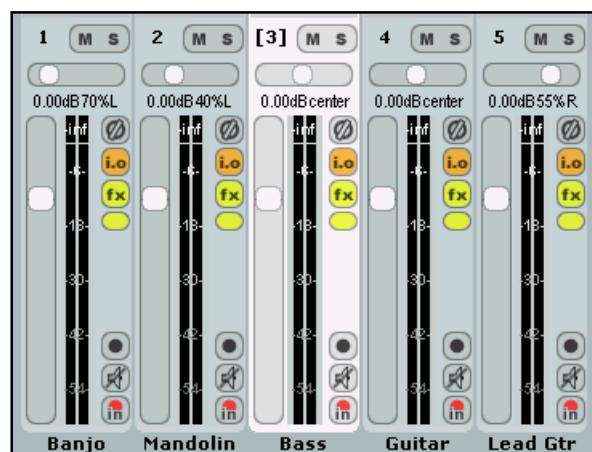


Exercise

In this next example, we will use an instrumental recording which includes a banjo, a mandolin, a bass guitar, a rhythm acoustic guitar and a lead acoustic guitar. We will be “bookending” the acoustic rhythm guitar around the lead guitar.

If you wish, open the **Options, Preferences** dialog box and click on the **Advanced UI/System Tweaks** button. If you then enable the option to **Allow track/routing windows to stay open**, you will be able to keep the routing windows open as you work through this exercise. This might make it easier to understand.

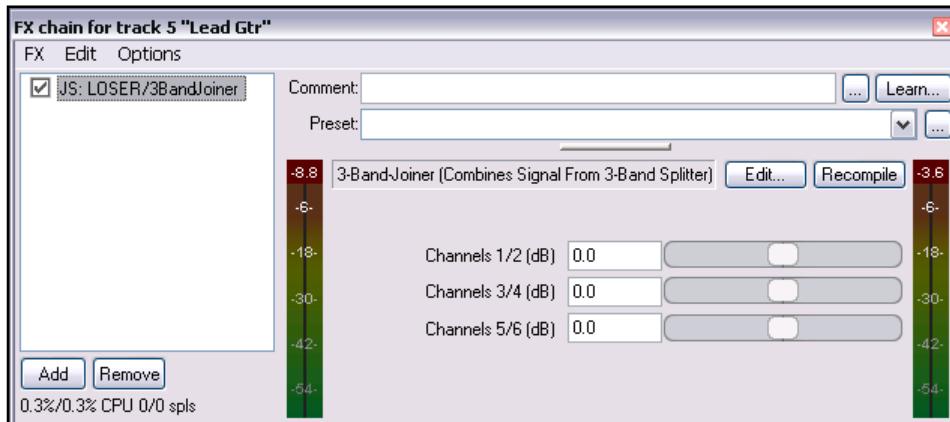
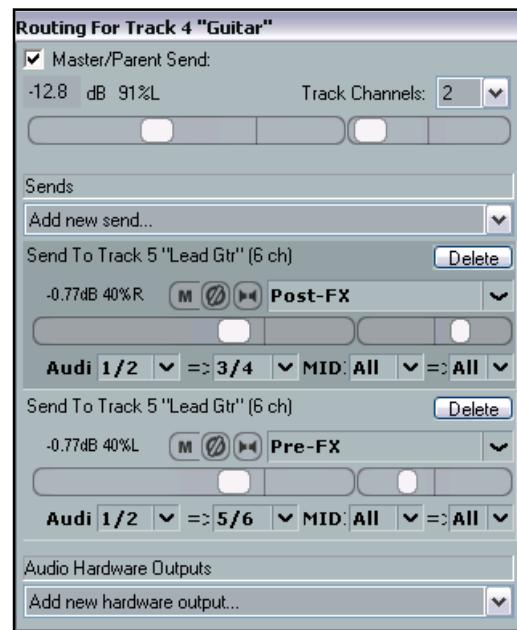
1. Open the file **Pelverata Frost BOOKEND** and immediately save it as **PELVERATA FROST BOOKEND1**
2. Pan the Banjo 70% left, the Mandolin 40% Left and the Lead Gtr 55% Right. You can change these settings later if you wish. Click and drag the tracks to change their order, so that left to right the tracks line up as shown (right).
3. Solo the Guitar Track (now Track 4) and play the tune. Insert an instance of **ReaEQ** into this track. You should find that by taking off about 4 dB at 120 Hz and adding



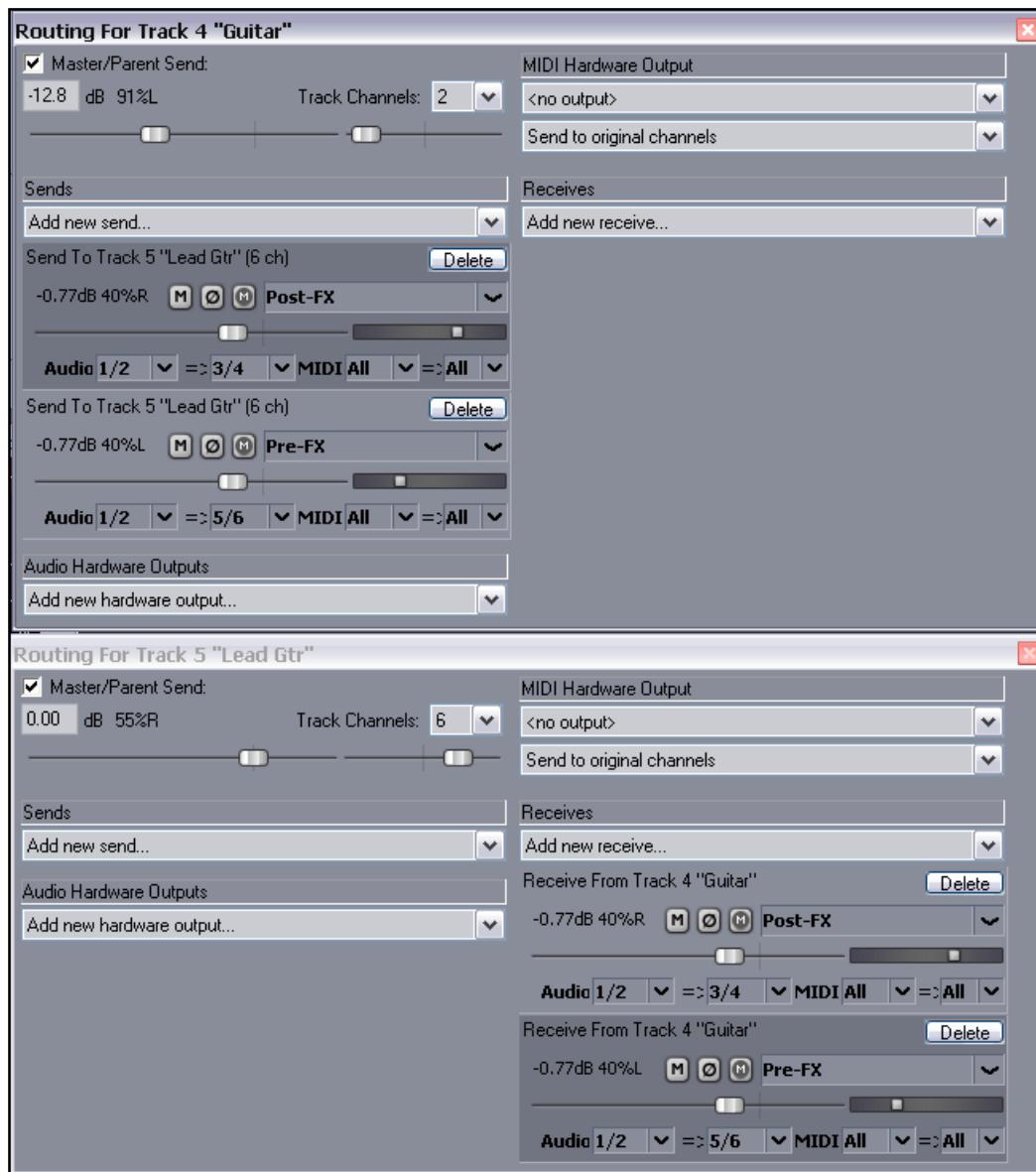
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about the same at around 7,000 Hz you should make the sound a little brighter.

4. The next few steps can appear strange if you have never done this before. Fade down the volume on this track to about -12 dB and Pan about 95% Left. We are going to hear most of this track's output not directly but as bookends wrapped around the Gtr Lead track.
5. Select **Track 5** (Gtr Lead) and open the I/O (**Routing**) window for that track. Set the number of Channels to 6.
6. Now display **I/O (Routing)** window for the Guitar track (**Track 4**).
7. Add the two sends shown on the right. Notice that:
 - Both outputs go to Track 5.
 - One is sent to Channels 3/4, panned 40% Right, set at about -0.8 dB and is Post FX. This signal will be modified by the EQ inserted into the FX Window of Track 4.
 - The other is sent to Channels 5/6, panned 40% Left, also set at about -0.8 dB and is Pre FX. This signal will not be modified by the EQ inserted into the FX bin for Track 4.
 - These left and right pannings will be relative to the panning of the destination track, Track 5. In other words, they will "bookend" Track 5, one to its left, the other to its right.
8. Now open the FX window for the Gtr Lead, Track 5.
9. Into this FX Window insert an instance of **JS: Loser/3BandJoiner**. The instance shown here has been modified to read Channels 1/2, etc but does exactly the same job as the original plug-in.
10. Solo the track and play. Adjust the levels of the three volume faders to suit.
11. Unsolo the track. Play the song. You should notice that the rhythm guitar sound is full and bright, yet allowing the other instruments to cut through very clearly.
12. If you wish to hear the rhythm guitar track by itself, hold down the **Alt** key while you **Solo** this track.
13. Save this file.

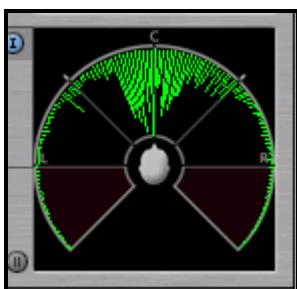


Track Routing Used for Bookend Panning



The illustration above shows the I/O Routing windows for the two tracks used in this bookend panning example. In particular, notice that:

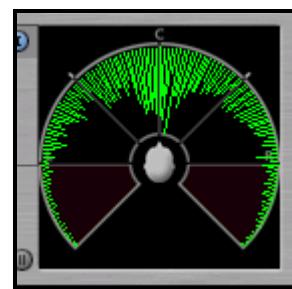
- Every time you create a Send, REAPER will automatically also create a Receive on the destination track. In this example, the Sends on the first track (Track 4) correspond exactly to the Receives on the second track (Track 5). If you wish to make any changes (e.g. to panning), you can do so on either the Send or on the Receive.
- One send is panned to the right, the other to the left. This ensures that the signal received from Track 4 will “bookend” the existing material on Track 5.
- Each send is sent to a different pair of audio track channels. This means that the volume of each receive that is finally used in the track mix can also be controlled using the 3 Band Joiner.



The two images show the stereo image of this tune without (left) and with (right) bookending.

Notice how the second illustration makes greater use of the available space.

You can test this for yourself using the **JS:LOSER/gfxGoniometer** plug-in, which produces a similar but not identical display to that shown here.



The file **Pelverata Frost BOOKEND1 A** shows a possible suggested solution to this exercise. Please note that this is an example designed to illustrate the concept and implementation of bookending. It is not intended to serve as an example of a complete mix.

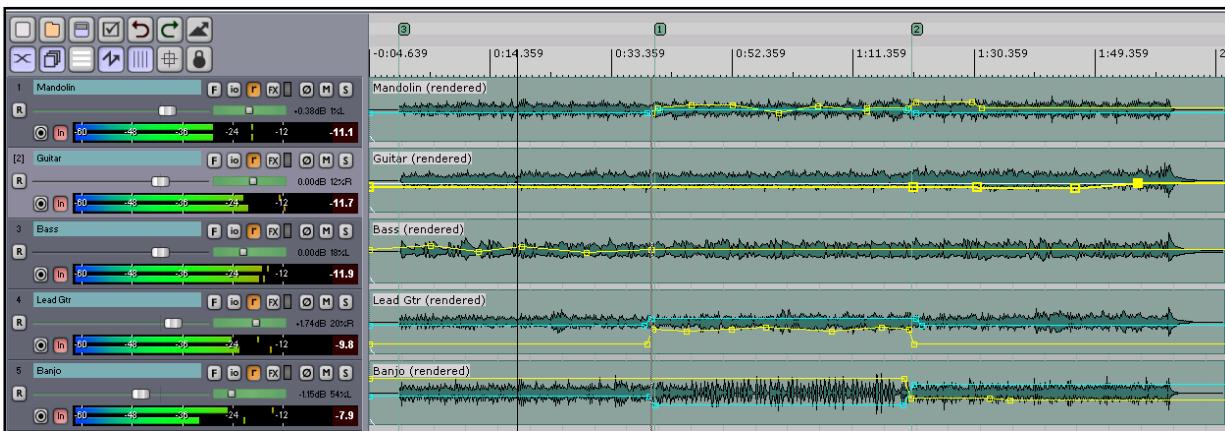
3.6.3 Dynamic Panning

The term dynamic panning simply refers to the practice of varying the panning of your instruments through time. Have you ever seen a live performance where every single member off the band remains motionless throughout the entire gig? No? Then why mix as if they do. Rather than keeping each instrument locked into one place for the entire mix, be prepared to use envelopes to make changes to your panning at different parts of the song. This can occur, for example:

- During a lead break. It's a very common practice to move an instrument into the centre for a lead break, then move it back out again when the break has finished.
- Subtle movements. This is a less commonly used technique. Its effect can be barely noticeable, yet almost at a subliminal or subconscious level the subtle use of changes in panning can help to maintain the listener's interest throughout a mix.

Example

Open the file **Pelverata Frost PAN2 A**



Unfortunately it may not be too obvious from the illustration above, but if you observe this file and listen to it carefully, you will see that:

- The tune is played three times.
- The Mandolin very much carries the tune during the first time round.
- Second time round the Lead Guitar comes into the picture more.
- Third time round the Banjo is featured more prominently.

What you should also notice is that there are subtle and minor variations in the panning (and volume) of most instruments at various times throughout the song. These changes are independent of which instrument is carrying which part of the song. The combined effect of these changes and variations is to produce a more live and spontaneous feel to the song.

Note

This file is not meant to represent a final mix for this song. You can see that, apart from a limiter in the Master to prevent clipping, no FX have been applied anywhere. The purpose of this project file is purely to illustrate how easy it is to improve your mix with just a little use of dynamic panning.

Now try it for yourself. Open the file **Pelverata Frost PAN1** and save it as **Pelverata Frost PAN2**. See how you can make your mix more interesting with the use of dynamic panning.

3.6.4 Automation Checkpoint

If you have just read the subsection that immediately precedes this one and wondered what on earth was going on and what envelopes are, then you should stop right now.

Automation and the use of envelopes is a fundamental aspect of mixing, not only in REAPER, but in most Digital Audio Workstations. You can create them manually, or tell REAPER to record and remember your fader movements.

This primer will give you examples and suggestions as to when you might wish to use envelopes, but it is assumed throughout that you already understand what envelopes are, how to create them, and how to make adjustments to them.

If you are in any way lacking confidence in this area, grab yourself a copy of the *REAPER User Guide* now and get to grips with that section.

3.6.5 Pan Envelopes

Whilst on the subject of envelopes, it's worth mentioning again that REAPER provides two Pan envelopes for each track – one **Pre FX** and one **Post FX**.

In most cases it is likely that you will want to use the Post FX envelopes, but the most important thing is that you understand just what you are doing!

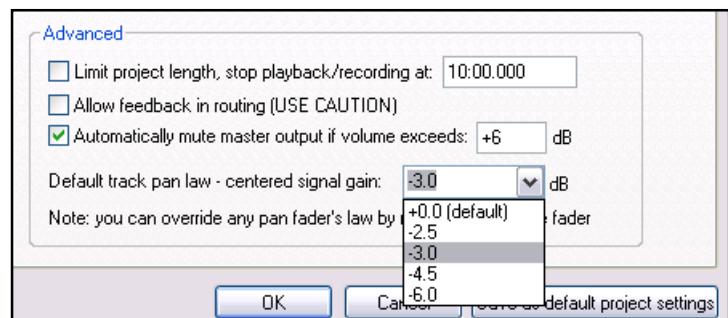
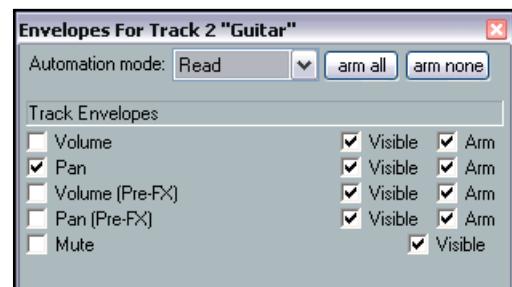
3.6.6 Pan Laws

Pan laws probably have more to do with the dimension of depth than width, but it's not a bad idea to mention them now, while we are still looking at the issues involved with panning in general.

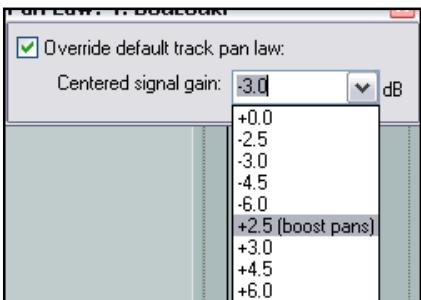
Put at its simplest, whichever pan law is selected will help determine the rate at which the volume of a track appears to decay in the mix as the track is panned further away from the centre.

The pan law is set in the Project Settings and is by default applied to all tracks in a project file.

If in doubt, it can be a good idea to choose a default setting of -0.0.



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REAPER allows you to over-ride the default project pan law for individual tracks. To do this, simply right click over the pan control fader in either the Track Control panel or the Mixer and select your required track setting from the drop down list.

A project default setting of -0.0 dB will still leave you room to move in either direction for individual mono tracks in order to make that track appear to decay more or less quickly than at present, according to which you prefer.

3.7 Height (Frequency)

We'll begin this section with an overview of the Frequency Spectrum, and how it is made up. This information should form a solid reference point when it comes to looking at the techniques and methods that we use to create a wonderful magical illusion with our mixes. That illusion is to use just two speakers to generate a sound that is rich and spatial in all its dimensions.

There's no universal agreement on where the exact boundaries lie between one area of the frequency spectrum and the next. Treat this chart therefore only as a general guide, not something that you must learn by heart and recite!

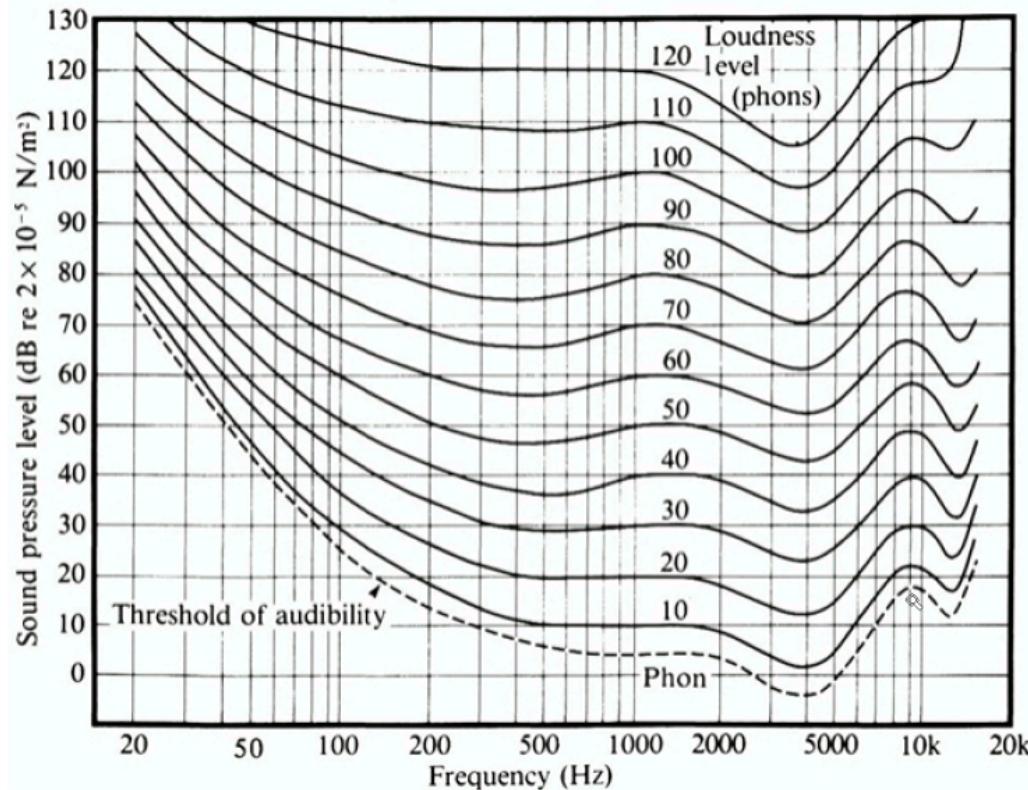
The Sound Spectrum	
Range	Comments
Sub Bass – below 40 Hz	This range is often more felt than heard. It's where you'll find earthquakes and the like in the soundtracks of movies. It's also where you'll find rap booms and the lower frequencies of bass guitars and kick drums. The demise of vinyl and the rise of music in digital format has seen a tendency to pump up this range to an extent that was previously not possible.
Bass (Low) – 40 to 200 Hz	This is the range normally thought of as the "bottom end". It is the range usually affected when you adjust the bass setting on your car or home stereo. Too much of this and your music may sound boomy.
Mid Range – 200 to 800 Hz	This is the range that perhaps needs the most constant attention. Too much here will make an instrument or mix sound muddy, and can even cause irritation and annoyance.
High Mid Range – 800 to 5000 Hz	This is the range that our ears are most at ease with. So much so that boosting a frequency around 1dB in this range has the same perceived effect as would be achieved by a 3 dB boost in any other frequency range. Thus, this is the area in which we need to be most careful when making adjustments to EQ.
High – 5000 Hz to 8000 Hz	This range pretty much reflects the range boosted or cut on your car stereo when you adjust the treble control. A little gain in the overall mix around here can make a production sound brighter.
Ultra Highs – above 8000 Hz	This is where the late harmonics occur. Be very careful about boosting here.

You'll be surprised at how often your intuition will serve you well when you're experimenting with and exploring EQ options. You've spent most of your life listening to music and other sounds. You know what you enjoy and what you don't. You know how you react emotionally and in other ways to various sounds. It's your life experience.

Don't be afraid to trust that experience and put it to good use in your mixing!

3.7.1 The Fletcher Munson Curve

We've already said that our ears are more sensitive to changes in volume at some frequencies than others. These differences are illustrated in the following diagram, the Fletcher Munson curve.



This diagram quite clearly illustrates the actual levels required at different frequencies for the perceived volume to appear equal. You can see from the dip around the 1000 Hz to 5000 Hz area that these are the frequencies that we hear the loudest. Similarly, our ability to hear sounds drops off quite rapidly at frequencies below about 200 Hz and above about 7000 Hz.

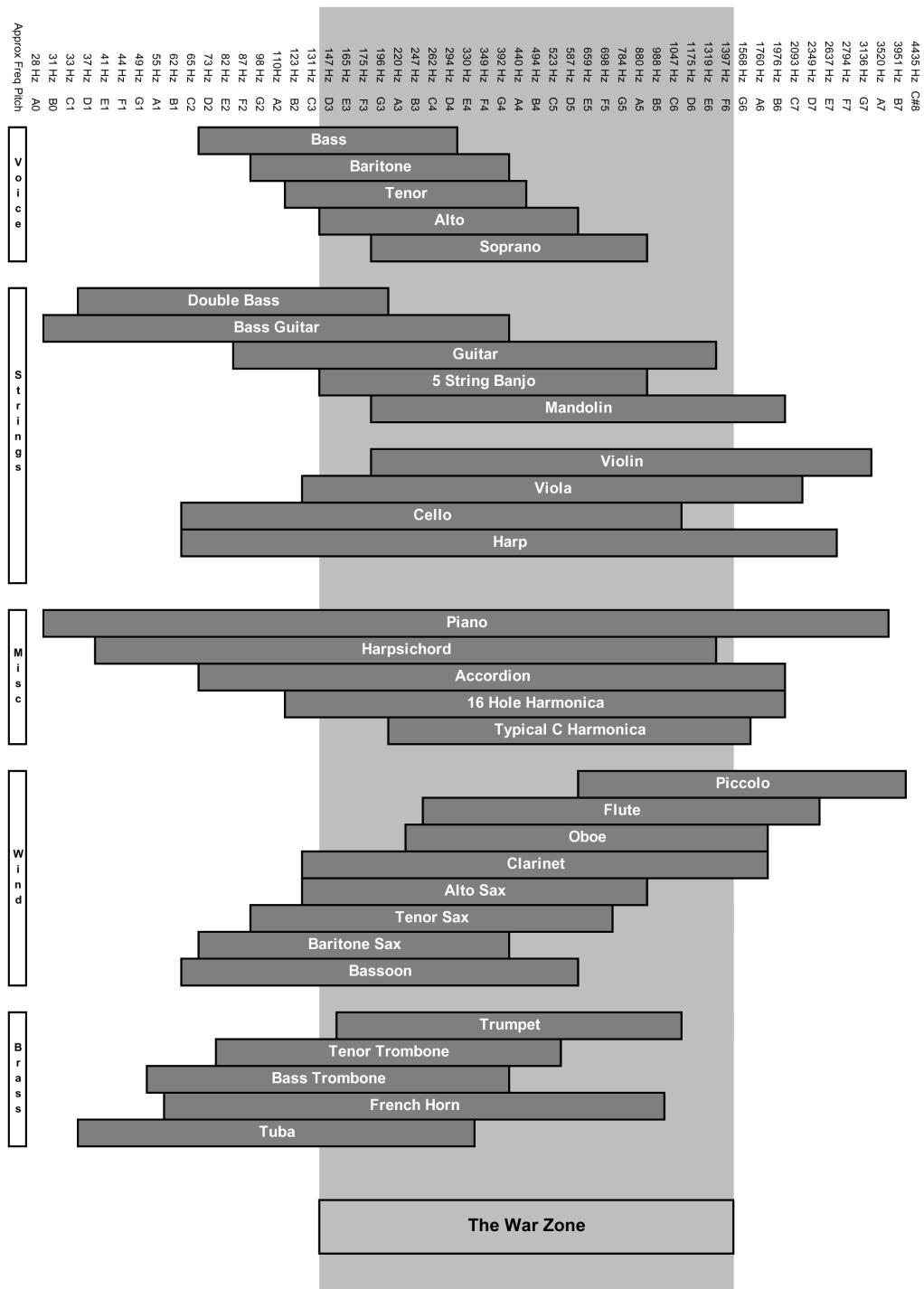
There are several interesting points that we can take from this:

- The relationships between the levels at which different frequencies are perceived are not constant. Notice in particular that as the overall volume is raised, the lower frequencies become more prominent. You can see this, for example, by comparing the shape of, say, the 100 phon curve with the shape of, say, the 40 phon curve.
- Of course you will want to use VU meters when monitoring your sound levels, but where there is a conflict you should generally trust your ears rather than your eyes. Depending on the mix of frequencies which make up one song compared to another, both may appear to be at the same volume, but to the listener one will appear louder than the other. You will ultimately want both to appear to be at approximately the same volume.
- When you are making adjustments to the EQ of a track, you will find that at different frequencies you will need to make greater or smaller adjustments to achieve your desired results. For example, if a track seems boomy, you may need to lower the bottom end by what appears to be quite a substantial amount around the 100 Hz or 180 Hz range to fix the problem. On the other hand, if a track seems to be too present, just the tiniest cut around the 3000 Hz to 5000 Hz area might be enough to fix it.

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3.7.2 The War Zone

The chart below shows the approximately frequency ranges of many popular instruments (excluding drum kits) as well as the human voice. Drums and percussion will be considered a little later.



For guidance only: this chart shows only fundamentals, not harmonics. Notice the lightly shaded area that we have described as *The War Zone*.

If managing the first dimension of your mix (width) is largely about crowd control, then managing the second (height) is as much as anything about developing a battlefield strategy. Take a careful look at the chart on the previous page. Notice how so many instruments are always competing with each other for the same piece of acoustic space. That, incidentally, is before we even begin to talk about harmonics.

This can happen at any frequency. For example, the viola and the clarinet occupy almost an identical range of acoustic space just about all the way from their lowest notes to their highest. However, the area to which you may need to give this issue the most constant attention is likely to be that area labelled *The War Zone*, between about 140 Hz and 1,500 Hz. Just about every instrument you are ever likely to need to mix will want to lay claim to some space within this zone.

Try an experiment. Put on a CD which contains a full range of instruments and sounds. Well produced classical music is ideal for this.

Now sit down and listen. Listen carefully for the different frequencies, starting with the highs and the lows then, after you have identified them, gradually converging towards the mids. Close your eyes and pay especial attention to where music seems to be coming from.

Do the lower notes seem to be coming up at you from below somewhere, while the higher sounds are drifting down from a plane higher up? Congratulations, you have just discovered the importance of the dimension of height to a good mix.

3.7.3 Understanding Harmonics

We've already seen how different frequencies affect us in different ways. Let's now take that concept several steps further. When you are listening to music, you never just hear one frequency on its own. You hear a complex pattern (or patterns) of many different frequencies in different combinations. If individual frequencies are capable of affecting us in various ways, how much greater is likely to be the effect of different combinations of frequencies?

The sound of any musical instrument is made up of not just a single clean note at a time, but of a whole series of notes that are buried within that sound. These are the harmonics, the elements that shape the sound. As much as anything else, it is the way one musical instrument produces its harmonics that gives the sound its timbre and distinguishes the sound of that particular instrument from any other.

Harmonic	Frequency	Pitch
10 th	4400 Hz	C#
9 th	3960 Hz	B
8 th	3520 Hz	A (3 rd Octave)
7 th	3080 Hz	G ¼ Flat
6 th	2640 Hz	E
5 th	2200 Hz	C#
4 th	1760 Hz	A (2 nd Octave)
3 rd	1230 Hz	E
2 nd	880 Hz	A
Root (Fundamental)	440 Hz	A

The table (left) shows the harmonics for the simple note A when played on an acoustic guitar.

Notice that when you use EQ to raise or lower the volume of any particular frequency, you are actually raising or lowering the volume of a particular harmonic.

This point matters because certain combinations of odd numbered harmonics will tend to produce a more edgy sound, whereas the even harmonics will create a more soothing sound.

There's just one more point to note about harmonics. Notice that every harmonic is arithmetically an exact multiple of the root.

3.7.4 Height and Colour

The dimension of height is one of the most powerful weapons in your armoury for adding colour to your mix. Let's illustrate this with another visual metaphor. Earlier, we explored how panning can be used to add width to a mix. Consider again our banjo – guitar – mandolin example, shown on the right.

Panning most certainly will have helped to create some space between the different instruments, but we may well be left still with that problem of all three instruments fighting each other for acoustic space up near the top of the banjo's range.

3.7.5 Adding Colour to the Mix

In this case, we can use EQ in a way which emphasises these frequencies on the weaker sounding instrument, and at the same time de-emphasise those frequencies on the more dominant instrument, in this example the mandolin.

The second illustration (right) demonstrates this concept.

It shows the effect of adding some gain to make the banjo sound a little brighter in its upper range, whilst at the same time dulling down the mandolin over the same range to make room for it. The visual pattern that represents our sound stage is now more varied and interesting, and less made up of homogeneous shades of grey.

If you find that this visual metaphor doesn't quite work for you, don't worry. Shortly we'll work through an actual example, showing just how this is done. Right now, it is only important that you get your head around the concept.

Notice that what we have done here has not so much been to add height to our mix as it has been to make the existing height more colourful and interesting.

3.7.6 Adding Height to the Mix

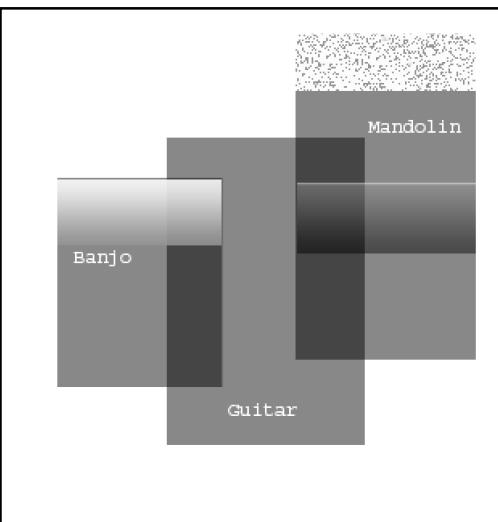
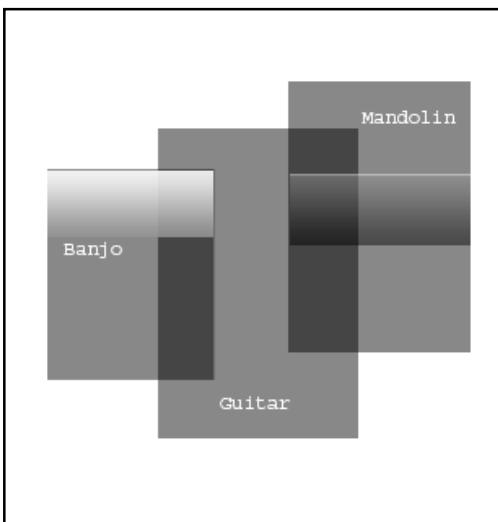
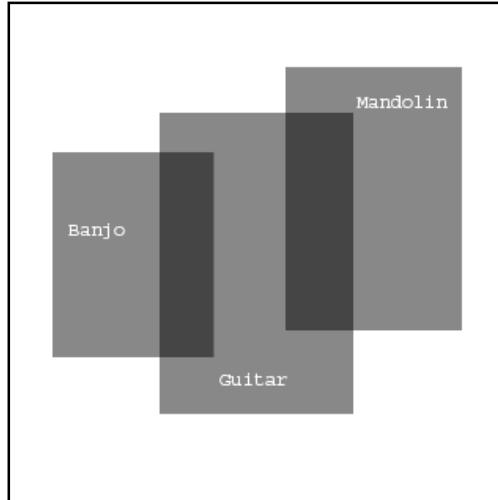
In many instances it may also be possible to manipulate the height (frequency range) of the mix using EQ. This is done by identifying those ranges within the harmonics where adjusting the EQ settings might add a little sparkle to our mix.

In the third illustration (right) we have done this with the mandolin.

To summarise, in this section we have learnt that there are two ways in which you can use EQ to modify (and improve) the way your mix fills out the frequency range and shares the available space there between the different instruments.

These are:

- Adding colour by using EQ at targeted frequencies.
- Using more of the available space by adding some sparkle to an instrument's harmonics.



3.7.7 Describing Sound

We had a brief encounter with EQ earlier, when we looked at Corrective Mixing. You will be better equipped to make the best use of EQ if you are able understand the relationship between different frequencies and how the listener perceives sound.

We've already mentioned, for example, terms like *muddy* and *boomy*.

In fact there's a whole vocabulary of terms and expressions which describe in one way or another the qualities of sound. The more you are familiar with these, the better you should be able to respond to the challenge of using EQ to its best advantage. Moreover, if you want to work with other musicians and/or engineers you will need to be familiar with those terms that are commonly used to describe the qualities and characteristics of sound.

Commonly Used Terms			
Range	Characteristics	Too Much	Too Little
Bass – 40 Hz to 200 Hz	Booming Full Powerful Punchy Solid Thick	Boomy Heavy Rumbly Stodgy	Anaemic Sparse Thin Wimpish
Low Mids – 200 Hz to 800 Hz	Body Fat Full Robust Warm	Barrelly Muddy Tubby	Distant Empty Hollow Disembodied
Mids – 800 Hz to 5,000 Hz	Clear Discernible Present Forward Up Front	Boxy Chunky Honky Nasal Telephonic Wooden	Covered Muffled Stifled Veiled
High – 5,000 Hz to 8,000 Hz	Bright Brilliant Clear Live Present Smooth	Cutting Metallic Piercing Shrill Strident Tinny	Dark Dead Dull Foggy Indistinct Unclear
Ultra High – above 8,000 Hz	Crisp Gleaming Present Radiant Sparkling	Brittle Glassy Searing Sizzly	Cheap Dull Flat Lifeless

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3.7.8 Conflict Resolution

Let's now return to the example **Pelverata Frost** that we panned earlier and see how by applying EQ we can resolve the conflict between the different instruments which are fighting for the same acoustic space. In doing so, we also add an extra dimension to our mix, a dimension that will make the recording immediately appear more vibrant and alive. This is the dimension of height.

We are going to sweep each track one by one to identify which frequencies appear to be the most interesting. Then by boosting those frequencies a little (and sometimes reducing the same frequency on those tracks panned close by) make that instrument more distinctive in our mix.

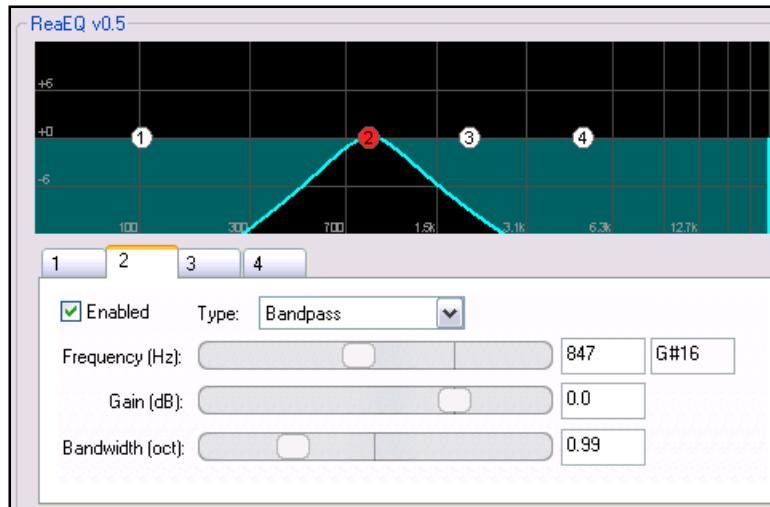
1. Open the file **Pelverata Frost PAN1** and immediately save it as **Pelverata Frost EQ1**

2. Solo the **Mandolin** track and play it.

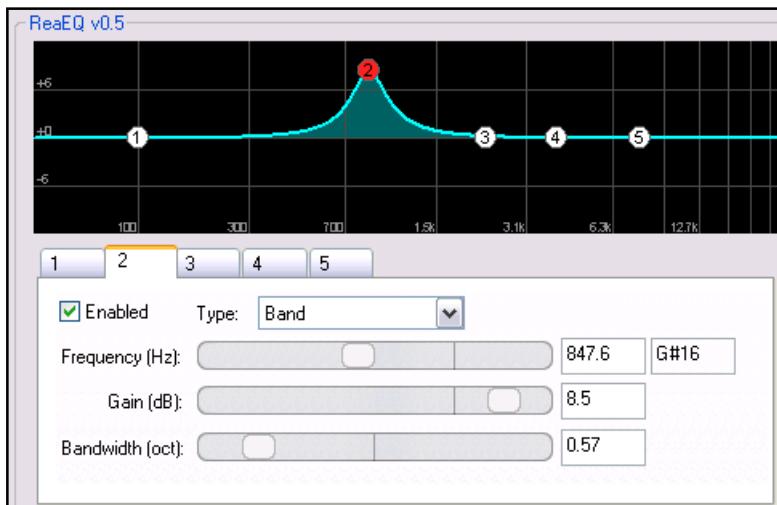
3. Open the FX Window for this track. Make sure that the **ReaEQ** plug-in is enabled.

4. Select Band 2 and change the band type to **Bandpass** with a bandwidth of about 1 octave.

5. As the tune plays, slowly move the frequency slider from left to right. You should find that round about the 850 Hz mark the sound has a pleasing distinct brightness and clarity. This, then, is a key frequency for this instrument. (see right).

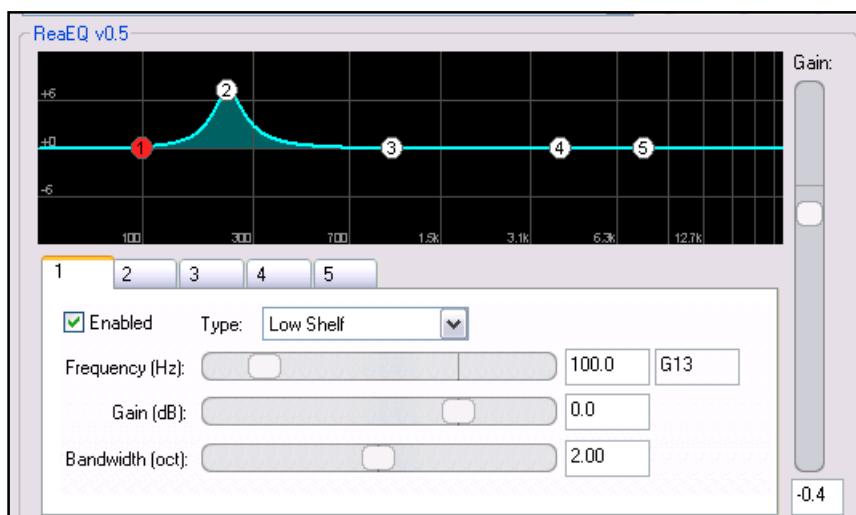
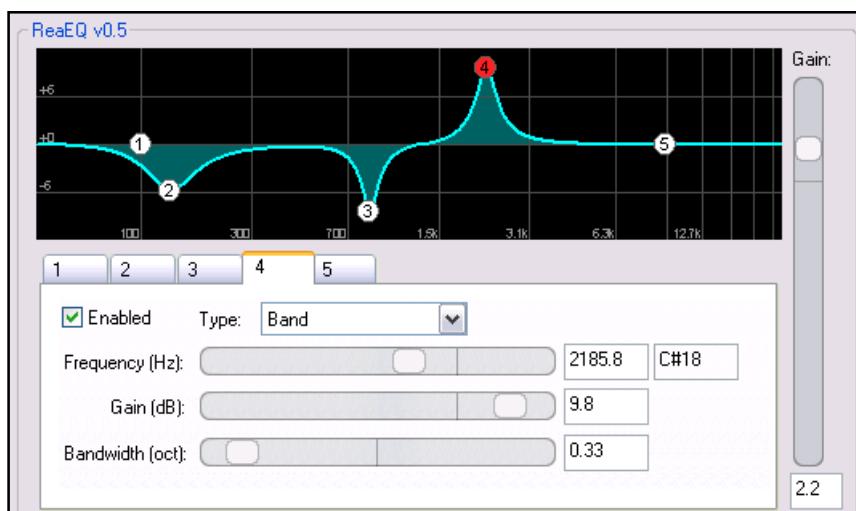
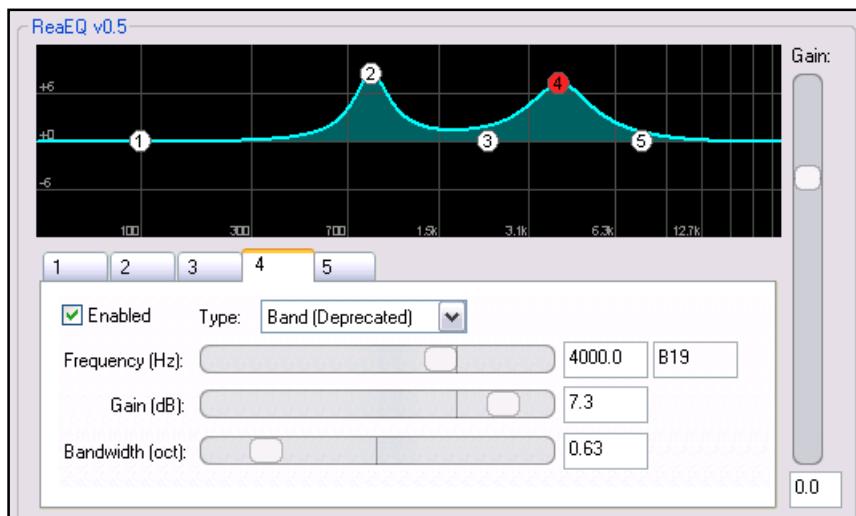


6. Change the band type to **Band** and create an EQ curve similar to that shown (below right). If you wish, add a similar gain around 4,000 Hz. You should now repeat this procedure for each of the remaining four instruments, but not at the same frequencies of course. In each case, sweep to find the optimum frequencies. If you are using the same panning as in our example, start with the Lead Guitar. Because this instrument is closest to the Mandolin, as well as adding some gain to its own key frequencies, you might also like to make reduction around the 847 Hz mark.

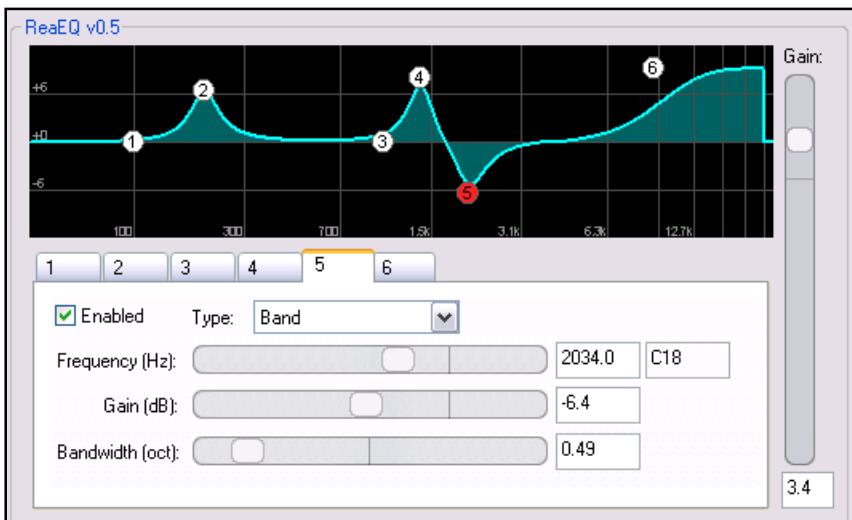


7. As you play the tune, you can switch global FX Bypass on and off to evaluate the effect of your changes. Either hold down the **Control** key and click on any individual track FX Bypass button, or better still, assign a keyboard shortcut to this function. Make it a key that doesn't wear out easily.

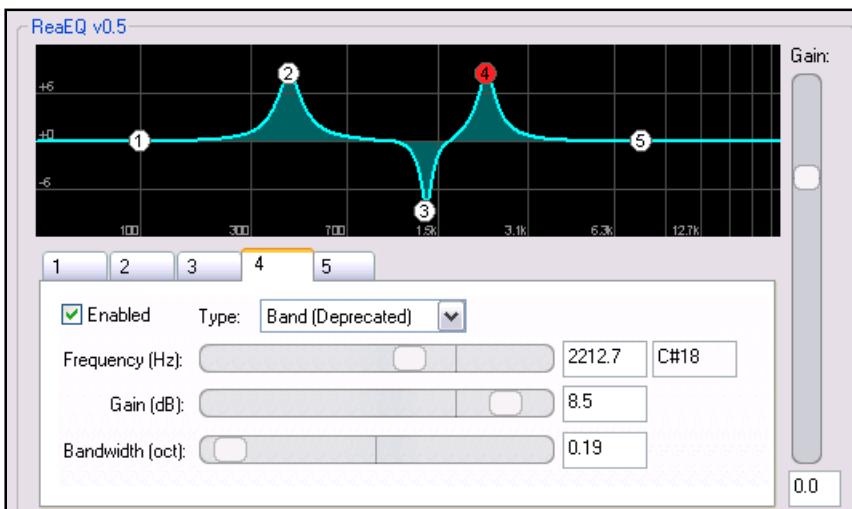
A possible *suggested* solution to this exercise is shown over the page. Don't worry if yours is different. In fact, our suggestions are, if anything, somewhat conservative. What matters is that your mix should sound right!



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Track 4
Lead Guitar



Track 5
Banjo

Summary

The above settings have been used in the project file **Pelverata Frost EQ1 A**

Remember that this project is still “work in progress” – it does not represent a final mix.

This primer spends a fair amount of time discussing EQ because it is such a powerful, useful and versatile tool. The purpose of these last few sections has been to help you to understand a theory, and then see how to put that theory into practice.

Whatever you do, don’t try to memorise the above settings. It is much more important that you understand the technique and the theory, so that you can apply them to your own mixes in the future.

Familiarise yourself with the technique of listening to a track scanning with bandpass EQ and then flipping to band EQ when you have identified the frequency to be cut or boosted. This is a very useful technique which we will use throughout this primer and which will serve you well in your own experiments with EQ-ing.

3.7.9 Fattening Up a Thin Instrument with EQ

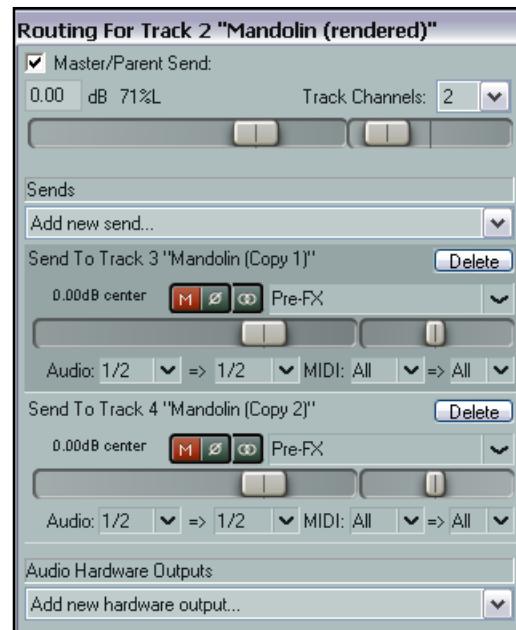
The principles that you have learnt in the last example can often be applied to good effect *even when you have only a single instrument*. The trick is to first identify the key frequencies for that instrument, and then to double (or even treble or quadruple) the track, making sure to EQ and pan each copy differently. Here is a very simple example.

Example

1. Open the file **Pelverata Frost MANDO** and immediately save it as **Pelverata Frost MANDO1**.
2. Play the file. Notice it consists of a single track, a mandolin. As a mandolin it's OK, but by itself it sounds rather thin and wimpy. There is almost no other instrument that on its own sounds as naked as mandolin. We can do something about this.
3. Using a combination of ReaEQ with a bandpass EQ Filter to sweep the track and an analyser plug-in such as **VST MultiInspector Free**, identify the three frequencies (approximately) which are most interesting in shaping the sound of this instrument.

There is no single correct answer to this question. Different combinations will produce different, but equally interesting outcomes. For the purpose of this exercise, let us suppose that we have identified 300 Hz, 1,500 Hz and 5,500 Hz as the frequencies that we wish to emphasise.

4. Add a new track and place it above the existing Mandolin Track. Label this track **Mandolin Mix**.
5. Add two more new tracks after the original Mandolin track. Label these **Mandolin Copy 1** and **Mandolin Copy 2** respectively. These will be Tracks 3 and 4.
6. Open the **I/O Routing Window** for Track 2 (the original Mandolin track) and create two sends, one to each of Tracks 3 and 4. It is important that both these should be Pre FX, as shown on the right.
7. Now make Track 1 a folder and Track 4 the last track in the folder. Your project should now appear similar to that shown below:



8. As you work through the remaining steps of this exercise you will probably want to leave the project running.

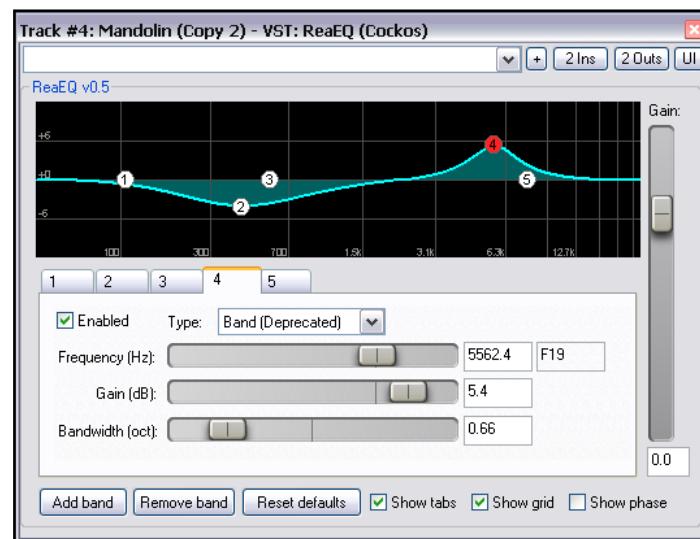
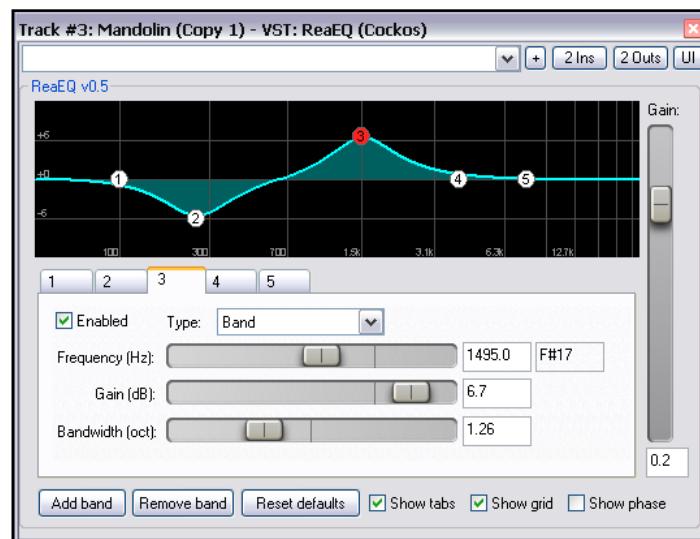
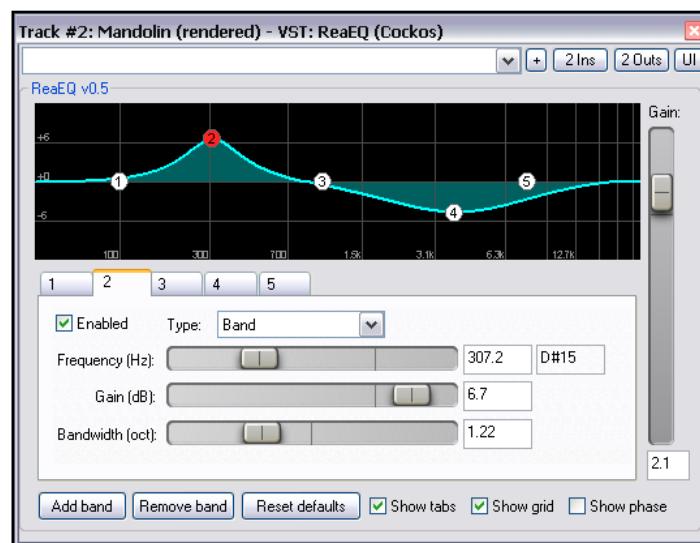
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9. We are now going to work on Track 2. Pan it about 70% left. Hold the **Alt** key while you click on the **Solo** button for this track.
10. Using ReaEQ, adjust the settings for this track so as to give a significant boost around the 300 Hz area, and a significant reduction around our higher key frequencies. A possible outcome is shown in the first of the screen shots on the right.
11. When you have finished, unsolo this track.
12. You will need to treat Tracks 3 and 4 in a similar fashion. Leave Track 3 panned at or near the centre and pan Track 4 to around 70% right.
13. In each case, solo the track that you are working on while trying to find the best EQ settings for that track. Be prepared to toggle the Solo on and off as you evaluate the results of your adjustments.
14. Possible EQ settings for Tracks 3 and 4 respectively are shown on the right, but you should be prepared to experiment.
15. Treat this process as iterative. You should be prepared to go back to tracks that you have already worked on and adjust their settings if necessary.
16. It might also pay to add ReaComp to Track 1, the Mandolin Mix track. Compression will be explained in more detail later, but for now, try setting the ratio at about 4:1 and the threshold at about –18 dB.

You should notice a significant improvement in the sound of the mandolin.

The file **Pelverata Frost MANDO 1A** contains a possible solution to this exercise. Open and examine it. Notice that a **gfxGoniometer** has been added to the Master FX Chain. Notice the difference in the display here with your track FX on and set to bypass.

Note: *In some of the later sections of this primer, you will learn that there are other techniques that can be used to further fatten up the sound of a thin instrument.*



3.7.10 Making Room for Vocals

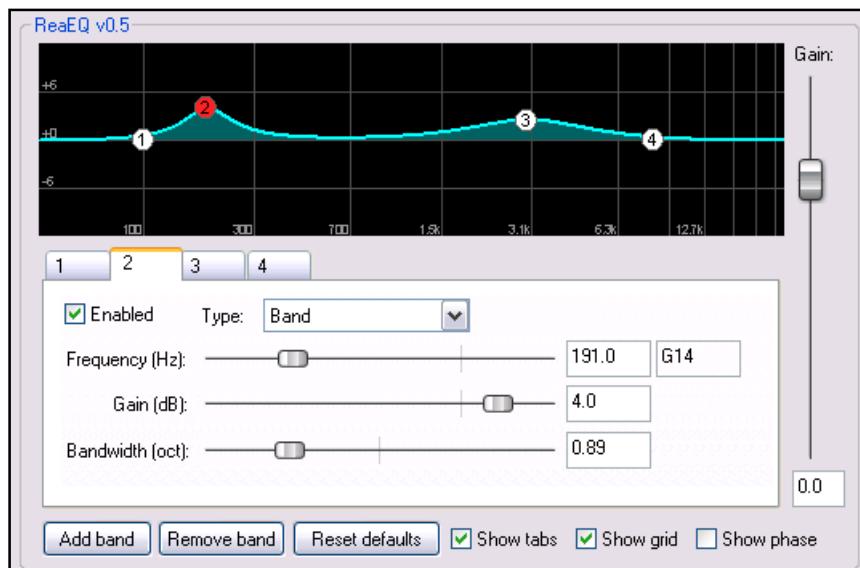
Probably more than anything else, you should pay careful attention to vocals in your mixes, and especially lead vocals. In this section we will look at one example of how just a few minor EQ tweaks can produce a large shift in the perception of how a vocal track sits in a mix.

You will always need to be mindful of the style of vocal with which you are working, and the need to work according to that style. For example, an in-your-face music hall style of singing will require significantly different treatment from a sensitive ballad. Nevertheless, the underlying principles that you will need to consider will always be the same.

Open the file **RosesBloom VOX 1** and play it. Save it immediately as **RosesBloom Vox 2**. Probably the first thing that will strike you is that the vocal is struggling to make itself heard in places. You can try simply raising the volume of the vocal track. However, listen carefully and you will find that this is not a satisfactory solution. At times it seems too loud, almost apart from the overall mix. Instead, try this:

Example

1. To the **Vox** track (Track 1) add an instance of **ReaEQ**. Add about 4 dB at or around 190 Hz (Bandwidth about .9) and 2.5 dB at or around 3,000 Hz (bandwidth 1.7). This will boost the voice at two important frequencies. This is shown on the right.



2. To compensate for this, we will make more or less equivalent adjustments to some of our instrument tracks. Add an instance of **ReaEQ** to Track 3 (**Gtr Neck**) and roll off about 3.5 dB at about 190 Hz, bandwidth about 2.00.
3. Add another instance of **ReaEQ** to Track 4 (**Slide**) and roll off about 5 dB at about 2,900 Hz, bandwidth about 2.00.
4. Now play the file, making slight adjustments as required to the volume faders for the various tracks. *You should find that the changes that we have made will allow more of the warmth of the vocal to be heard through the left speaker and more of its presence to come through on the right speaker. This helps to create a fuller and more natural sounding vocal.*

Of course this is not yet a complete mix. For example, there will be places where you might wish to use Volume envelopes, or **ReaComp** to further modify these tracks, not to mention any possible reverb or delay or any other FX.

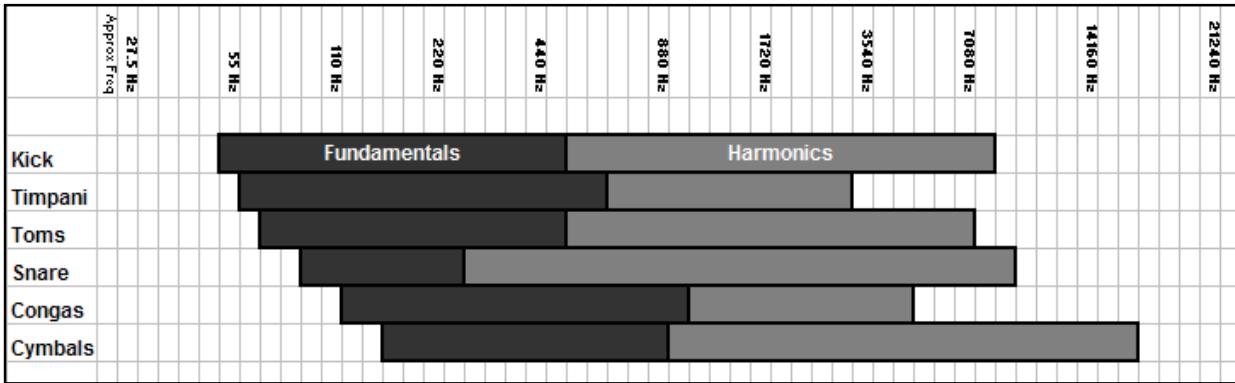
Nevertheless, if you compare how this file sounds with Global FX bypass enabled and with it disabled, you will probably be surprised at the extraordinary difference just these few very small adjustments will have made to the overall sound.

The file **RosesBloom VOX 1A** contains one suggested possible solution to this exercise.

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3.7.11 Drums and Percussion

Below is a frequency chart for some of the most commonly used percussion instruments. In this case, harmonics as well as fundamentals are indicated.



The following comments might also be helpful, but only as a guide. Ultimately, you must let your ears be your judge.

Instrument	Comments
Kick Drum	May be muddy around 300 Hz. Boost around 2,000 Hz to 2,500 Hz for more presence.
Toms	May be boomy around 300 Hz. Boost around 3,000 Hz to 8,000 Hz for clarity.
Snare	May add body around 100 Hz to 120 Hz. Crispness around 4,000 Hz.
Overheads	May be muddy around 300 Hz. Presence around 2,500 Hz to 3,000 Hz. Brightness around 6,000 Hz.
Hi-Hat	May be muddy around 300 Hz, Sparkling around 10,000 Hz to 12,000 Hz.

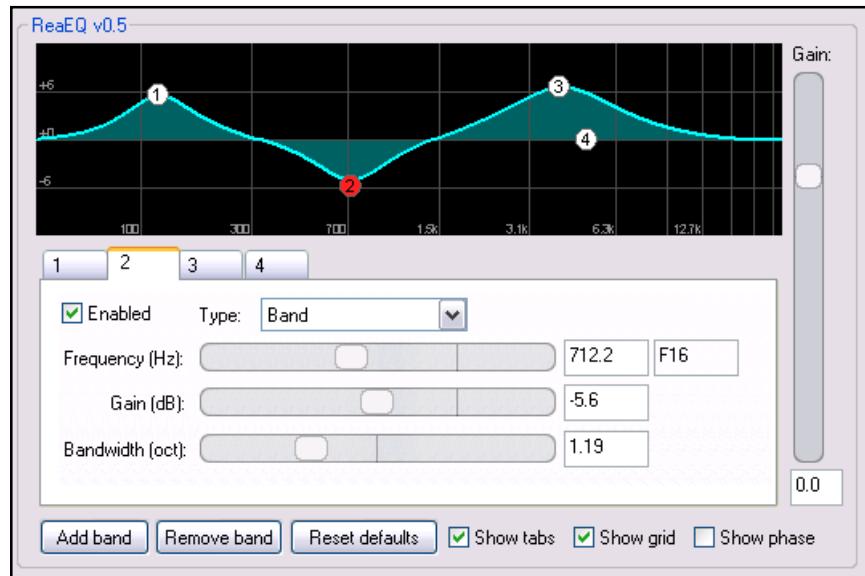
Example

In the example that follows, you will be able to experiment with the application of EQ, Compression and Panning to a project file that includes percussion in the mix. *The object of this exercise is not to create a perfect overall mix.* It is to help you to understand how you can go about bringing out the best from your percussion.

1. Open the file **Don't Keep Me Waiting DRUMS** and immediately save it as **Don't Keep Me Waiting DRUMS1**
2. Insert a new track immediately after the current Track 3. Name this new track **Percussion** and use the Track Folder button to make it a track folder. Make Track 7 the last track in folder.
3. If you wish, change the Track Colours so that Track 1 is one colour, Tracks 2 and 3 another, and Tracks 4, 5, 6 and 7 a third colour.
4. The effect of what you have so far done is shown on the page that follows.

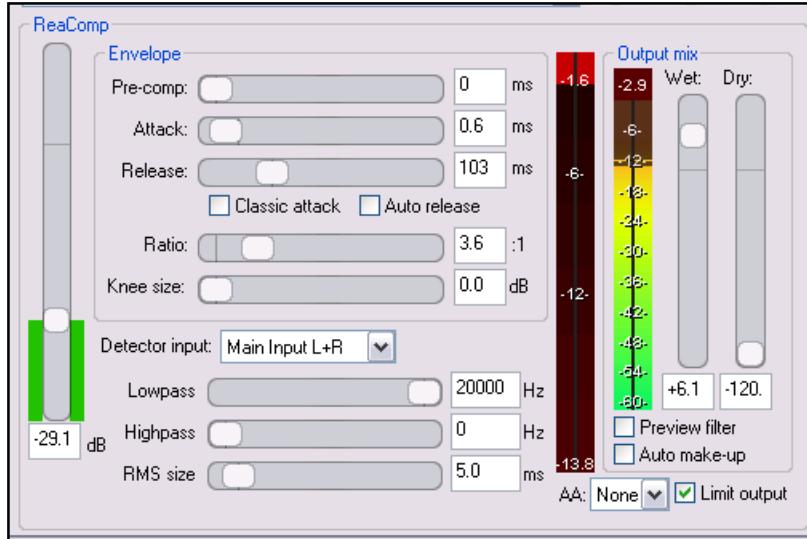


5. Select and solo track 5 (Snare) and open the FX Window for that track.
6. Insert an instance of **ReaEQ** into this FX Window. Play the track.
7. Select **Band 1** and make the type **Bandpass**. Slowly sweep the lower frequencies until you find the frequency at which the body of the instrument sounds the most pleasing. Change the type to **Band**, add about 5dB gain, then for the time being untick the **Enabled** box.
8. Select **Band 2** and make it type **Bandpass**. Slowly sweep the mid-range until you find the frequency at which the instrument sounds at its muddiest. Change the type to **Band**, take off about 5dB, then for the time being untick the **Enabled** box.
9. Select **Band 3** and make it type **Bandpass**. Slowly sweep the mid to high ranges until you find the frequency at which the instrument sounds at its clearest. Change the type to **Band** and add about 5dB gain.
10. Now enable the other two bands and play the track, making such adjustments to your EQ as you now see fit. Probably you will end up with something quite similar to that shown above.
11. Add **ReaComp** to the FX chain, after **ReaEQ**. We'll examine and explain ReaComp in more detail shortly, but in the meantime, let's experiment. To emphasise the sharp, percussive nature of the instrument, you will want to set relatively short attack (about 0.5 ms) and release times (about 100 ms) and a small knee size (0.0 dB).



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12. Set a ratio around 3 or 4 to 1 and adjust the Threshold and Wet Gain settings while you play the track. You are aiming to tame some of the peaks and lift some of the quieter notes.
13. A possible outcome is shown on the right.
14. Optionally, you may wish to also place **ReaGate** after **ReaComp**, so as to keep out the bleed from other microphones when the Snare is not being played.
15. If you do this, you will want the Gate to open and shut quite briskly. Attack and Hold times should be no more than about 1 ms, and Release no more than about 40 or 50 ms (to allow the natural decay from the instrument to pass through before the gate closes). You will need to adjust the Threshold and Wet Gain settings to suit the particular volume of the track.
16. We are now going to do the same for the Kick.
17. Insert **ReaEQ**. See if you can identify the respective frequencies where the body of the instrument is the firmest, the sound is the muddiest, and where the clarity of the instrument is at its best (for this latter one you may need to raise the volume).
18. After you have sorted out your EQ settings, add **ReaComp** to the chain. Because of the nature of the kick (as compared to the snare), the sound takes a little time to build up after the drum is struck, but it dies off more quickly. Start with an Attack time of about 50 ms and a Release time of about 20 ms and see how you go.
19. We are now going to do the same for the **Overhead**.
20. Add **ReaEQ** as the first item in the FX chain. This time the EQ task is slightly different. You'd be hard pressed to find a low frequency here that you would wish to raise. Focus instead just on finding the muddiest mid frequency and the most interesting high frequencies.
21. When you have done this, add **ReaComp** immediately after **ReaEQ**. Start by trying longer attack and release times than you did for either the kick or the snare.
22. When you have finished, play all the tracks. You should notice that your percussion items are now much more clear and punchy. Compare how the song sounds with global FX bypass on and off (hold **Ctrl** while you click on the **FX Bypass** button for any track).
23. You should notice also that the percussion will dominate the mix. That's how it should be at this stage. Remember that we haven't yet done any work with the Vocal or Guitar tracks for this song.
24. Save your work when finished.



Note:

The file **Don't Keep Me Waiting DRUMS A** contains a suggested possible solution to this exercise.

Open this file, play it and inspect the various FX settings carefully. Be prepared to tweak them (especially the use of gating) to see if you can improve on the sound.

3.7.12 Key Frequencies for Some Popular Instruments

The following list indicates the frequencies where you should start looking in order to shape the sound of various popular instruments. Be aware that it is only a guide, and use it as such. Remember that no two instruments are exactly alike. That which works a treat on one acoustic guitar, for example, might not have the same effect on another. Notice that for those instruments where it is especially appropriate, the formants are shown in this chart. The formants are those frequencies at which the instrument is most distinctive. Formants can often be considered as being the frequencies which contribute most to giving the instrument its distinctive sound.

Instrument	Comments
Accordion	Fatness on the left side at 80 Hz to 240 Hz. Brightness (both sides) at 2,500 Hz to 4,000 Hz. Shrill on the right side above 5,000 Hz.
Acoustic Guitar	Fullness and body around 100 to 200 Hz. May be dull around 1,000 to 3,000 Hz. Presence and clarity around 4,000 to 6,000 Hz. Sparkle above 10,000 Hz.
Bass Guitar	Feeling around 40 to 60 Hz. Presence around 1,200 Hz to 2,400 Hz. High harmonics around 5,000 Hz.
Dobro	Fullness around 300 Hz to 500 Hz. Bite around 1,500 Hz to 2,000 Hz. Bright around 2,500 Hz to 5,000 Hz.
Electric Guitar	Fullness around 200 Hz to 300 Hz. Bite around 2,000 Hz to 3,000 Hz. Presence around 5,000 Hz to 7,000 Hz. Sparkle above 8,000 Hz.
Harmonica	Fat around 240 Hz. Highs around 2,500 Hz. Bright harmonics around 5,000 Hz.
Mandolin	Fullness around 200 Hz to 300 Hz. Clarity around 2,500 Hz to 5,000 Hz Sizzle around 10,000 Hz.
Piano	Resonance around 50 Hz. Bass around 80 Hz to 100 Hz. Bite around 3,000 Hz to 5,000 Hz. Presence and Harmonics 5,000 Hz to 15,000 Hz.
Trumpet	Fundamentals around 165 Hz to 1,200 Hz. Formants at 1,000 Hz to 1,500 Hz and 2,000 Hz to 3,000 Hz.
Violin	Fullness at around 240 Hz. Formants at 300 Hz, 1,000 Hz and 1,200 Hz. Scratchy at 7,000 Hz to 10,000 Hz. Overtones above 16,000 Hz.
Woodwinds	Full at 200 Hz to 300 Hz. Crisp around 2,500 Hz. Clarity around 4,000 Hz to 6,000 Hz.

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3.8 Depth

The dimension of depth is used to create the illusion in the listener's ears that some instruments are closer or further away in the mix. You might at first think that this dimension at least would be an easy one to fix. After all, the closer a sound is, the louder it sounds, right? So surely, it's basically a question of just turning the volume up or down on different instruments, yes?

Well, no, actually. Before you can begin to understand how to manipulate the dimension of depth, you need to understand two important facts.

1. *Different frequencies decay through space at different rates.* This means that as you move closer to or further from a sound, the relative levels of different frequencies will change. As a rule, higher frequencies decay at a faster rate than lower frequencies. That is why when a distant sound first approaches you, depending on the physical environment, you may find that hear only the bass frequencies at first, or in other circumstances the higher frequencies first, with the total picture filling out as the sound gets closer and closer.

2. *The clarity of sound deteriorates with distance.* Put another way, the more distant a sound, the more it appears muffled. This happens not by any absolute factor, but according to the environment in which the sound is being produced and heard.

From this we can draw a number of inferences, but in particular this:

Making an instrument seem closer to us or further away in a mix is an illusion that can seldom be created satisfactorily by adjusting the volume of that instrument alone.

Let's then take a look at the tools that we do have at our disposal.

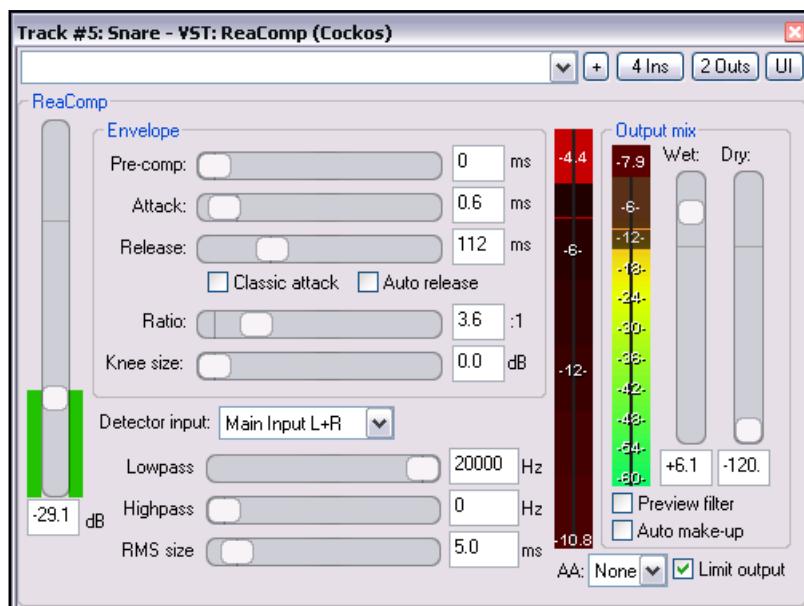
3.8.1 Compression

The Compressor is really a multifunctional tool. It can be used to change the perceived distance of an instrument in the mix, making it appear closer forward or further back. Unlike, say EQ or Delay, the effect that compression has on a signal is often quite subtle. This makes it a more difficult tool to understand and to master. REAPER supplies you with

two compressors – **ReaComp** (a straightforward compressor) and **ReaXComp** (a multiband compressor). We'll return to ReaXComp later in this primer. For the moment, let's focus on the simpler of the two plug-ins, ReaComp. We'll start by getting a handle on its main controls.

The Threshold is the level at which the compressor will kick in. Strangely enough, this isn't actually labelled in the GUI. It's the vertical fader on the left. If, for example, you set the threshold to, say, -10dB, then as long as the volume of the track stays below -10dB, the compressor will do absolutely nothing to the signal (except apply any Gain that you might add to the Output Mix).

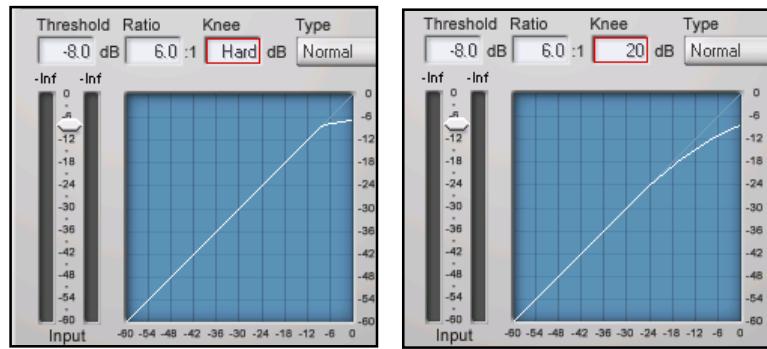
The Ratio determines the degree of compression that is applied. For example, a ratio of 4 to 1 means that if the signal coming in to the compressor is 4 dB above the threshold level then the signal going out will be 1 dB above the threshold level. The available range is from 1:1 all the way up to Infinity:1.



Attack allows you to specify a period of time before the compressor kicks in. For example, an attack setting of 3 ms would result in the compression not beginning until 3/1000th of a second after the volume passed above the threshold level. As a general rule, longer attacks are better for percussive sounds, shorter attacks for gentler more melodic parts, such as strings and vocals.

Release time determines for how long the compression will be applied after the signal falls back below the threshold. Short release times work well with percussive, punchy sounds, but can be somewhat abrasive when applied to vocals. However, too long a release time on a track with strong dynamics (such as a lead vocal) can result in unwanted compression on quieter passages. This can result in an unwanted stuttering effect.

Knee Size. This setting determines whether the compressor kicks in suddenly or gently. A low setting (Hard Knee) of 0.0 dB ensures that the full compression ratio is applied the instant the threshold is exceeded. As you increase the setting, the ratio is applied more gradually. The two graphs represent two examples, on the left with a Hard Knee setting, on the right with a Soft Knee Setting.



Detector Input. This should normally be left at Main Input except when you are sidechaining. Sidechaining will be discussed separately.

Low Pass / High Pass. These settings allow you to set filters, so that only that part of the signal that falls within the specified frequency range will be compressed.

RMS Size. When set to zero, the peak signal will be used to trigger the compressor. As you increase the value of this setting, a RMS (Root Mean Squared) calculation will be used instead. This generally means that the higher the RMS setting, the more you will need to lower the threshold for the compressor to become engaged.

The ReaComp compressor is a very effective tool for bringing an instrument or vocal further back or forward in a mix. Use the following table as a guide.

Compressor Tips	
To achieve this outcome ...	Do This ...
Bring an instrument forward in the mix	<p>Set a ratio within the range 3:1 to 6:1.</p> <p>Set a threshold level that will ensure the compressor never or only rarely takes more than 2 or 3 dB off the signal level.</p> <p>Set an RMS value around 200 to 250.</p> <p>Add as much gain as required the Wet Output fader.</p>
Push an instrument further back in a mix	<p>Set a ratio within the range 8:1 to 16:1</p> <p>Set a threshold level that will ensure that the compressor is engaged most of the time, taking around 6dB to 10dB off the signal level. Set an RMS value of 0.</p> <p>Add between 1dB and 3dB gain to the Wet Output fader.</p>
Bring an instrument really up front in a mix	Use settings similar to those suggested in the second example above – then really pump up the Wet Gain, perhaps + 9 dB or even more.

3.8.2 Sidechain Compression

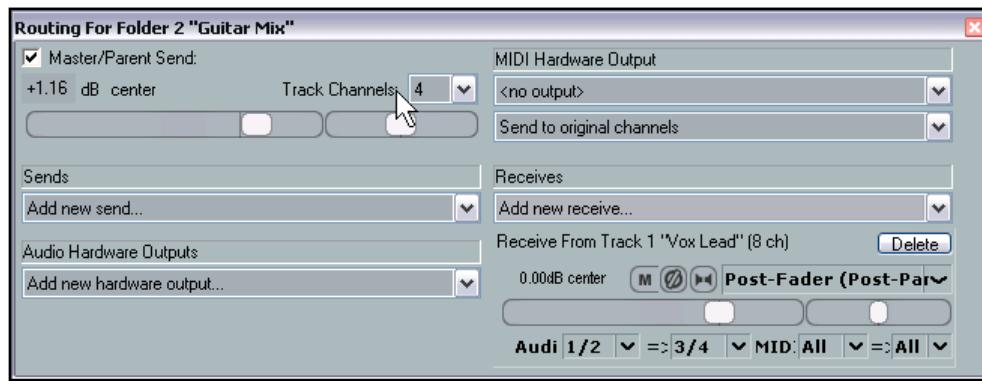
Sidechain compression is a technique which allows the volume of one track (or group of tracks) to determine and control how compression is applied to another track (or group of tracks). A typical example of this would be to compress an instrument mix gently whenever an audio signal is present on a vocal track, thus allowing the vocal to be heard above the mix more clearly. This technique is sometimes known as *ducking*.

The compressor plug-in **ReaComp** supports sidechaining in this way. It uses the audio signal from its *Auxiliary Inputs* to compress the audio signal on its *Main Input*.

Example

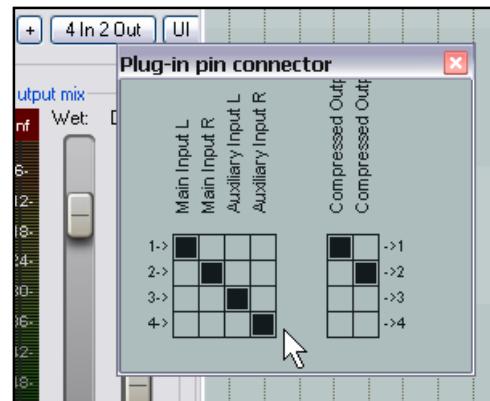
1. Open the file **RosesBloom CHAIN** and immediately save it as **RosesBloom CHAIN 1**.
2. Notice that this file consists of a vocal track and a mix of three guitar tracks. As you play the file, you may notice that focus is taken off the vocal in places because of peaks in the instrument mix.

3. Select the **Guitar Mix** track folder. Open the **I/O** window for this track. Specify that you require 4 track channels, and create



a Post Fader Receive from the **Vox Lead** track to Channels 3 and 4 of our Guitar Mix. These channels will be used as auxiliary inputs in our sidechain compressor.

4. Open the **FX Window** of the **Guitar Mix** track folder. It already contains an instance of **ReaComp**. Enable this plug-in.
5. Check that the Main Inputs are set to Channel 1 (Left) and Channel 2 (Right), and that the Left and Right Auxiliary inputs are set to the Receives from Channels 3 and 4 respectively. Compressed Output 1 should be Channel 1 and Compressed Output 2 Channel 2. These are the default settings.
6. Set the **Detector input** to **Auxiliary Input L + R** as shown.
7. Play the song.
8. Set the ratio to about 5 or 6 to 1 and adjust the threshold so that the compressor is activated during the louder instrumental passages.
9. Adjust the other compressor settings to suit. An example of appropriate settings is shown below, but you might prefer your own variations especially in knee size, release time and RMS size.
10. You should notice how the guitar is “tamed” during its louder passages when the vocal track is active, but is unaffected when the vocal track is silent.

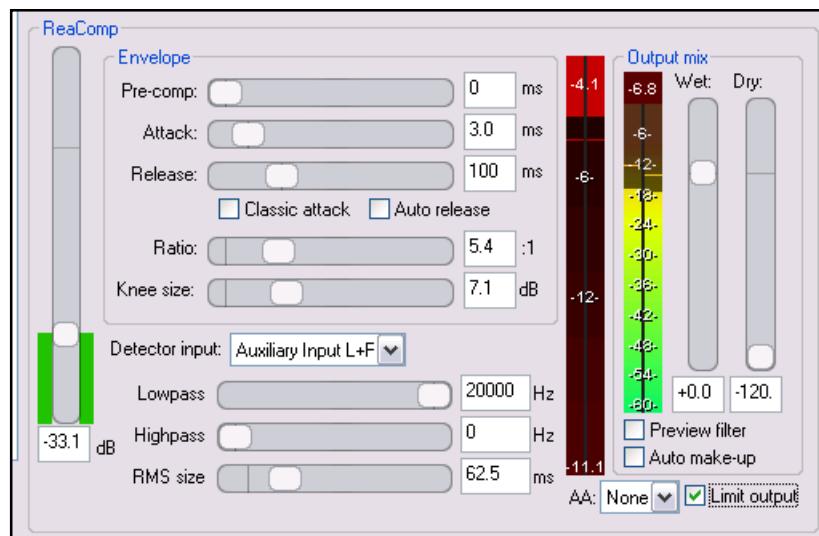


11. Save the file.

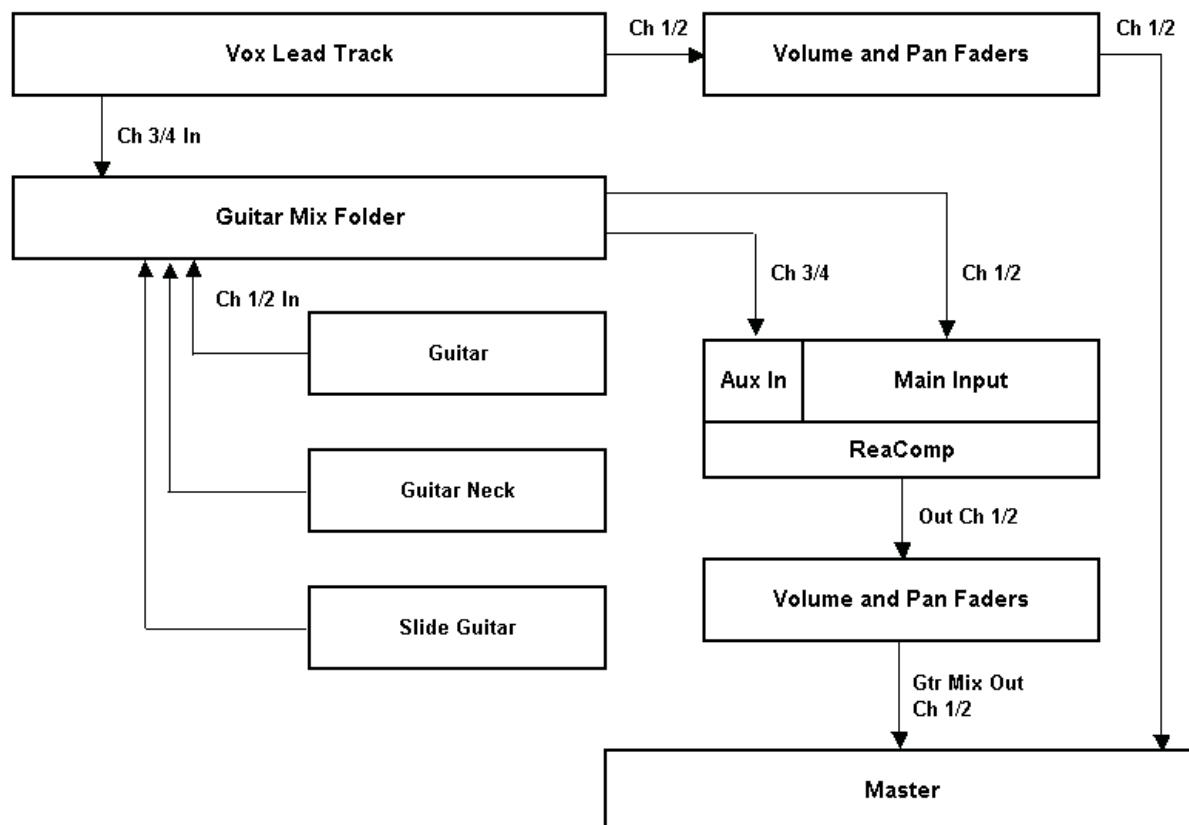
Note:

A sample solution to this exercise is represented by the file **Roses Bloom CHAIN 1A**. If you wish, open this file, play it and examine it.

This file is not intended to serve as a final mix for this project, merely to illustrate a practical example of how sidechain compression can be used.



The flow chart below illustrates the signal flow that occurs when sidechaining is used in this way.



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3.8.3 EQ

We have already covered EQ extensively in earlier sections. Remember that by using EQ to make an instrument appear more or less present we can make it seem to be closer or further away.

Example

1. Open the file **Don't Keep Mr Waiting COMP** and immediately save it as **Don't Keep Me Waiting COMP 1**.

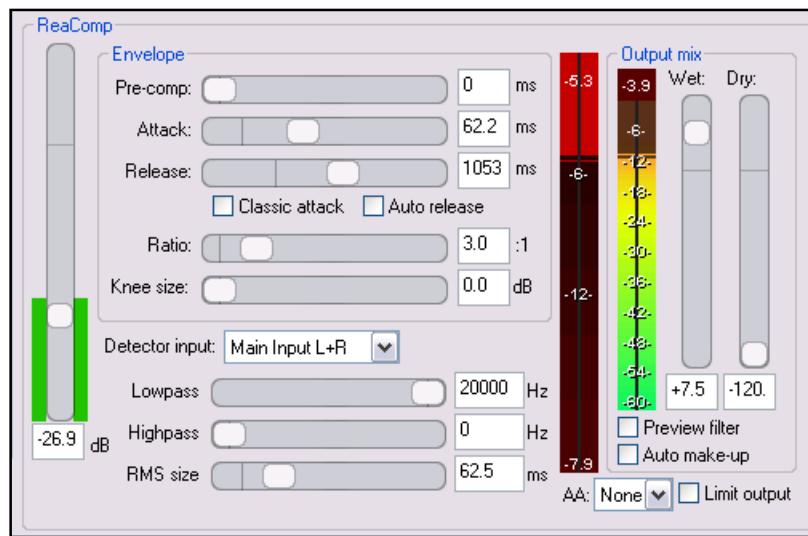
2. Play this file. It might seem that the Harmonica is too far forward in the mix and the Vocal too far back. You could try, for example, raising the volume on the Vox track to fix this, but you will most likely find that this is not really satisfactory. If you raise it sufficiently for the quieter phrases to be heard, you will find that the louder phrases are too loud. Possibly you could solve this with a volume envelope with perhaps dozens of points, but using a compressor is certainly easier and very often smoother.

3. Play the song. As you do so, select the Vox track and open its FX window. Insert **ReaComp** into the FX Chain for this track.

4. Set the Threshold to about -27 dB (as shown) and the Wet Gain to about +7.5 dB (also as shown).

5. Fade each of the following controls fully to the *left*:

Attack Release
Ratio RMS Size



6. As you proceed to adjust these settings (see illustration above), listen carefully to learn how each of them helps shape the sound.

7. Now slowly move the Ratio out to somewhere around 3:1 and 4:1.

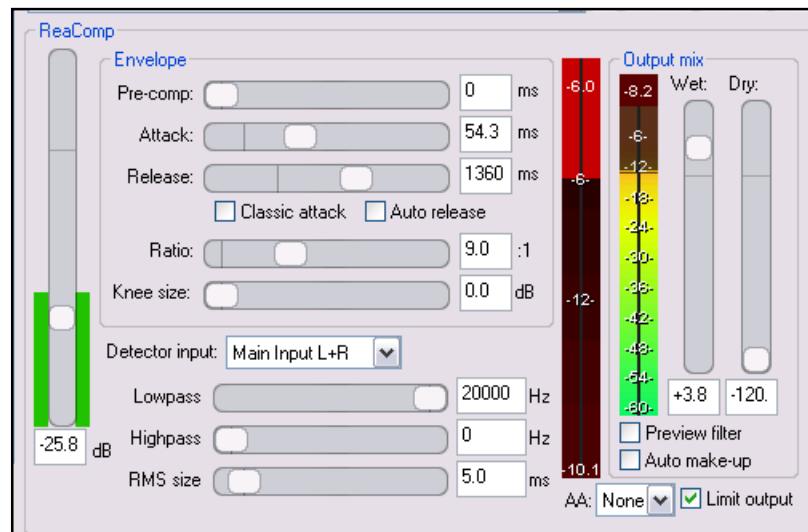
8. Slowly move the Attack fader to about 60ms or 70 ms.

9. Slowly move the Release fader to about 1000ms or 1200ms.

10. Slowly move the RMS size fader out to about 60ms or 70ms.

11. Now select the **Harmonica** track and display its FX Window.

12. We are first going to use EQ to push it a little further back in the mix. Insert an instance of **ReaEQ** at the start of the track's FX Chain.



13. Select Band 4 and set its type to **High Shelf**. Set the Frequency to about 4700 and the Bandwidth to 2 octaves. Lower the Gain control to about -4.5 dB. Already the harmonica should appear to be a little more distant.
14. Now add **ReaComp** to the FX Chain, after ReaEQ.
15. Slide the faders for Attack, Release and Ratio fully left. Slide the fader for RMS Size all the way to the right.
16. Set the Threshold, Ratio and Wet Gain levels as shown in the second of the illustrations above.
17. Now slowly adjust the Ratio, Attack, Release and RMS Level as shown in the second of the illustrations above.
18. If you think that you have now overdone the compression and perhaps pushed the Harmonica too far back in the mix, make the necessary adjustments to make it just right.
19. Save your file when finished.

Note:

The file **Don't Keep Me Waiting COMP A** contains one possible outcome of this exercise. Open it, play it and examine its settings. This is not, of course, intended to represent a definitive and final mix for this project (far from it!). The purpose of this file is purely to demonstrate a specific example of the use of EQ and compression to create a sense of depth and distance.

3.8.4 Delay

The **ReaDelay** plug-in can be used to add either simple delay or multi-tap delay to an audio stream. If you use only one page of ReaDelay settings, then you are using simple delay. If you use more than one page, enabled at the same time, then

you are using multi-tap delay (the illustration shows multi-tap delay with three separate settings pages). The difference between how these two types of delay function will be explained shortly.

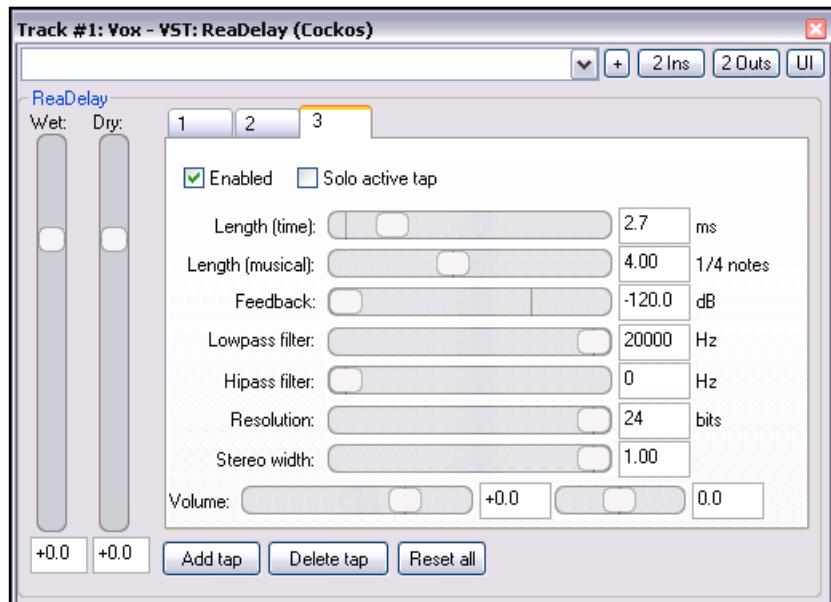
Put at its simplest, a delay takes an audio signal, and plays it back after adding a delay time. The delay time can range from a fraction of a millisecond all the way up to several seconds.

Let's start by considering how the use of simple delay behaves, with no feedback.

Output levels which include the Wet level faded all the way down and the Dry level faded up will not implement the delay at all. You might as well set the FX to Bypass.

Output levels which include the Wet level faded up and the Dry level faded all the way down will produce only the delayed signal, clearly on its own. The original signal will be delayed by the period specified.

Output levels which include some mixture of Dry and Wet will create an echo effect, with both the original signal and the delayed signal each heard clearly and distinctly.



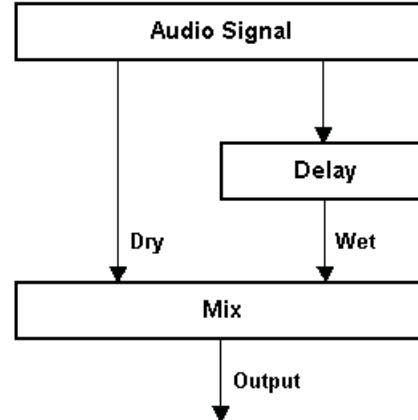
ReaMix: Breaking the Barriers with REAPER

Simple Delay

This concept is illustrated by the illustration on the right.

It is important when using delay that you keep in mind the relationship between time and distance. The greater the delay time added to an audio stream, the more distant it will appear to be. Be careful not to overdo the use of delay. The following table shows that even modest amounts of delay can produce quite a dramatic impact:

Delay Time (ms)	Perceived Distance
1	1.07 feet
2	2.14 feet
4	4.28 feet
8	8.56 feet
16	17.12 feet
32	34.24 feet
64	68.48 feet
128	136.96 feet



Note: 1 foot approximately equals 30.48 centimetres. Just be thankful that we do at least have one single universally accepted standard for measuring time!

ReaEQ offers you the option of using the Length (musical) setting to specify your delay period as fractions of a note rather than in units of absolute time. If you choose to use this option, be sure to check your Project Settings first, in particular the Project BPM and Time Signature settings.

Feedback

The simple echo effect created by the use of simple delay certainly has its uses, but they are somewhat limited. That's where feedback comes back in. By feeding back into the delayed signal a further certain level of that delayed signal we are able to create a smoother transition rather than just two distinct and separate signals.

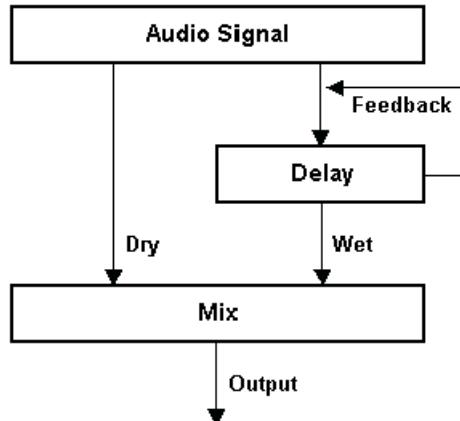
The illustration on the right illustrates this concept. It comes with a word of caution. Too much feedback will give you just that – feedback! Always begin with the feedback fader fully to the left and introduce it gradually.

As you will see shortly when we work through an example, Delay can play a significant part in the way your mix makes use of the available space, particularly to make an instrument sound fuller.

Notice that ReaEQ includes Lowpass Filter and Highpass Filter controls. These function in the same way as the EQ Lowpass and Highpass filters that we have already discussed and used earlier. They can be used to restrict the frequency range to which the delay is applied.

For example, if you set a Lowpass filter of 8,000 Hz and a Highpass filter of 2,000 Hz, then the delay will only be added to the 2,000 Hz to 8,000 Hz frequency range. Using filters in this way can make the delayed signal seem more present, but may also make the overall audio stream appear somewhat less full. It really depends on what effect you are aiming to create. The normal rule applies – be prepared to experiment and to learn by listening!

You also have available Stereo Width and Pan controls. We'll see how these can be used shortly when we examine multi-tap delay, but in short these controls do not affect the shape or nature of the delayed signal, only its destination.



Multi Tap Delay

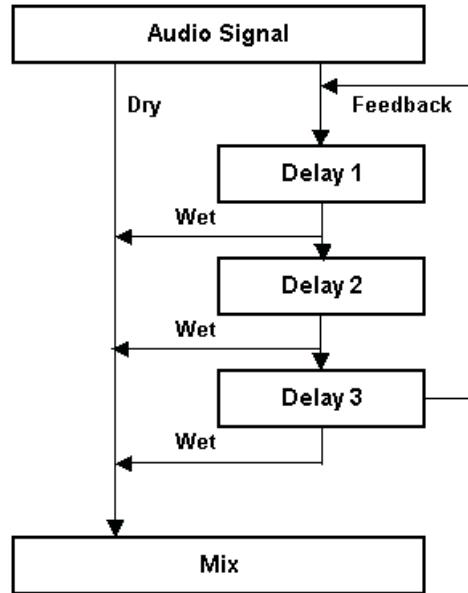
Multi-tap delay occurs when you have more than one page of delay settings enabled at once. Multi-tap delays allow you to create more complex patterns that can add a rhythmic quality to the instrument. The possibilities open to you by the use of Multi-tap delay are huge. However, because it is such a powerful tool it really does need to be handled with caution. With multi-tap delay, it is very easy to create an undignified cacophony.

The amount of delay between the various taps can be different. Any feedback that you add to individual taps (or pages) is fed right back to the beginning of the delay chain (see illustration on right). This can have rather unpleasant consequences.

Without wishing to inhibit your spirit of adventure, it's probably wisest, at least until you are sure that you really know what you are doing, to be extremely careful about the use of feedback within a multi-tap delay chain.

A more interesting effect might be to make use of the Stereo Width and Pan Control faders for different taps (pages) so as to send different elements of your delayed signal to different locations on your virtual sound stage.

We'll look at an example of this shortly.



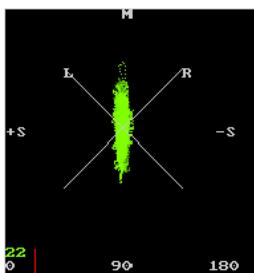
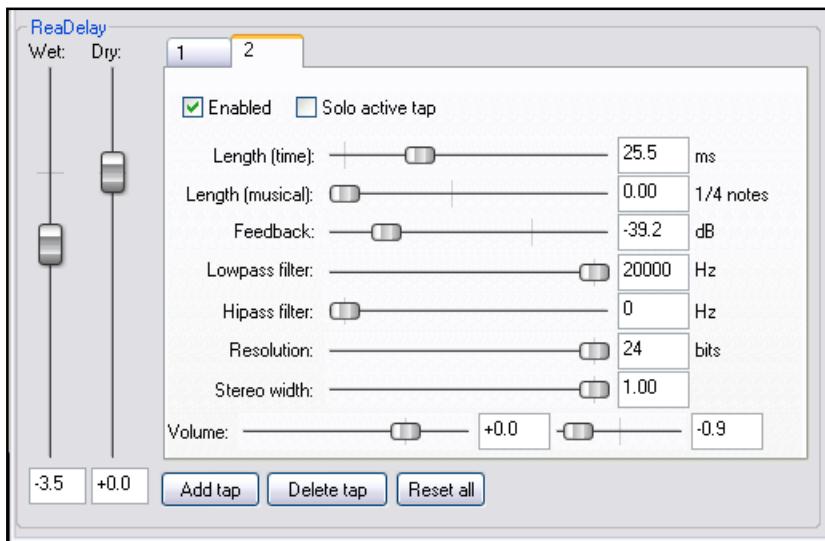
3.8.5 Using Delay in a Mix

1. Open the file **Don't Keep Me Waiting DELAY** and immediately save it as **Don't Keep Me Waiting DELAY1**
2. Notice there are two Guitar Tracks. These are the same instrument, a Resonator Guitar, recorded with two microphones at the same time, placed in different positions. We are going to add some Delay to the Guitar recording.
3. Immediately below the Vox track, add a new track called **Guitar Mix** and make this a track folder. Make the **Gtr Middle** track the last track in the folder, as shown on the right.
4. Open the FX Window for this track and insert at the beginning of the FX Chain an instance of **ReaDelay**.
5. Play the song. Fade the Length (musical) setting all the way left (to 0.0). Set the Wet output level to -5 dB and the Dry Output level to 0.0 dB. Set the Length (time) of the Delay to 10.0 ms. Slowly increase the Feedback setting to about -35 dB or -30 dB. This should have the effect of making the delayed guitar track sound noticeably more spacious.
6. Now click on the **Add tap** button to add another settings page. By default, it will take a copy of the existing settings sheet.
7. Raise the Wet Output Level to -3.5 dB. Modify the original settings (Tap 1) so that the feedback is lowered to about -40 dB. This should be just around the point where it is barely discernible. Change also the Pan setting for Tap 1 to +0.9 (this is 90% Right).
8. Now select the second settings page (Tap 2).

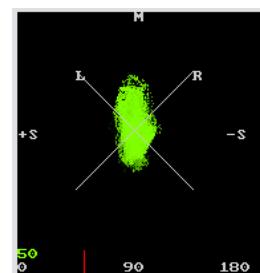


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9. Set the Pan fader to the -09. position (90% Left).
10. Increase the Delay time to about 25 ms. Again, fade the Length (musical) setting all the way left. In fact, when using ReaDelay you should move Length (musical) all the way to the left when you want to use Length (time) and vice versa.
11. Reduce the feedback to about -0 40 dB.
12. Make sure that both taps are Enabled. As you listen to the song, you should notice that the Guitar sounds at least as full and spacious as it did immediately after step 5, but has an improved clarity.
13. If you are not perfectly happy with the Delay sound, make the necessary changes to these settings to get them just as you want them. Don't forget to save the file.



The image on the left shows the placement of the sound of the soloed Guitar Mix folder without the added Delay effect.



The image on the right shows the placement of the sound of the soloed Guitar Mix folder after the Multi-Tap Delay effect has been added.

In both cases, LOSER's gfx/Gonmiometer is used. This JS plug-in is supplied with REAPER.

Note:

The file **Don't Keep Me Waiting DELAY A** contains a possible suggested outcome for this exercise. Open it, play it and examine it. Please note that this is *not* intended to represent a perfect mix for this song. Its primary function is to help you to understand the nature of simple delay and multi-tap delay.

3.8.6 Using Delay to Fatten a Single Instrument

In order to be able to get the most from this example, you will need to have first completed the completed the example headed *Fattening Up a Thin Instrument with EQ*.

1. Open the file **Pelverata Frost Mando 1A** and immediately save it as **Pelverata Frost 2**. We have already seen how this project uses routing and EQ to add body and definition to an otherwise thin solo instrument.
2. Add another track (Track 5) at the end of your project. Name this track **Mando Delay**. Create a Pre FX send from Track 2 to this track, as shown here. Make the new track (Track 5) the last track in the Mando Mix folder instead of Track 4. Adjust the panning for Tracks 2 and 4 to now be about 60% left and right respectively. The project layout is



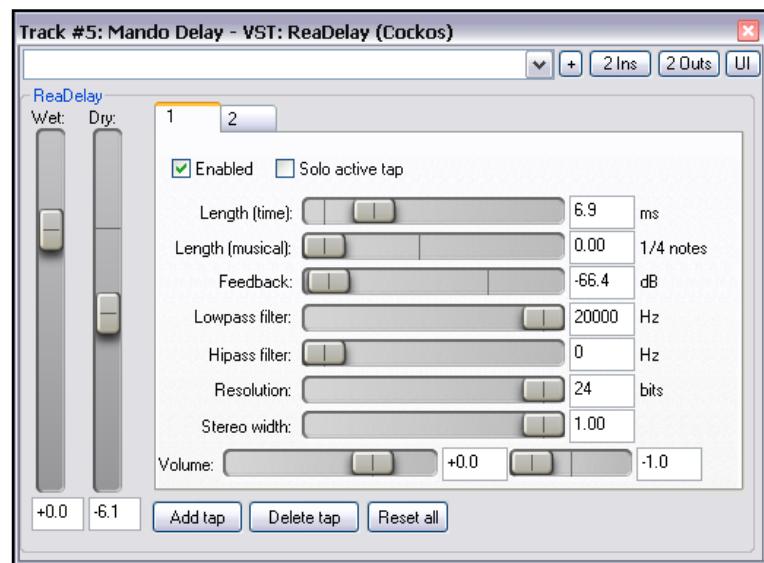


shown below.

3. Add an instance of **ReaDelay** to the FX Chain for Track 5. Make the settings approximately as shown on the right.

Notice the **Length (time)** is about 7 ms, **Length (musical)** is 0, **Feedback** is about -66 dB, and panning at -1.0 is 100% left.

4. Add a second tap. The settings should be similar to the first tap, except that the setting for **Delay (time)** should be about double the first tap, and panning at +1.0 should be 100% Right.
5. After ReaDelay, add an instance of **ReaEQ**. Add some gain at about 180 Hz to warm this track up a little.
6. At the end of the FX Chain, add **ReaComp**. Apply some gentle compression to “tame the peaks” for this tracks.
7. Make any other adjustments you wish and save the file. Notice how the Mandolin now seems fuller than it did before.



The file **Pelverata Frost MANDO 2A** contains a possible solution to this exercise.

3.8.7 Understanding and Using Reverb

REAPER supplies you with at least two Reverb plug-ins – **ReaVerbate** and **ReaVerb**. ReaVerbate is simple but surprisingly powerful. ReaVerb is even more powerful but quite complex in its setup. You’d be well advised to get a good grip on the basic theory and application of reverb before attempting anything too ambitious with ReaVerb. For this reason, in this section we will be using another excellent freeware reverb program, **Kjaerhus Audio Classic Reverb** in the various examples.



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This plug-in can be downloaded from <http://www.kjaerhusaudio.com/classic-reverb.php>

The challenge of using reverb is to try to recreate digitally and artificially the sound produced in a wide variety of environments, ranging for example from a small nightclub to a church or concert hall to a cavern or a cellar. Before putting reverb into practice, therefore, it's worth spending a little time becoming familiar with reverb's main parameters and how they help create the illusion that music is being experienced in a church, hall, or other natural environment.

Different reverb plug-ins vary slightly from each other. Some use different terms to describe what is essentially the same parameter. Some include extra features, for example a number of "colour" controls which essentially apply EQ to the reverb feature. The key parameters, however, are as follows:

Reverb Parameters	
Parameter	Explanation
Pre Delay	<p>Imagine that you are sitting in a room listening to a musician who is playing a violin. As she starts to play, the sound of her music travels out in all directions. If you had been alone in a vast open field, all of the music that you would hear would have travelled directly from the violin to your ears.</p> <p>In an enclosed environment, however, what you will hear will be an incredibly complex pattern of sound. Some will reach your ears directly from the instrument. These will be immediately followed by those sound waves that have bounced off a surface (such as a wall). The very short time that passes between these two events taking place is known as the Pre Delay. Increasing this variable creates the illusion of a larger space.</p>
Early Reflections	<p>Early reflections are those sounds that reach our ears directly and distinctly after bouncing off a surface such as a wall or a ceiling, or a piece of furniture.</p> <p>It is worth understanding that these sound waves do not come to an abrupt halt after bouncing off one surface. They instead travel further to bounce off another surface, then another, and another. Gradually, as they fade through time, these reflections become less distinct and merge into each other.</p>
Room Size Decay Time	<p>Some reverb FX use a combination of two parameters – Room Size and Decay Time – to achieve this next effect, others use just one or the other. The principle is the same.</p> <p>The time it takes for reflections, early and late, to reach the listener's ears and the rate at which these reflections will decay will depend in part upon the size of the room in which the music is being played and in which the listener is seated.</p>
Damping	<p>As our sound waves bounce around all over the place, their timbre or nature will be affected by the kind of material that they encounter.</p> <p>For example, reverberation off a hard surface like a concrete wall will be clearer and more distinct than will reverberation if curtains are hung in front of the same wall. In the latter case, the higher frequencies will decay more quickly, resulting in a warmer sound.</p>
High and Low frequency filters or attenuation	<p>These settings can be used to restrict the reverb to only the range of frequencies that we specify.</p> <p>We have already encountered this concept when we were looking at Delay.</p>

The Good and Bad News About Presets

It's worth taking a moment to discuss the presets that come with many reverb plug-ins.

The first thing you need to understand is that there is no magic or genius about them. A preset is simply a collection of settings that you might logically expect to belong together. For example, if you have a small room size, you would expect to find along with it a short pre-delay time. So the good news about presets is that for the most part they represent fairly safe and sensible combinations of settings. If you feel that you want to recreate the atmosphere of a basement nightclub or a medium sized concert hall, then it is possible that a suitable preset might be able to help you. You do need, however, to be much more wary of presets with names like *Male Vocal* or *Female Vocal*. Would you really, for example, treat voices as varied as Dean Martin, Sid Vicious, Bryn Terfel and Eminem in exactly the same way?

Another issue with presets is that their strength might also at times be regarded as their weakness. What if you are aiming to add a certain edge to an instrument's sound, or create more tension in a vocal? Quite possibly, one of the methods that you may wish to use to create that edge or tension might be to create a reverb effect that models an environment that simply cannot exist in the real world. If you want to be creative, if you want to really make the best use of reverb, you really do need to be prepared to travel outside the comfort zone of presets.

In short, presets may be often safe ... but they are not the be all and end all, and they are often also boring.

A Word About Convolution Reverb

Convolution reverb uses actual sound samples captured in certain specific environments to enable you to recreate those environments in your mixing. We'll look at some examples in a later section. One of the exciting aspects of **ReaVerb** is that you can use convolution reverb and build on it.

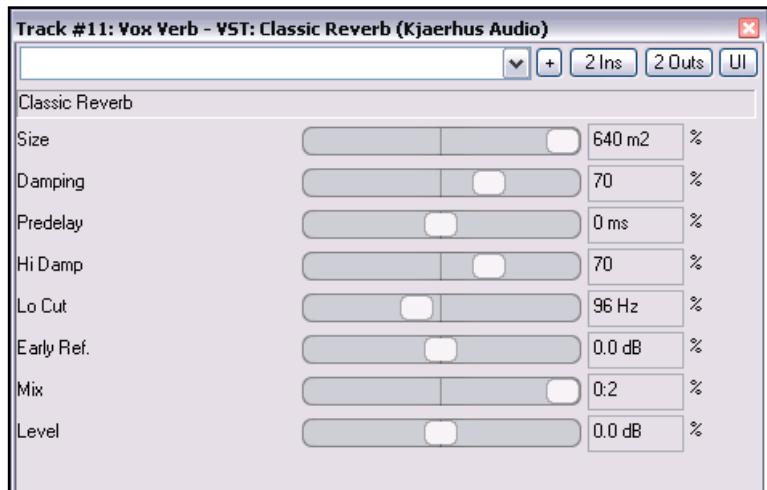
The REAPER UI Interface

At this point it's worth noting that REAPER allows you if you wish to use a plain interface for any VST plug-in, rather than the plug-in's native Graphical User Interface.

This can have certain advantages, for example:

- A consistent format across different plug-ins.
- Easy to use horizontal faders instead of virtual knobs and switches.

Shown on the right is the REAPER UI for Kjaerhus Classic Reverb.



Example

In this example, we are going to add some reverb to a project. We will start by applying a nice safe preset to an instrument mix. We will then see how by being just a little adventurous we can make our own reverb setting for our vocals and our percussion.

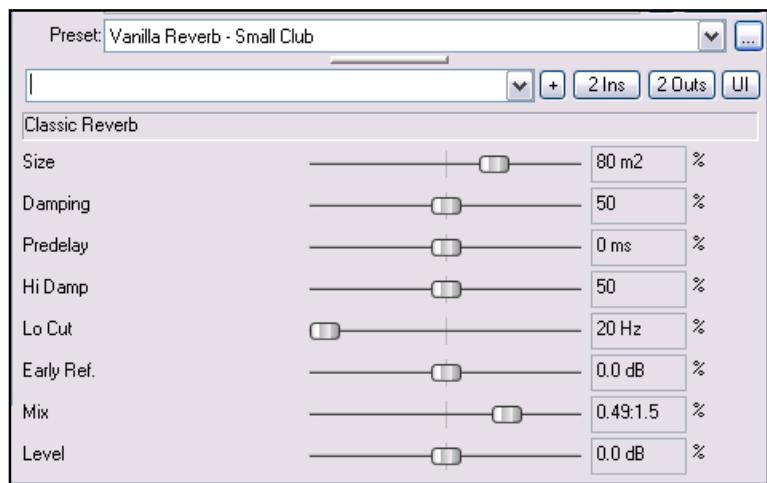
Please note, again, that the object of this exercise is not to create the ultimate mix. When you open the file you will see, for example, that neither EQ nor compression have been applied to the tracks. Usually you would do this before adding reverb. In practice you will usually find that the optimum reverb settings will in part be affected by such factors as your use of EQ and compression (which, incidentally, makes the use of reverb presets even more pointless). In this example, however, the focus is on helping you to learn and understand how to use reverb to get the sound that is best suited for your mix, not for someone else's.

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1. Open the file **Don't Keep Me Waiting REVERB** and immediately save it as **Don't Keep Me Waiting REVERB 1**
2. Select the last track. Insert four new tracks after it.
3. Label the first of these tracks **Reverb Mix** and make it a track folder.
4. Label the other three new tracks **Vox verb**, **Instr Verb** and **Perc Verb** respectively. Make the **Perc Verb** track the last track in the folder.
5. Insert an instance of **Kjaerhus Classic Reverb** in each of the last three tracks.
6. Insert a new track immediately above the **Guitar Body** track. Make it a track folder and label it **Instruments**. Make the track **Harmonica Amp** the last track in the track folder.
7. Insert a new track immediately above the **Kick** track. Make it a track folder and label it **Percussion**. Make the track **Perc Ohead** the last track in the track folder.
8. Save your file, which should now resemble that shown below:

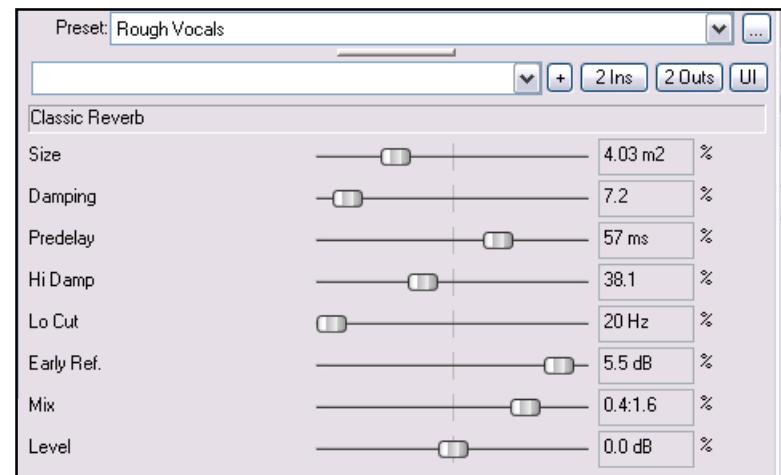
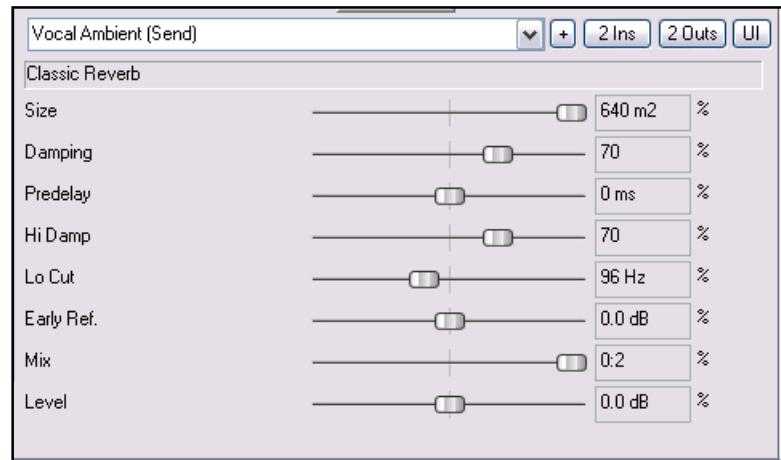


9. Make sure that your Mixer View is displayed and that you have checked the option to display both Sends and FX Inserts. In mixer view, drag and drop from **Vox** to **Vox Verb** to create a send.
10. Drag and drop from the **Percussion** folder to **Perc Verb** to create a send.
11. Drag and drop from the **Instruments** folder to **Inst Verb** to create a send.
12. We are now ready to set about creating our different reverb effects. In this exercise many of the decisions made will of necessity be very subjective and dependent upon exactly what sound the producer has in mind. For the time being, go along with the assumptions and examples given. If you don't like them, feel free to change them later.
13. Let us suppose that our

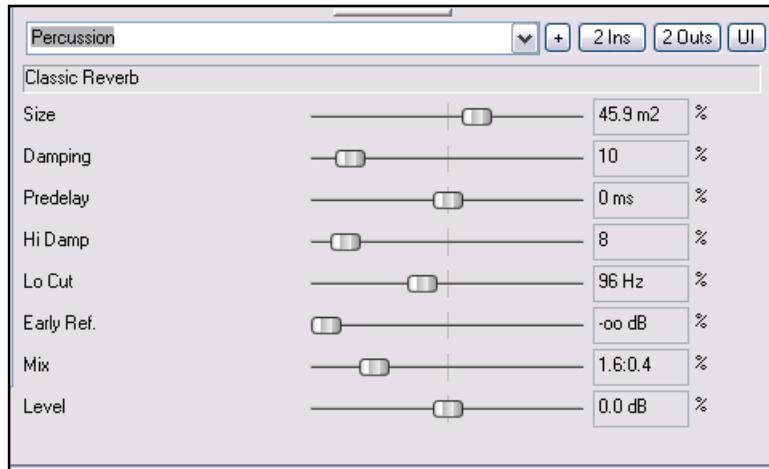


producer has asked for an overall effect of a Small Nightclub, with a rough edge on the vocals and “out there”, sharp, almost brittle, percussion. We’ll start with the general instruments.

14. Solo the **Inst Verb** track. Open the Classic Reverb plug-in. Select the preset **Small Club (send)**. Fade the Mix setting about three quarters of the way down so that you can hear how the track will sound when mixed with the reverb. Play the track. Let’s say that we’re happy with that as a general reverb sound.
15. Solo both the **Instruments** folder and the **Inst Verb** track. Adjust the mix and volume levels for the reverb plug-in along with the track volumefader until it sounds about right. If you like these settings, save them in your own presets list. In the example shown above, we have named it **Vanilla Reverb – Small Club**.
16. Now for the Vocals. Select the **Vox Verb** track, open the FX Window and try the plug-in **Vocal Ambient** as shown right.
17. Play the song. Clearly this vocal sound is nothing like the effect we are after. Sweet and sugary would be a better description than rough around the edges.
18. By making radical changes to these settings, however, we can create the desired effect. This can be done by creating a permutation of settings that adds a certain tension to the effect. For example, what happens if you define a low setting for the Room Size with apparently contradictory high settings for Early Reflections and Predelay? Try it and see (lower right).
19. Again, as you experiment, do so initially with the **Vox Verb** track soloed and a low mix setting. This will enable you to test your reverb as it will be applied in the final mix. When you have the results that you want, increase the mix level and save it as a preset of your own.
20. Settings similar to those shown on the right should give you that rough sound that you want on this vocal track. Notice that this bears almost no resemblance to the vocal preset that we started with.
21. Now for the percussion. Again, if you wish, you can try out one of the percussion presets. You will find that brittle is the last word that you would use to describe any of them. This is not a blanket criticism of the presets – for certain styles of music and in certain situations they would no doubt be admirable. They just aren’t what we want here.
22. Use the same technique as before to create the effect that you are seeing. Below are shown, for comparison, one of the Percussion presets and a possible permutation of settings that should provide the kind of sound that we are seeking.

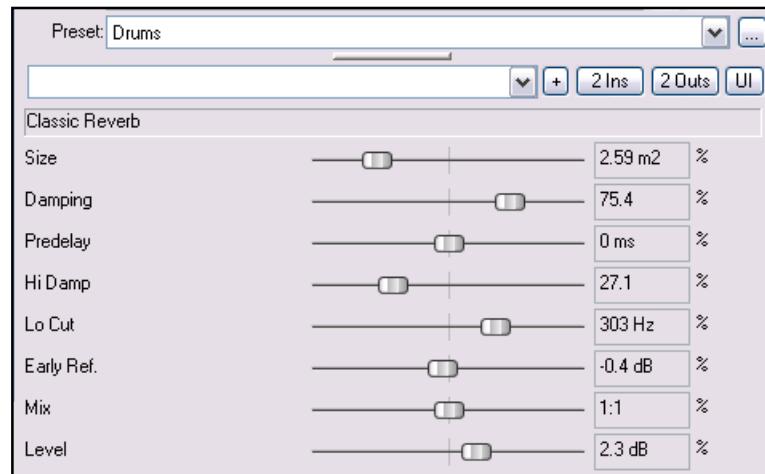


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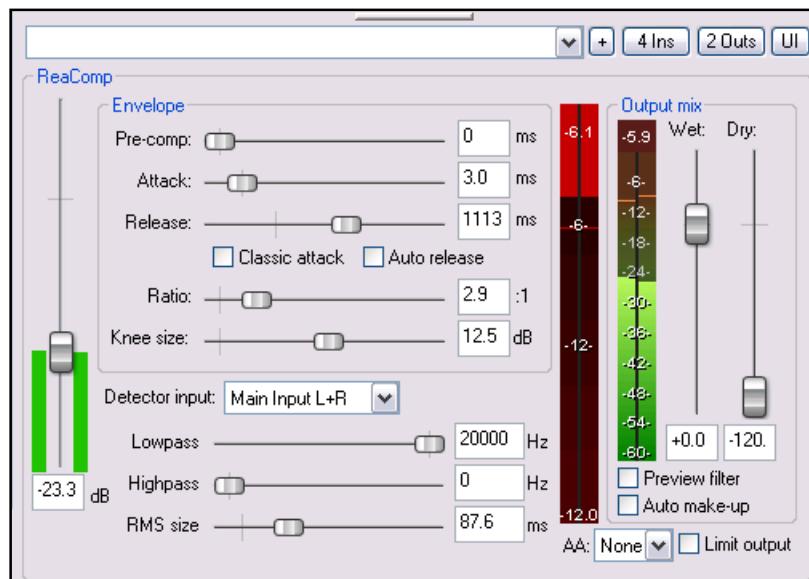
Shown left are the settings generated by the Percussion preset.

Shown right is an entirely different set of settings, designed to create a more up front, brittle percussion effect.



23. Finally, we're going to try another trick. Add **ReaComp** to the **Reverb Mix** track folder. This can be very effective not only in preventing reverb peaks from jumping out of the mix, but also, especially in this case, of polishing up, or perhaps evening out, some of the rougher edges. This statement might at first appear rather contradictory, but try it and you should be able to discern the difference.

24. Save your work.



Note 1:

The file **Don't Keep Me waiting REVERB A** contains a suggested possible outcome for this exercise. Open it and explore it at your leisure!

Note 2:

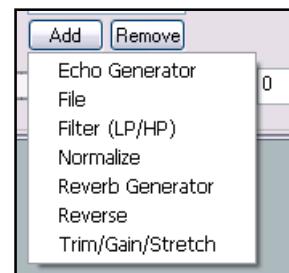
Adjusting reverb settings on the fly can produce crackles and other audio glitches if your sound card's buffer size, number of buffers, or latency settings are not optimal. You may need to experiment with your sound card's settings to get this just right.

3.8.8 Reverb Magic with ReaVerb

We are now ready to look at a very special reverb plug-in: ReaVerb. Its capabilities are truly awesome. In fact, it's no exaggeration to say that ReaVerb begins where many other reverb plug-ins leave off.

With ReaVerb, you can create your own completely custom reverb effect by defining and then chaining modules of various types. The possibilities are almost literally limitless. The first thing to realise about the **Add** menu (shown right) is that there is no special significance (other than alphabetical!) to the order in which the choices are listed. You can freely experiment with chaining your modules in different orders, to obtain different results. The better you understand it, the more confident you will be in using it – but as ever, the golden rule is to trust your ears.

Shortly, we'll work through one or two examples, but first let's get an overview of the different types of module that are available to you.



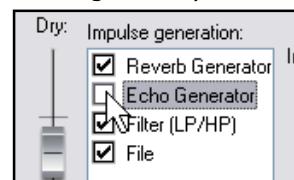
ReaVerb Modules	
Parameter	Explanation
Echo Generator	Used to generate an echo effect. Parameters which shape the sound and duration of the echo include: <ul style="list-style-type: none"> Start position – milliseconds after the sound before the echo starts. Length – how many seconds the echo lasts. Spacing – how many milliseconds between repeat echoes. Error – allows for some imprecision in the creation of the echo to make it sound more natural. Start and End Volume. Volume of the echo at the start and end.
File	Allows you to import a convolution reverb file, referred to as an impulse. Impulses are actual recordings that have been sampled in specific environments and are used to recreate the reverberation experienced in those environments. These files can be created in various formats, but ReaVerb allows for only one file type (e.g. WAV or OGG) per project. <p>You will find a growing collection of convolution reverb files available for free download at http://stash.reaper.fm/tag/Reverb-Impulses</p> <p>If you search the web, you will find plenty of others besides these.</p>
Filter (LP/HP)	Allows the effect(s) in the chain to be applied to only those frequencies in a specified frequency range. This can help cut out low frequency reverb rumble and high frequency reverb sizzle.

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ReaVerb Modules	
Parameter	Explanation
Normalize	Adjusts the overall level of the output of the chain.
Reverb Generator	Used to generate a reverb effect, in a similar way to that which is used by other reverb plug-ins such as ReaVerbate or Kjaerhus Classic Reverb.
Reverse	Reverses the direction of the reverb effect.
Trim/Gain/Stretch	Enables you to further shape the output of the reverb signal by stretching its time. Parameters include: <ul style="list-style-type: none"> Start position. The position at which the time stretch will begin. Maximum length of the time stretch. Gain – increase or decrease in signal strength. Stretch – the factor by which the time is to be stretched (if greater than one) or compressed (if less than one). Pre silence. A similar concept to pre-delay, this is the period of silence before the reverb is stretched.
Width Pan	Notice that near the bottom of the ReaVerb dialog box there are controls for Width and Pan . These determine how your reverb effect will be perceived with regard to these particular dimensions.

The combination of several of these tools allows you to create reverb effects that will have significantly more layers of depth to them than is often possible with conventional reverb plug-ins.

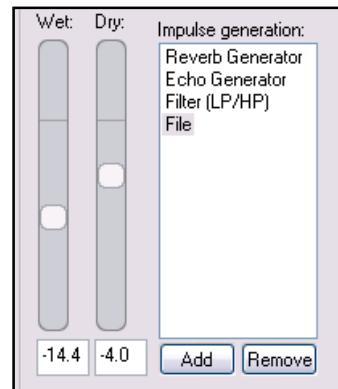
If all this seems a little daunting, then just keep in mind this next point. *You don't have to be an expert to start using this amazing toolkit.* You just have to be prepared to be patient, innovative, a little courageous and proficient with the **Toggle effects bypass** option (see right). As you experiment, you'll soon discover for yourself what works well and what doesn't.



Example

As with all of the other examples in this section of the primer, the exercise that you are about to undertake is not designed to create a definitive perfect mix. It has specific, limited objectives – in this case to teach you how to use ReaVerb to create great sounding reverb.

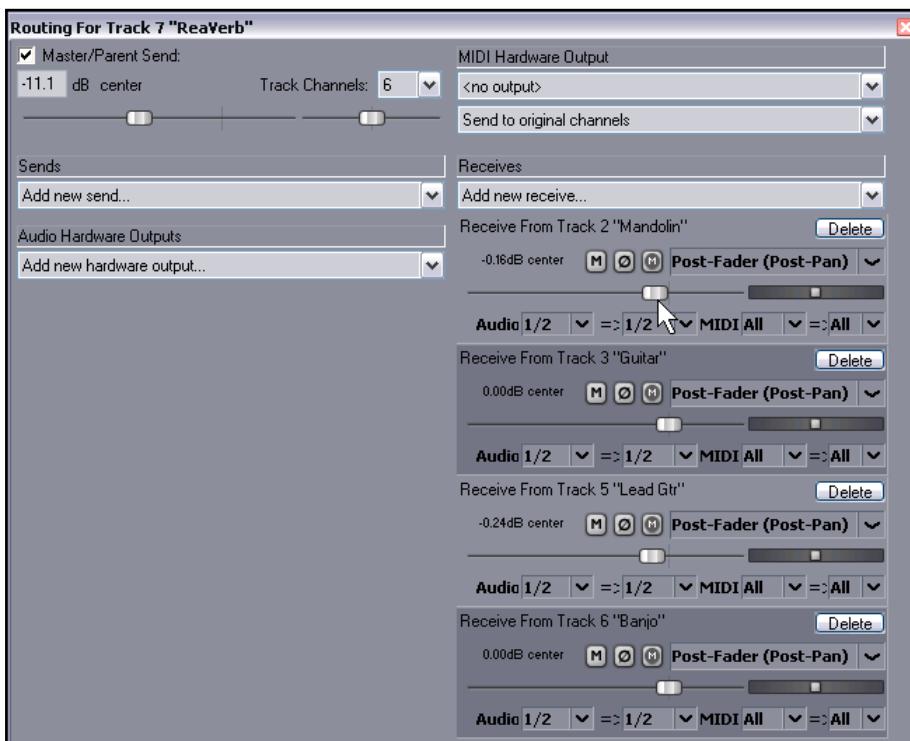
Before you begin, visit <http://stash.reaper.fm/tag/Reverb-Impulses> and download the various **Pipeline Audio** convolution reverb files. Unzip them and place the assorted .WAV files into a folder somewhere on your hard drive. Something like **C:\Program Files\REAPER\Reverb Impulses\Pipeline** would be as good a location as any.



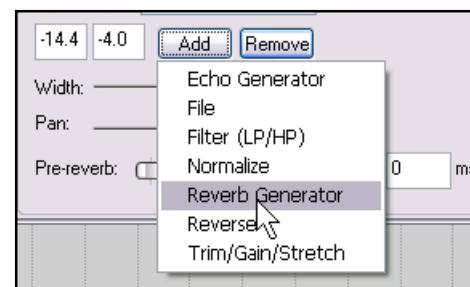
In the example that follows, we will build up a reverb effect using several of the available modules (see right). Our goal is to create an effect which creates a real feeling of depth and space without sacrificing definition, presence or clarity. As you develop a better understanding of ReaVerb, you will find that the most convenient way to do this is by creating a chain of modules within a single instance of ReaVerb. However, for learning purposes in this exercise we will be using two separate instances of ReaVerb. This makes it easier for you to understand what we are doing.

As you will see, one of the keys to success here is not to overdo it. With Reverb probably more than any other FX, a little can go a long way.

1. Open the project file **Pelverata Frost REAVERB** and immediately save it as **Pelverata Frost REAVERB1**
2. After the last track, insert a new track, Track 7.
3. Name this track **ReaVerb**. Make sure that it is *not* included in the Instruments track folder.
4. In Mixer View, make sure that the options to **Show FX Inserts** and **Show Sends** are both enabled.
5. Still in Mixer View, drag and drop in turn from each of the tracks Mandolin, Guitar, Bass, Lead Gtr and Banjo to create sends for each of these to the ReaVerb track.
6. Add two instances off **ReaVerb** to the FX Bin for the ReaVerb Track. Remember that you would usually use just one instance. We are instead using two instances for learning purposes.
7. Add an instance of **ReaComp** at the end of this track's FX Chain.
8. For the time being set all of the FX in the ReaVerb track to Bypass.
9. Solo the ReaVerb track and play the project.
10. Adjust the levels of the four sends if necessary until you are happy with the overall mix (see illustration right).



11. First, let's sample some convolution reverb. Enable the first ReaVerb instance, so that it is no longer set to bypass. View it, click on the **Add** button (shown right) and choose **File**. Navigate to where you stored your downloaded impulse files and select **02-6 Hall 1-18.wav**. Click on **Open**.
12. Make sure that **Normalize impulse** is selected. Play the file both with and without the ReaVerb track soloed. Adjust the wet level to suit. See sample settings shown on the right.
13. Rename the ReaVerb instance to something recognisable, such as **Verb File**.
14. This is actually quite a nice reverb – but you'll probably find it a little too "mushy". This is often a problem with reverb. If you fade it down to remove the mushiness, the reverb may disappear altogether.
15. Set this instance of ReaVerb to bypass. Select and enable the second instance so that it is no longer set to bypass.

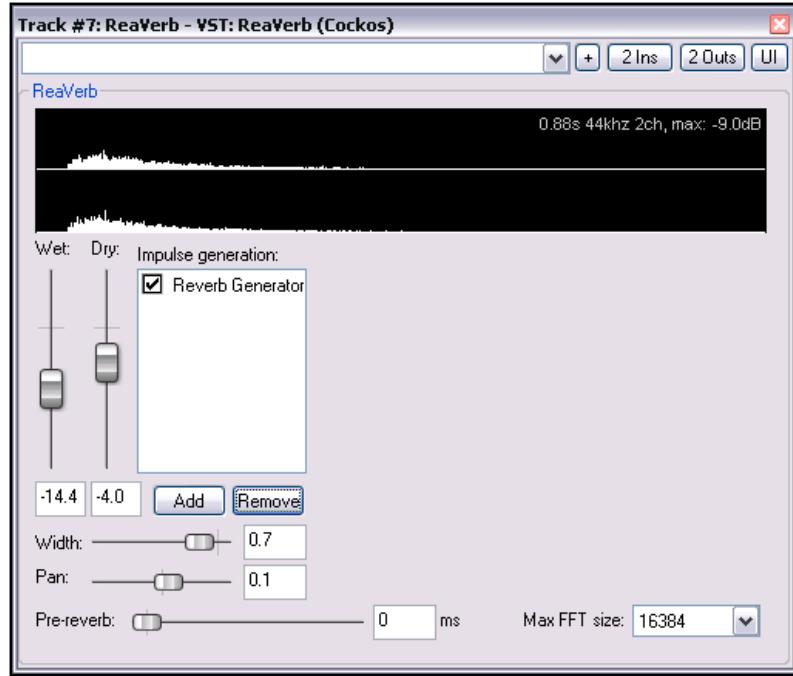


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16. Click on the **Add** button within the plug-in and select **Reverb Generator** from the menu.

17. Adjust the settings approximately as shown. Note especially:

- By specifying a Start Pos of 10 ms we ensure that the audio signal is heard clearly for a brief moment before the Reverb kicks in.
- Both Length and Room Size are fairly conservative settings.
- The slightly higher Dampening setting prevents the reverb tail from lingering too long.



18. Now click on **Add** again and add an **Echo Generator** to this plug-in. This is shown below.

19. In this case we are going to add a very small amount of echo to our Reverb chain. This will very subtly create further depth.

20. Try settings such as those shown on the right at first. Later you can adjust them if you wish.

21. Experiment as you play the song. You will probably end up with settings similar to those shown on the right.

22. You might notice some rumble from the reverb on the low frequencies and some sizzle from the high frequencies. We can filter these out.

23. Click on the **Add** button and select **Filter** from the list.

24. Make your adjustments slowly and carefully so that you can judge their effect.

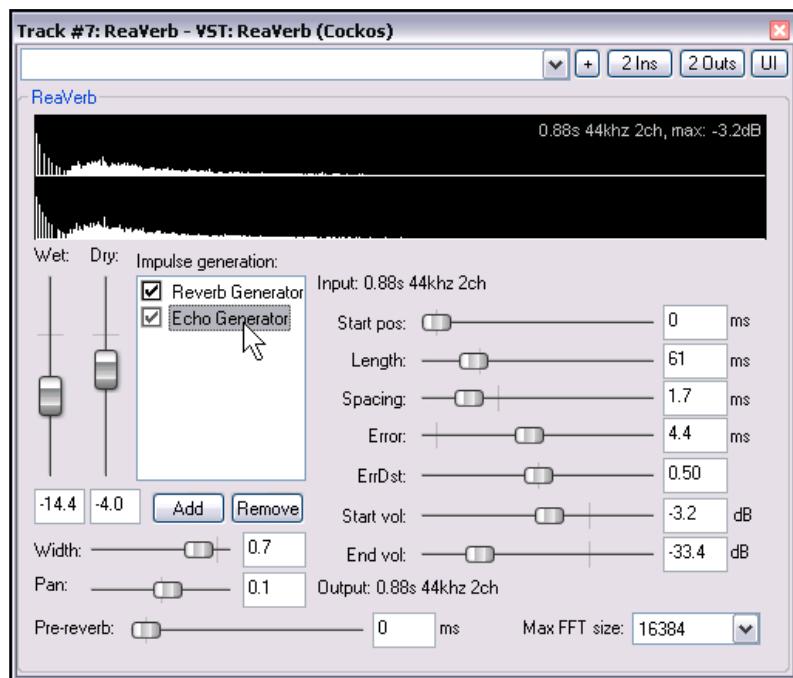
25. Lower the Lowpass setting to about 0.750.

26. Raise the Highpass setting to about 0.005,

27. We are starting to build up quite a chain. Adjust the Wet and Dry output faders so that the Wet level is about -14 dB and the Dry about -4 dB on each of them.

28. Play the file with the Reverb track soloed.

29. As you listen, you might

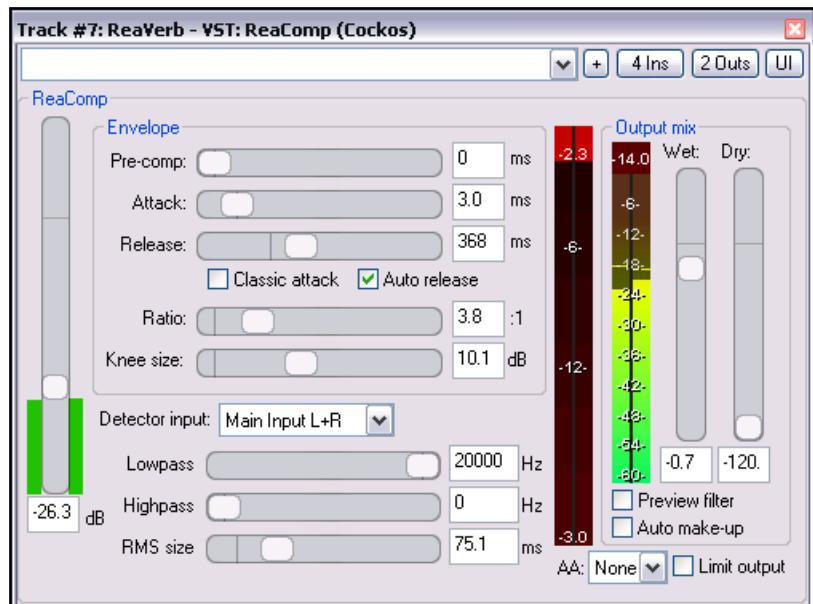
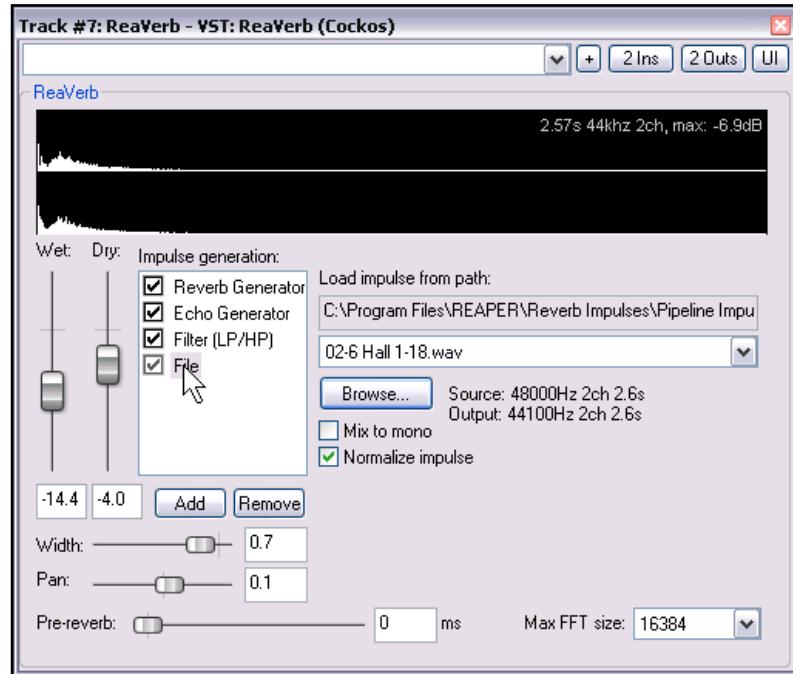


notice that the Reverb is perhaps a little too tinny, or edgy. It could do with some smoothing.

30. We are now going to add back our original convolution reverb file at the end of our reverb chain. This should smooth out the sound quite nicely.
31. Click on **Add** again, choose file and select **02-6 Hall 1-18.wav**. Click on **Open**. Make sure the **Normalize impulse** option is ticked. Play the file again. You should notice a significant difference.
32. Play the file again, alternatively bypassing one or other of the two ReaVerb instances.
33. You should find that the chain that you have created has more depth and space about it than just using the convolution reverb file, yet at the same time it maintains clarity and distinction between the different instruments.
34. Save the file.
35. Play the file. As you do so, experiment with bypassing the various different ReaVerb individual modules. This will better help you to understand not only the effect of each individual module, but also how they blend together.
36. With all ReaVerb modules again engaged, extend the **Width** fader to 1.0. You should notice the sound becoming distinctly fuller.
37. We've got one more trick up our sleeve – **ReaComp**. By gently compressing the signal after the reverb (see right) we can prevent any rogue reverb passages from jumping out of the mix.
38. Adjust the Volume fader on the Reverb track. You don't want to make it too loud, probably around -11 dB.
39. Save your work!

Note 1:

The file **Pelverata Frost REAVERB1 A** contains a possible suggested solution to this exercise. By all means explore it!



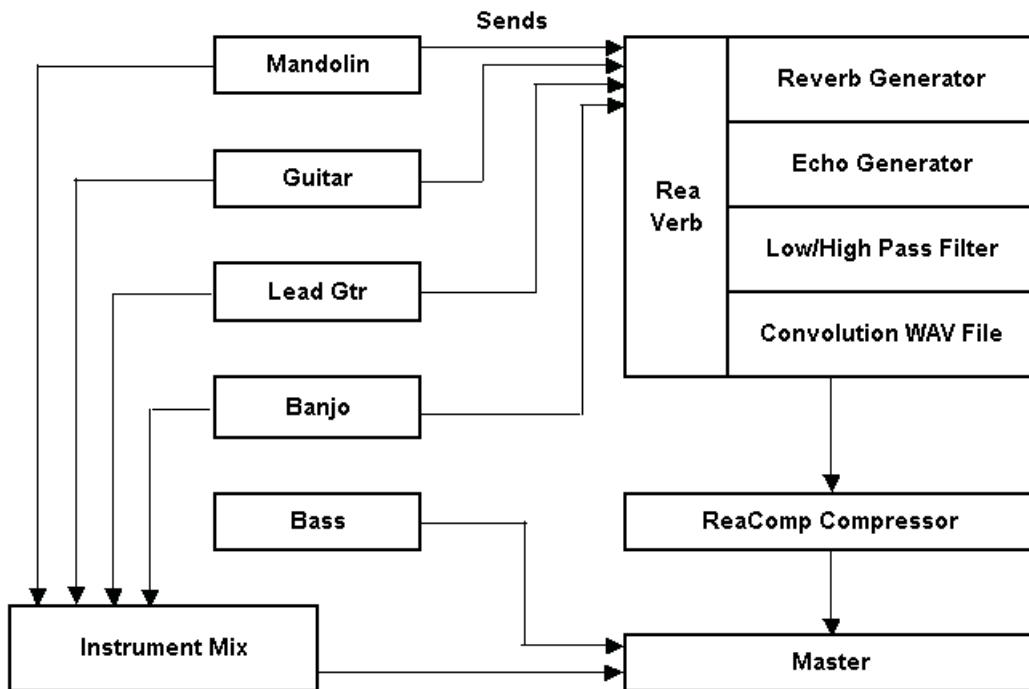
The audio signal routing for this project is represented in the flow chart below.

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Note 2:

There are many interesting experiments that you can perform with ReaVerb to get exactly the effect that you are after. Here are a couple of tips:

- Try dragging and dropping to change the order in which the modules are placed in the chain. This can make a dramatic difference to the sound. In particular, you can get some really good results placing the impulse file first in your chain, then using other modules to modify it.
- Adding a **Time/Gain/Stretch** module can help to make the reverb effect crisper and sharper (Stretch value less than 1.0) or smoother and gentler (Stretch value greater than 1.0).
- Adding a **Noise Gate** after the ReaVerb plug-in can have the effect of cutting off more suddenly the late reverb tail.



3.9 Time (Length)

Time as a separate dimension – real time that is – is a concept that may seem difficult to grasp at first. It is certainly one that is often overlooked. In fact, it is probably the simplest dimension of all to use in mixing, as well as arguably being the most under-used. It is simply this:

Any song or tune is played in and through time. A three minute song will play for three minutes. Those three minutes are dynamic, not stationary. Therefore, neither should your mix be stationary. The mixes that will leave most impression on your listeners are likely to be those where changes, often subtle changes, will occur to various elements of the mix through time. These might be changes in panning, or in EQ emphasis, or in volume, or in some combination of these, or in many other aspects of sound. Usually they will require the use of automation envelopes.

Sometimes the most effective uses of automation in a mix can be to add subtle changes of which the listener may not even be consciously aware. Many of the examples that follow will encourage you to do this.

3.10 Multidimensional Mixing Examples

Now that you've got to grips with the four spatial dimensions of sound, and how they interact with each other, you are ready to go on to learn the most exciting point of all. When you have mastered this next concept and its implementation, you will be able to begin making mixes that will truly take the listeners' breath away (and without them ever knowing why!).

We have already learnt that in mixing we are using the tools at our disposal to create not real space, but the *illusion* of space. The secret lies in learning how to combine the ways in which you use width, depth, height and time so as they work *together* to create a truly multidimensional mix.

Since what we are creating is not real but an illusion, *this means that in your mixing you should be capable of creating sound scapes that cannot actually exist in the real world*. Sounds can behave inside your mix in any number of exciting ways that are simply not possible in the real world. Let's look at some examples. They have been selected with the intention of expanding your mixing horizons. Some will be easy to follow, others not so. Persevere if you really want to learn.

3.10.1 Shadow Panning

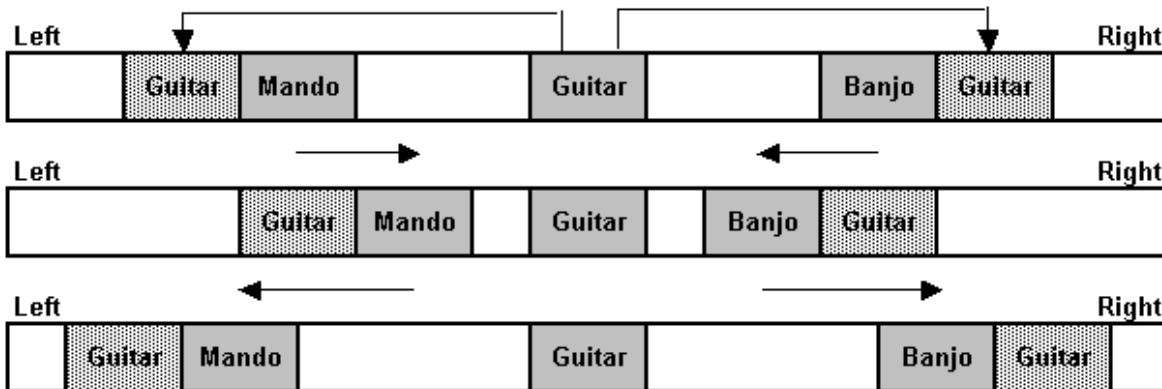
Shadow panning is a variation on the technique of bookend panning that we encountered earlier. With shadow panning, in addition to normal panning we use sends and channel splitting to ensure that the signal from one track will shadow that on another track always, for example, remaining just a little to the left or right of the signal it is shadowing. This can ensure that as one track is panned further away from or closer to the centre, the track that is shadowing it will always remain just that little bit further outside it. Shadow panning is at its most effective when used in conjunction with other mixing techniques, such as EQ and delay or reverb.

One use for shadow panning is to fill out and fatten up an otherwise sparse mix. It can be especially effective when this thin mix includes a fairly bland instrument which is too easily over-dominated by the other instruments. We will do this by using sends from our subject track (in this case the Guitar) to the tracks that are to be shadowed (in this case, Mandolin and Banjo). By this process, that portion of the signal that is sent from the subject track actually becomes attached to and a part of the track being shadowed.



Above: Before Shadow Panning

Below: After Shadow Panning. Notice that as the panning of the Mando and Banjo tracks are changed, the guitar signal received from the original Guitar track is dragged along with them, as if it were their shadow.

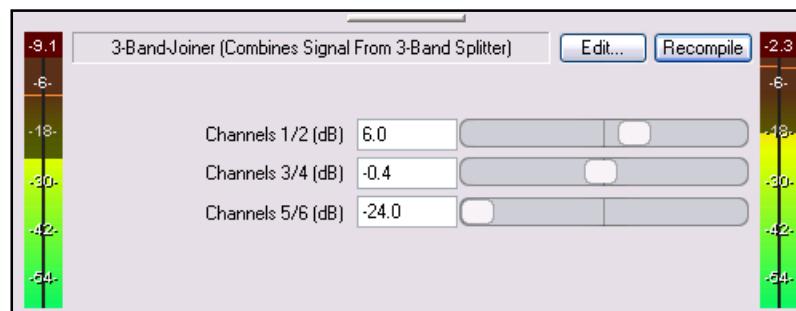
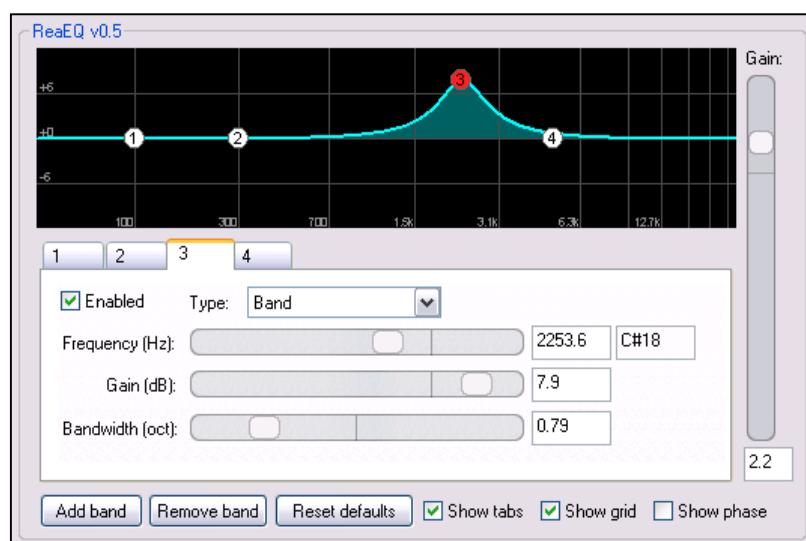
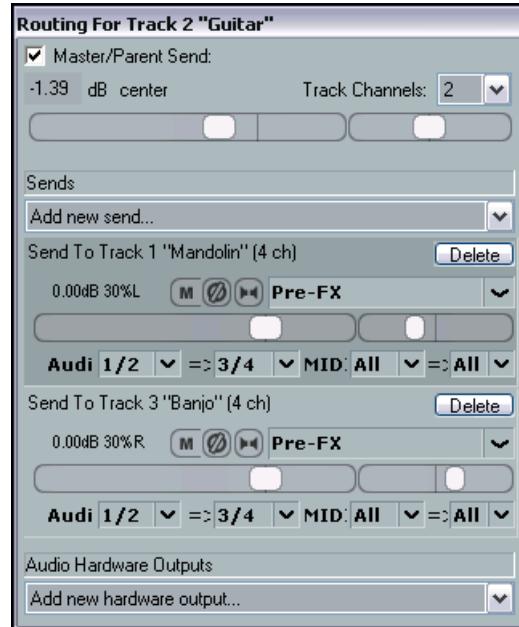


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The effect that we are aiming to achieve is illustrated in the diagram above. Notice that no matter what panning changes are made, each instrument still has its own defined space in the left-right spectrum.

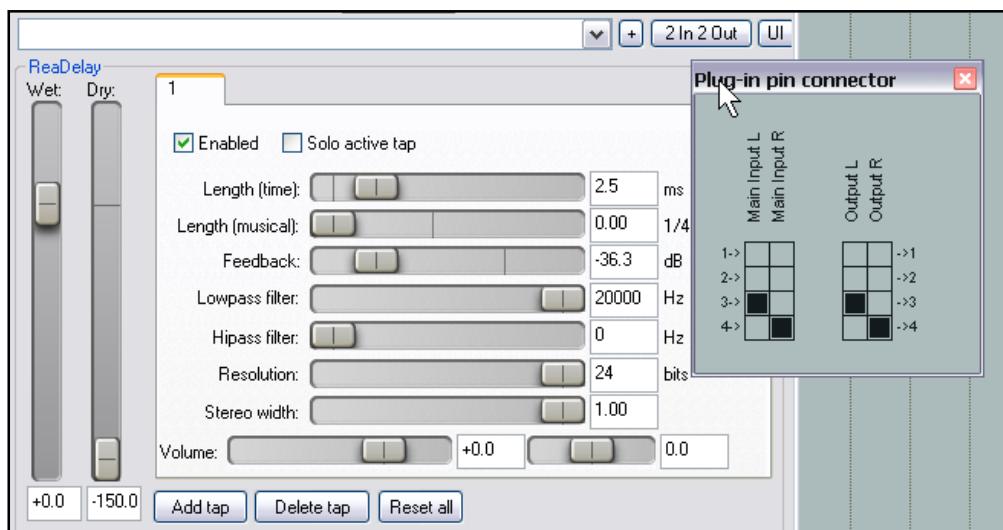
Example

1. Open the file **Pelverata Frost SHADOW** and immediately save it as **Pelverata Frost SHADOW1**
2. Play the song. You can see it consists of a mandolin, a banjo and a rhythm guitar.
3. **Pan** the Mandolin about 70% left and the Banjo about 70% right. This will certainly give you more separation and make the individual instruments more distinct. However, the mix still seems a bit thin and even disjointed.
4. Open the **Routing (I/O)** window for the Mandolin and set the number of Channels to 4. Do the same for the Banjo.
5. Open the **I/O window** for the **Guitar** (see right) and create sends to both the Mandolin and Banjo tracks. In each case, the send should be **Pre FX** and go to **Channels 3/4** on the receiving track. Pan the Mandolin send 30% left to ensure it stays to the left of the Mandolin track, and pan the Banjo send 30% right. This is shown on the right.
6. Open the **FX Window** for the **Guitar**. If you like, add ReaEQ to this window and make such adjustments as you think appropriate for brightening the guitar a little.
7. Solo and play the **Mandolin** track.
8. Add an instance of **ReaEQ** and select band 3. Set the frequency to about 1500 Hz, bandwidth to about .65 Octave and add about 6 or 7 dB of gain. This should make the Mandolin a little more present. Add also a little overall Gain, as shown.
9. Add at the end of the FX chain **JS LOSER/3BandJoiner**. As you play the track you should now be able to hear the Guitar that is being fed from Track 2 as well as the Mandolin. Note that the three bands are labelled Low, Medium and High, but in fact they simply represent Channels 1/2, 3/4, and 5/6 respectively.



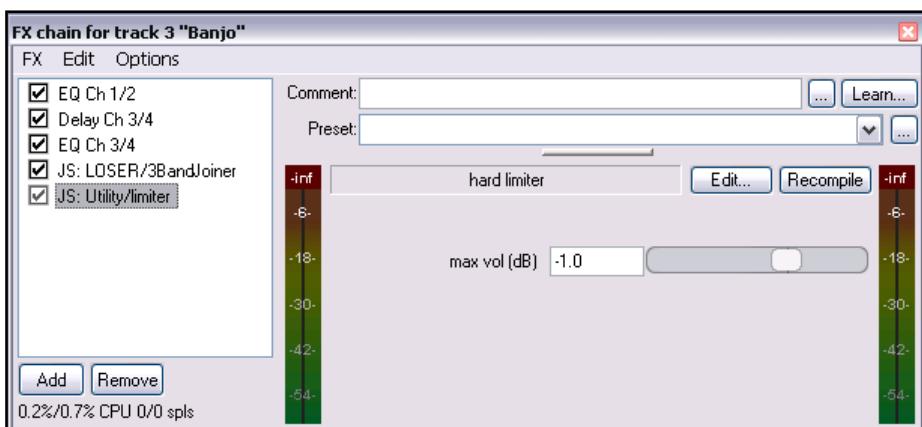
If you wish, you can edit the Plug-in text and recompile to change this (as shown).

10. Fade Channel 5/6 all the way down (these channels are not used in this example) and adjust the other two faders to suit. An example is shown above.
11. Immediately above the **3BandJoiner** we are going to insert a plug-in to enhance the feeling of depth. In this example we will use **ReaDelay**, but you could try ReaVerbate or some other time based plug-in if you wish.
12. Set the Outputs for the Delay plug-in to only Channel 3 (Left) and Channel 4 (Right) as shown below. Set the Inputs to only Channel 3 (Left) and Channel 4 (Right). Use fairly conservative settings (you can always be more adventurous later) but make sure the Wet Output is set at 0.0 and the Dry output all the way down.



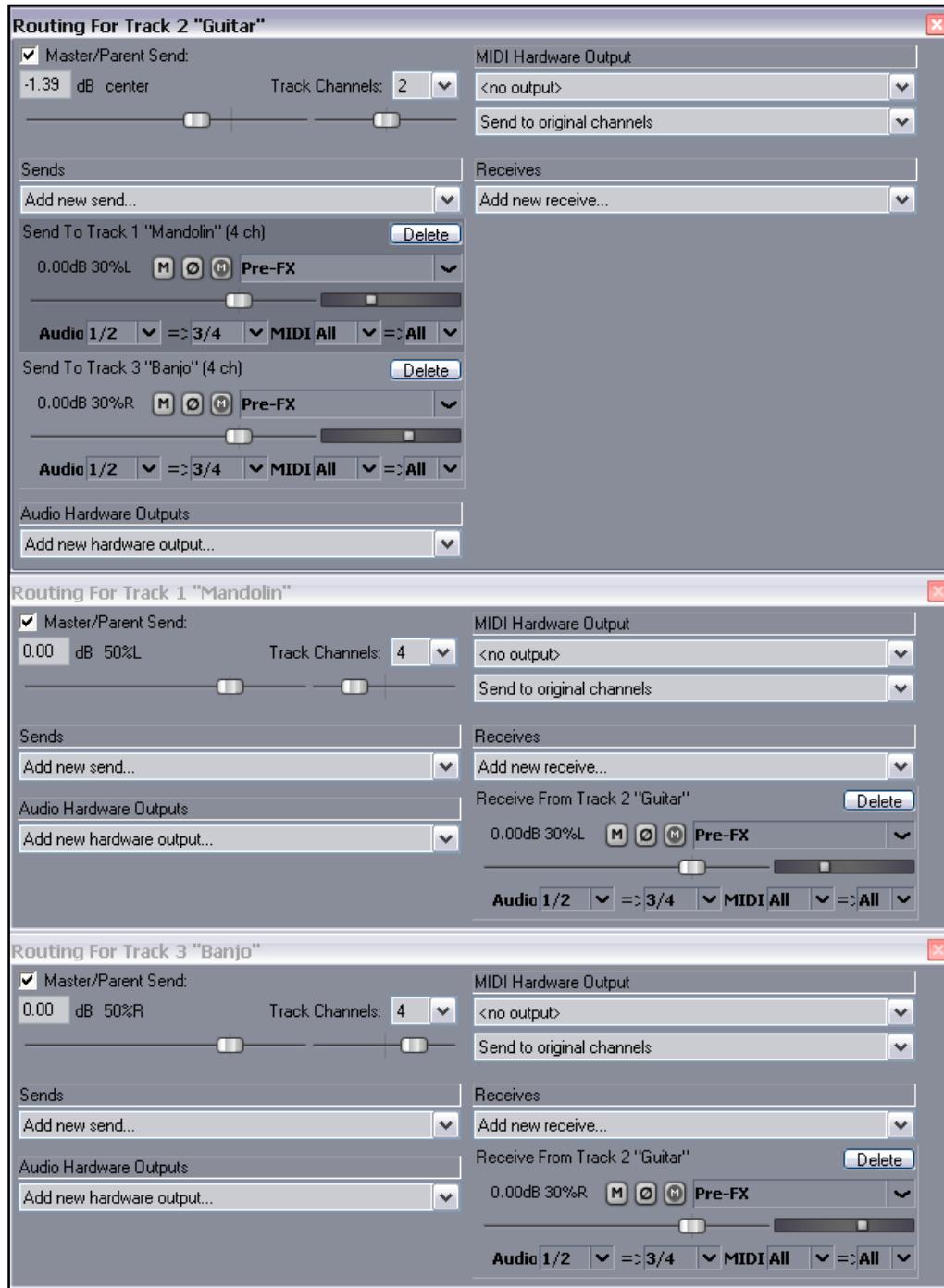
13. Immediately after the Delay plug-in and before the 3BandJoiner, insert an instance of **ReaEQ**. We will use this to shape the delayed audio signal a little so as to brighten it up. For this example, try setting Band 2 to 320 Hz, -7.5 dB, Bandwidth 2.00 and Band 3 to 4,700 Hz, +3.5 dB, Bandwidth 2.00. Don't forget to make the Input Channels 3 (Left) and 4 (Right) Only, and the Output Channels 3 (Left) and 4 (Right) only. If you wish to hear the delayed stream by itself, fade down Channels 1/2 in the 3BandJoiner.
14. Now unsolo the Mandolin track. Select and solo the Banjo track. Repeat steps 8. to 13. for the Banjo track. The EQ and Delay settings need not be exactly the same (it might be more interesting if they are not) but of course the signal flow – Input and Output channels – for each plug-in will need to be exactly the same.

15. The FX chain for the Banjo track is illustrated on the right. Notice that in this example the **JS Utility/limiter** has been added at the end of the chain to prevent the signal from becoming too loud.



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Track Routing Used for Shadow Panning



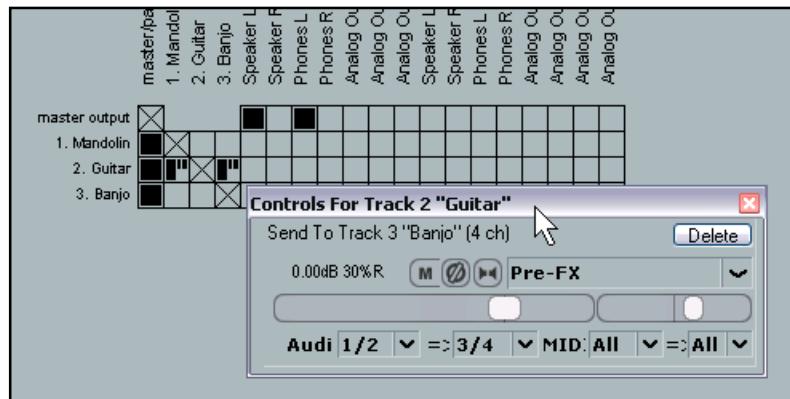
The illustration above shows the track and channel routing used in our Shadow Panning example. Notice in particular that:

- For each send from the source track (Track 2 in this example), there is a corresponding receive in a destination track (in this example, Track 1 and Track 3).
- Each send uses a dedicated pair of channels (in this example, Channels 3/4) in the destination track. This facilitates mixing using (in this case) the 3 Band Joiner.

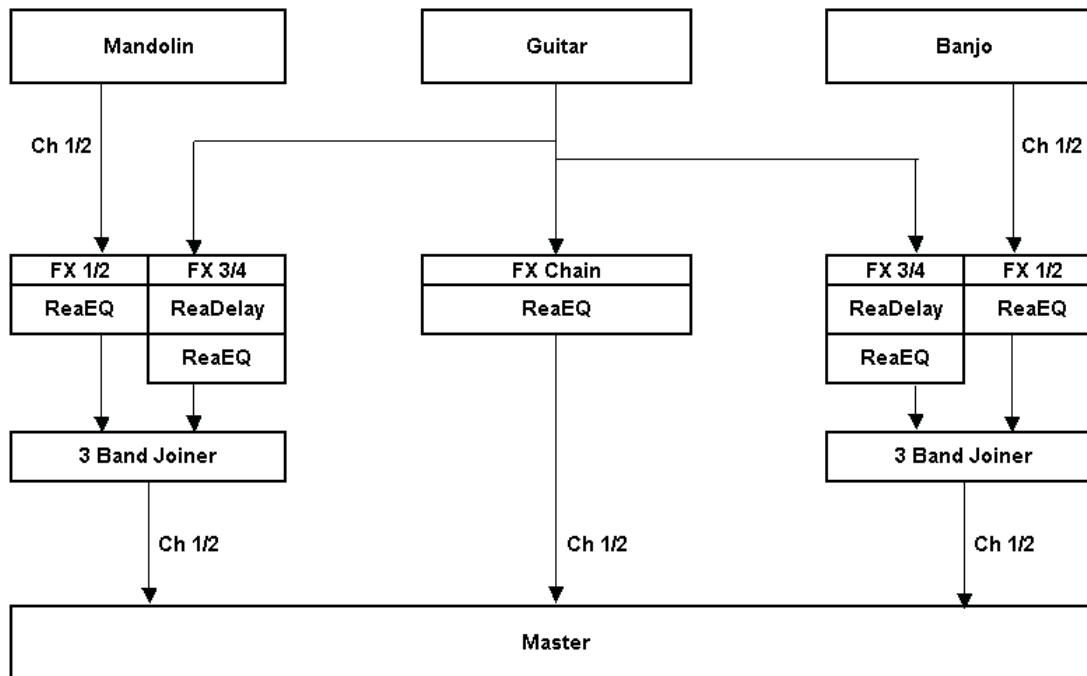
16. Now unsolo your Banjo track. Play the song. Each track should still be clear and distinct, but the rhythm guitar should now sound richer and fuller. Move the Mandolin and Banjo a little closer to the centre at 50% left and right respectively. The delayed guitar sends will fill the space outside them.
17. To test this, solo the guitar track and play the tune for a few seconds. Now hold down **Alt** and click again on the Solo button for the guitar track. You will now hear both delayed feeds along with the original guitar track.
18. Unsolo the Guitar track. Hold the **Ctrl** key down and click on any FX Bypass button to bypass all FX. Play the song for a few moments. Again, hold **Ctrl** while you click on any FX Bypass button – this will remove the bypass status. You should notice a considerable difference in the quality of your mix.
19. Save your file. If you wish, check out the file **Pelverata Frost SHADOW1 A**. Note that the final mix for this project is not yet complete – it's still "work in progress".

Notice that the various Sends and Receives that you have created are displayed on the **Routing Matrix** for this project.

If you wish, you can right click over any of the intersects to edit the parameters (such as volume and panning) of these Sends.



The flow chart below illustrates the signal flow used in this example:



3.10.2 Spacey Vocals

Everything in your mix is equally important, right? Well maybe, but I'd bet that if you had to choose just one aspect of your mixing which was more equal than all others, it would for most styles of music be the vocals. How many times have you heard a mix in which a thin wimpish vocals trickle out at you from dead centre between the speakers, often too loud because raising the volume has been the main or only technique used to lift them above the rest of the mix.

This sort of activity isn't mixing. It's assault on your ears with criminal intent. It's like inviting your friends for dinner, having a gourmet kitchen at your disposal and then serving up to them a plate of white sliced bread and margarine.

Let's see how by thinking smart we can come up with really interesting vocals. Remember two things that we have learnt so far:

1. It's about crowd control.
2. It's about developing a battlefield strategy.

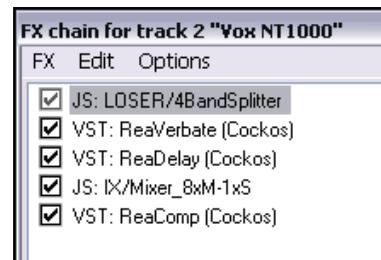
Think about the nature of singing. There are two particular characteristics of the human voice just crying out with the mixing opportunities that they create. Both are blindingly obvious, which might be why they are so often overlooked:

1. The frequency of the vocal will change constantly and continuously throughout the song.
2. The volume of the vocal will change constantly and continuously throughout the song.

It simply doesn't make sense to mix your vocals as if these factors were constants. Yet so many people do. Within your mixing arena you have a huge amount of space available in terms of various permutations of height, depth and width. The very last thing you should be doing is what so many people in fact choose to do – just confining it to a worn out scraggy little path straight down the centre mid-way between your speakers. With this in mind, we can subtly manipulate our vocals so that the voice weaves in and out of much of the space available, creating inside the listener's head a wonderful feeling of presence, fullness and majesty.

The really good news is that REAPER's channel splitting capabilities make this sort of activity so easy to do, and offer you so many options. The example that follows uses female vocals. The same principles, of course, can be applied to male vocals, just with different parameter settings.

The illustration on the right shows the FX chain that we will be using in this example. It is only an *example*, and once you have got to grips with the technique you will be able to create far more interesting instances for yourself.



Some Ideas for Spacey Vocals

There are a number of factors which determine how best you can use the technique described in this section to create spacey vocals. These include the timbre of the voice, the style of singing, the variations in volume, the microphone used and the microphone placement. Keeping this in mind, some of your per channel options include the following.

EQ to emphasise specific qualities of the voice.

Compression with different settings to make different frequency bands more or less present.

Reverb and/or **Delay** to add depth to the voice.

Also be prepared to experiment for the best effect with the frequencies at which you split your bands.

The principle at play here is this. We will first split the vocal tracks into four pairs of channels, in this case by frequency range – low, medium, high, ultra high. Each range will be panned differently, with different subtle FX applied to (in this case) two of the four ranges. The four channel pairs will then be joined up and gently compressed.

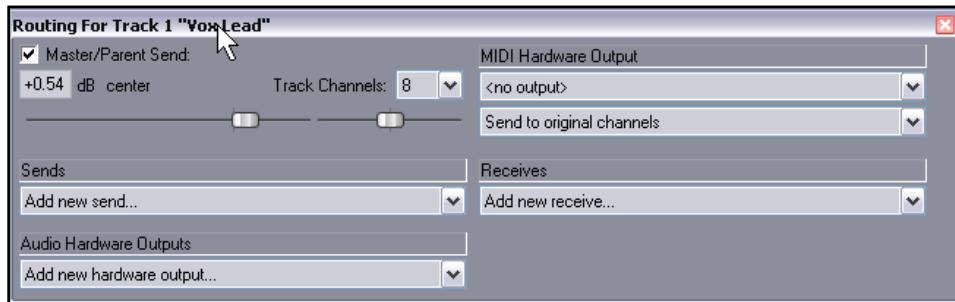
This will not only create a richer, fuller and more interesting vocal. It will also mean that as the song is played, various of these effects will be discernible from time to time (depending on other factors such as the levels of different instruments), ensuring that subtle changes to the vocal will occur as we move through that fourth dimension, time.

OK, let's do it. For this example, you can use the supplied project **RosesBloom.rpp** for learning purposes. Of far greater importance, however, is that you should learn to apply these techniques to your own mixes.

Example

1. Open the file **RosesBloom** and immediately save it as **RosesBloom SPACEY**.

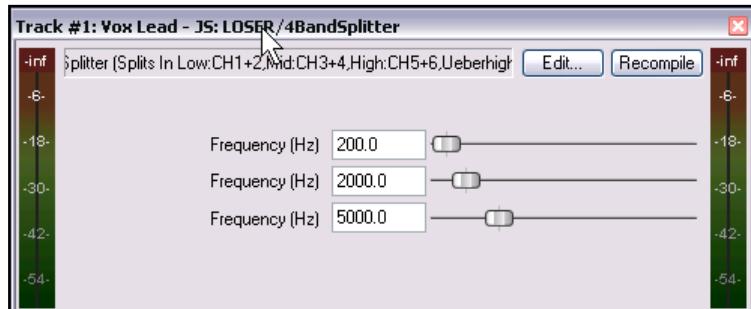
2. Select your vocal track, display its Routing Window and set the number of channels to 8 (as shown). Make sure the track is panned dead centre.



3. Open the FX Window for this track and insert the **JS: LOSER/4BandSplitter**. If you have any corrective mixing plug-ins in this track, place the 4BandSplitter immediately after them. Otherwise, the 4BandSplitter should be the first plug-in in the chain.

There are no hard and fast rules for choosing the frequencies at which you should split the signal. The example shown creates the following four bands:

Ch 1/2: Below 200 Hz
Ch 3/4: 200 to 2000 Hz
Ch 5/6: 2000 to 5000 Hz
Ch 7/8: Above 5000 Hz



4. What we are going to do next is simplicity itself, yet if you have never tried it before it will probably astound you. We are merely going to join our split channels up again and experiment with panning.

Add to your FX Chain the **JS: IX/Mixer_8xM-1xS**. Experiment with the panning as shown below. *Already your vocal track should sound brighter, fuller and warmer.* That's before adding any FX even! All we have done is given our vocal a little freedom to move at will within a band between the limits of the width and height of our mix.

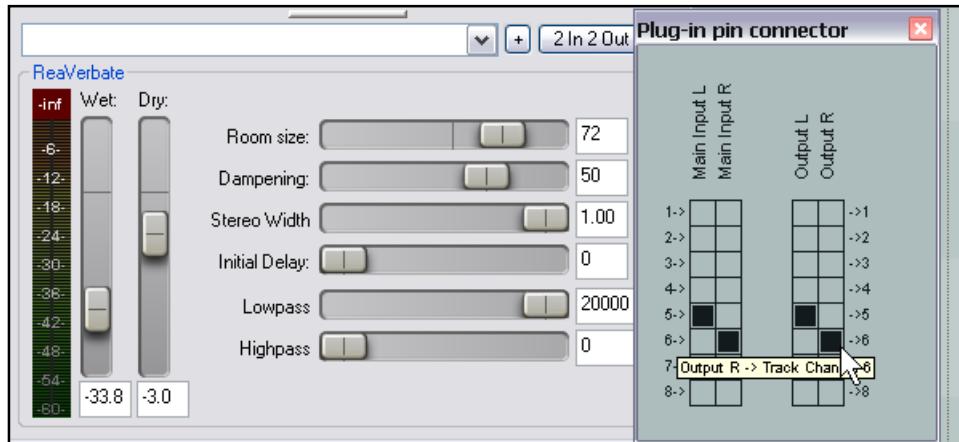
If you wish, experiment also with subtle changes in the levels of volume for the different channels. By doing so you are effectively applying some EQ to your track.

For this particular example, however, after you have finished experimenting, restore the levels for all eight channels to 0.0.

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Of course the best places to leave your pan settings will depend largely upon what else is in your mix. Remember also that you can apply automation envelopes to make dynamic changes to the panning of your different frequency bands as the song progresses.

5. Channels 3/4 and 5/6 cover the range of frequencies that our ears hear the best. By applying some subtle effects at these targeted frequencies we should be able to produce something quite interesting.
6. Add **ReaVerbate** to your FX Chain and position it immediately after the splitter plug-in. We have chosen this particular reverb plug-in because it is about as simple and unassuming a reverb FX as you will ever find. One point we will be demonstrating here is that *you don't need a \$1,000 reverb plug-in to make good sounds*. What matters most is how you use what you've got!



7. In order to apply the reverb to the frequency range 2000 Hz to 5000 Hz only, set Main Input L to channel 5 only (as shown), Main Input R to channel 6 only, Main Output L to channel 5 only and Main Output R to Channel 6 only.
8. Experiment with reverb settings to suit. If you're not sure, start with the settings shown.

Room Size is quite large, to create a feeling of depth.

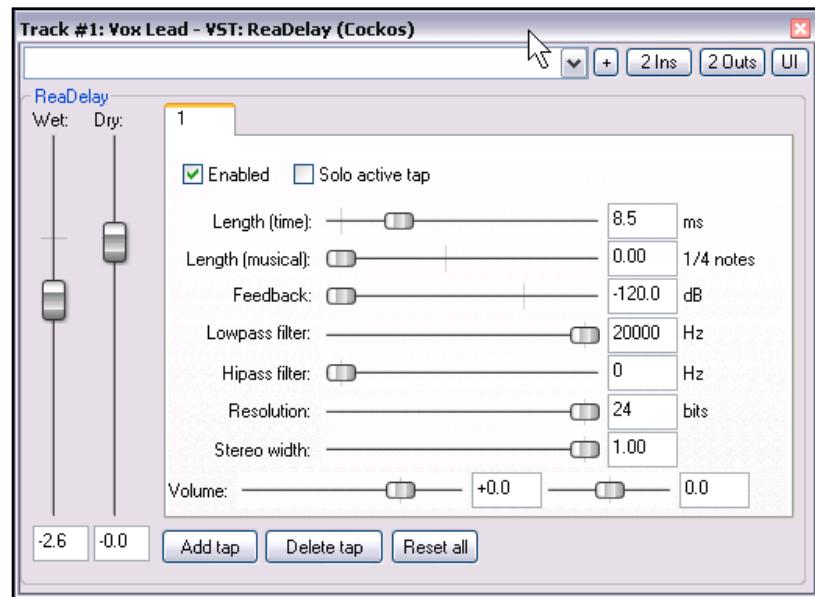
Dampening affects especially the rate at which higher reverb frequencies decay. This can help to make the sound smoother.

Stereo Width. A high setting maximises the use of width.

Initial Delay. A higher setting here can give the reverb more of an echo effect.

Wet/Dry Mix. Experiment with these to suit. Insufficient Dry signal will create an exaggerated sense of delay.

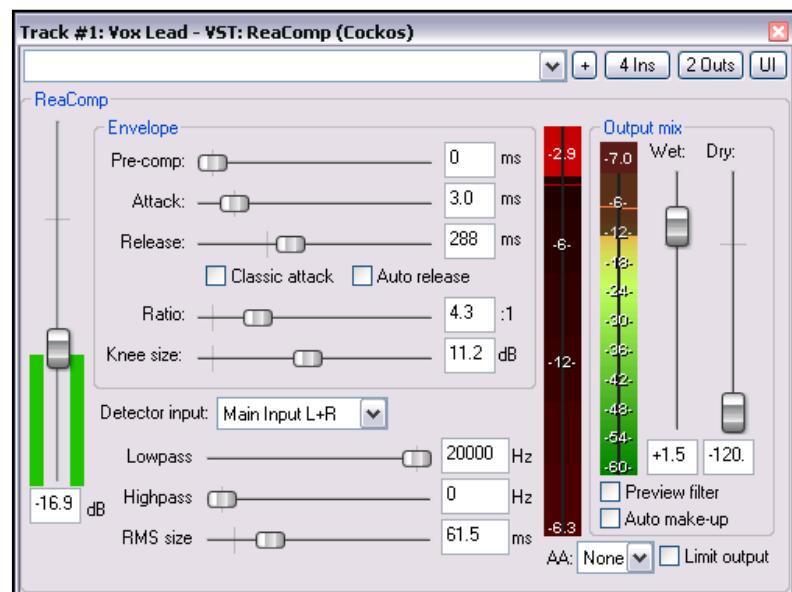
9. We are now going to add a touch of Delay to Channels 1 and 2. Put at its simplest, the main difference between Reverb and Delay is that Reverb creates a continuous decaying illusion, whereas Delay creates a discrete separate instance of the original sound.
10. Insert **ReaDelay** into your FX Chain, immediately above the **ReaVerbate** plug-in. Set Main Input L to channel 1 only, Main Input R to channel 2 only, Main Output L to channel 1 only and Main Output R to channel 2 only.



11. Especially with delay, it is advisable to use a fairly conservative setting. Specifying a time of less than about 9 milliseconds will normally ensure that the human ear hears the delay not as a separate discrete sound but rather as a fattening of the original sound. An example of how you can do this is shown.
12. For convenience and future reference, it is a good idea to rename the plug-in instances as shown below.

To do this, simply select the plug-in name in the FX Chain and press **F2** to display the **Rename FX Instance** edit box. Type the new name and press **Enter**.

13. The final plug-in that we will be using in this instance is **ReaComp**. As with the others, the secret is to be gentle!
14. The exact settings required will of course depend on many factors including the volume of the track. Remember that you reasons for using the compressor are to smooth down any peaks, to lift up the quieter passages, and to make the overall vocal seem more present. To this end, you should be aware of the following:



Attack time: too high a setting here will cause the compressor to be slow to kick in when a sudden increase in volume occurs.

Release time: too low a setting will cause the compressor to draw back too quickly, creating a

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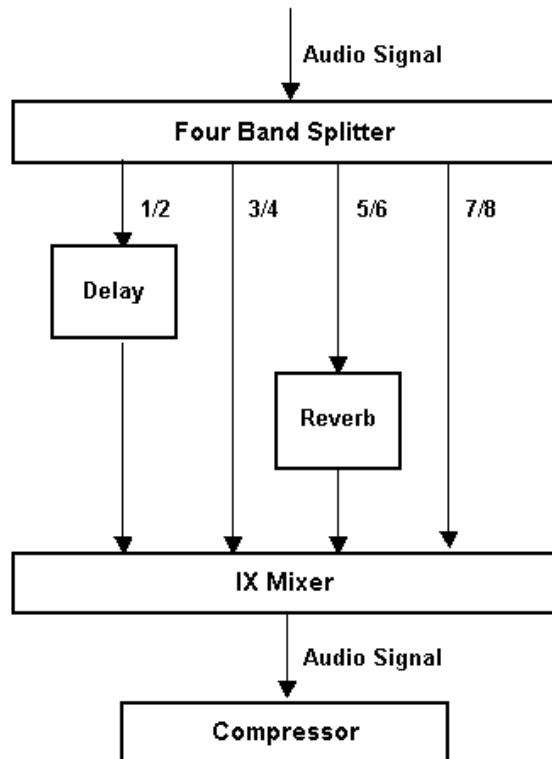
"pumping" effect. Too high a setting causes it to hold on for too long, compressing perhaps also quieter passages,

Ratio: a ratio less than 4:1 is not likely to be very effective, higher than 8:1 here can make the difference too noticeable when the compressor kicks in.

Knee Size: experiment with this setting to ensure that the compressor is engaged smoothly.

Wet Gain Fader: raise this by just enough to ensure that your quieter passages are heard clearly.

15. That's it! The diagram below shows our final FX Chain in this example, and below that is a flow chart indicating what we have just done.



This illustrates the signal flow that we have just created for our spacey vocals.

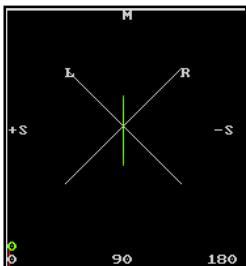
Remember that you can save it as an FX Chain (Right Click, Save FX Chain) which you can then apply to vocals on other tracks if you wish.

The file **RosesBloom SPACEY A** contains a suggested possible outcome for this exercise.

Please remember that this example is only an example, nothing more.

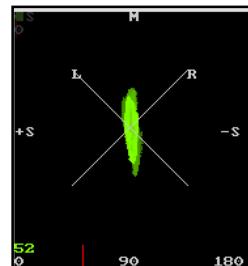
You should be prepared to experiment with those FX which work best on your vocals to achieve the outcomes that suit you best.

Stereo Spread of Vocal Track – Dry compared to Spacey



The illustrations shown here are rather interesting. Using our Goniometer, they show the effective positioning of our vocal track between our ears when dry (left) compared to after inserting the spacey vocals FX chain (right)

It can be interesting to leave this display in view while adjusting the panning of the various channels in the IX Mixer.



3.10.3 Customising the Channel Mixer

Philip Consadine's truly wonderful **IX Channel Mixers** are amongst REAPER's most valuable mixing tools. By customising them, you can make them even more appropriate for some of the applications we are going to use in this primer. This is because:

- The default Volume setting of 0dB per channel is louder than we want in some cases.
- The Volume range of -120dB to +30dB per channel is wider than is ideal for some applications.

It's not difficult to tweak these settings yourself. Don't worry if you've never done anything like this before. You just have to be thorough and careful, that's all.

In this next example, we are going to create a modified version of one of Philip's mixers, with a range of -40dB to +6dB and a default setting for each channel of -6dB.

1. Close REAPER.
2. Open Windows Explorer and navigate to C:\Program Files\REAPER\Effects\IX
3. Right click on **Mixer_8xM-1xS**
4. Choose **Open** from the context menu. If the file doesn't immediately open, select a text editor (such as Notepad) from the list offered to you, then click on **OK**.
5. When the file opens, use the **File, Save As** command to save as **Mixer_8xM-1xS_Modified**
6. This ensures that you cannot do any damage to the original plug-in file!
7. Identify the following block of lines:

```
slider1:0<-120,30,0.1>Level 1 (dB)
slider2:0<-120,30,0.1>Level 2 (dB)
slider3:0<-120,30,0.1>Level 3 (dB)
slider4:0<-120,30,0.1>Level 4 (dB)
slider5:0<-120,30,0.1>Level 5 (dB)
slider6:0<-120,30,0.1>Level 6 (dB)
slider7:0<-120,30,0.1>Level 7 (dB)
slider8:0<-120,30,0.1>Level 8 (dB)
```

8. These are the lines that set up the volume faders. Modify this text as shown below (changes shown in bold face).

```
slider1:-6<-40,6,0.1>Level 1 (dB)
slider2:-6<-40,6,0.1>Level 2 (dB)
slider3:-6<-40,6,0.1>Level 3 (dB)
slider4:-6<-40,6,0.1>Level 4 (dB)
slider5:-6<-40,6,0.1>Level 5 (dB)
slider6:-6<-40,6,0.1>Level 6 (dB)
slider7:-6<-40,6,0.1>Level 7 (dB)
slider8:-6<-40,6,0.1>Level 8 (dB)
```

9. Identify the following line:

```
desc:8 channel mixer.
```

10. Modify it to add your own name as the modifier:

```
desc:8 channel mixer modified by My Name.
```

11. Now save the file and close it. Note that the file should not have any extension. If the editing program gives it an extension, edit the file name afterwards to remove it. The file should be just called **Mixer_8xM-1xS_Modified** *not* **Mixer_8xM-1xS_Modified.txt**
12. In Windows Explorer, create a folder with your name as shown (using of course your own name):
C:\Program Files\REAPER\Effects\My Name
13. Move the plug-in that you have just created into this folder.
14. When you next open REAPER, this plug-in will be available under the JS category.

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3.10.4 Mellow Vocals

This next example shows you a different interpretation of the same vocal track, this time to produce a more mellow, laid back effect. We do this again using channel splitting, but in a different way.

In our *Spacey Vocals* example, we split up our track into a number of different frequency bands, applying different FX and panning to each band. This helps to create that live effect of the vocal seemingly floating slightly across space, with the focus shifting to different points between the speakers. In this next example, we will split the channels differently, sending the same raw material into each channel, before using EQ, delay and panning (together with a final touch of compression) to produce a more relaxed and relaxing sound.

Example

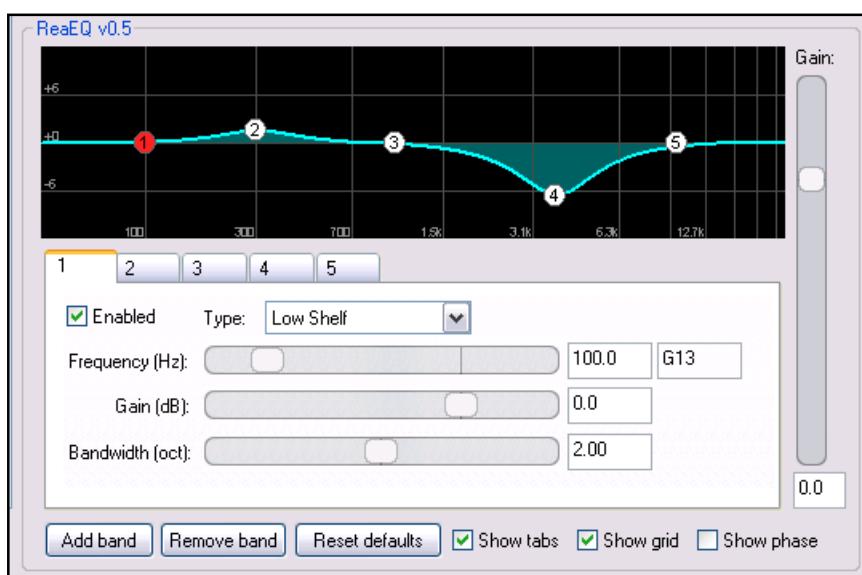
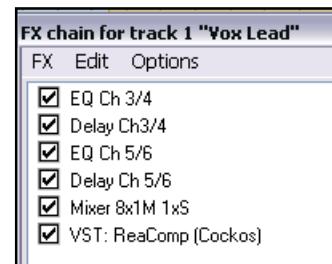
1. Open the file **RosesBloom** and immediately save it as **RosesBloom MELLOW**
2. Into the FX Chain for the **Vox Lead** track insert (in this order) the following plug-ins:

ReaEQ
ReaDelay
A further instance of ReaEQ
A further instance of ReaDelay
Your 8 channel mixer (8x1M 2x1S)
ReaComp

3. Rename these plug-in instances as shown on the right.
4. Select the **EQ Ch 3/4** plug-in. Leave the Inputs (2 Ins) at their defaults of Input 1 – Channel 1 and Input 2 – Channel 2. Change the two outputs (2 Outs) to Output 1 – Track channel 3 only and Output 2 – Track Channel 4 only.

5. Our intention here is to make the vocal stream in these channels somewhat less present. This can be achieved with settings similar to those shown on the right. However, if you lower all faders in the 8 channel Mixer except for the faders for Channels 3 and 4, you should be able to experiment for yourself until you get the sound that you like.

6. Now select the **Delay Ch 3/4** plug-in. Set the two inputs for this plug-in to track channel 3 (Input left) and track channel 4 (Input right) only. This ensures that the EQ'd stream will be fed to this delay plug-in.
7. Change the two outputs (2 Outs) to Output L – Track channel 3 only and Output R – Track Channel 4 only.
8. Create a fairly conservative delay setting of about 10 ms, panned fully to the left and with a Wet/Dry mix similar to that shown below.

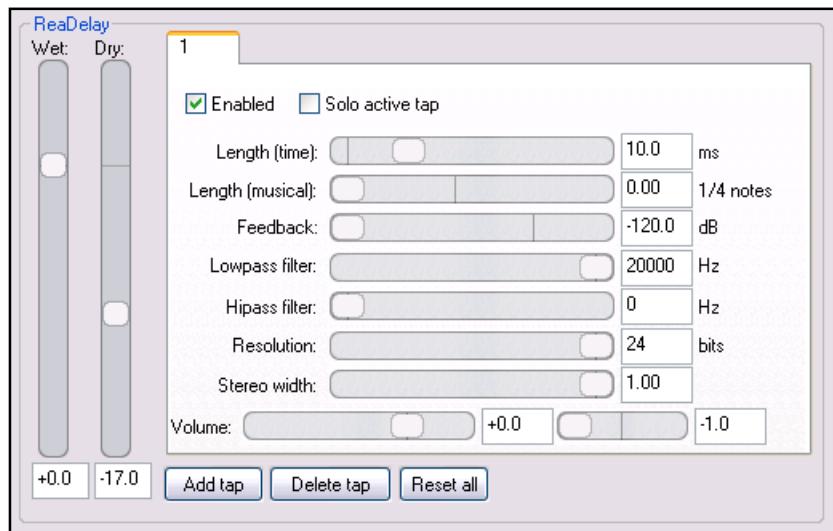


9. Select the **EQ Ch 5/6** plug-in. Leave the Inputs (2 Ins) at their defaults of Input 1 – Channel 1 and Input 2 – Channel 2. Change the two outputs (2 Outs) to Output 1 – Track channel 5 only and Output 2 – Track Channel 6 only.

10. Our intention here is to again make this vocal seem a little less present. Experiment with setting your EQ levels to achieve this. They should be somewhat similar to the EQ used on Channels 3 and 4, but not identical. You will get better results if you allow for some albeit subtle differences here.

11. Now select the **Delay Ch 5/6** plug-in. Set the two inputs for this plug-in to track channel 5

(Input left) and track channel 6 (Input right) only. This ensures that the EQ'd stream from Channels 5 and 6 will be fed to this delay plug-in.



12. Change the two outputs (2 Outs) to Output L – Track channel 5 only and Output R – Track Channel 6 only.

13. Create a fairly conservative delay setting of about 15 ms, panned fully to the right and with a Wet/Dry mix similar to that used in the earlier ReaDelay instance.

14. Play the song, toggling on and off the Solo status of your Vox Lead track. As you do so, adjust the panning and volume faders of your 8 Channel Mixer to obtain the most pleasing effect. An example is shown on the right.

15. When you are satisfied with your results, open the **ReaComp** plug-in. Your main intention here is to smooth the vocal track out a little more. Try settings similar to these at first, and adjust them to suit:

Threshold – Minus 19 dB

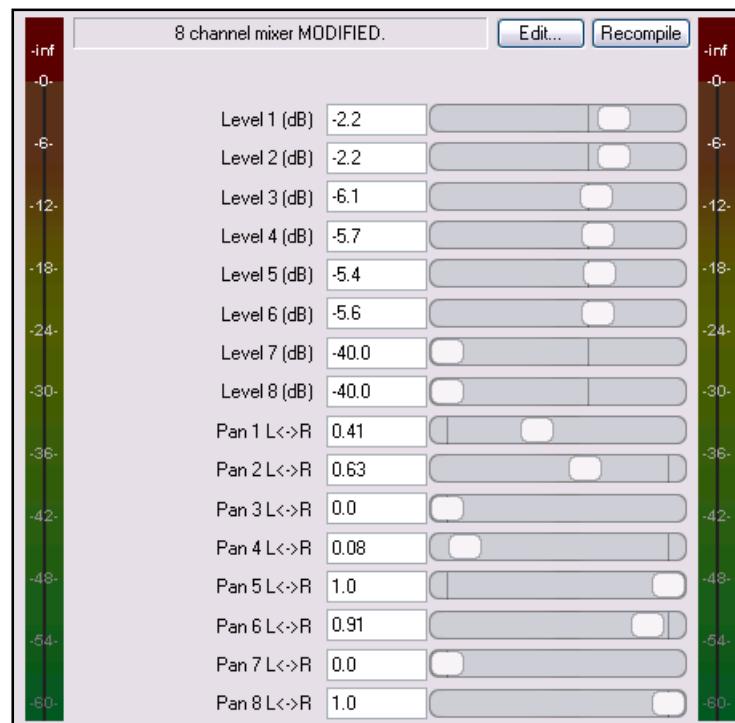
Release – 202 ms

Ratio – 5 or 6 to 1

Knee Size – about 16 dB

RMS size – about 35 to 40 ms

Wet gain – about plus 2 dB.

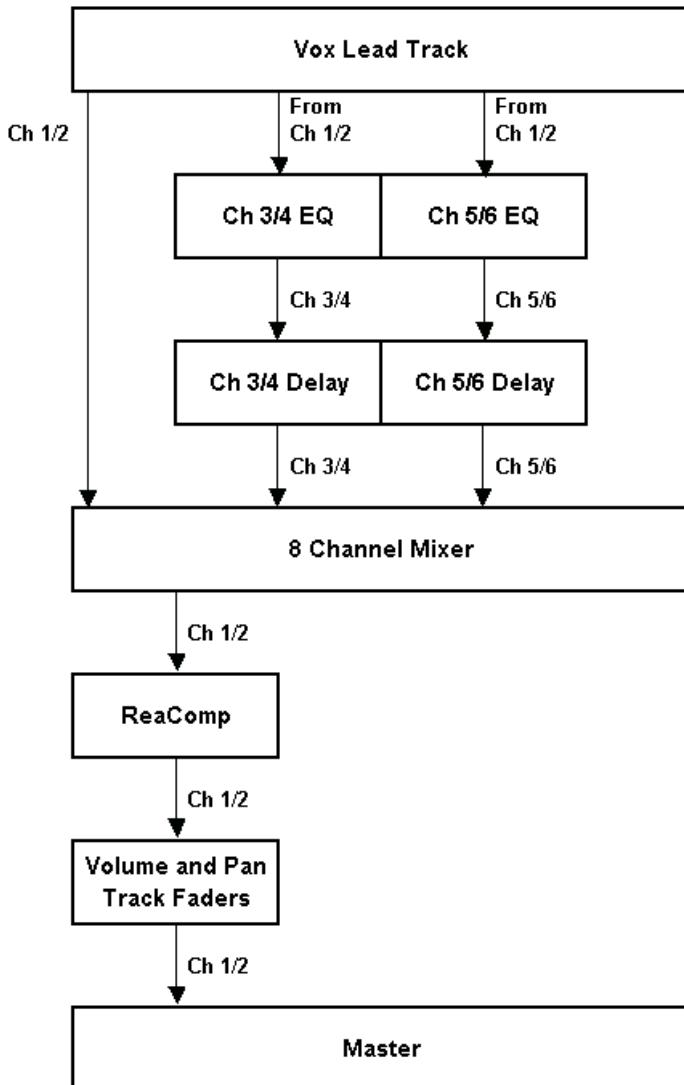


16. Save your work when finished.

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Note:

The file **RosesBloom MELLOW A** contains a possible outcome for this exercise. If you wish, open it, play it and examine it. Remember that this file does not purport to be a finished mix for this project. Its purpose is to serve as an example of this particular mixing technique.



Don't be afraid to experiment with these techniques. Always remember that when you are pleased with your results you can save an FX Chain and/or Track Template.

We'll be leaving this project file for the time being (but returning to it later). Our next example will examine how we can use multi-dimensional mixing techniques to add a raw edge to vocals.

This exercise will make use of the project file **Don't Keep Me Waiting**.

3.10.5 Smokey or Edgy Vocals

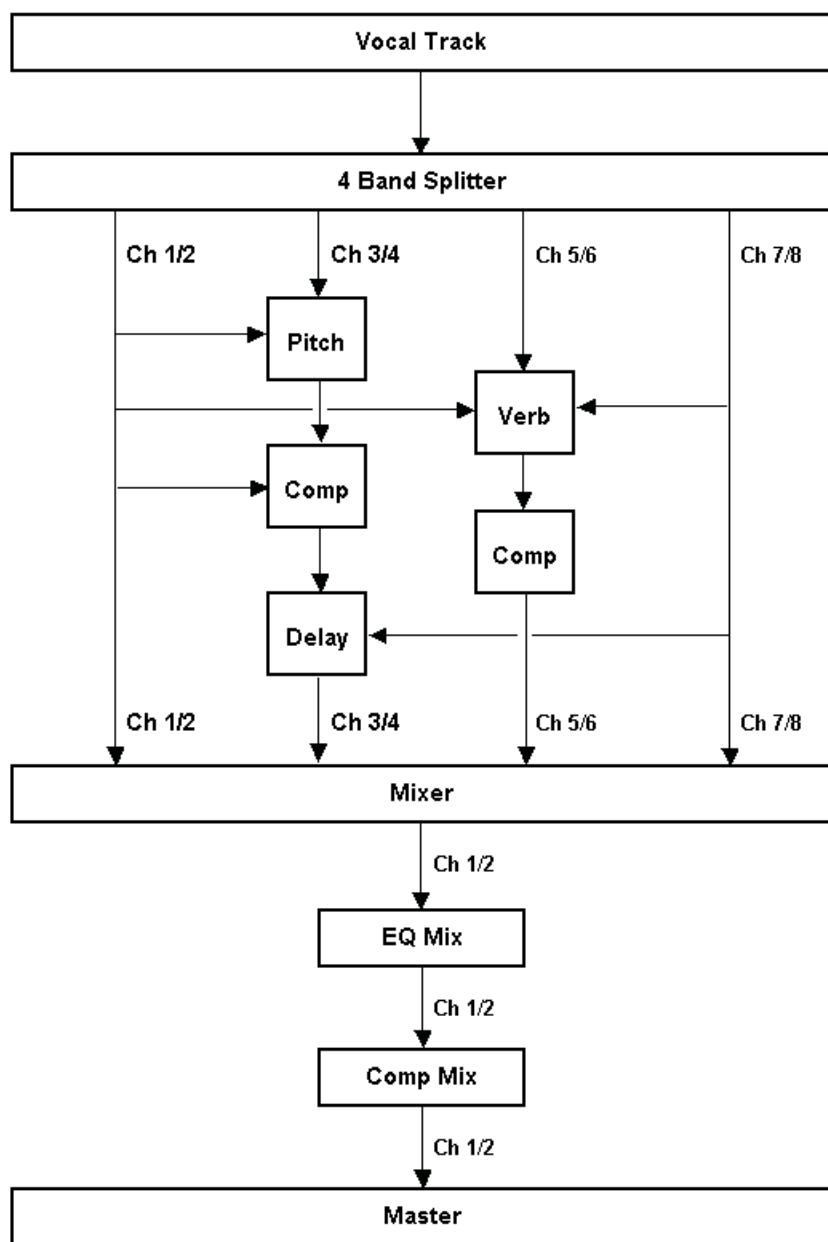
With a bit of practice you'll amaze yourself at what you can do to your vocal tracks by the imaginative and original application of multidimensional mixing techniques. There are no restrictive rules, no limits and no boundaries on what you can achieve. Let's take just one more example, one that we'll call "smokey vocals" or "edgy vocals".

Some styles of music require a certain edge or tension in a singer's voice, an effect that can be difficult to obtain naturally, and equally difficult to create artificially. For example, every good blues singer needs to sound like they smoke at least two packs of cigarettes a day, right? Well now you can create that kind of sound for them without them having to wreck their lungs to do it. The trick is to play around with reverb, delay and compression on different frequencies to achieve your goal.

The example that follows is, as usual, only an *example*. Because of the nature of the human voice and its infinite variety, it can only ever be thus. You might find these settings work well for you, you might find that they don't. If they don't, just keep experimenting until you get it right. The more you do this, the more you will learn.

The illustration above right shows the FX Chain that we will be creating for this example. Many of the FX items have been renamed, but it should be obvious which is which. For example, the item labelled *Delay 3/4* is the **ReaDelay** plug-in applied to Channels 3 and 4. However, in this example we will also be introducing a further idea that will take our multidimensional mixing to a whole new level – *cross-mixing*. Cross-mixing, as you will soon see, is the technique of adding an effect to the input from one channel (or pair of channels) and feeding it directly to a different channel (or pair of channels). This can have the effect of adding a degree of tension to the overall vocal track. If it isn't immediately obvious what this means, don't worry. It will make sense after you have worked through an example.

Because the signal flow is a tad more complex this time, it's worth



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taking a look at the signal flow chart before embarking on the exercise.

The key characteristics to look out for, understand, interpret and implement are:

- A fair number of plug-ins are used here. However, each individual Pitch, Delay and Verb plug-in is used quite sparingly. In each case, the settings are fairly conservative. Each individual FX makes only a subtle difference to the overall sound. It is their cumulative impact that creates the effect that we are seeking.
- Notice how the cross-mixing at several points adds FX to one chain and feeds the output directly to another. For example, the signal from Channels 7 and 8 – the very high frequency range – is fed into a Reverb plug-in, with the resulting Reverb being directed directly to Channels 5 and 6.
- There is a pattern here: FX added to very high and very low frequencies are mixed directly back into those channels which cover the frequency ranges that we hear the best. This more than anything else is what creates that edgy or smoky effect.

Let's now take a look at how it is done. Again, please remember that this is an example and only an example. You will get the best results if you are prepared to experiment and learn for yourself.

Example

The following example is one of the more difficult in this primer. In particular, the order in which the various FX appear in the FX chain is important or it may not work. It is strongly suggested that in working through it you regularly check back to the FX Chain shown on the previous page to make sure that you have the FX organised in the correct order. Also, if it helps, check out the suggested solution to this exercise at any time.

1. Open the file **Don't Keep Me Waiting** and immediately save it as **Don't Keep Me Waiting EDGY**
2. To create a quick rough and ready sound stage, pan your tracks as follows:

Vox – Centre

Gtr Body – about 40% left

Gtr Neck – about 40% right

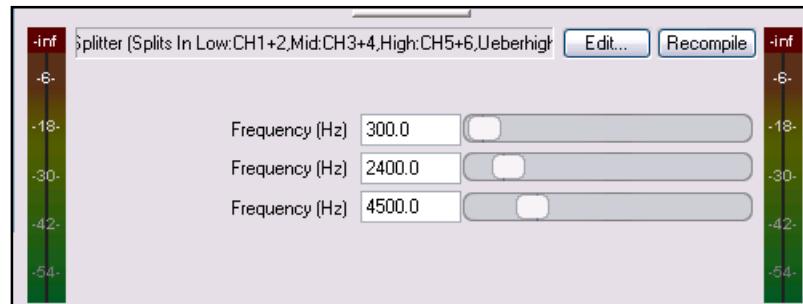
Harmonica – about 20% right

Kick – about 20% left

Snare – about 70% right

Ohead – about 70% left

3. It is not suggested that these are the optimum panning positions, but they should be fine for this example. Remember that the objective here is to demonstrate how to create Smokey Vocals.



4. Solo the **Vocal** Track.

Open the I/O Routing

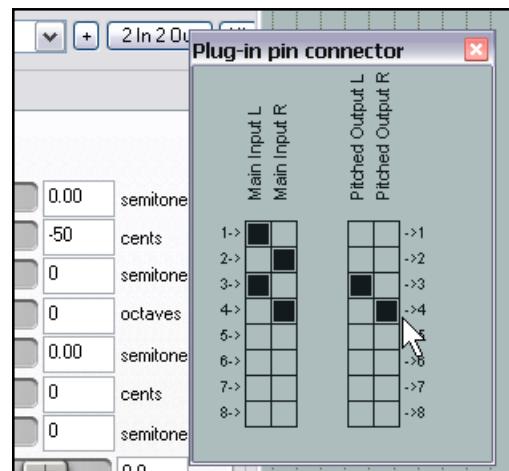
Window and make sure this track has **8 channels**.

Display the **FX Window** for this track.

5. Insert the **JS: LOSER/4BandChannelSplitter** and to begin with set the split frequencies as shown above. Of course you can experiment with adjusting these later if you wish.

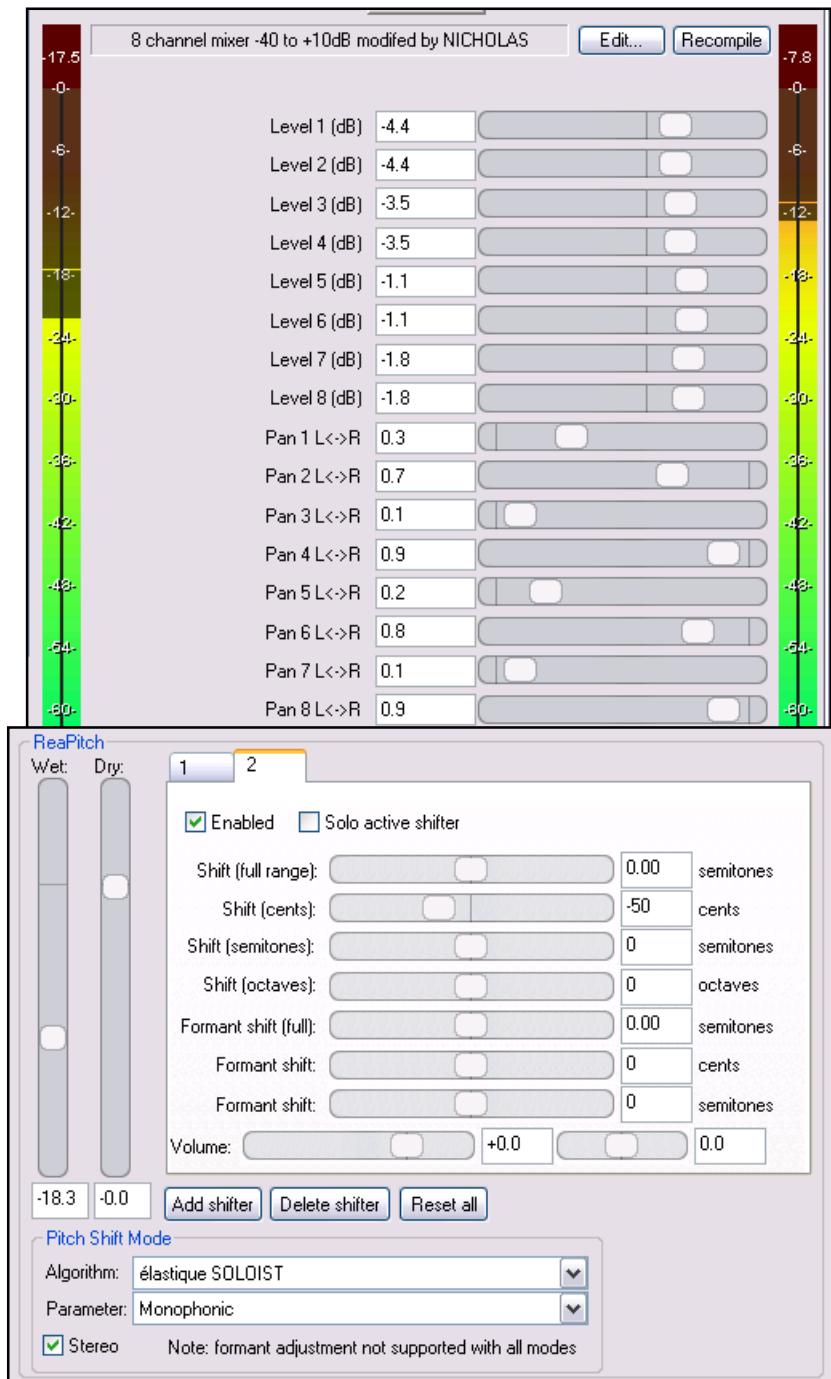
6. Immediately after the Channel Splitter, insert the **Mixer_8xM-1xS**. Either use the version supplied with REAPER or your own modified version if you have one.

7. For the time being, adjust Volume and Pan settings approximately as shown below. Of course you can

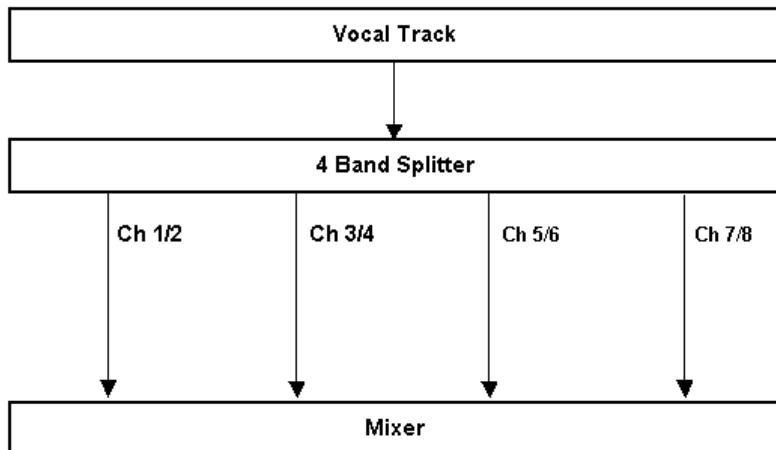


change these settings later if you wish. Now check Note 1 and Note 2 on the page after this one..

8. Immediately after the Splitter (and before the Mixer plug-in) insert an instance of **ReaPitch**. Set the inputs for this plug in to Channels 1 and 3 (Left – as shown above) and Channels 2 and 4 Right.
9. Set the Outputs to only Channel 3 (Left) and Channel 4 (Right).
10. Add a Shifter to this plug-in so that it contains two pages of settings.
11. For each of the two pages, change the default settings as follows:
 - Wet to -22.5 dB.
 - Dry to -0.0 dB.
 - Enabled on.
 - Algorithm: Elastique SOLOIST
 - Parameter: Monophonic
 - Leave all other settings at their defaults.
12. For the first settings page, set the Shift (cents) setting to 50.
13. For the second settings page, set the Shift (cents) setting to -50.
14. Solo the track and play it.
15. Adjust the level of the Wet fader so that the effect of the pitch shift can *just* be detected. This will probably be at or around -18 dB.
16. A sample settings sheet for Page 2 of the ReaPitch plug-in is shown on the right.
17. In the FX Window, immediately after the ReaPitch plug-in, insert an instance of **ReaComp**.
18. Make the Main Inputs for this plug-in Channels 1 and 3 (Left) and Channels 2 and 4 (Right).

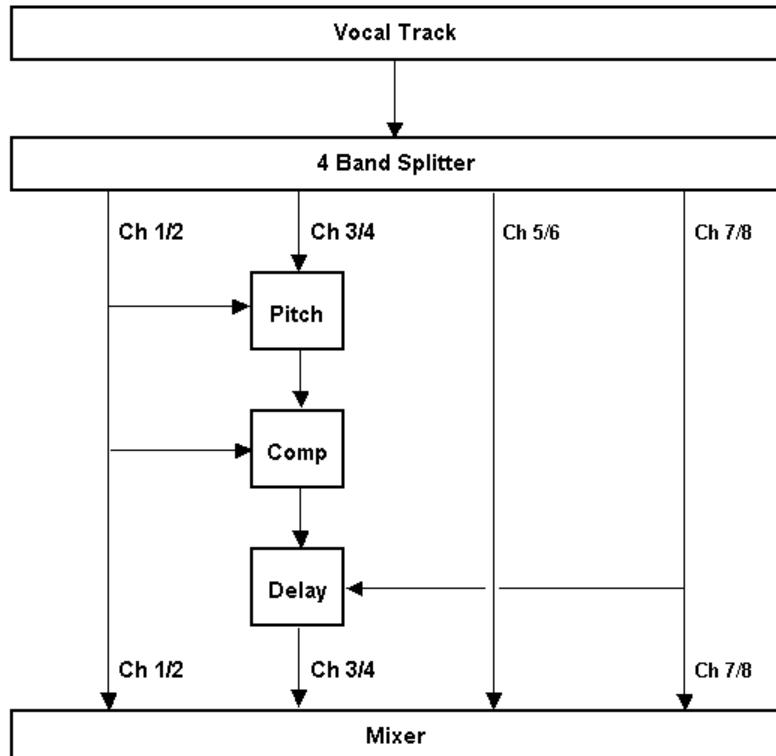


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Note 1:

This diagram (left) illustrates how the audio signal for the **Vocal** track will flow through the track FX chain at the completion of step 7 of this example.



Note 2:

In steps 8 to 25, we set up the FX chain that will, eventually be fed to the channel mixer through channels 3 and 4. This includes input from the signals on other channels, as shown (left).

This second diagram (left) shows how the audio signal for your **Vocal** track will flow through the track FX chain at the completion of step 25 of this example.

Signals from Channels 1/2 and 7/8 are fed into our different FX, but the processed output is directed only to Channels 3/4.

On the right is shown the mixing chain after step 25.

In the illustration shown, all plug-ins except for the 4 Band Splitter have been renamed.



19. Make the Outputs for ReaComp only Channels 3 (Left) and 4 (Right).

20. Play the soloed track.

21. Set a ratio somewhere between 4:1 and 6:1. Adjust the threshold so that the compressor kicks in quite sharply at the louder vocal passages.

22. To enhance that “edgy” sound, you don’t want the compressor to be too smooth. Make the Knee size setting quite hard – 0.0 dB if it sounds OK – and the Release time quite low – perhaps even as low as 40 or 50 ms.

23. Immediately after the ReaComp, insert an instance of **ReaDelay**. The secret here is to use the Delay effect with subtlety.

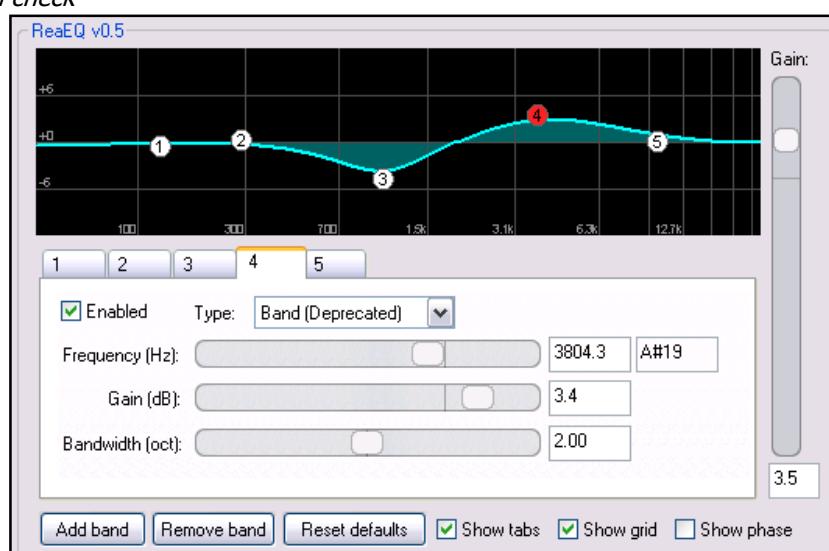
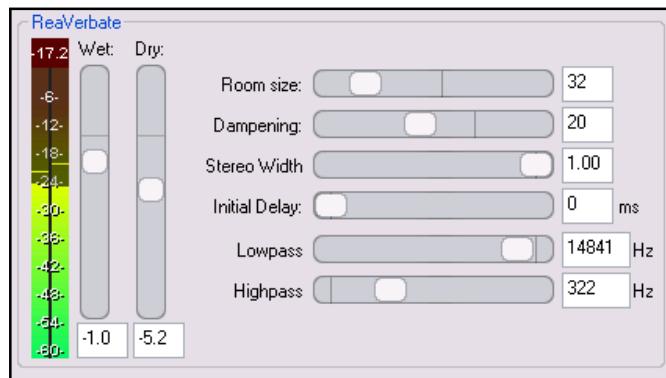
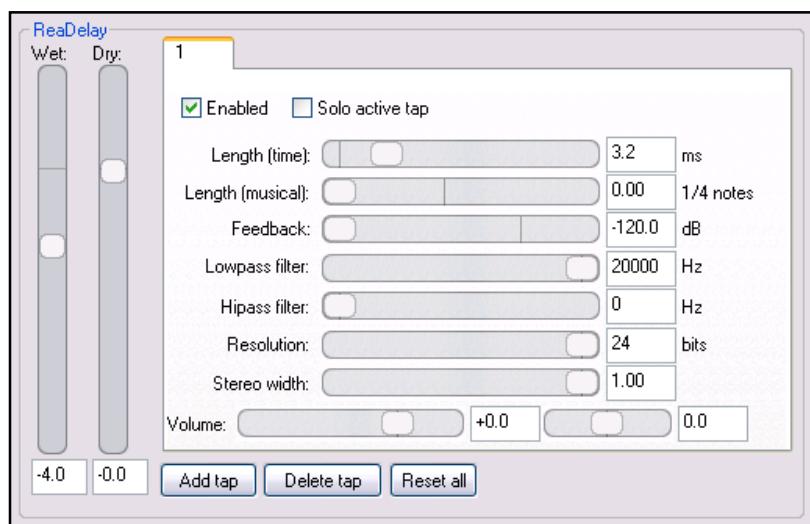
24. Set the Inputs for this ReaDelay to Channels 3 and 7 (Left) and Channels 4 and 8 (Right). Set the Outputs to only Channel 3 (Left) and Channel 4 (Right).

25. Experiment with Delay settings to suit, but don’t be too adventurous at first – you can always ramp it up later! The illustration (top right) shows a fairly sensible set of settings. *Now recheck Note 2 on previous page and check Note 3 on the page after this one.*

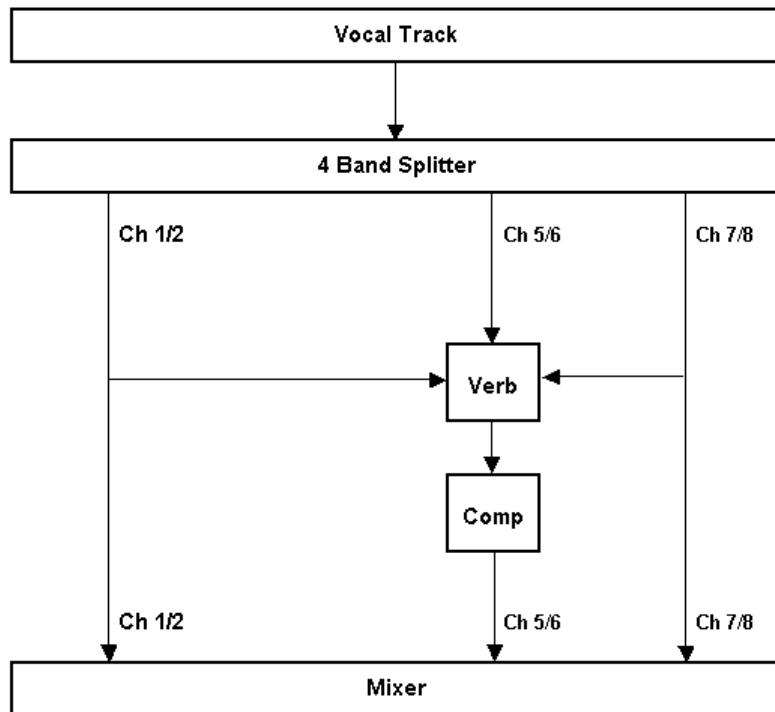
26. Immediately after ReaDelay, insert an instance of **ReaVerbate** in the FX Chain.

27. Set the Inputs to Channels 1, 5 and 7 (Left) and Channels 2, 6 and 8 (Right). Set the outputs to only Channel 5 (Left) and Channel 6 (Right).

28. Again, your reverb settings here should err on the side of caution at first (see above). You can come back to them later if you wish to be more adventurous. The illustration (second from top) shows a possible starting point.



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The illustration on the right shows how your FX chain should look after step 31. Notice that in the illustration, most of the FX have been renamed.

Note 3:

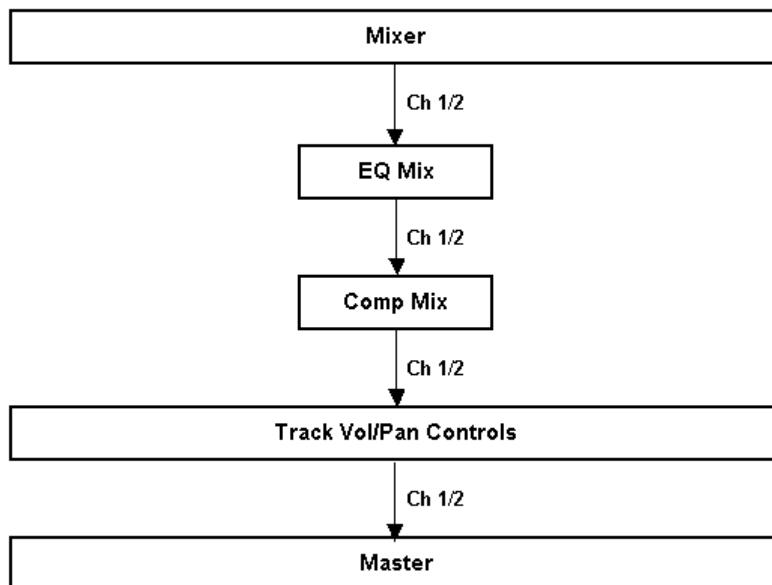
In steps 26 to 31, we set up the FX chain that will, eventually be fed to the channel mixer through channels 5 and 6. This includes input from the signals on other channels, as shown (left).

For ease of understanding, this diagram shows *only* the additional FX that are applied to your **Vox** track during steps 26 to 31, *not* those FX already applied by steps 8 to 25.

The low frequency signal (Ch 1/2) and high frequency signal (Ch 7/8) are fed into the Reverb plug-in, but the processed output is sent only to Channels 5/6.

FX chain for track 1 "Vox"

FX	Edit	Options
<input checked="" type="checkbox"/> JS: LOSER/4BandSplitter		
<input checked="" type="checkbox"/> Pitch 3/4		
<input checked="" type="checkbox"/> Comp 3/4		
<input checked="" type="checkbox"/> Delay 3/4		
<input checked="" type="checkbox"/> Verb 5/6		
<input checked="" type="checkbox"/> Comp 5/6		
<input checked="" type="checkbox"/> JS: NICHOLAS/Mixer_8xM-1xS MODI...		

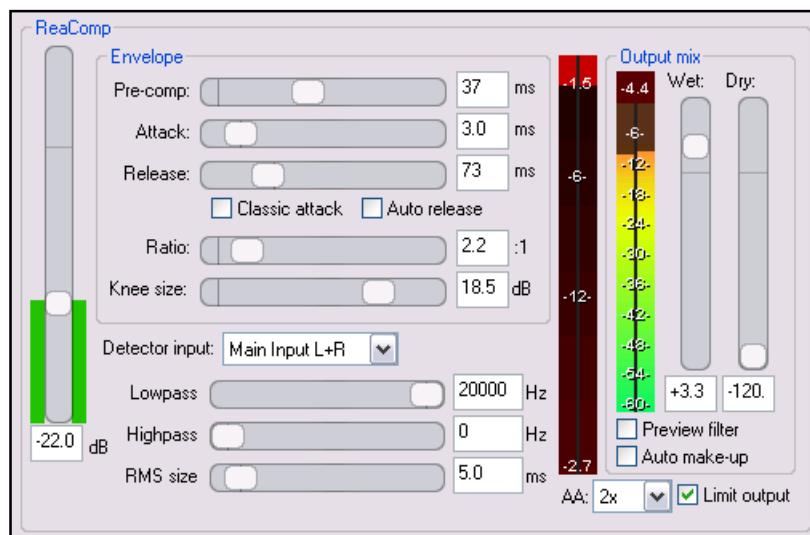


Note 4:

The diagram on the left shows the effects of the final items that we add to our FX Chain by steps 33 to 35.

For ease of understanding, this diagram shows *only* the additional FX that are applied to your **Vox** track during steps 33 to 35, *not* those FX already applied by steps 8 to 31.

29. Immediately after ReaVerb, add another instance of **ReaComp**.
30. Make the Main Inputs for this ReaComp instance Channels 5 (Left) and 6 (Right) only, and make its Output channels also 5 (Left) and 6 (Right) only.
31. Set a Ratio around 5:1 and adjust the Threshold so that the compressor kicks in on the louder passages. Make the other settings similar to those used in the earlier ReaComp instance.
32. Play the song, making further fine tuning adjustments to your Channel Mixer settings. *Now recheck Note 3 (previous page) and check Note 4 (previous page).*
33. Immediately after the Mixer, add an instance of **ReaEQ** (see above).
34. Take off about 4 dB around the 1,000 Hz mark and add about 3 dB around 4,000 Hz. This will help make the vocal more present in the mix. If necessary, adjust the final Gain level.
35. Finally, add another instance of **ReaComp** at the very end of the chain (see right). Your settings should be fairly gentle here, just enough to smooth down any peaks that might still be jumping out of the mix.
36. Now play the song, with the vocal no longer soloed.
37. Be prepared to experiment with your plug-in settings to create that “edgy” vocal effect!
38. Save your file.



Note

The file **Don't Keep Me Waiting EDGY A** contains a suggested example of one possible outcome of this exercise. It is, of course, a work in progress, not a final mix for that project file.

3.10.6 The Singing Guitar

One of the secrets of successful multidimensional mixing is simply not to overdo it. If you try the same tricks on every track, you end up risking creating an overall effect of a chaotic battleground. In other words, you want to make sure that every instrument and track in your mix has its own space. The previous example introduced you to one way of ensuring that your vocals find plenty of room in your mix. However, if you were to apply the exact same technique to every other track, the chances are that at best your instruments would be likely to be fighting against each other while at worst you could end up with an unstructured mess.

I usually like to take more liberties with the vocals than with other parts, mainly because the vocal is more likely to be the stand out track. With other instruments it pays to be a little less adventurous. This doesn't mean that you can't still have some fun. Let's take as our next example the acoustic guitar. Let's assume that it is the main rhythm instrument in a mix. That makes it entitled to some special treatment.

Fullness and body around 100 to 200 Hz.
May be dull around 1,000 to 3,000 Hz.
Presence and clarity around 4,000 to 6,000 Hz.
Sparkle above 10,000 Hz.

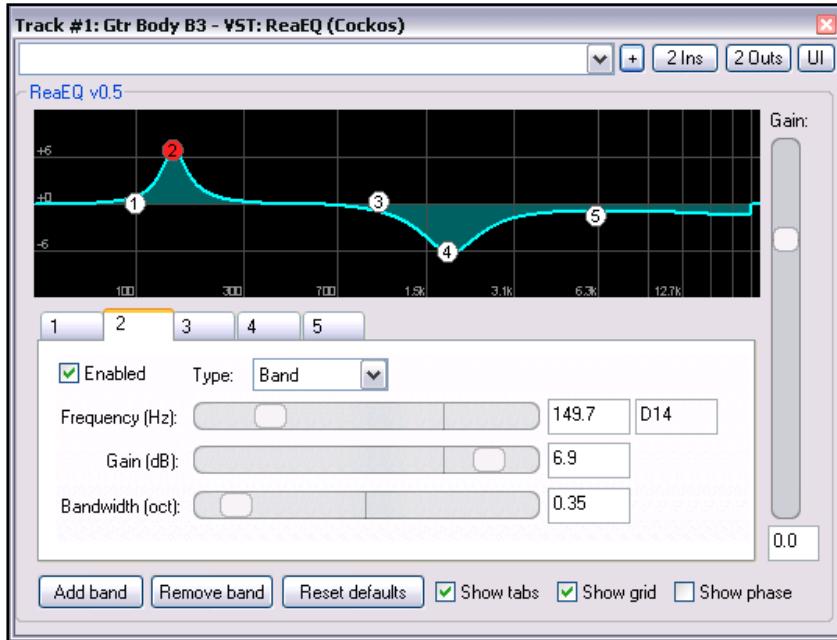
From the table *Key Frequencies for Some Popular Instruments*

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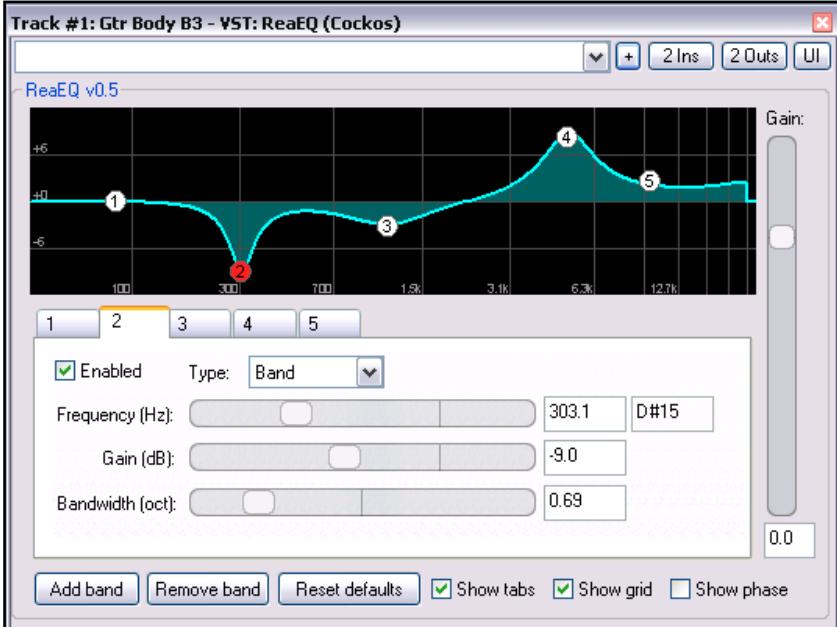
we can develop a good idea of the frequencies that we are likely to need to work on to bring the very best out of our acoustic guitar track.

Example

1. Open a file containing a fairly simple arrangement of an acoustic guitar and lead vocal, perhaps no more. You can use the supplied project **RosesBloom GUITAR.rpp** if you wish. Open this file and immediately save it as **RosesBloom GUITAR 1**
2. Select the guitar track and pan it dead centre. Solo it.
3. Open the I/O (Routing) window for this track and set the number of channels to 8.
4. Open the FX Window.
5. Insert an instance of **ReaEQ**. Play the track and experiment with your EQ settings so as to emphasise the body and fullness of the instrument. You are aiming to really bring out the body, not to create a balanced sound. An example of the kind of settings that you *might* emerge with is shown top right.

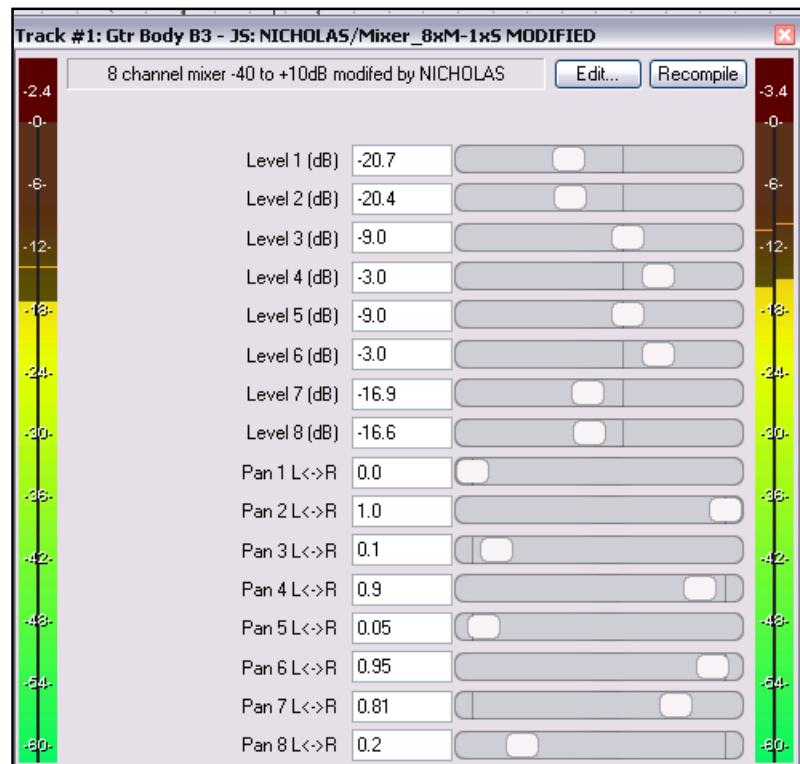
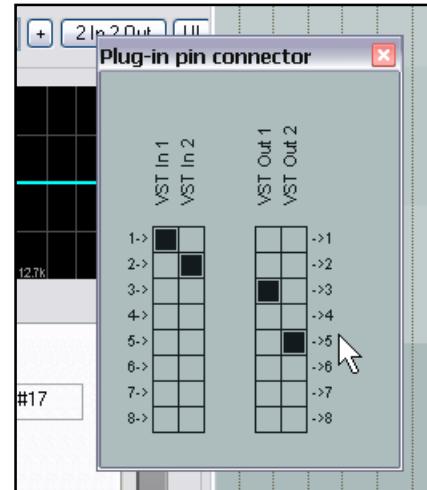


6. Set this EQ instance to bypass. Now insert a separate instance of **ReaEQ** and adjust the various parameters so as to really emphasise the clarity, presence and sparkle of the instrument. Again, you are not trying to create a balanced sound just yet. An example of the kind of settings that you might come up with is shown above.
7. Now enable both EQ instances. We are going to send the first EQ instance to channels 3 and 5, and the second EQ instance to channels 4 and 6.
8. In both cases, leave the input to the EQ Plug-ins as Channels 1 and 2 (these are the default settings). In this case, we are not using a channel splitting plug-in but will be using the plug-ins themselves to perform this function.

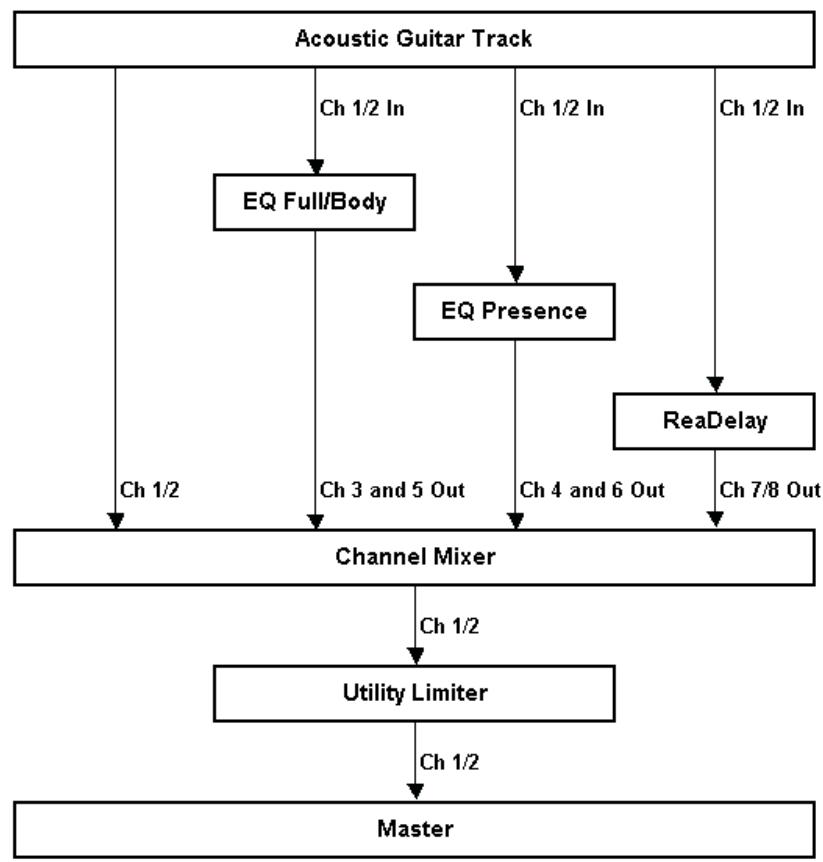


9. For the first EQ Plug-in, set the 2 outs to channels 3 and 5 respectively (see illustration on right).
10. For the second EQ Plug-in, set the 2 outs to channels 2 and 4 respectively.
11. Rename each plug-in instance as you think appropriate, eg **Ch 3 /5 Body** and **Ch 4 /6 Presence**.
12. After the second of the EQ plug-ins, you might optionally wish to insert an instance of **ReaDelay**. If you do, leave the inputs at their default settings (Ch 1/2) and direct the outputs to **channels 7 and 8**. Make the delay settings fairly conservative, with a length of no more than 7 ms and a wet setting of no more than -12 dB. You can of course adjust these later.
13. After the ReaDelay plug-in, insert your modified channel mixer.
14. After the mixer, insert the **JS Utility Limiter** plug-in and set the max volume to about -2.0 dB. This will prevent the sound from getting too loud while you are tweaking.
15. Now examine the Mixer. You will want to achieve a number of goals:
 - Keep the guitar channels mostly panned reasonably wide, left and right, to leave plenty of space in the sound field for the vocals.
 - Obtain the optimum balance between the levels for the different channels to ensure that the separate elements of the guitar track – body, warmth, presence, clarity, etc – can all be distinctly heard.
16. An example of how your settings *might* end up is shown right. Remember, however, that every recording is unique, and you will likely find many instances where very minor tweaks to your mixer settings will produce quite significant changes in the sound.
17. Notice that in this case Channels 1/2 contain a completely dry, unmodified signal. This can be useful for correcting any over-emphasis that you may have made in your EQing.

Remember that you can use automation envelopes if you wish to change the balance between the different channels at different parts of the song.



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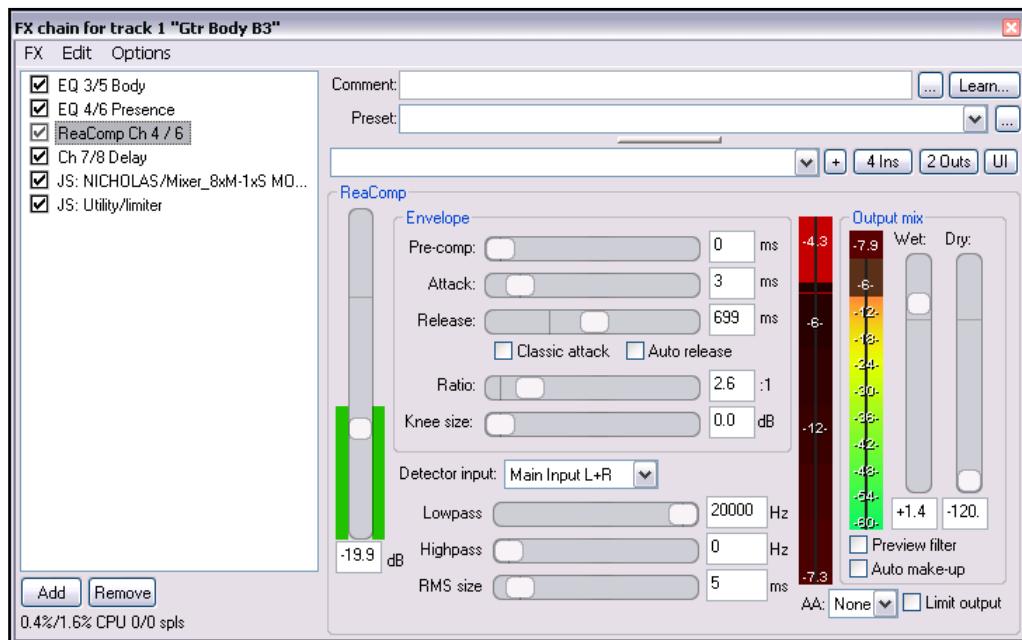


The flow chart on the left illustrates the signal flow used so far to create our singing guitar effect. If you wish, you can save this setup as an FX chain.

Remember too that this method brings with it an almost limitless number of possibilities.

One obvious variation is to use **ReaComp** in this chain, either to compress certain frequencies, the overall track mix, or both. For example, you could try inserting ReaComp into your FX chain immediately after your second EQ instance.

In this case, the Main Input to the compressor would come from channels 4 and 6 and be output to channels 4 and 6. You could use the compressor both to tame some of the peaks and to add a little sustain to the signal that is being routed through those channels.



The supplied project file **RosesBloom Guitar 1A** demonstrates one possible outcome of this exercise. As you play it, toggle the FX Chain for the Guitar track on and off. You should notice quite a difference.

3.10.7 Big Wide Vocals

This next example is a good illustration of why you will never create a great mix if you depend on presets and preconceptions. There is only ever one correct answer to questions like “How should I EQ my vocals?” or “What is the best reverb effect for my guitar?” That answer, of course, is *It all depends on what you want to do!* For whilst it is true that there are very many wrong answers in mixing, it’s also true that there are usually several right ones as well. Which is best? You decide.

In this example, we are going to take the same recorded media as in an earlier example and treat the vocal in an entirely different way. Not better. Not worse. Just different. You’ll have to decide which of the two you prefer, or, hopefully, come up with a third treatment for yourself.

This example comes with the usual disclaimer, i.e., it isn’t meant to represent the ultimate mix, rather to demonstrate a particular point. In this case, we will be taking advantage of the fact that lower frequencies seem to occupy more width than do higher frequencies. We will create three effects:

- The vocal will fill out much more and occupy more of the space between the speakers.
- Because of the way we will be using EQ and panning, you should be able to discern subtle changes in the left-right vocal balance throughout the song, without the need to use any panning envelopes. This creates a very natural “live” feel for the vocal.
- By adding just a small touch of delay to the lower frequencies and panning them towards the outside, we are also able to create a greater sense of depth and time.

Example

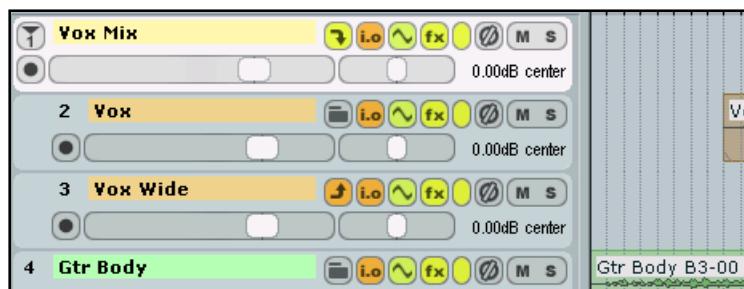
1. Open the file **Don't Keep Me Waiting VOX** and immediately save it as **Don't Keep Me Waiting VOX1**

2. Our producer feels that the lead vocal is rather thin for the sound that she is hoping to create. We have been asked to somehow fill out the vocal so that it dominates the recording more.

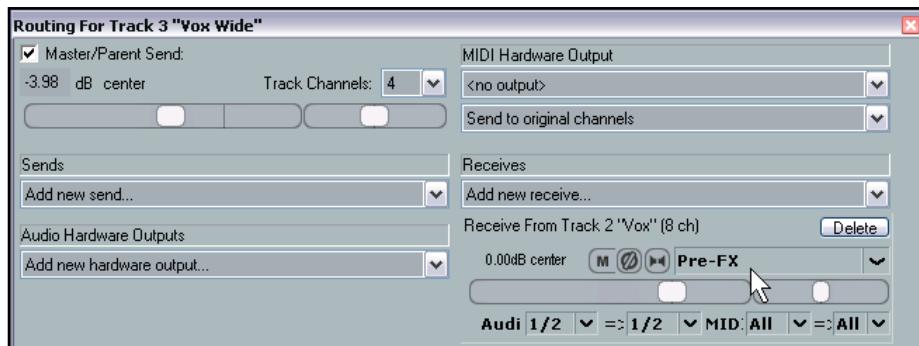
3. Select the first track, the vocal track. Insert two new tracks. Place one of these above the original vocal track, rename it as **Vox Mix** and make it a track folder.

4. Name the other new track (Track 3) **Vox Wide** and make it the last track in the folder.

5. Now open the **I/O** window for the **Vox Wide** track. Create four track channels and insert a **Pre FX Receive** from Track 2 – Vox, as shown on the right.

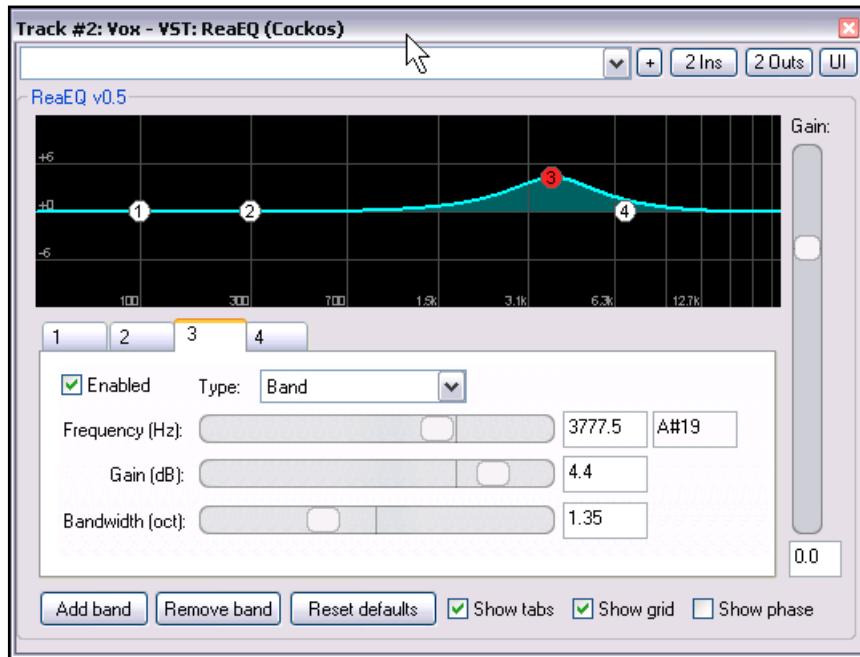


6. Open the **FX Window** for **Track 2 Vox** and insert an instance of **ReaEQ**. We are aiming to make this track a little more present.



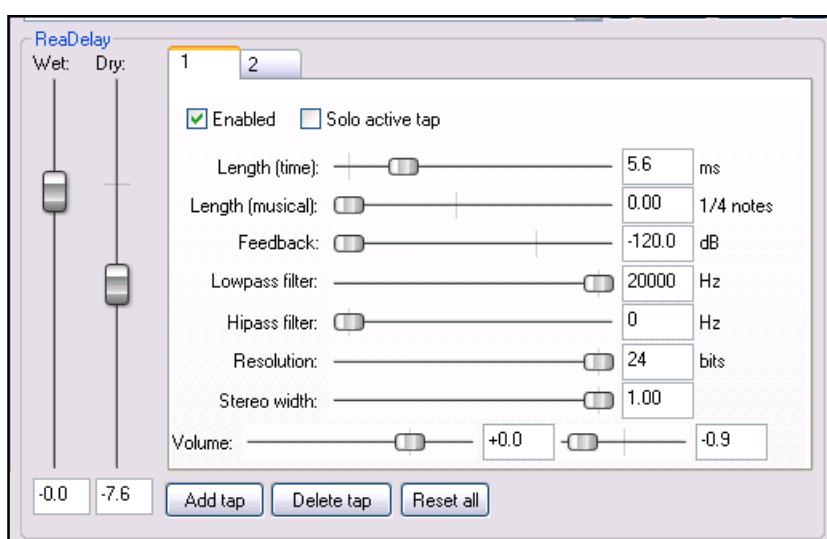
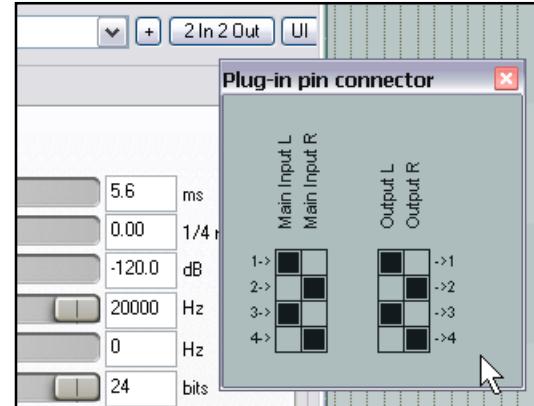
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7. Experiment with the EQ settings while you play the song with this track soloed. Settings similar to those shown on the right will add presence to this track.
8. Keep the panning for this track either at or very close to the centre.
9. Now open the **FX Window** for your **Vox Wide** track.
10. Insert your **Mixer 8xM 1xS** plug-in into this FX bin.



In this example, we have created our own four channel mixer by making some fairly simple modifications to our JS eight channel mixer plug-in. If you would prefer not to do this, you can use the eight channel mixer. In that case, fade all the way down the volume faders for all channels except the first four.

11. This will be required as the last plug-in in this track's FX chain. Insert above the mixer one instance of **ReaDelay** followed immediately by two instances of **ReaEQ**.
12. Select the **ReaDelay** plug-in and ensure that its VST Outputs will be directed to all four channels – Output L to Channels 1 and 3 (as shown above), Output R to Channels 2 and 4.
13. Make your first settings page fairly conservative, with a delay of about 5.5 ms panned almost fully left (as shown). Adjust the wet/dry mix to something similar to that shown. You can of course change this later if you wish.
14. Add a second page, with settings similar to the first, but panned almost fully to the right and with a Delay time about double that used on the first page.



15. Now select the first **ReaEQ** plug-in and change the VST Input and VST Output settings to Channel 3 (Left) and Channel 4 (Right) only.

16. Make some adjustments that will make the output from this plug-in less present and with more bottom end. An example is shown on the right.

17. Select the second **ReaEQ** plug in. Make sure that the only inputs and outputs used by this plug-in are Channel 1 (Left) and Channel 2 (Right).

18. Adjust the EQ settings for this plug-in to again add more body at the lower frequencies and to take off some of the presence. Do not use the same frequencies or octave band widths as before however. We are aiming here to create subtle variations between the two.

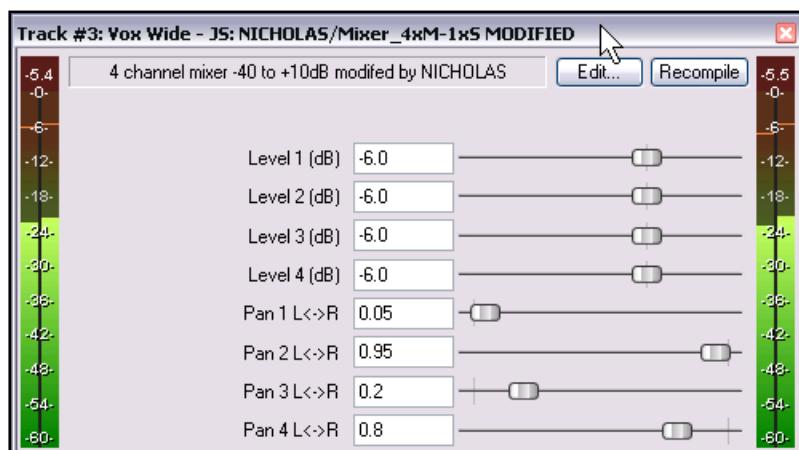
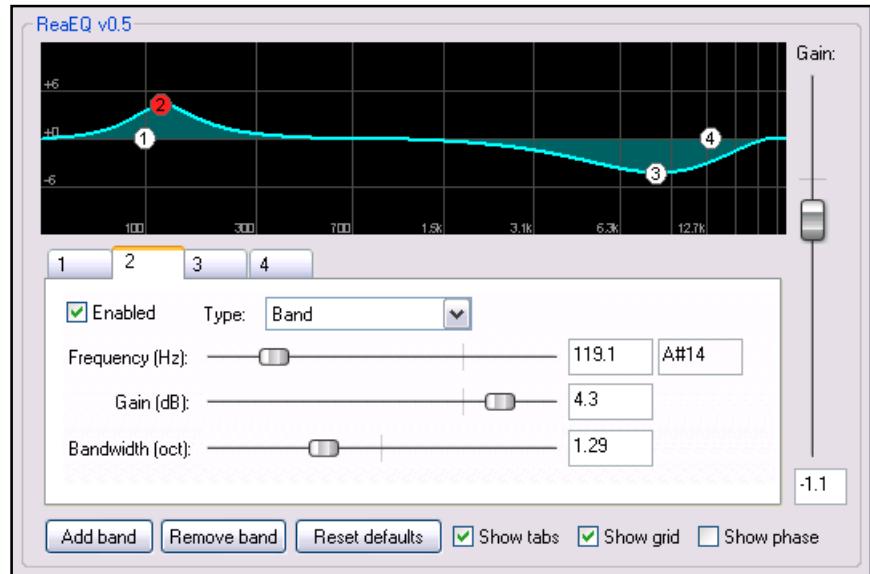
19. Now adjust the volume and panning levels in your Channel Mixer. Channels 1 and 3 should both be panned well to the left but not identically. Channels 2 and 4 should be panned well to the right but, again, not identically. A possible suggested outcome is shown on the right as a guide.

20. Play the song, making adjustments to any of your settings, and to the relative volume levels of tracks 2 and 3, as well as that of your volume mix. Leave all three tracks panned dead centre. Your FX panning will take care of that.

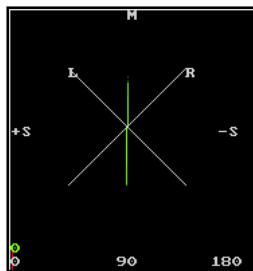
21. Add an instance of **ReaComp** to your Vox Mix track. Adjust the Threshold so that the compressor kicks in on the louder passages and set a ratio of about 4:1.

22. Adjust the other compressor settings as you think appropriate.

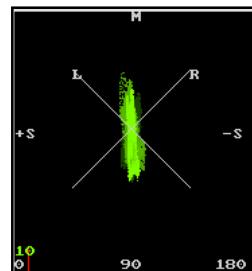
23. Save the file and play the song. Make any further adjustments to your settings and mix levels as you think might be appropriate.



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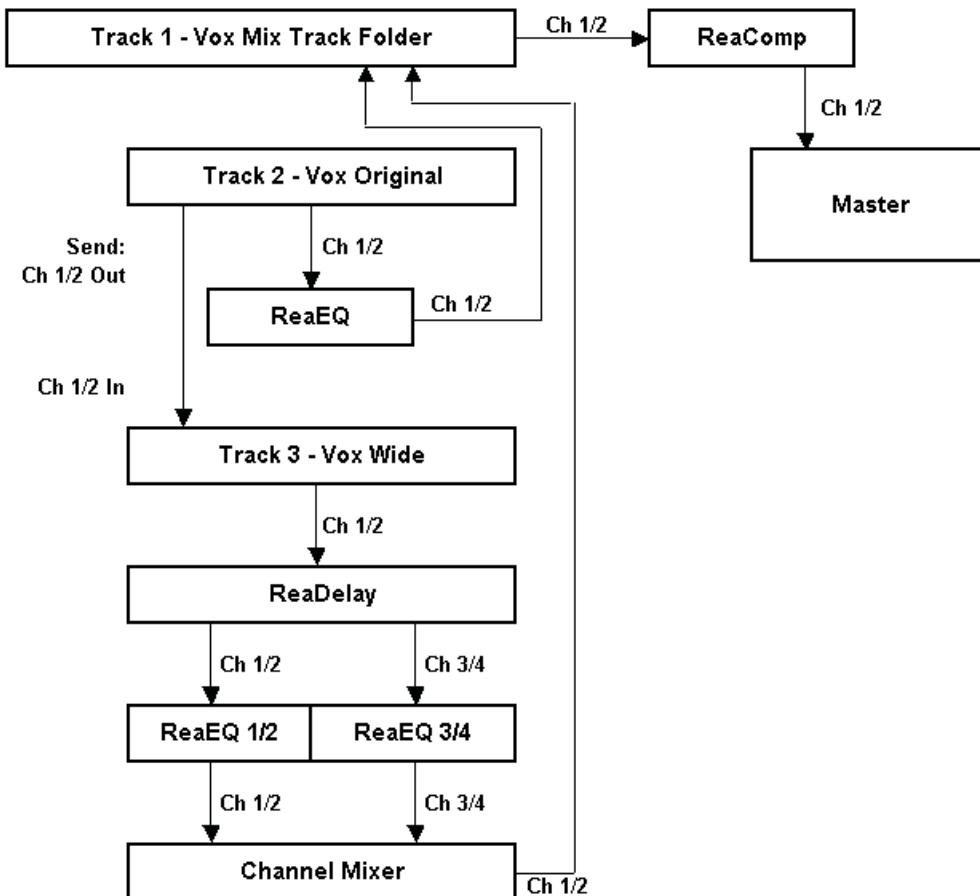
The image on the left represents the stereo spread of the output of the Vox Mix track folder with all FX bypassed.



The image on the right represents the output of the same track with all track FX enabled.

Note:

The file **Don't Keep Me Waiting VOX A** contains a suggested possible outcome for this exercise. If you wish, open it and examine it.



The diagram on the left displays the flow of the vocal audio signal through this project file.

Remember that this is only an example. The number of permutations of FX and channel splitting that you can use is almost limitless.

The trick is to think about exactly what kind of sound you would like to create, and then to set about working out just how you can get REAPER to give you what you want.

Mixing Challenge!

Before leaving this page, think of a vocal effect that you would like to achieve – such as *whispering vocals*, or whatever. See if you can use the techniques taught in this section to achieve it. This example should be 100% customised to suit your own requirements. This time, we're not providing any model answers!

3.10.8 Dreamy Harmonies

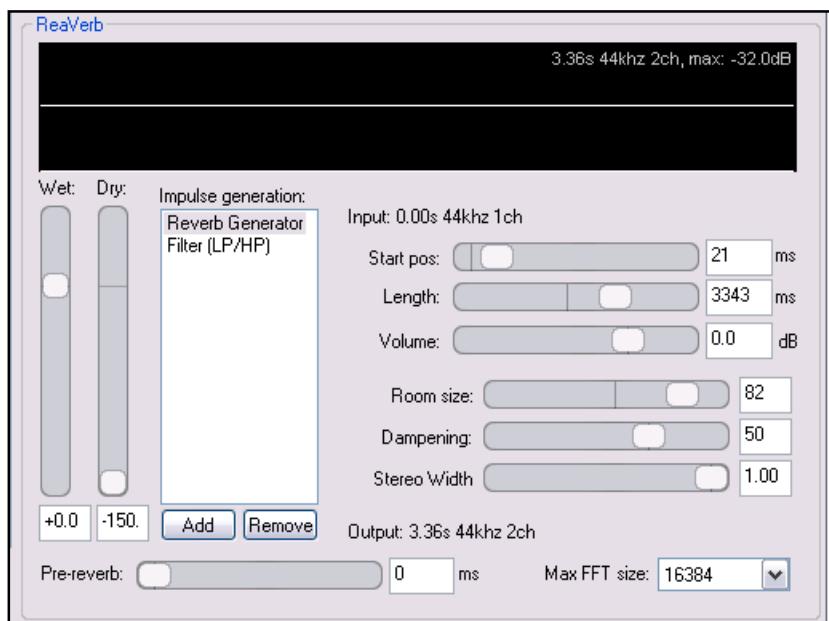
Just as is the case with lead vocals, there's no "one size fits all" solution for dealing with vocal harmonies. It all depends on exactly what kind of effect you are trying to create. In this first example, we'll look at creating a ambient or distant effect for our vocal harmonies. We will be aiming to make our vocal harmonies clearly audible, yet appearing to come from a distance away, with an almost sleepy or dreamy quality about them. We will aim to achieve this using a combination of volume settings, panning, EQ, reverb and compression.

Our second example will remix the same tracks, this time with the vocal harmonies much more up front.

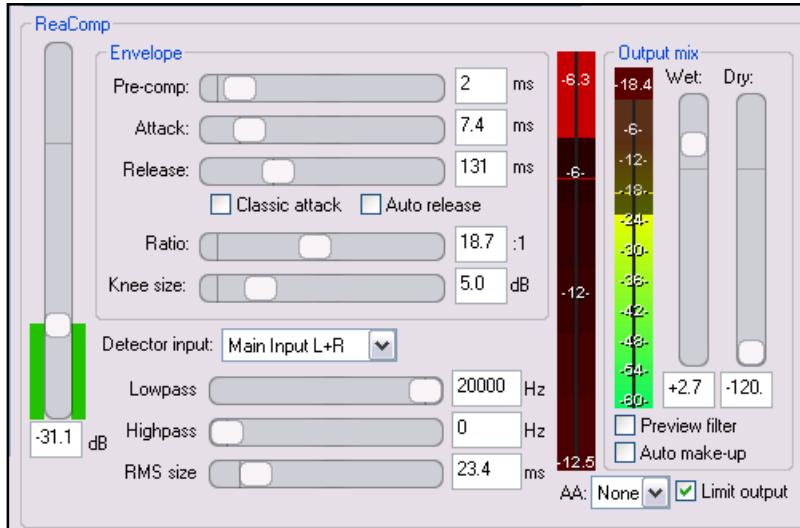
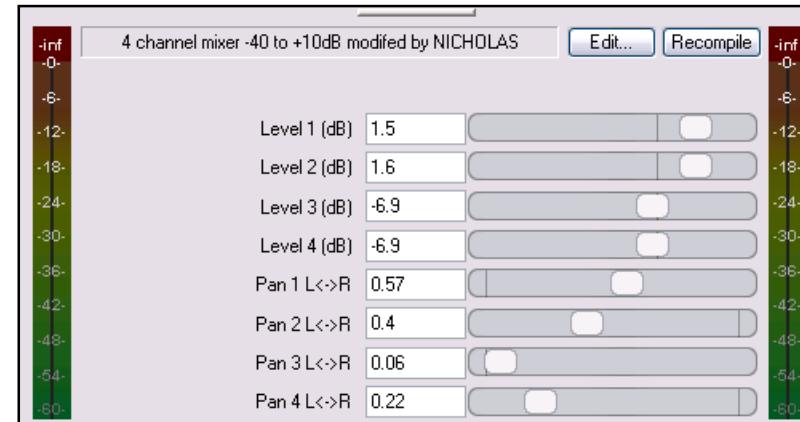
In both cases, the example is not intended to be a final and complete mix for this song. Their purpose is solely to illustrate different ways in which you can interpret and use vocal harmonies.

Example

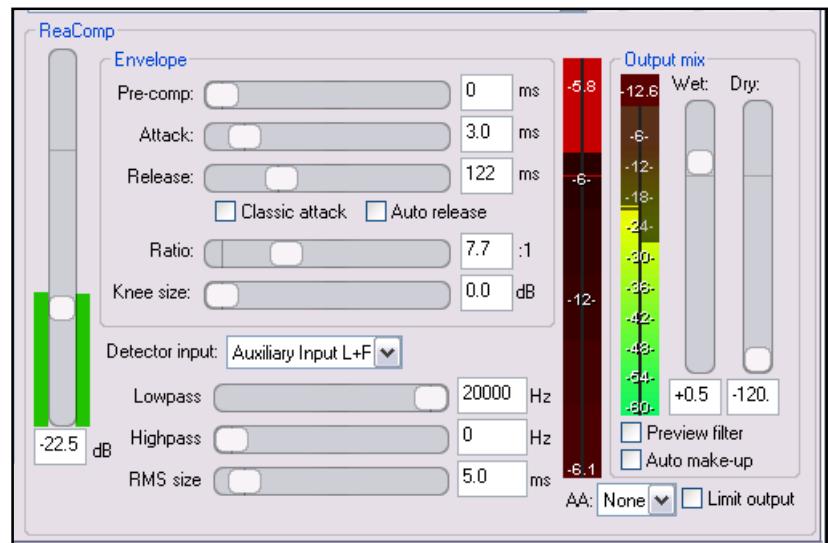
1. Open the file **RosesBloom BVOX** and immediately save it as **RosesBloom BVOX 1**.
2. Play the song. Two vocal harmonies can be heard, first a female then also a male. Because the **Vox Lead** track in this mix has been given our *Spacey Vocals* treatment, the two harmony tracks already sit quite nicely behind the lead vocal. However, in this case, we want to give them a more dreamy, mellow and ambient feel.
3. Place both backing vocals into a track folder as shown right. This will make it easier for us to adjust the overall level of the vocal harmony submix.
4. As your first step in creating a feeling of distance, pan the vocal harmonies further away from the centre, about 50% left and right respectively.
5. Open in turn the **I/O** windows for each of the three tracks **Vocal Harmonies** (track folder), **Vocal Harmy 1** and **Vocal Harmy 2**.
 2. In each case, set the number of **Track Channels** to **4**.
6. Pan the Tracks 5 (Guitar) and 6 (Guitar Neck) a little closer towards the centre, so that they are each about 33% left and right respectively. This helps to move the vocal harmonies further away from the main Vox Lead track.
7. If you are working in Track View, open the **FX Window** for the **Vox Harmy 1** track. If you are working in Mixer View, make sure that the option to **Show FX inserts** is enabled.
8. Into the FX chain for this track insert (in this order) **ReaVerb** and **ReaComp**. If you have made your own **Mixer 4xM-1xS** insert that at the end of the chain, otherwise use the **Mixer 8xM-1xS** that is supplied with REAPER.



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9. Solo this track. As you play it, you can modify its sound.
 10. Select the **ReaVerb** plug-in. Leave the two inputs at their default settings (track channels 1 and 2) but change the two outputs to only **Track channel 3** and **Track channel 4** respectively.
 11. Add a **Reverb Generator** to ReaVerb. Create a fairly generous distant reverb effect and set the output to Wet only. A possible combination of settings is shown above.
 12. Add a Filter to your ReaVerb plug-in. Set the **Lowpass** to about 0.16. This will prevent the reverb from being added to the higher frequencies.
 13. Open the instance of **ReaComp**. In this case we wish to compress the signal passing through track channels 1 and 2 quite aggressively, to push them further back. A possible set of settings is shown on the right.
- 
- The screenshot shows the ReaComp plugin window. It has sections for Envelope (Pre-comp, Attack, Release, Ratio, Knee size), Output mix (Wet: 18.4, Dry: 12.0), and various filter controls (Lowpass at 20000 Hz, Highpass at 0 Hz, RMS size at 23.4 ms). A vertical dB scale on the left indicates -31.1 dB. Buttons for AA (None), Preview filter, and Auto make-up are visible.
14. Now select the Mixer plug-in. We are aiming to include mostly the compressed signal from track channels 1 and 2 with just a little of the reverb from track channels 3 and 4. By panning channels 3 and 4 further to the outside we are also increasing the feeling of space and distance.
 15. Track 4 **Vox Harmy 2** needs a similar (but not identical) treatment.
 16. Add the same FX chain – **ReaVerb**, **ReaComp** and your **Mixer** to this track.
 17. Again, create a distant wet reverb stream for channels 3 and 4, a compressed sound for channels 1 and 2, and a mix that consists mostly of the compressed stream from channels 1 and 2 with a little of the Reverb from channels 3 and 4, pushed to the outside (in this case, this will be to the right).
- 
- The screenshot shows the 4 channel mixer window for the Vox Harmy 2 track. It lists four channels with their levels and panning controls. Channel 1 (Level 1: 1.5 dB, Pan 1 L<->R: 0.57) and Channel 2 (Level 2: 1.6 dB, Pan 1 L<->R: 0.57) are compressed and panned towards the center. Channel 3 (Level 3: -6.9 dB, Pan 2 L<->R: 0.4) and Channel 4 (Level 4: -6.9 dB, Pan 3 L<->R: 0.06) receive reverb and are panned to the far right.
18. We can now turn our attention to the **Vox Harmonies** track folder.
 19. Add an instance of **ReaEQ** to this folder. At around the 1,000 Hz mark add about 6 dB gain with a bandwidth of about 1.5 octaves. Reduce the overall Gain by about 3 dB to compensate for this. This will take some of the brightness and immediacy off the vocal harmonies submix.
 20. After this, add an instance of **ReaComp**. We are going to use this as a sidechain compressor.
 21. Open the **I/O Window** for the **Vox Harmonies** track folder and insert a Post fader receive from Track 1 – Vox Lead. This will “drive” our sidechain compressor.

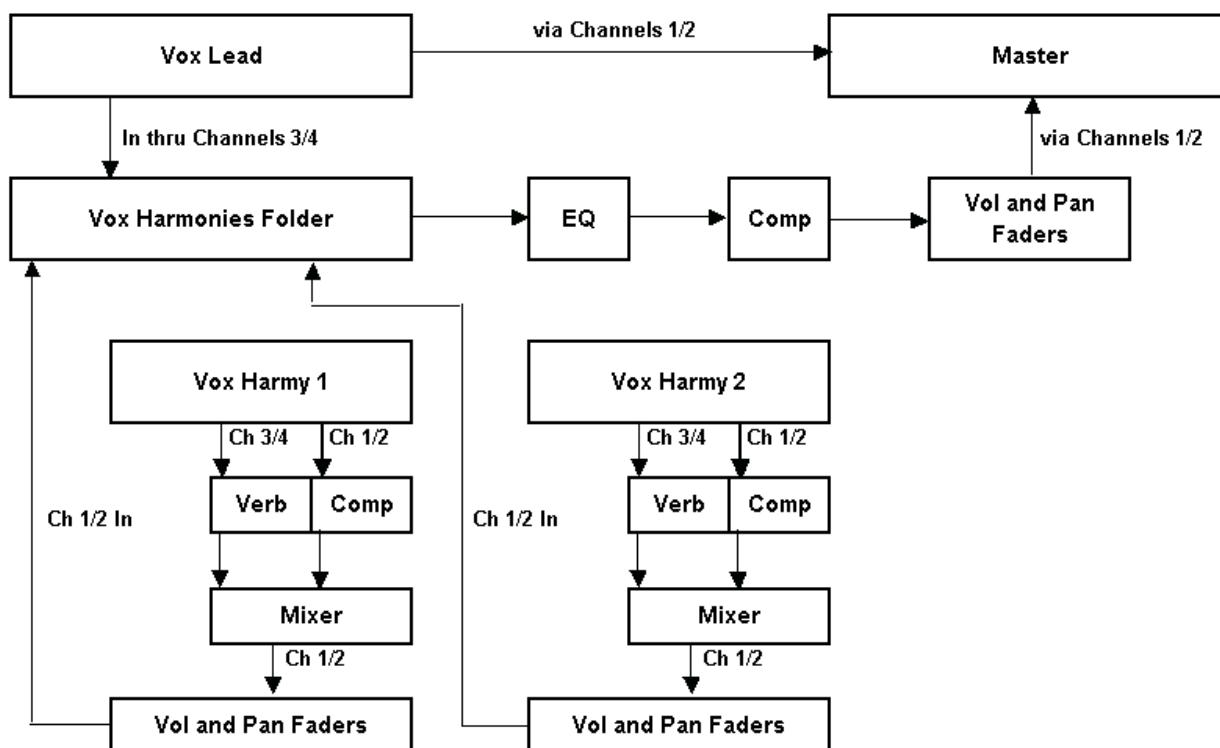
22. Select the **ReaComp** plug-in and make sure that the **Main Input** is coming from track channels 1 and 2 and the **Auxiliary Input** is coming from track channels 3 and 4. These should be the default settings.
23. Adjust the **ReaComp** settings to suit. Remember that your main objective here is to prevent the vocal harmonies from ever jumping up over the **Vox Lead**. An example of such settings is shown on the right.
24. Adding a Volume envelope to the Vox Lead track with a gain of about 1 dB from about the 37 second mark onwards will help to achieve this.
25. Play the song, making any further adjustments that you think are appropriate. Your vocal harmonies should now sit dreamily behind the main vocal in your mix. Save the file.



Notes:

The file **RosesBloom BVOX 1A** contains one possible outcome for this exercise.

The flow chart below illustrates the interaction between our various vocal tracks as well as the signal flow.



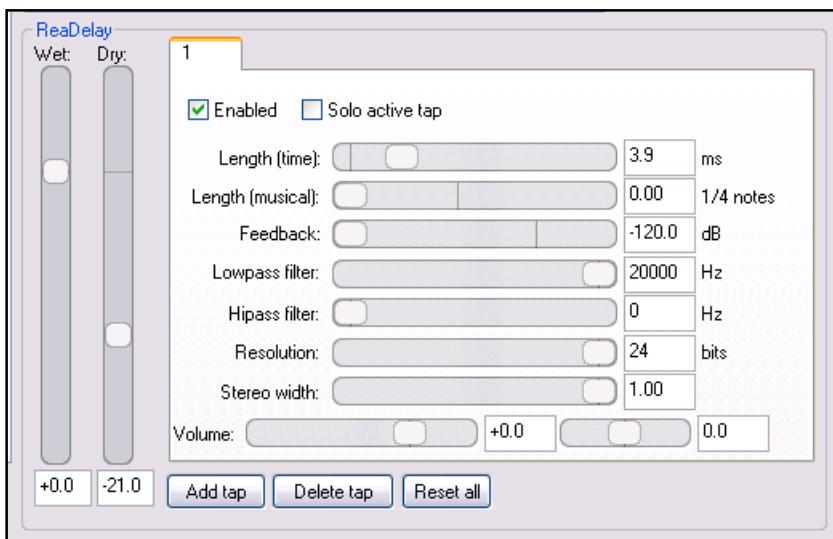
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3.10.9 Sparkling Harmonies

In the previous example, we created a dreamlike vocal harmony effect from just one or two vocal harmonies. This technique can be especially effective when you have a fair few backing vocalists to mix. In this next example, we want our two vocal harmonies much more up front in the mix. Some of the techniques we will use to achieve this outcome will include:

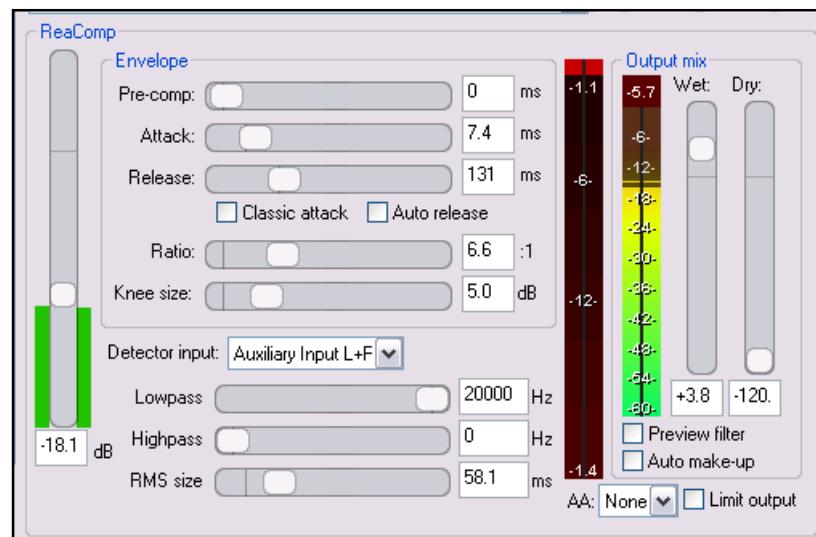
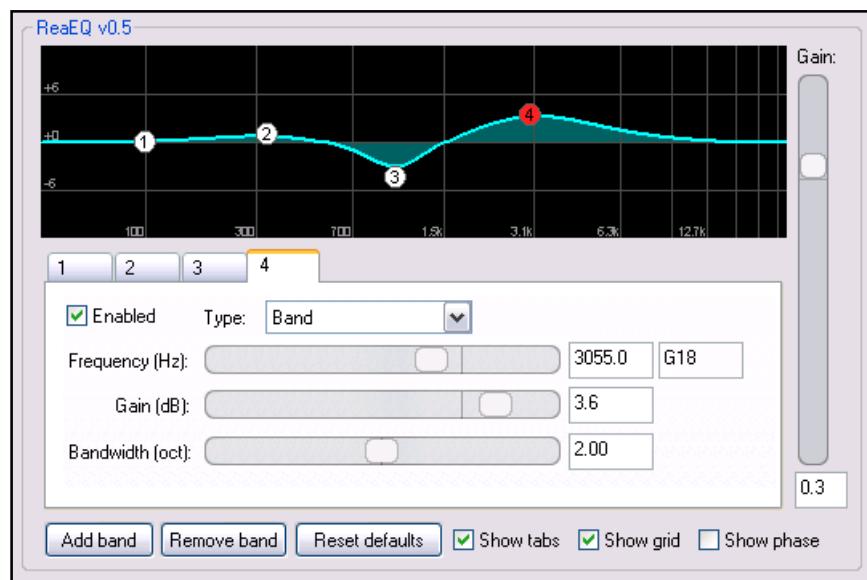
- **Panning:** panning will be much less aggressive, moving our harmonies closer to the centre to be more integrated with the lead vocal.
- **Sidechain compression:** this may still be used here, but less aggressively than in the previous example, and individually for each track, as we might actually want to allow the harmonies to occasionally cut through to the front of the mix this time.
- **No harmonies track folder:** a track folder is not required because we will be treating each vocal harmony track this time very much as an individual track. We are not seeking to create a choir effect, or anything like it.
- **Less depth:** because we are not aiming to push our harmonies back in the mix, they will not require any special reverb effects. Sometimes, however, we might want to use a little delay, just to fill the voices out a little.
- **EQ:** in the previous example we used EQ to remove some of the presence and character from the vocal harmonies. In this case, we will want to use it to accentuate the strongest characteristics of each vocal harmony.

Example

1. Open the file **RosesBloom BVOX** and immediately save it as **RosesBloom BVOX 2**.
2. Adjust the panning for the two **Vox Harmy** tracks so that they are about 20% left and right respectively.
3. Adjust the panning for the tracks **Guitar** and **Gtr Neck** so that they are about 50% left and right respectively.
4. Adjust the volume faders of the various tracks so that the balance of the mix sounds quite close to the levels that you are hoping to achieve.
5. If you are working in track view, open the FX Window for the **Vox Harmy 1** track. If you are using Mixer view, make sure the option to **Show FX Inserts** is enabled.
6. Add the following FX to this track, in this order: **ReaDelay**, **ReaEQ**, **ReaComp**.
7. Adjust the parameters for **ReaDelay** to create a very subtle delay effect and add a generous level of that delay to the track's mix. One suggested possible set of values is shown here.
8. Experiment with the EQ settings, so as to remove a little of the mid-range from this track whilst adding a little more

presence. Remember that you can use the technique of sweeping the frequency range with a bandpass EQ setting to help identify the frequency or frequencies that you wish to boost.

9. One possible set of EQ settings is shown on the right.
10. For each of the tracks **Vox Harmy 1** and **Vox Harmy 2**, open the **I/O window** and specify that you require 4 track channels.
11. In each case, add a **Post Fader Receive** from the **Vox Lead** track, to **Channels 3/4**.
12. Now select the **ReaComp** plug-in for **Vox Harmy 1**. Make sure the Detector input is set to **Auxiliary Input L+R**.
13. Adjust the settings for the other parameters to ensure that your sidechain compressor will kick in quite gently and only during the loudest of the phrases on the Vox Harmy 1 track. Your settings will probably end up quite similar to those shown on the right.
14. Notice in this case we are also using the Wet output fader to give the volume of this track a significant lift.
15. Play the song making any tweaks that you think appropriate to any of these settings.
16. Next, the **Vox Harmy 2** track requires similar treatment to this one. Use the same plug-ins, but of course with different settings. For example, you can try using about 8ms delay rather than 4 ms (to achieve a more varied and blended sound). For the EQ, you will probably want to boost this track to emphasise the body or warmth of the vocal rather than the presence.
17. Finally, and very importantly, we can use Volume envelopes to really good effect in this mix. By making some quite precise adjustments to the volume of the three vocal tracks, we can create a very live feel, with individual voices being lifted just above the mix here and there for just the odd phrase, word or even syllable.
18. An example of how this might be done is shown below.



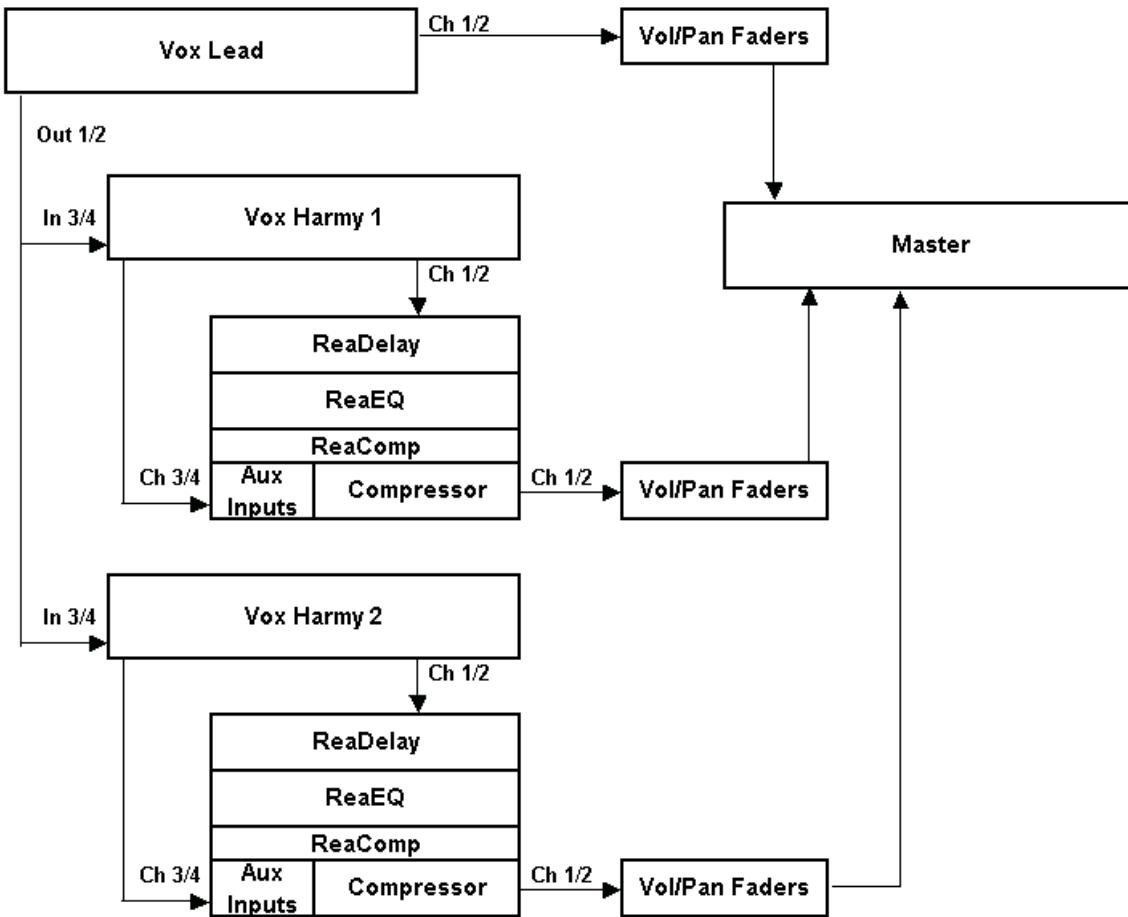
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19. Save your work when you are happy with the results.



Note:

The file **RosesBloom BVOX 2A** contains one possible outcome for this exercise. If you wish, open it and examine it at your leisure. The flow chart below illustrates the interaction between the Vox lead track and the Vocal Harmony tracks in this example.

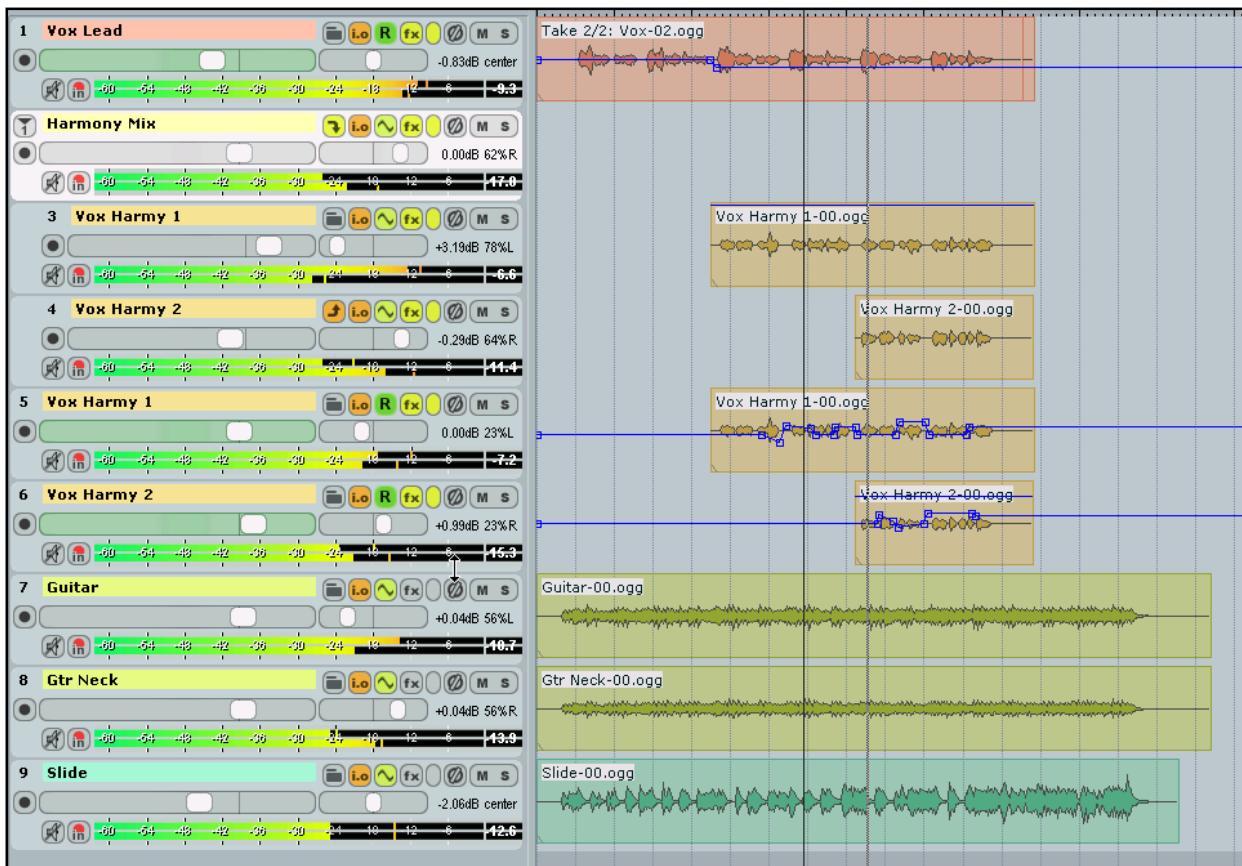


We have just examined two completely different approaches to, and techniques for, mixing vocal harmonies in a song. It is not suggested that these are the only available techniques, or even the best technique. Rather, they are there to encourage and help you to think about what kind of sound you want to achieve, and how you can set about creating it.

3.10.10 Full, Fat Harmonies

Here's one to really get you thinking.

In this example, we're slipping in another way of dealing with vocal harmonies, one that quite literally combines the characteristics of both our Dreamy Harmonies and our Sparkling Harmonies. The result is a vocal mix that somehow manages to combine a definite strong presence with a comforting mellow feeling, and at the same time.



The above illustration shows a project file in which the vocal harmony tracks have each been duplicated.

Tracks 2, 3 and 4 are essentially treated in the same way as were our vocal harmonies in the Dreamy Harmonies example.

Tracks 5 and 6 have been essentially treated in the same way as were our vocal harmonies in the Sparkling Harmonies example.

If you open the file **RosesBloom BVOX 3A** you will find a sample mix that does just this. If nothing else, it should give you some ideas.

And while we're on the subject of ideas ...

We have spent a fair amount of time looking at vocal harmonies and just some of the amazing opportunities that REAPER presents you for mixing them. However, you would be very seriously missing a trick if you think that these tools are only there to be applied to vocals. No matter what the style of music and what the instruments and other parts, the opportunity is there for you to dig in and get some really great sounds. In fact, shortly we'll be applying the REAPER treatment to a lead instrument.

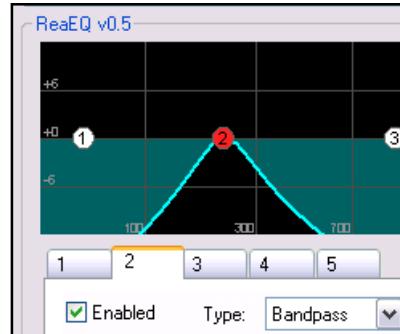
Don't be afraid to experiment and don't be afraid of making mistakes along the way, because it's all going to help you to get to your destination of coming up with a really great mix.

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3.10.11 Lead Instruments

By now you should be getting the idea. To get the most out of any instrument in your mix you need to first identify those frequency ranges where the strongest and most desirable characteristics of the instrument's sound are to be found. One way of doing this is to sweep the track using a bandpass filter (see right). You can then use the techniques that you have learnt in this section to really bring that instrument to life. You should also keep in mind the need to avoid clashes of different instruments fighting for the same acoustic space.

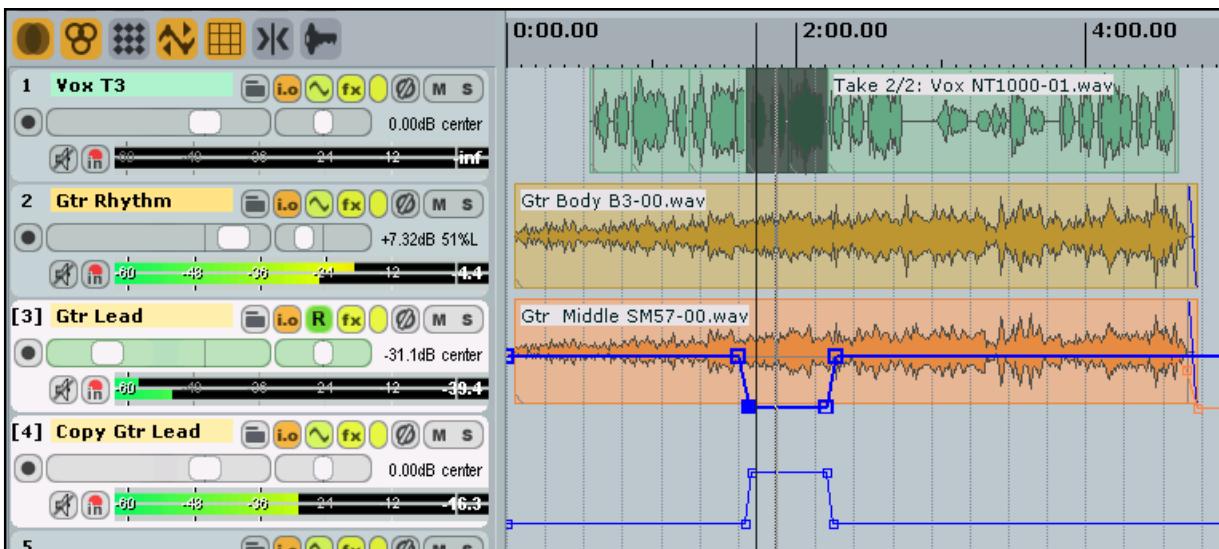
For example, it might be possible for two instruments to exist closely side by side in your panning (left-right) spectrum if the frequencies at which they are primarily to be heard are very different. This might be the case, for example, with a piccolo and a cello. Likewise, it might be possible for two instruments to share the same frequency range if your use of panning keeps them well apart in the left-right spectrum between your speakers. This might be the case, for example, with two guitars. But you most certainly will not get the best out of either if they are placed close to each other in more than one dimension at the same time.



Remember that often an instrument, such as a lead guitar, may have a relatively minor or supporting role to play in a mix, except for perhaps the 20 or 30 seconds when it is featured in a break. When this is the case, the use of the techniques shown in the preceding couple of sub-sections can often be really effective in bringing that instrument to life. Remember that by using bypass envelopes, you can run a completely separate FX Chain for one passage of a song than that used for the remainder of the song.

If the use of bypass envelopes seems too unwieldy, there is a different technique that you can use:

1. Create a new track immediately below the track which contains the instrument to be featured in the lead break.
2. Create a Pre-FX send from the original track (with the Media Item) to the new track.
3. Insert the multidimensional FX chain into the new track. Use whatever other FX you find appropriate in the original track.
4. Use volume envelopes to create a cross fade between the two tracks during the lead break.



An example of this is shown above. Track 3 contains the Lead Guitar. A Pre FX Send is used to send a copy of this audio signal to Track 4. The multidimensional FX Chain has been inserted into the FX window for Track 4.

Volume envelopes have been used on Tracks 3 and 4 so as to cross fade between the two tracks at the start and end of the lead break.

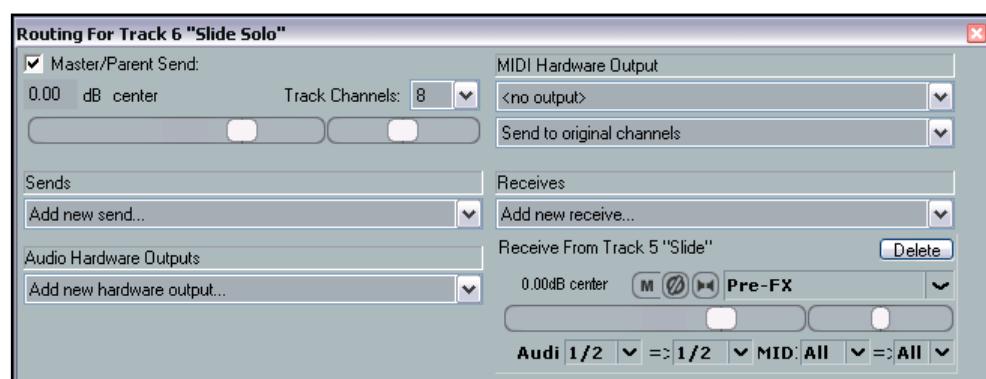
Before you know it, you'll be creating lead breaks far better than anything you'd ever thought possible! It just takes practice, persistence and patience.

Example

As with all of the other examples in this section, the example that follows is designed to illustrate one or two specific techniques, and is not intended to serve as a model for a perfect mix for the sample project used.

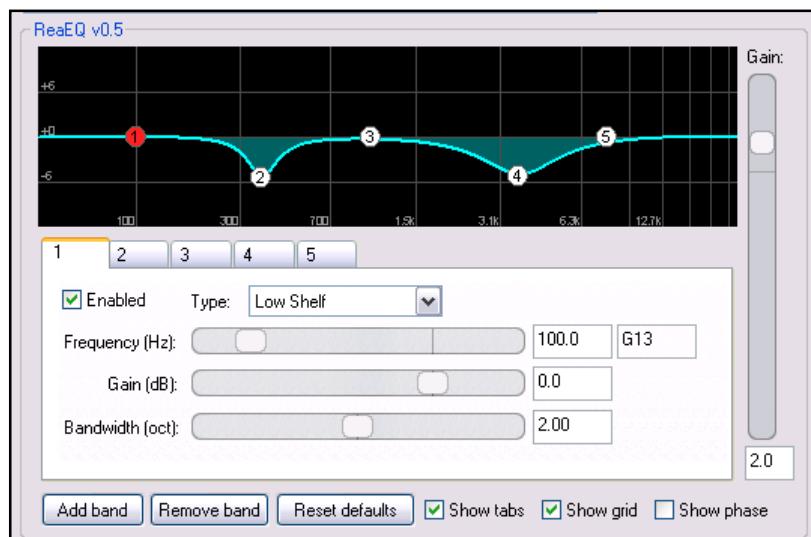
1. Open the file **RosesBloom LEAD** and immediately save it as **Roses Bloom LEAD 1**
2. We are going to do some work on the **Slide** track so that the last 30 seconds or so of the song will feature this instrument.
3. Select this track (Track 5) and press **Ctrl T** to insert a new track immediately after it. Label this new track **Slide Solo**.

4. Open the **I/O Window** for the new track. Define it as having eight channels, and add a Pre FX receive from the

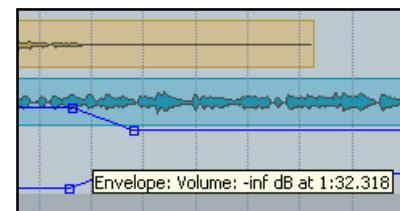


Slide track, as shown.

5. Into this track's FX Window, insert an instance of **ReaEQ** and adjust the settings as shown here. The effect of taking a little off the fullness and a little off the brightness of this instrument, whilst adding a compensating gain overall will be to make the instrument appear to be a little further back in the mix without it necessarily being quieter.

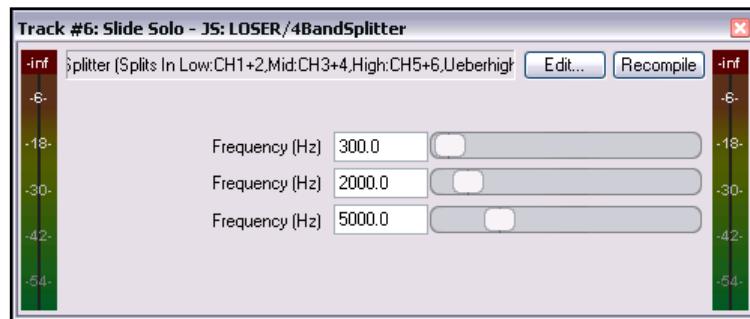


6. Now add a Volume envelope to this track. Add the necessary nodes to fade this envelope all the way down just after the point in the song where the vocals finish.
7. Add a Volume envelope to your new **Slide Solo** track. Drag this envelope all the way down to **-inf**, then fade it up to around 0dB just around the point where the vocals stop. See illustration on right.

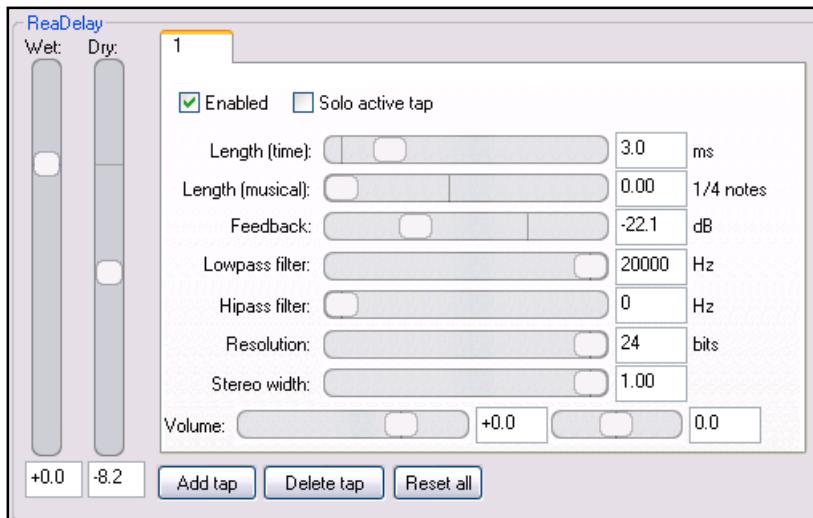
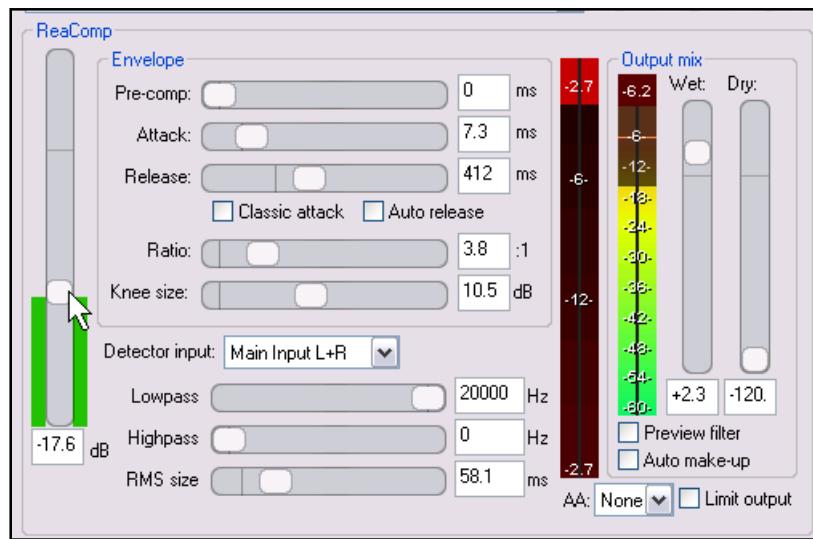


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8. Open the **FX Window** for your **Slide Solo** track.
9. Insert into this FX Chain an instance of your **Mixer 8xM 1xS**.
10. Just above this, insert an instance of your **JS:LOSER/4BandSplitter**.
11. Over time, you will probably want to experiment with the settings to get the best results. To begin, try settings similar to those shown here.



12. Create a loop for the last fifty seconds or so of the song. Play the song while you make your adjustments.
13. Between the Splitter and the Mixer, insert an instance of **ReaComp** and an instance of **ReaDelay**.
14. Set the left and right Main Input for **ReaComp** to only Channels 3 and 4 respectively. Set their left and right Outputs to only Channels 3 and 4 respectively. Adjust the settings to apply some fairly gentle compression to these channels. One possible set of settings that you could use is shown here.
15. Select the **ReaDelay** plug-in. Make the necessary adjustments to the plug-in's settings to ensure that it takes its only inputs (left and right) from channels 5 and 6 respectively, and also directs its outputs (left and right) only to those same channels.
16. Make such adjustments to the plug-in's other parameters so as to apply some fairly subtle delay. A suggested possible set of settings is shown here.
17. Select your Mixer plug-in. Adjust the volume levels and pan positions for your eight channels until you are happy with the sound.



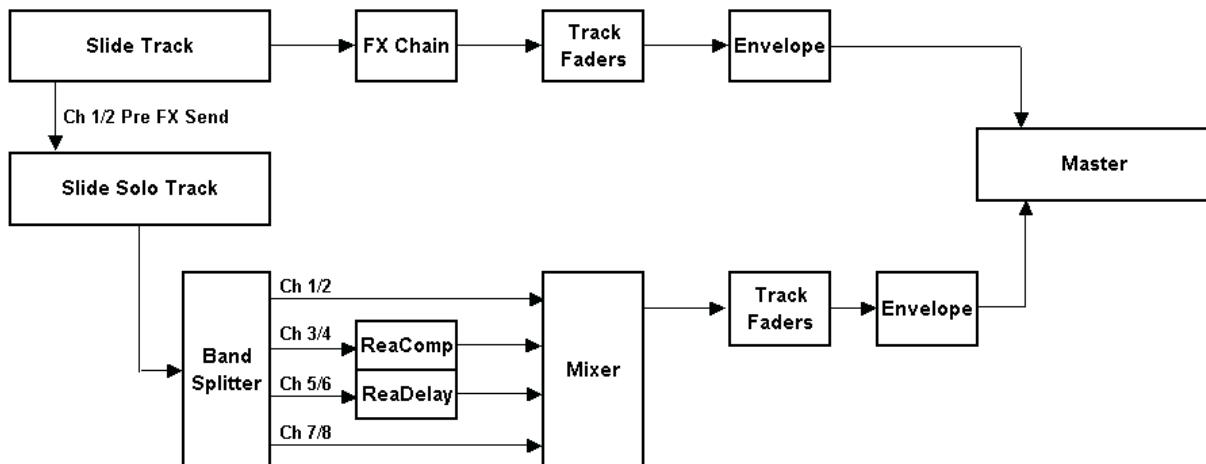
18. Make any further adjustments that you like to your envelopes or any other settings. You should now notice that after the vocal finishes, the **Slide Solo** appears to come forward in the mix as well as spreading out to command the stage.
19. One significant advantage of using this method is that to switch between your two slide tracks at any time you have to make adjustments to only two envelopes, rather than to a whole number of plug-ins and other parameters.

Note:

The file **RosesBloom LEAD 1A** contains a possible outcome of this exercise. Open this file, play it, and examine its settings.



The diagram below represents the signal flow for the audio signal for the Slide Guitar in this project.



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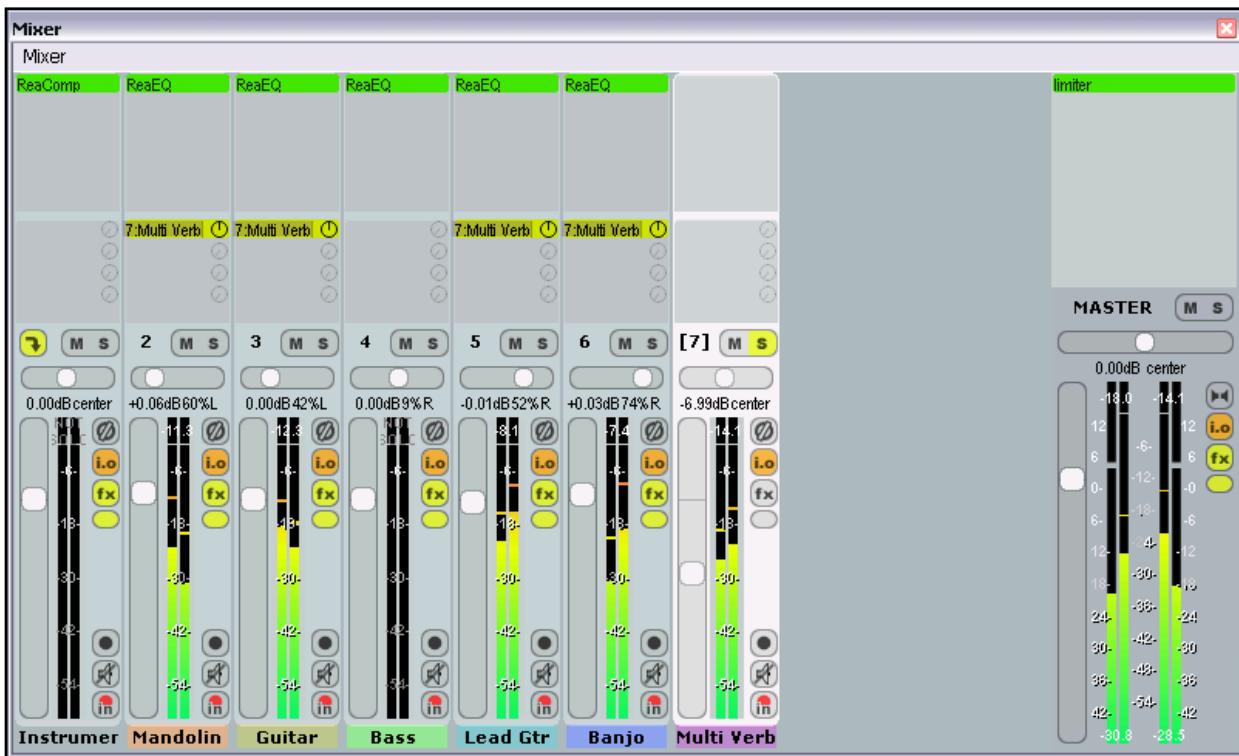
3.10.12 Multi-Channel Reverb

We've already explored quite a few possibilities for using Reverb in REAPER, some of them in ways that might be new to you. This next example will introduce you to another.

In this case, we will be taking one of our projects and adding a touch of reverb to our overall mix. We will do it, however, in such a way that by splitting our Reverb track (bus) into several channels, variations in our Reverb settings will be applied to different frequency ranges and also panned differently. This technique has an extraordinary number of permutations and possibilities. In this example, we will set out in pursuit of the Holy Grail of reverb – to use Reverb to add depth and warmth to our mix while at the same time actually enhancing clarity.

Example

1. Open the File **Pelverata Frost VERB** and immediately save it as **Pelverata Frost VERB1**
2. After the last track add a new track and label it **Multi Verb**. Make sure that this is not included in your **Instruments** track folder.
3. Display the **I/O** window for this track and set the number of channels to four.
4. In mixer view, make sure that both FX Inserts and Sends are visible.
5. Drag and drop to create sends from the Mandolin, Guitar, Lead Gtr and Banjo tracks to your new Multi Verb track. See the illustration below.



6. Notice that there is no send from the **Bass** track. It's actually a fairly common practice not to add reverb to a Bass.
7. Solo the **Multi Verb** track and adjust the levels of each send to get a balanced mix.
8. Into the **FX Window** for the **Multi Verb** track, insert two instances of **Kjaerhus Audio Classic Reverb**. Set one of these to bypass.

9. For the active reverb plug-in, we are aiming to create a sound which will add Reverb but also maintain brightness. A fairly small room size, very short predelay, quite modest early reflections and a fairly aggressive low cut value will help us to create this sound.
10. A possible set of settings to achieve this effect is shown in the first of the two illustrations on the right.
11. Now set this Reverb FX to bypass and engage the other Reverb plug-in. Remove the bypass setting from this plug-in.
12. For this second plug-in, we want to create a much fuller, lusher reverb effect.
13. For this instance, we will require a larger room size, more predelay, a much lower low cut value, and other changes to the various parameters. A suggested possible outcome is shown in the lower of the two illustrations on the right.
14. When you have got the sound that you want, remove the bypass status from both of the Reverb plug-ins and play the song.
15. You might notice that the effect of the two different reverbs is to create something of a clash. We can solve this by the use of channel splitting and panning.
16. At the end of the Multi Verb track's FX chain, add your Channel Mixer plug in. Fade the volume faders for all except Channels 1, 2 , 3 and 4 all the way to the left.
17. Select your first reverb plug in and change its outputs to only Channel 3 (Left) and Channel 4 (Right).
18. Now play the song again, with the Reverb Bus soloed.
19. Adjust the pan positions and volumes for your four channels until you get the best sounding reverb that you can.
20. You would expect to be likely to want to use higher volume faders for Channels 3 and 4 than for 1 and 2 because Channels 3 and 4 are giving your Multi Verb its clarity and definition, whereas Channels 1 and 2 will be tending to produce a more distant effect.
21. It is important that each channel is panned sufficiently apart from the others for each to have its own space.
22. As a rule, you would expect to place the more present of the channels (3 and 4) closer to the centre, with the more distant sounds from the other channels trailing off more into the distance.



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23. A possible outcome is shown on the right.
24. You may wish to the **JS: utility limiter** after the mixer, to prevent the output of this track from becoming too loud. Set a maximum output of about -3 dB.
25. Unsolo the Multi Verb track and play the song. Adjust the track's volume fader to suit. You may also need to make changes to some of the individual plug-in settings. Save your work.

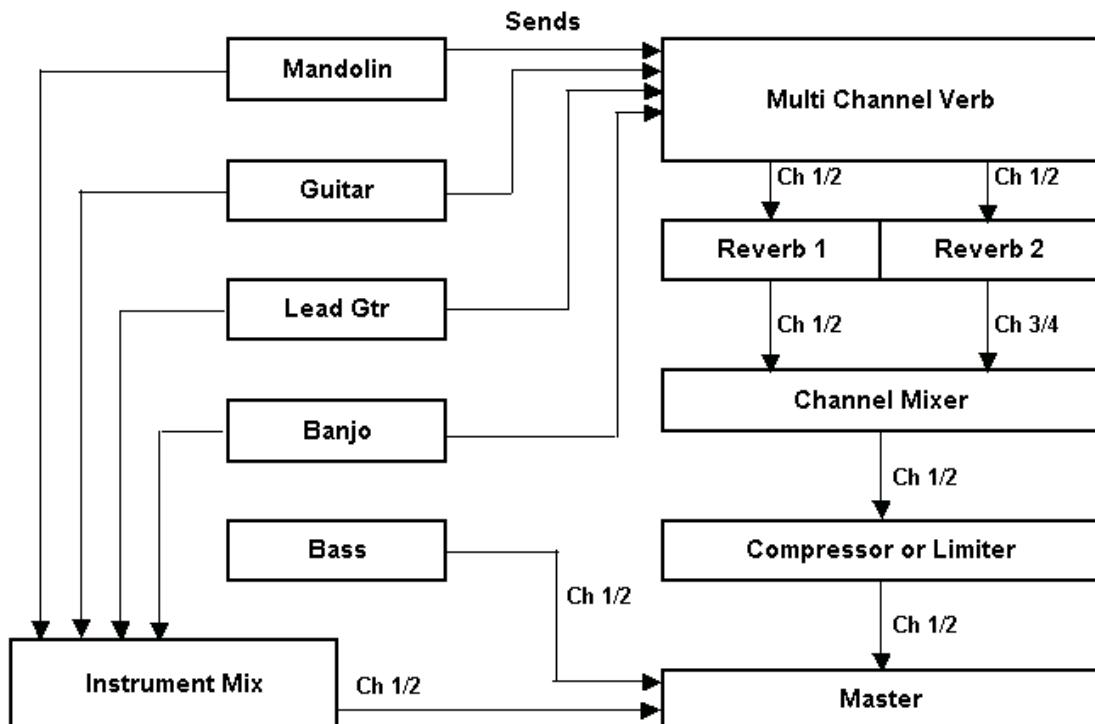
Note 1:

The file **Pelverata Frost VERB1 A** contains a suggested possible outcome for this exercise. Open this file, play it and explore its various settings. The flow chart below represents the signal flow for this project.



Note 2:

This example introduces you to a whole range of possibilities. For example, you can use **ReaVerb** in one or more of your reverb chains, in addition to which you can also insert other FX, such as EQ in your chains.



3.10.13 Phasing Issues

When you apply effects such as Delay and EQ to an audio signal, there is always a risk that phasing issues might arise. Put at its simplest, anything that you do that affects the time a signal takes to reach the ears can potentially put part of the signal partially out of phase. If this happens, you will notice your instrument sounding dull, muddy and probably quieter than you think it should.

One way of resolving this issue is to analyse your EQ settings, on their own and in combination, to identify where the problem is occurring and what steps you should take to fix it. This approach is the most commonly used method. However, with multidimensional mixing you should often find that you can take a different and more interesting approach. Try adjusting the pan settings in your channel mixer. By separating in this way the combination of settings that are causing the problem you should be able to achieve a successful outcome.

Notes

4 Artistic Mixing

For many of us, this is the aspect of mixing which is most challenging and most satisfying. This is where you have the opportunity to take a good mix and make it into a great one. This short section aims to provide you with some guidelines which you can apply when deciding how best to mix your songs.

- **Understand the Song.** By the time we get to this stage of the mixing process, *every* mix is a one off job. Listen to the song carefully. Experience it all the way deep down inside yourself. Figure out what it is trying to say. A warm, hopeful and positive love song most likely wants a warm and mellow mix. A song of anguish and despair will probably need to have a certain edge about its sound.
- **Get with the Mood.** Following on from the previous point, what is the overall mood of the song? If it is placid and gentle, then so should you be. On the other hand, a dramatic and overpowering song may be just crying out for dramatic adjustments to EQ and panning (and perhaps more) as the song develops.
- **Listen to the Melody.** Understand and learn to feel the song's melody line. A busy melody may require few if any FX and be best left to speak for itself. In contrast, a simple (and perhaps too simple) melody can be enhanced with many of the techniques covered in this mixing primer, such as fattening, EQ, delay or reverb.
- **Don't Fight against the Rhythm.** As a general rule, the more complicated the rhythm, the less you will want to interfere with it. For a complicated rhythm, your challenge is to emphasise clarity and distinction. For a simpler rhythm, you may need to use FX in a more creative way to keep it interesting.
- **Use Sound Effects (but sparingly).** Listen carefully to the lyrics. Often you will find opportunities where they are crying out for enhancement. "Can't you hear that church bell chime" could be your cue to add a distant church bell somewhere in the background. "I hear that train a coming" might just be crying out for the faint sound of an approaching train. Don't overdo this though, or you'll drive your listeners mad.
- **Figure out the Arrangement.** Don't make any pre-judgements here. Simple logic might dictate that a thin arrangement (perhaps vocal and acoustic guitar only) should need fattening up and filling out, whereas a full band sound will need weeding and thinning out. But simple logic isn't always right. Sometimes that simple arrangement works better the thinner it is. And sometimes the way to deal with that full, busy mix just might be to make it fuller and busier.
- **Less Can Be Best.** Many mixes suffer from being too busy. This has been discussed earlier – depending on the style of music maybe you'll want a wall of sound, maybe you won't. In either event, often an instrument can have more impact on a song by being underused than by being overused. This can be the case for example with a flute or an ocarina, which may sound better faded subtly in and out than being present all the time.
- **Look to Build Your Mix.** Depending in part on the mood of the song and the lyrics themselves, consider holding back some instruments and introducing them gradually at different stages of your mix. This is a very old technique that has been used in many hit records just about since the beginning of hit records. That's because when used appropriately it can be so effective,
- **Stay with the Structure.** Listen out for changes in the song's structure. There might be an opportunity here to be really creative by mixing different parts of the song differently. These changes could be major or quite minor, depending on the song. One obvious example of this is to change the balance, sound and positioning of the various instruments during any lead breaks, or during a song's bridge.

Notes

5 Cooking the Mix

5.1 Introduction

As stated in the Preamble, this Mixing Primer aims to help you to produce great mixes that will be ready for mastering. It does not take you into the realm of mastering itself. There are a number of reasons for this, including these:

1. Not everybody will wish to do their own mastering. Many prefer to make their mixes ready for mastering, then hand the projects on to a mastering professional.
2. Of those REAPER users who do prefer to do their own mastering, in all probability most use a separate program such as Sound Forge, Wavelab or CD Architect for this purpose.
3. Mastering is a specialist art and science in its own right. The techniques, knowledge and skills required for this are far less REAPER specific than anything covered in this handbook. There is no shortage of good quality books that have been written on the subject of mastering, none better in my opinion than **Mastering Audio** by **Bob Katz**. It would be ridiculous of me were I to suggest that I had any wisdom or knowledge to offer that goes beyond that.

What you will see, however, in some of the case studies that follow, are some examples how you can add those finishing touches to your mixes that will make them ready for mastering.

5.2 Mixing Order

There is no hard and fast order that you should use to approach your tracks when getting your mix ready for mastering. Different people will have different ideas. Be prepared to experiment until you find a methodology that suits you – and be prepared to be flexible.

That said, if at present you're floundering around wondering where to begin, you could consider this as a starting point.

1. Mute all vocals. Start with the main rhythm instruments. Get their panning, EQ and so on as right as you can. Consider any other FX that might be needed. Is there a main instrument that sounds too thin, for example, and could benefit from a touch of shadow panning or bookend panning?
2. Deal with the percussion. Check out especially how you may need to use panning, EQ, gating and compression here.
3. Add in your other instruments. These may include instruments that have little cameo roles. Consider adjusting your panning through time to make room for them. This too is the time to deal with any instruments that need to be featured as lead instruments during a break.
4. Mute everything except your main vocal. Get its timbre, shape and other qualities as close to how you feel it should appear in the final mix. Consider any special treatment that the main vocal may require.
5. Add in any vocal harmonies or backing vocals.
6. Bring back into your mix all the instruments. You will now almost certainly need to make adjustments to at least your panning and volume levels, possibly also to EQ to create the necessary acoustic space for all your instruments, and possibly adjustments to your compressor settings.
7. Identify opportunities where you can add some further artistic touches. This might be adjustments to panning or EQ in places to make the mix more varied and interesting through time.
8. Be aware that the process is iterative. If you don't like something that you did earlier, go back and change it.

5.3 Pseudo Mastering

The whole question of mastering can create a serious dilemma, especially for less experienced users. What do you do if you don't have enough money to pay for a professional mastering engineer, don't have enough experience to master to a professional standard yourself, but need to produce, say, a demo recording.

In an attempt to provide a stop-gap solution, I've added a section later in this primer on **Pseudo Mastering**. This, I fear, will cause more than a few eyebrows to be raised. In this section, you will be shown a few relatively straightforward techniques that should be able to at least improve the overall sound of your final mix. *This Pseudo Mastering is not intended to serve in any way as a substitute for correct mastering.* Pseudo mastering should only be considered in specific circumstances, and then only as a short term solution. Meanwhile, let's look at the issues involved in pre-mastering – that is, getting your project ready to be mastered by somebody else.

5.4 Pre-Mastering

Basically, we are looking here at what changes you might wish to make to your Master to bring your mix to its best possible standard before mastering. There is one golden rule that applies here. *If in doubt, don't!* Any mastering engineer will tell you that they will prefer to work with a mix that is slightly underdone rather than one that is overdone. You should avoid the use of mastering plug-ins such as Linear Phase EQ, Multiband Compressors, Digital Detailers, Dynamizers and Mastering Limiters. Also stay away from mastering software suites such as T-Racks and Ozone – unless, of course, you are doing your mastering yourself.

Remember always that anything you do to the Master will apply to your whole mix. Don't use this to correct flaws within the mix itself. For example, if your instruments sound muddy, go back and revisit how you have handled the instruments. As far as possible, you should always correct problems at their source.

That said, here are some issues that you might wish to consider when working with your project's track master. Before you try any of them, read the advice offered in Section 5.4.5!

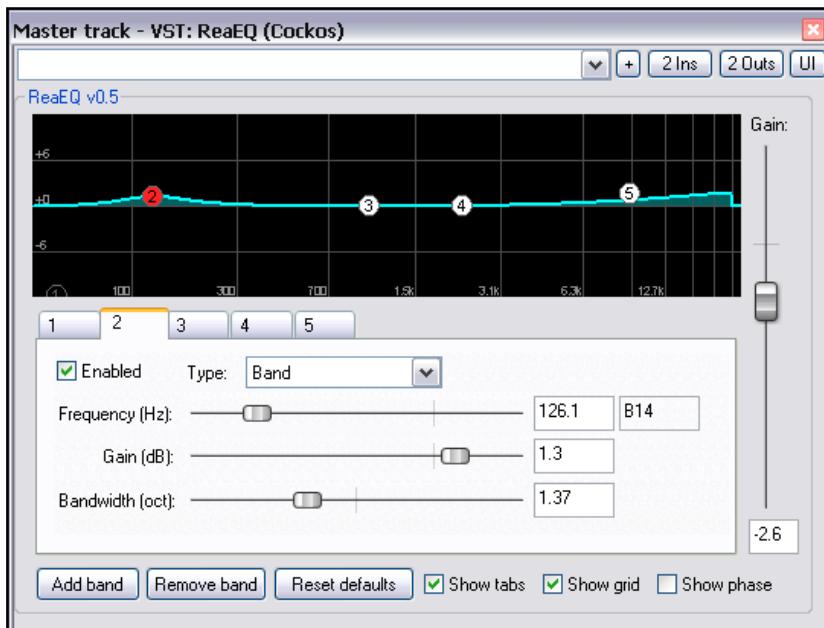
5.4.1 EQ

If you wish to, you can use a little EQ to *gently* shape the overall sound of your final mix. Such an application should be subtle, and will reflect as much as anything else your interpretation of the project's musical genre.

Typically, this is used to add a little warmth and/or air to a project. An example of how this might be done is shown here.

Some people also prefer to use this EQ to roll off the very bottom end, at about 40 or 60 Hz, below the level of human hearing. This can help prevent the uncomfortable rumble that can sometimes be felt when songs containing a fair amount of bass are played back through some systems.

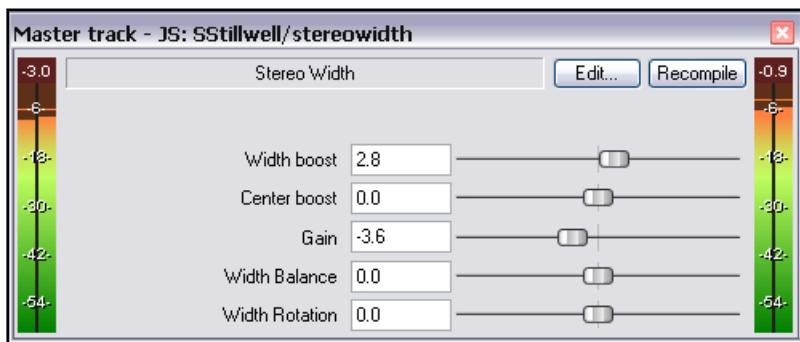
Later in this primer you will encounter an example where this has been done.



5.4.2 Stereo Enhancer

A number of the plug-ins supplied with REAPER can be used to enhance the stereo qualities of your final mix. These include Loser's **Stereo Enhancer** and Stillwell's **Stereowidth** (shown here).

If you use any of these, be conservative in their application. Use them sparingly if you think your mix can benefit from a little extra separation.



5.4.3 Volume Adjustment

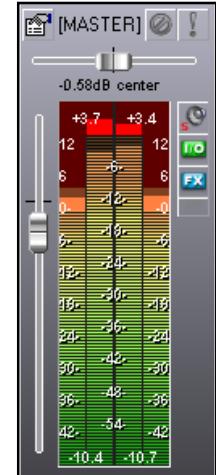
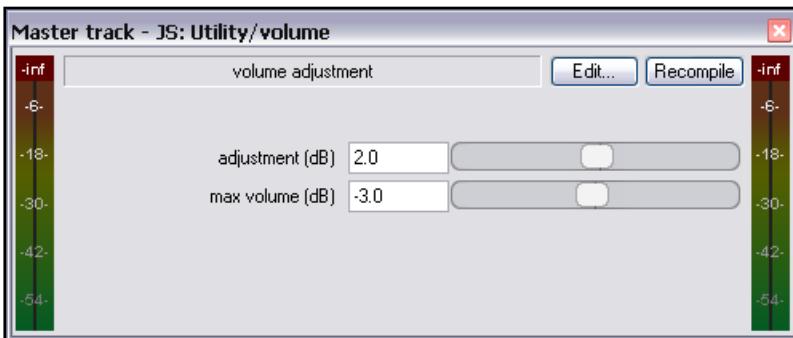
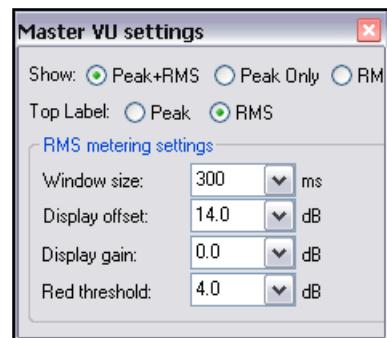
You should aim to produce a level of output suitable for mastering. If your mix is too quiet, this may present difficulties for the mastering engineer. As a rule, you should aim to:

- Peak Volume at between –6 dB and 0 dB.
- Peak RMS at around –12 dB.

Be prepared to adjust your Master VU Meter options to help yourself achieve this. If you are peaking too low, the answer is *not* to increase the Master Volume Fader above 0 dB, as this can result in clipping.

REAPER includes a handy little Volume Adjuster that you can use to resolve this problem.

In the example shown below, this plug-in is used to lift the level of the Master track by 2 dB, but to also ensure that at no time is the volume allowed to rise above –3.0 dB.



5.4.4 Simple Limiter

More often than having the problem of your mix sounding too quiet , you are likely to encounter the problem of it being too loud, causing clipping on your Master VU (see right).

Should this be the case, use the following method for resolving this problem:

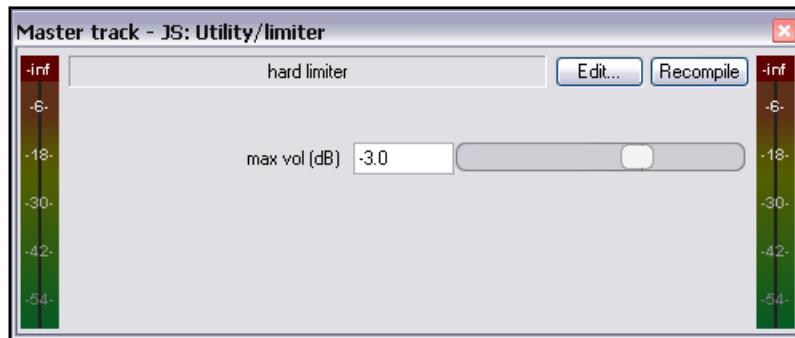
1. Slightly reduce the levels of the Volume faders on your various tracks, until the VU Meter on your Master Track strays into the red only very occasionally and then only momentarily.

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2. You can now use a Simple Limiter purely for the purposes of preventing clipping. It is wiser to use a simple limiter than a mastering limiter at this stage. You can easily tell which is which – a mastering limiter has many more controls and parameters than does a simple limiter.

In the example shown here, the simple Utility Limiter has only one control – Max Vol. You set this control to prevent the output of your Master Track going above that level.

As before, you should use this in conjunction with your Master Track volume fader being set at 0 dB.



5.4.5 Talk to Your Mastering Engineer

Before doing any of the above, however, it is a good idea to talk to your mastering engineer. Different engineers are more used to different genres of music, as well as having their own preferred methods of working. They might have their own suggestions as to what you should and, more importantly, should not do when getting your final mix ready.

Notes

6 Case Study 1: When The Roses Bloom Again

6.1 Introduction

In this chapter, we will look at two possible approaches for mixing one of our sample project files, **When The Roses Bloom Again**.

The first approach creates a full and produced sound, rather in the vein of a pop song. The second aims for a more “down to earth” sound, closer to that which you would associate with folk music. In both cases, the songs have been taken to the stage where they should be ready for mastering.

These are just two interpretations of where you might wish to take this song when mixing it down. Be aware that there are many others. With mixing, there may indeed be many wrong answers, but it is seldom if ever true that there is only one correct one.

6.2 The Big Production Mix

The file **RosesBloom MIX 1A** contains a suggested possible mix for this project. It combines a number of the techniques that we have used in earlier examples, plus a few other changes. Open the file and save it as **RosesBloom Mix 1B**.

Listen to and examine this file in conjunction with the notes that follow.

6.2.1 The Mixer



One glance at the Mixer for this project (above) shows that we have made quite a lot of use of both FX and Sends/Receives. Examine the FX bins of the various tracks more closely and you can also see that this project also makes a significant use of audio channel splitting and joining.

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6.2.2 The Track Layout



Likewise, one glance at the track layout (above) shows that this mix also makes a fair use of Track Folders. This is despite the fact that for this simple song only five tracks were actually recorded!

6.2.3 The Lead Vocal

The Lead Vocal in this example has been mixed in the manner of our *Spacey Vocals* example that was analysed in an earlier section. The actual settings have been tweaked to suit the overall mix.

In addition, two more plug-ins have been added at the end of the FX Chain – **ReaComp** and **ReaEQ**. Their main purpose is to tame down the occasional excessive vocal peak coming out of the channel mixer, and to make the overall vocal track a little warmer and more mellow. If you play the song with and without these two FX bypassed, you should be able to evaluate their effect.

6.2.4 Vocal Harmonies

The two recorded vocal harmonies (Tracks 3 and 4) are contained within the **Dreamy Vocal Harmonies** folder and given a similar treatment to that used earlier in this primer.

Track 3 is also sent to Track 6 and Track 4 to Track 7 (both Pre FX). These are treated in a similar fashion to our sparkling harmonies in a previous example. Both these tracks are enclosed in the folder **Bright Harmony Mix**.

Both folders receive a send from the Vox Lead track for the sole and single purpose of sidechain compression. Tracks 6 and 7 make use of automation volume envelopes to allow the odd phrase to push through the sidechain compressor, thus creating a more natural, live feel to the mix.

6.2.5 Guitar and Guitar Neck

There's not much remarkable about how these tracks have been mixed. EQ is used to add a little bottom end. This both emphasises the fullness of the instrument and adds a little to an area in which the mix is otherwise somewhat lacking.

The Pan law for both these tracks has been changed from -3.0 to -1.5. This helps the instruments to sound reasonably forward in the mix even when pushed out wide. Notice too that both tracks are shifted further out to the left/right edges of the mix during the Slide



6 – Case Study 1: When The Roses Bloom Again

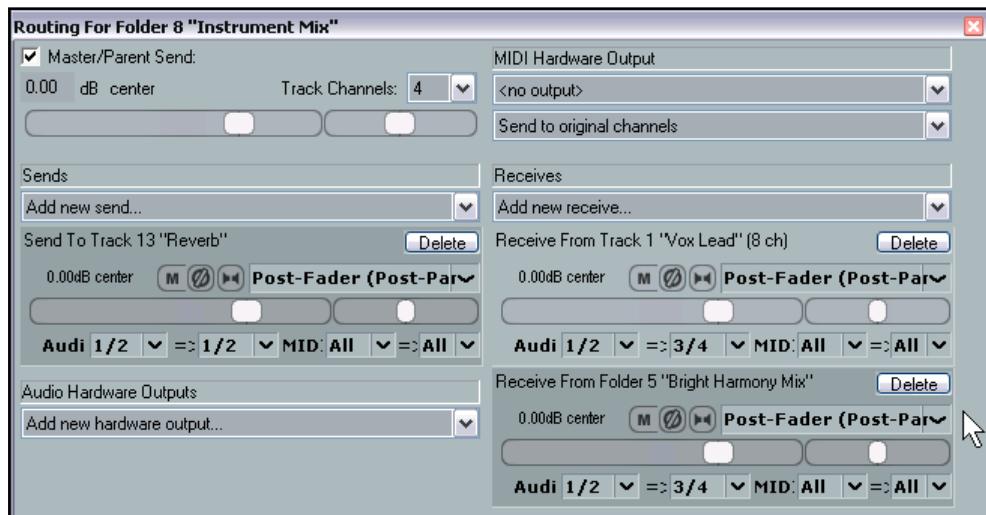
Guitar Solo at the end of the song.

6.2.6 Slide and Slide Solo

Here we have used routing to send a copy of our Slide Guitar track to a new track called **Slide Solo**. This later track is given the Lead Instrument treatment that was analysed earlier in this mixing primer.

6.2.7 Instrument Submix

Notice that the four acoustic guitar and slide guitar tracks are all routed to the Master via an **Instrument Submix**. The main reason for this is to allow sidechain compression to be applied to the Instrument sub mix. Notice that Post Fader Receives come into this submix from both the **Lead Vox** and the **Bright Harmony Mix**.



6.2.8 Reverb Bus

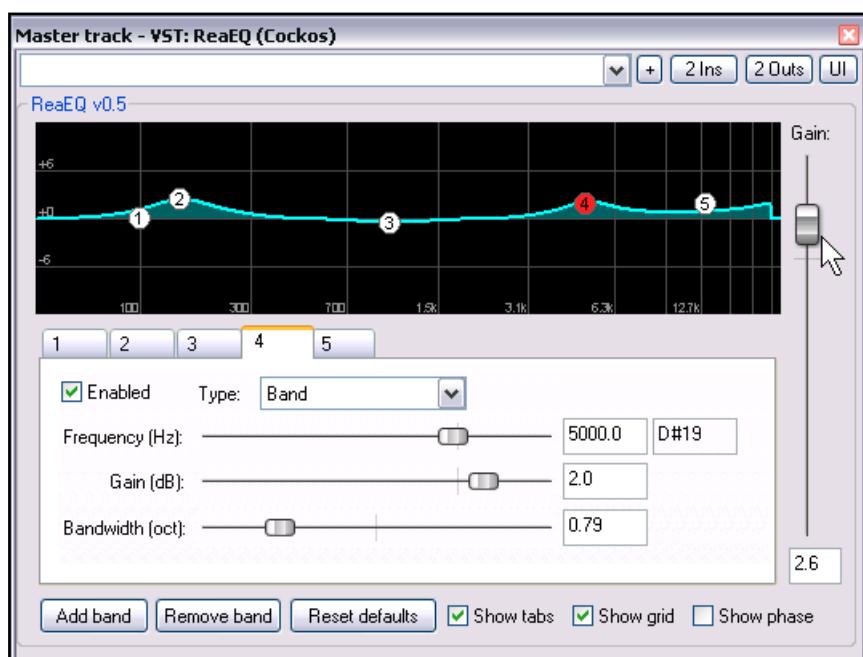
At the end of our track list you can see that another extra track has been added, called **Reverb**. This is used to add a touch more Reverb to our Instrument Mix, as well as a little Reverb to our Lead Vox and Bright Harmony Mix. Remember that reverb increases the sense of depth and distance. By adding a little more reverb to the instruments than to the vocals, we help to keep the vocals more forward in the mix.

6.2.9 The Master

We have done very little with the Track Master. Basically we have just added two FX – **ReaEQ** and the **JS: Utility Limiter**.

The EQ is used to warm up the overall mix just a little and to add some air to it. We then add just a couple of decibels of overall gain, to ensure that the overall volume of the song's output will be suitable for mastering.

The Utility Limiter is simply a precaution to prevent the output from clipping at any stage.



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6.3 The Simpler, Gentler Mix

The project file **RosesBloom MIX 2A** contains an alternative mix for this song. On the whole, it aims to create a less produced, more mellow and more natural sound. One way in which it does this is by making less use of presence and more use of width. This should be especially noticeable with the lead vocal and the Slide Guitar solo which occupies about the last 30 seconds or so of the song.

Even a quick look at the Mixer and Track Views will give you an indication that this is a less complex mix. Less use is made of Track Folders, FX and Channel Splitting, and there are fewer tracks.



Open this file and play it. Listen to it carefully and compare it with the previous mix. Ask yourself questions such as what are the major differences, and which do you prefer?

You should now be ready to examine and analyse the characteristics and distinguishing features of this particular mix.

6.3.1 The Lead Vocal

This has received basically the *Mellow Vocals* treatment that was explained in an earlier section. In addition, some gentle compression has been added at the end of the FX chain, and a send has been added to Track 8 (Reverb bus).

6.3.2 Vocal Harmonies

These have received very little treatment. This helps preserve the simplicity of this recording. In both cases, they have been panned about 20% to one side and a reasonable amount of compression has been used to push them a little way back in the mix, behind the lead vocal. This ensures that no sidechaining is needed. On the odd occasion when a note or two still wants to jump out at you a little, this serves to enhance the authenticity of the sound.

As with the Lead Vocal, a little Reverb has been added to these tracks, significantly more than was added to the Lead Vocal.

6.3.3 Guitar and Gtr Neck

The two guitar tracks have been panned about 50% left and right respectively ... and apart from the addition of a little reverb, that's almost all. In the case of the first of these two tracks, EQ has been modestly applied to make the track a little less up front.

6.3.4 Slide Guitar

This track (Track 7) is the track whose treatment varies the most dramatically from the other mix. Look carefully at the FX Chain and sends from this track. Note also that this track has been allocated 4 Track Channels.

ReaEQ has been used to make the instrument sound a little more present. The output from ReaEQ is fed both to **ReaDelay** and to **ReaComp**. The gently compressed output from ReaComp is fed to the Track 7 Volume and Pan faders,

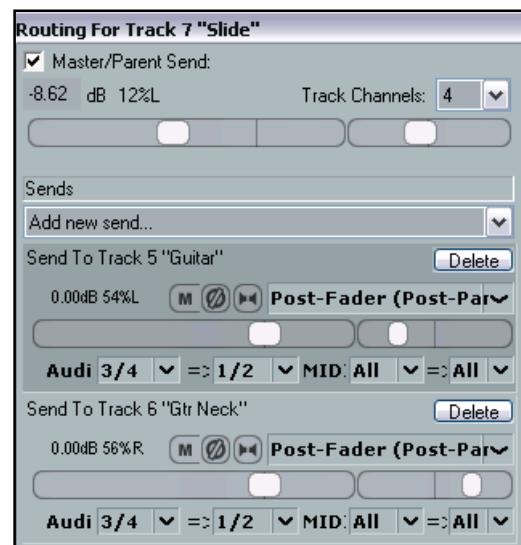
Notice, however, that the output of ReaDelay is sent only to Channels 3 and 4, not to Channels 1 and 2. *Because we do not use a channel mixer here, the delayed signal is not added to the output of Track 7 at all.*

Instead, the output from ReaDelay is sent via two sends to the **Guitar** track and the **Gtr Neck** track, in each case panned further to the outside.

For example, Track 5, Guitar, is already panned about 50% left, and the signal coming in through its receive from Track 7 is panned further left again. Track 6, Gtr Neck, is already panned about 50% right, and the signal coming in through its receive from Track 7 is panned further right again. This is a slight variation of the *Shadow Panning* technique that we encountered earlier.

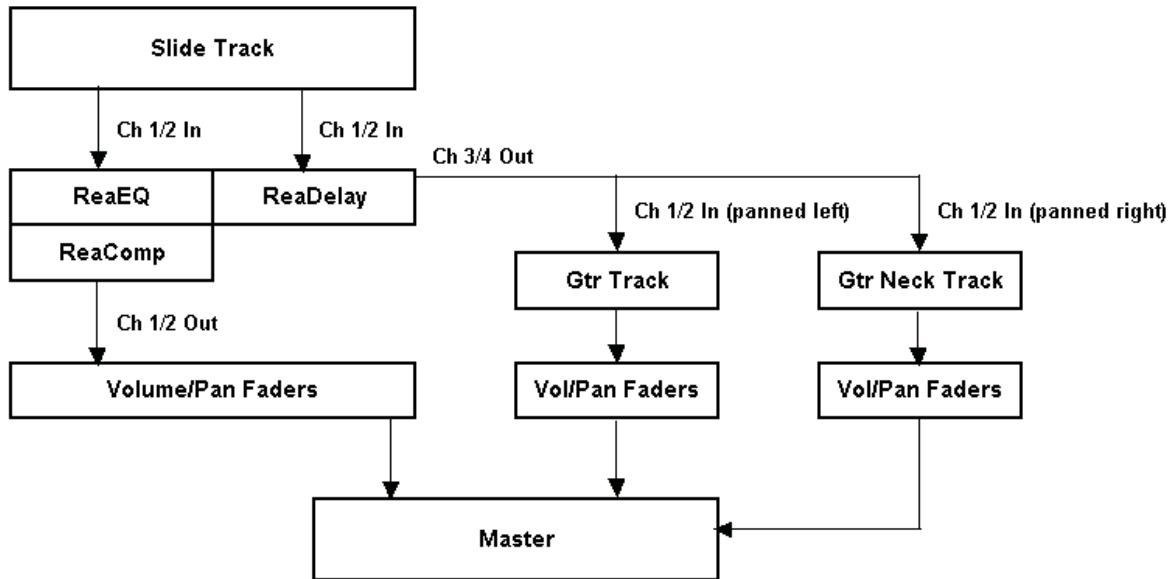
The volume of the signals sent from Track 7 to Tracks 5 and 6 is controlled by two automation envelopes. Except in one or two places earlier where they are used briefly for effect, these envelopes are faded all the way down until the last 30 seconds or so of the song.

You can ascertain the effect of this arrangement by listening to it. Rather than coming up front in our mix (which is what happens in **RosesBloom MIX 1A**), the instrument spreads out to occupy more width. The result is to certainly give it its 30 seconds of fame, but in a more relaxed and laid back manner.



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The flow chart below represents the signal flow for the Slide Guitar in this mix. The Reverb send is not shown in the diagram because it is not relevant to the concept that is being illustrated.



6.3.5 The Instrument Mix

Finally, the overall level of the combined Guitar, Gtr Neck and Slide Guitar signal is controlled by the Instrument Mix faders. This track contains an instance of **ReaComp** which is controlled by the **Vox Lead** signal as a sidechain compressor.

6.3.6 The Master

As before, ReaEQ is used to warm up the mix, add a little air and raise the volume sufficiently to be ready for mastering. A limiter is added as a precaution against clipping.

6.4 Project Assignment

Now's your chance to put into practice what you have learnt!

Open the file **RosesBloom** and save it as **RosesBloom MIX 3**

Now mix it!

6 – Case Study 1: When The Roses Bloom Again

Notes

7 Case Study 2: Pelverata Frost

7.1 Introduction

In this chapter we will examine, analyse and deconstruct a mix of one of our sample project files, **Pelverata Frost**. You will then have the opportunity to create your own mix for this project.

The mix puts into practice many of the topics covered in this mixing primer, but there is one aspect especially which you might find interesting. This project is a simple arrangement of only five instruments, but it uses multiple sends to build the song so that by the time it nears the end it achieves a remarkably full bodied sound. Especially with acoustic music, this can often be a much more natural and dynamic approach to filling out a mix than, say, the use of multiband compression.

So, let's get started. Open the file **Pelverata Frost MIX 1A** and immediately save it as **Pelverata Frost 1B**. This will make it easy for you, should you experiment with any changes, to recover the file in its original state at any time.

Play the song. Notice how the song builds. By about the 1 minute 25 second mark the sound becomes remarkably full, yet each individual instrument can still be heard with great clarity.

For comparison purposes, compare this with the sound of the original file as recorded, **Pelverata Frost MIX 1**. You'll notice straight away that the sound of the original file is much less full than is the mixed version. In analysing this mix, you should develop confidence in your ability to create a very full sound from even the sparsest of arrangements, if that is what you want.

Now let's examine the mixed file **Pelverata Frost MIX 1A** a little more closely.

7.2 The Track Layout



As the illustration above shows, this project has a very simple track structure.

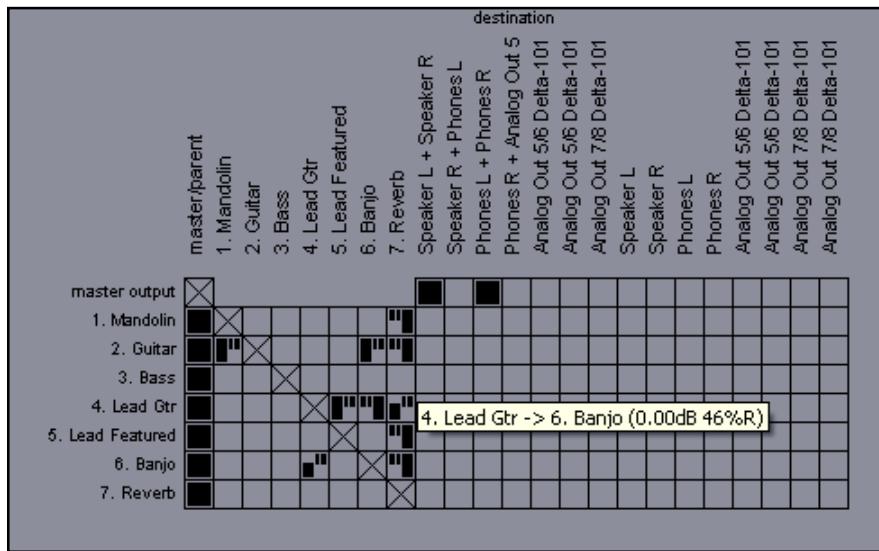
It contains five recorded tracks – **Mandolin**, **Guitar**, **Bass**, **Lead Guitar** and **Banjo**, and no track folders.

The track **Lead Featured** is simply a duplicate of the **Lead Guitar** track. A separate track is used to enable certain effects to be easily applied for the lead break in which this instrument is featured.

The last track **Reverb** is simply a reverb bus.

7.3 The Routing Matrix

Let's start with a look at the Routing Matrix for this project.



You can see that although this project contains only a small number of tracks, there are sends all over the place. You can hover your mouse over any of the intersections on the matrix (as shown above) to display a tooltip with information about that send.

For more detailed information (or to make adjustments) you can of course right click over the intersection.

In overview, however, this project uses sends in four ways:



1. Track 7 is in effect a Reverb bus. Sends to this track from other tracks are used to add some reverb to each of those tracks. By adjusting the levels of individual sends, the amount of reverb added individually to each track is controlled. If you wish, you can also use the pan control on these sends to create a greater sense of width.
2. Sends from the Guitar to both Mandolin and Banjo are used to spread the guitar sound so that it occupies more width. This enables it to be given a strong enough role in the mix whilst at the same time keeping it towards the back.
3. Complementary sends from the Lead Guitar and Banjo (i.e., one from each to the other) are used to enable a fuller sound to be built as the song progresses. These sends are faded up gradually late into the song.
4. A send from the Lead Guitar to a separate track, Lead Featured, enable channel splitting techniques to be applied to this track to help it to stand out during a period of about 25 seconds when it is featured.

In the case of both 2. and 3. above, these are variations on the techniques of Bookend Panning and Shadow Panning. We have already experimented with both these techniques in earlier sections.

7.4 The Mixer



A look at the Mixer confirms the number of sends and receives that you saw in the Routing Matrix. Send levels can, of course, be controlled from the Mixer. Notice also that quite a few FX have been used on some tracks (albeit for the most part fairly conservatively). In the case of both Track 1 (Mandolin) and Track 5 (Lead Featured), channel splitting is used to create a fuller sound.

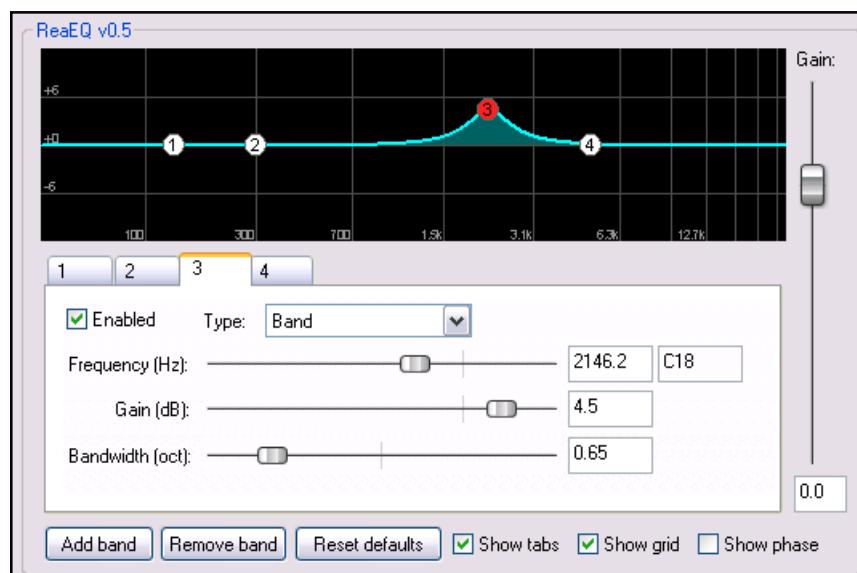
7.5 The Individual Instruments

7.5.1 The Guitar

We'll start by taking a look at Track 2, the Acoustic Guitar.

Notice the EQ boost at around 2150 Hz. This lifts the guitar slightly above the mix at this frequency. When you inspect other tracks such as the Mandolin, Lead Guitar and Banjo, you will see that each of these has a small boost at a different frequency. This helps increase the clarity between each of these different instruments.

You can see also that there is a Pre FX send from the Guitar



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to the Mandolin (Track1). This send is panned to the left of the Mandolin. It helps fill out the space to the left of the Mandolin.



7.5.2 The Mandolin

Let's look next at Track 1, the Mandolin. Notice that it is made up of four channels (see above).

A receive from Track 2, the Acoustic Guitar track, is fed into Channels 3 and 4 of this track. This is panned to the left of Channels 1/2.

A very small amount of Delay is added to the Guitar signal before EQ is used to make it sound just a little brighter.

The Mandolin itself has some EQ applied before all four channels are joined together, after which some gentle compression is applied to prevent either instrument (but especially the Mandolin) from "spiking" and jumping too much out of the mix.

The diagram on the right represents the signal flow for the Mandolin Track.

Notice on the track itself how several minor variations in panning are used throughout the song. This technique is also used on other tracks at various times. The overall effect of these subtle changes is to very subtly enhance a live performance feel of this recording.

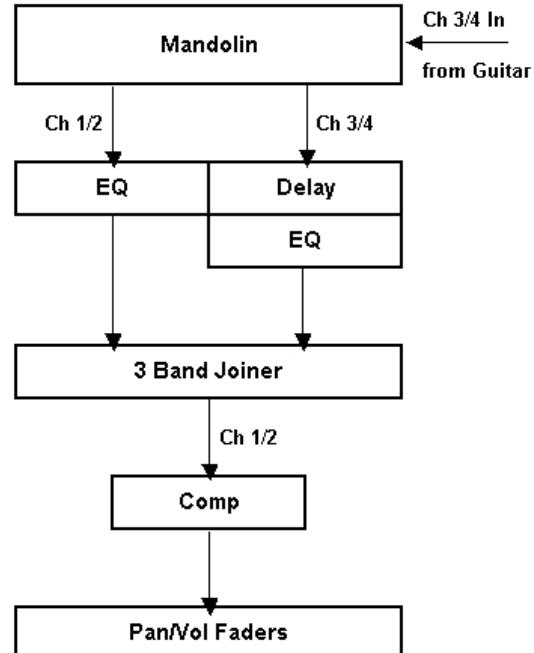
7.5.3 The Bass Guitar

Just a little EQ and compression are applied to make the Bass Guitar sound just a little bit more punchy.

7.5.4 The Lead Guitar

This is the instrument that we will be featuring most in this mix. For this reason it gets a lot of attention.

Track 4 itself is fairly simple. It uses EQ to add a little clarity to the instrument. The main trick worked on this instrument, however, is through the send to Track 5.



This track uses channel splitting with FX (see diagram on right) to fill out and boost the instrument during a period from about 38 seconds to about 63 seconds. This second track is then faded out for about 20 seconds before it is slowly faded back up to help build a dramatic ending to the tune.

7.5.5 The Banjo

EQ is used on this track to add a little body and freshen up the sound a little.

Notice that during the latter stages of the song, the panning is changed for the Banjo and the Lead Guitar relative to each other.

7.5.6 The Reverb

ReVerb has been used to add a little reverb has been added to all tracks except the Bass.

In this example the Reverb Generator, Echo Generator and File (02-7 Plate Reverbs-10.wav) have been used (together with a LP/HP Filter) to create an unusual but not overpowering reverb effect.

In order for the example to work, you must first have downloaded the necessary files from <http://stash.reaper.fm/tag/Reverb-Impulses>

If you play the tune with the reverb first on, then bypassed, then on again you will see how this reverb combination creates an encompassing sense of space.

7.5.7 The Master

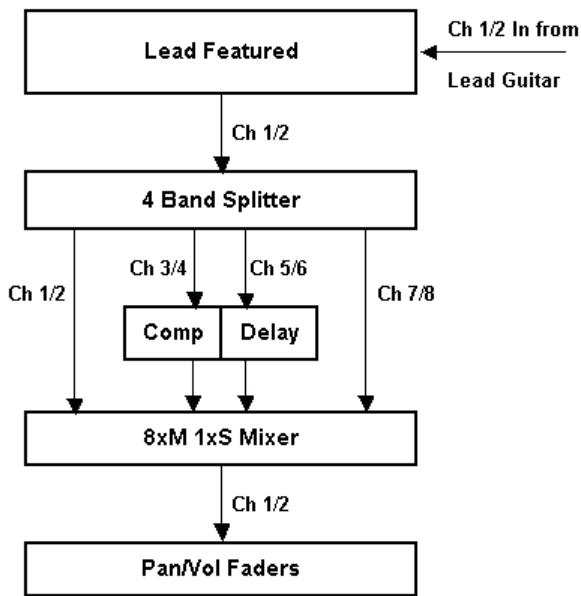
Notice how ReaEQ has been used to add a little warmth, sparkle and air to the overall mix (with a compensating overall gain reduction. Finally, a limiter is placed at the end of the chain to prevent clipping.

7.6 Project Assignment

Now's your chance to put into practice what you have learnt!

Open the file **Pelverata Frost MIX 1** and save it as **Pelverata Frost MIX 2**

Now mix it!



Notes

8 Case Study 3: Don’t Keep Me Waiting

The song *Don’t Keep Me Waiting* has been used to illustrate many of the concepts introduced at various stages of this primer. In this example, we will be looking at one possible example of a final mix. By now you should realise that there is no simple, single answer to the question, “What is a good mix?” (although it is a lot easier to define a bad one). This will depend very largely on interpretation. The example here represents one such interpretation. You should feel encouraged to try out your own.

Open the sample file **Don’t Keep Me Waiting MIX 1A** and immediately save it as **Don’t Keep Me Waiting MIX 1B**. You can now make any changes you wish to this mix, without in any way changing the settings in the original project file. Play the project file. In producing this mix, a lot of emphasis has been placed on emphasising the clarity of the different instruments, together with creating the Edgy Vocals effect that we encountered earlier. *If you find that playing this file produces a crackling sound, you can try adjusting the Anticipative FX Processing settings under Options, Preferences, Audio, Buffering.*

8.1.1 Project Overview

This project uses audio ducking (sidechain compression) in a slightly more sophisticated way than we have previously encountered.

Notice that the project contains two folders – **Instrument Mix** and **Percussion Mix**. If you check the I/O (Routing) Window for either or both of these, you will see that neither of them sends its signal directly to the Master.



Instead, the output of both of these submixes is sent to another track called **All Instruments**. It is in this track that both submixes are combined before being sent to the Master. This fact can also be discerned from the Routing Matrix for this project.

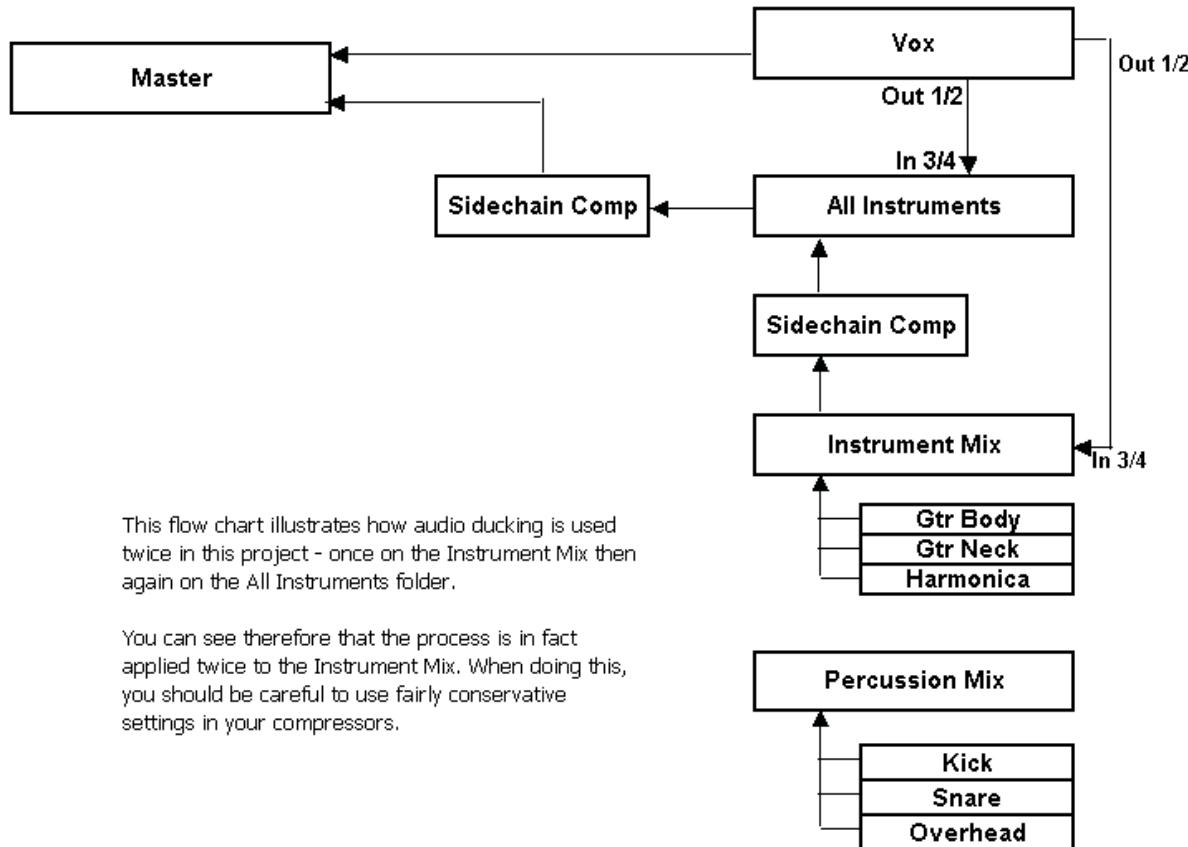
This arrangement lets us use sidechain compression in a different and clever way. By using sends from the **Vox** track, we are able to use the vocal for sidechain compression on not only the **All Instruments** track but also on the **Instrument Mix** folder. No sidechain compression is applied directly to the **Percussion Mix** folder. This enables us to control the overall level of all the musical instruments (to prevent them getting in the way of the vocals), whilst at the same time preserving as far as possible the dynamics of the percussion instruments such as the Snare. This enables them to preserve a strong presence without dominating the overall instrument mix too much. Combined with the Edgy Vocals, this aims to create an “earthy” and live performance feel.

The diagram at the top of the next page illustrates in overview this signal flow. Notice that it does not show all track FX, only those which are used for sidechain compression.

You can see that despite the fairly complex arrangements, the only feeds shown directly into the Master are from the **Vox** track and from the **All Instruments** track. (In fact, there are also feeds into the Master from the two Reverb tracks, but they are not relevant to the concept being discussed and illustrated here).

This is an area where you should tread carefully. If you experiment with making changes to the settings for the two sidechain compressors (especially the Threshold and Ratio settings), you will find that relatively small changes to the parameters can have a marked effect on the overall sound.

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The track layout for this project is outlined below:



8 – Case Study 3: Don't Keep Me Waiting

Finally, you can also see from the Routing Matrix that there are two additional sends that can be identified:

1. A send from the **Instrument Mix** folder to the **Instrument Verb** track. This is used to add some reverb to the Instrument Mix.

If you wish to exercise more control over how the reverb is added to individual instruments, you could delete this send and instead add sends to the Instrument Verb track individually from each of the three tracks Gtr Body, Gtr Neck and Harmonica.

Alternatively, or additionally, you could use this technique to apply extra reverb or a different form of reverb to any of these tracks if you wished to.

2. A send from the **Percussion Mix** folder to the **Percussion Verb** track. This is used to add some reverb to the Instrument Mix.

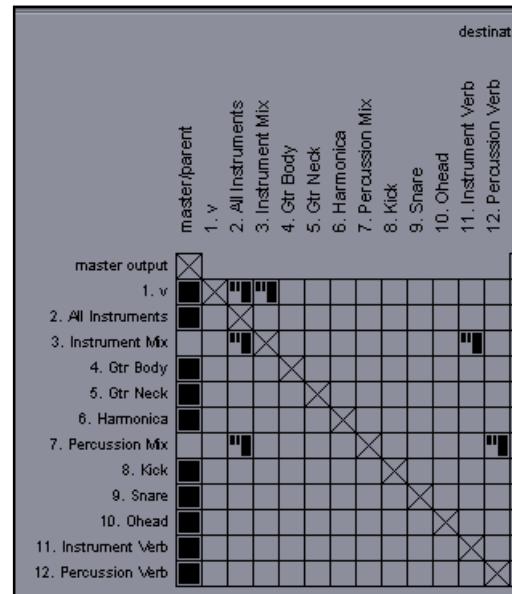
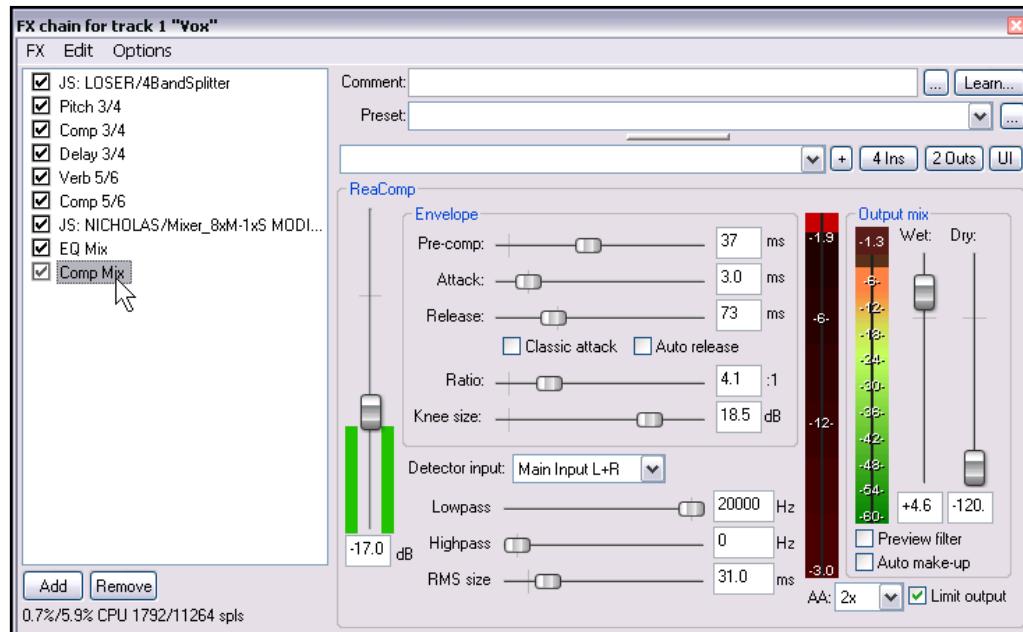
If you wish to exercise more control over how the reverb is added to individual instruments, you could delete this send and instead add sends to the Instrument Verb track individually from each of the three tracks Kick, Snare and Overhead.

Alternatively, or additionally, you could use this technique to apply extra reverb or a different form of reverb to any of these tracks if you wished to.

8.1.2 The Vox

The FX chain on the Vox track is very similar to that used in the Smokey Vocals example that was analysed earlier in this Mixing Primer. The key technique here is that by Channel Splitting we are able to apply different FX to different frequency ranges, then mix those FX back in with a different frequency range. This is what adds the edgy feeling (or tension) to the voice.

This technique is used with all of the first four effects applied immediately after the Four Band Splitter – ReaPitch, ReaComp, ReaDelay and ReaVerbate. You can examine each of these FX windows to see how this is applied.



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The four audio streams are merged together using the 8xM-1xS Mixer. After that, a little EQ is used to make the vocal a touch more present even than before, then a little final compression to smooth off some of the very roughest edges on the vocal.

You can evaluate for yourself the effect of any individual FX item by setting it to bypass while the track is played.

8.1.3 The Guitar Tracks

Not much has been applied to these tracks – just a little gentle compression.

8.1.4 The Harmonica

Again, very little is done here by way of FX, apart from a little compression to smooth off some of the peaks. Notice also that for about 40 seconds (from around the 1 minute 40 second mark), this is panned to the centre and lifted up so that it can be featured in a break. The Vox track is muted at this point. Dropping a verse from the mix at this point and featuring the harmonica in this way makes for a more interesting and varied arrangement.

8.1.5 The Instrument Mix

This mix comprises the two Guitar tracks and the Harmonica track. Notice that for a few seconds during the intro, ping-pong panning is used to create quite a dramatic effect with the Guitar. This immediately creates interest in the listener's ears, before we even get to the main part of the song.

The only plug-in used on the Instrument Mix is ReaComp. As already discussed, this is used as a ducking compressor to prevent the instruments from jumping up over the top of the vocal.

8.1.6 The Kick

Here a combination of EQ and Compression are used to give the Kick more body, warmth and punch. The Gate is used to cut out the bleed from other instruments.

8.1.7 The Snare

This track uses EQ and Compression to give the Snare more presence and bite.

8.1.8 The Overhead

Notice here how some top end has been added to the overhead mic recording of the drum kick. This adds a little sparkle and air to the overall mix.

8.1.9 The Reverb

Different reverb settings have been applied to the Percussion and Instrument Mixes. Experiment with making any changes that you like.

8.1.10 The Master

Not a lot has been added to the master track, simply:

- EQ has been used to add a little warmth and a little air.
- Some subtle stereo enhancement has been added. Try adjusting the settings if you wish.
- A simple limiter has been applied to prevent clipping.

8.2 Project Assignment

Now's your chance to put into practice what you have learnt! Open the file **Don't Keep Me Waiting MIX 1** and save it as **Don't Keep Me Waiting MIX 2**. Now mix it!

Notes

9 The Finishing Touches

9.1 Pseudo Mastering

The whole question of mastering can create a serious dilemma, especially for less experienced users. What do you do if you don't have enough money to pay for a professional mastering engineer, don't have enough experience to master to a professional standard yourself, but need to produce, say, a demo recording?

In an attempt to find a stop-gap solution, you can try applying the techniques outlined in this section. I have called the technique **Pseudo Mastering**. This practice may be more than a tad controversial, and by many will no doubt be regarded as heresy. You might wish to consider its use only if no other avenue is open to you.

In this section, you will be shown a few relatively straightforward techniques that if used carefully and sparingly should be able to at least improve the overall sound of your final mix. *This Pseudo Mastering is not intended to serve in any way as a substitute for correct mastering.* Pseudo mastering is only recommended if you really do have no other options, and then only as a short term solution. It's up to you to try it and judge for yourself if you are happy with the results.

We will use four of the plug-ins that are supplied with REAPER in this example. They are:

Sstillwell's Stereo Width – This is a plug-in which we briefly encountered in one of the earlier examples. As its name implies, it can enhance the feeling of width in your mix.

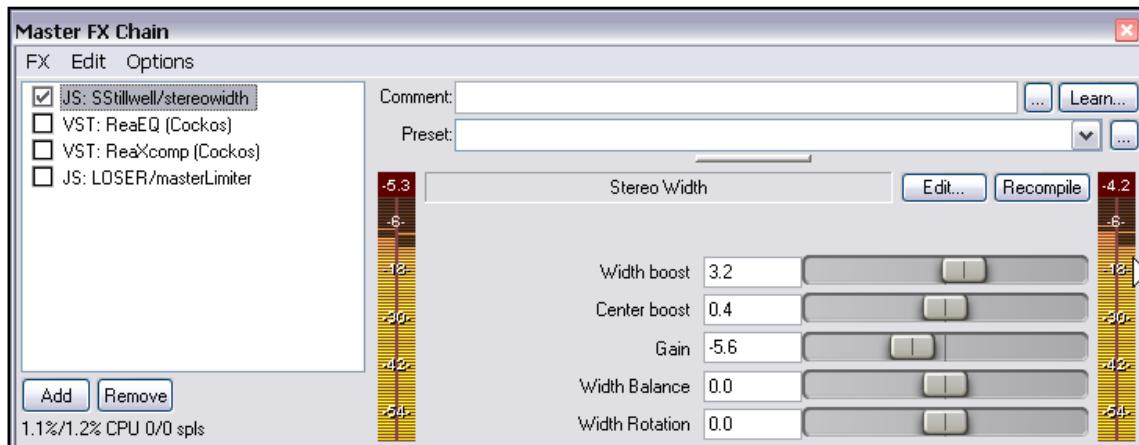
ReaEQ – This is an equalizer with which by now you should be extremely familiar.

ReaXComp – This is a multiband compressor. We encountered it in one or two of the very early examples in this primer when we looked at Corrective Mixing. In this example it will have a very different use.

LOSER's masterlimiter – Up until now we have used only a simple limiter. The Master Limiter is used to help raise the overall volume level of a project. Another possibility is to use **LOSER's MGA JS Limiter**.

Example

1. Open the file **RosesBloom PSEUDO MASTER** and immediately save it as **RosesBloom PSEUDO MASTER 1**. You can work on this copy. *Make sure the Master Volume fader is set at 0 dB.*
2. Play the song. Insert in the Master Track an instance of each of **Sstillwell/stereowidth**, **ReaEQ**, **ReaXComp**, and **LOSER/masterLimiter**. Set all except the first of these to bypass.



3. Now adjust the settings for the **stereowidth** plug-in. The object of the exercise here is to create a fuller sound yet at the same time add a little more clarity between the different parts, by widening the stereo spread. Avoid the temptation to just pump everything up. As a general rule, you will want the perceived volume of the song to be pretty much the same whether the plug-in is engaged or in bypass

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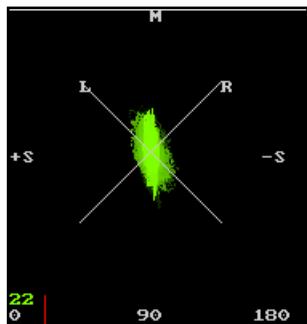
mode. Notice that in the example shown, width and centre spread have both been boosted but overall gain has been reduced to compensate for this.

Settings such as those shown above will often make a definite difference to how your mix sounds.

4. *This next comment is a slight digression but an interesting one.* The plug-in

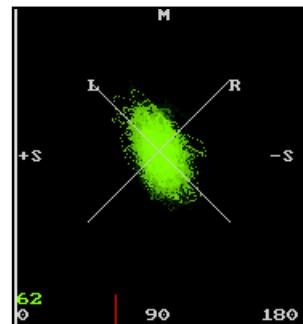
JS:LOSER/gfxGoniometer can be used to analyse the effect of your enhanced stereo imaging.

Below is shown the output of this plug-in with the **Stereowidth** plug-in bypassed (left) and engaged (right). The Goniometer here is placed in the FX Chain immediately after Stereowidth.



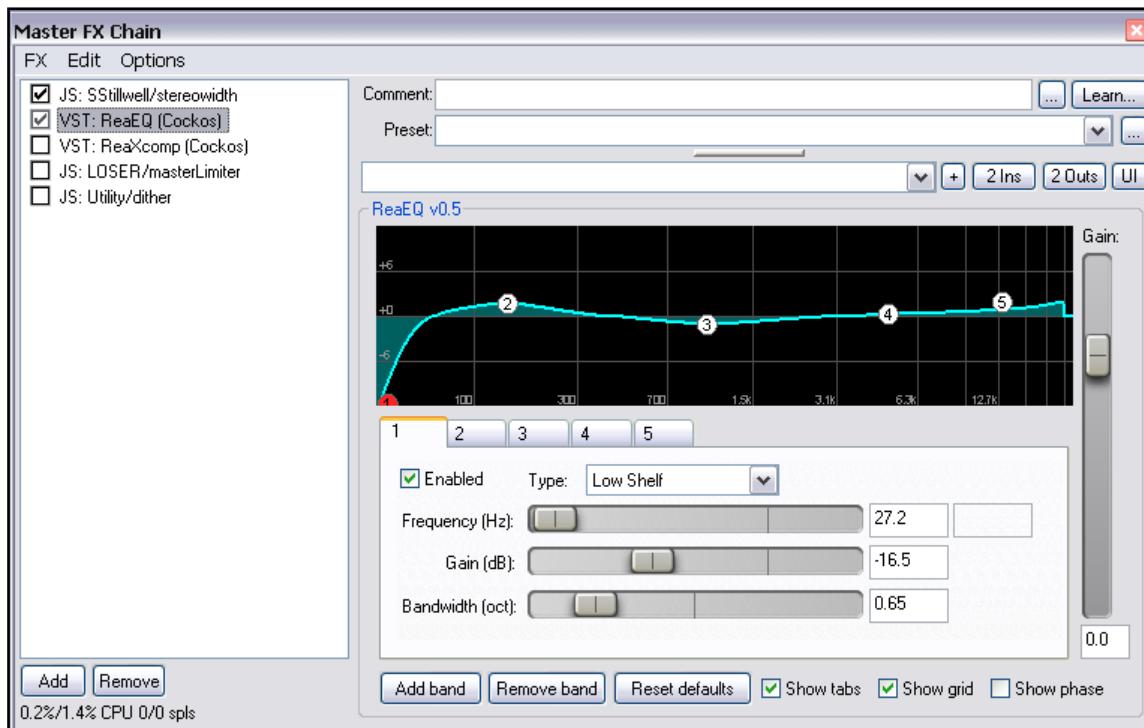
These two images illustrate the effect of adding the **Stereowidth** plug-in to our FX chain.

You can see how this plug-in helps to create a significantly fuller sound.



5. Now enable the **ReaEQ** plug-in. Our intention here is threefold:

- To remove any possible rumble that can occur on some systems at very low frequencies below the threshold of human hearing.
- To add a little warmth at the bottom end.
- To add a little air at the top end.



It is not our intention necessarily to use this plug-in to raise the overall volume. Indeed, if your dry mix is on the hot side, you might even wish to reduce the gain a little at this stage.

As a rough indicator, you would want to adjust the gain in the EQ plug-in so that with both the first two plug-ins engaged, the VU meter of the Master peaks more or less as shown on the right.

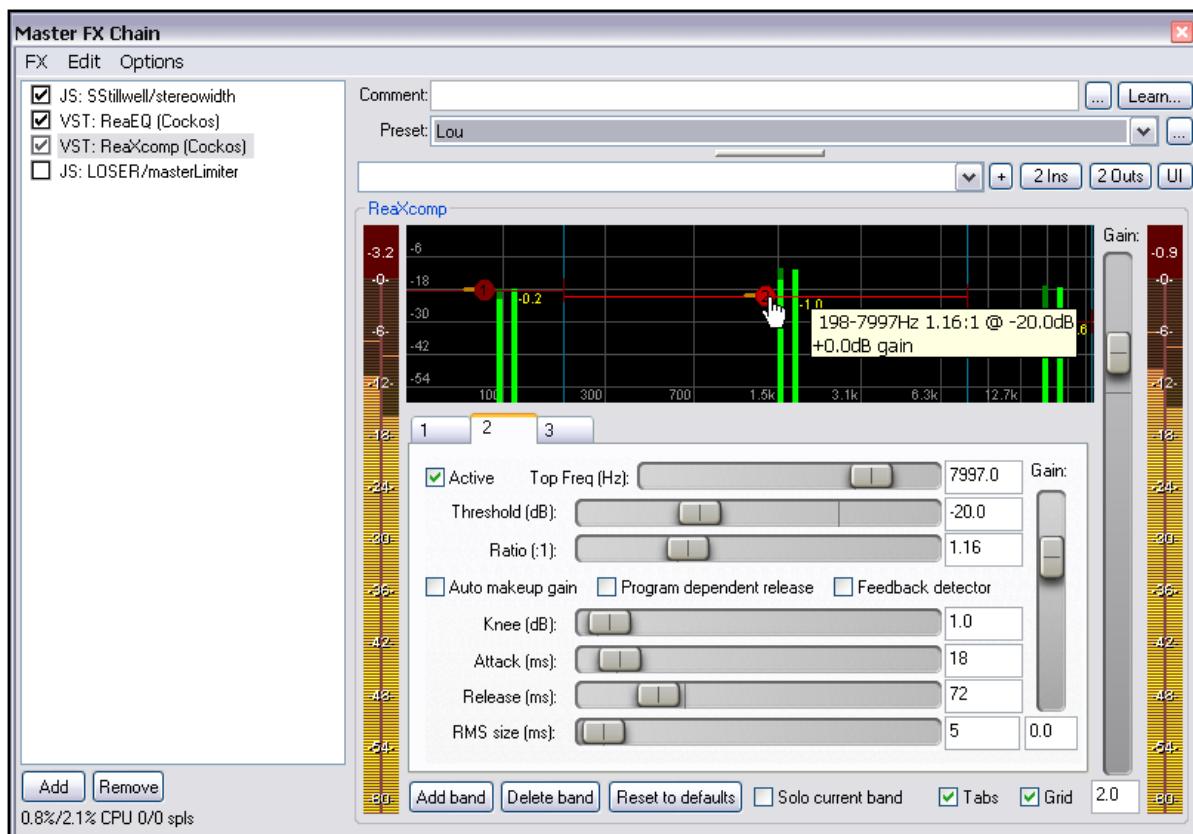


6. Now enable the **ReaXComp** plug-in and select it.
7. Display the list of presets and choose the preset **griz:Mastering 3 band electro**. Notice that there are a number of mastering presets. You can explore the differences between these at your leisure.

A multiband compressor works like an ordinary compressor, but with one major difference. You can apply different settings to different frequency ranges. For each defined range, you can pull down the peaks and lift up the quieter passages, thus helping you to create a smoother, more even sound.

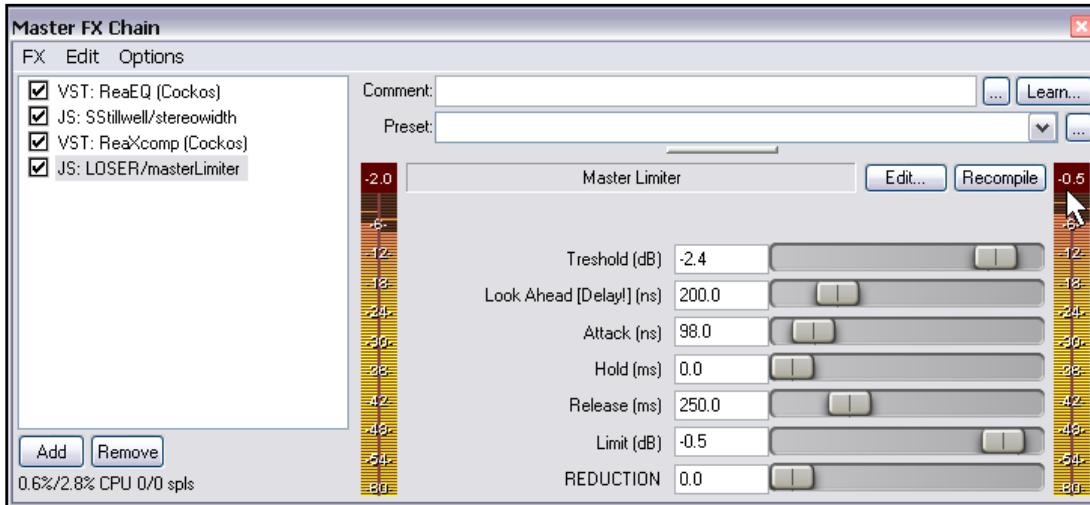
How much you will want to do this depends as much as anything else on the style of music. The important thing is that you should understand that what is going on here is a trade off between volume and dynamics. If in doubt, be gentle!

8. Play the song, adjusting for each band the threshold setting, so that the green VU meters for each band flash just above the red threshold line for that band (as shown below for Band 2). If in doubt, it is better to be too cautious at first than to be too adventurous.



9. Now enable the **LOSER/masterLimiter** plug in. We are going to use this to raise the overall volume of our output a little. This is done by adjusting the Threshold control. Again, how aggressively you should do this depends in part on the style of music. The more aggressively you apply the limiter (by sliding the Threshold further to the left), the more you risk destroying the dynamics of your mix.

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10. In the above example, by setting a threshold of -2.4 dB and a Limit of -0.5 dB we ensure that the overall level of our mix is raised just a little. The effect is sufficient top ensure that the track will now peak at our declared limit (-0.5 dB) but still have enough dynamics to register lively activity in the VU Meter.
11. Now play the song with the Master FX Chain alternately engaged and bypassed. You should notice a significant difference.

The project file **RosesBloom MASTER A** contains a suggested possible solution to this exercise.

Note: If you are producing a demo with more than one song, you will need to ensure that all of the songs appear to the listener to be of an equivalent volume. When mastering correctly, there are tools and techniques available for doing this. Alas, with Pseudo Mastering , you'll need to depend to some extent on trial and error.

9.2 Some Other Master Track Plug-Ins (Overview)

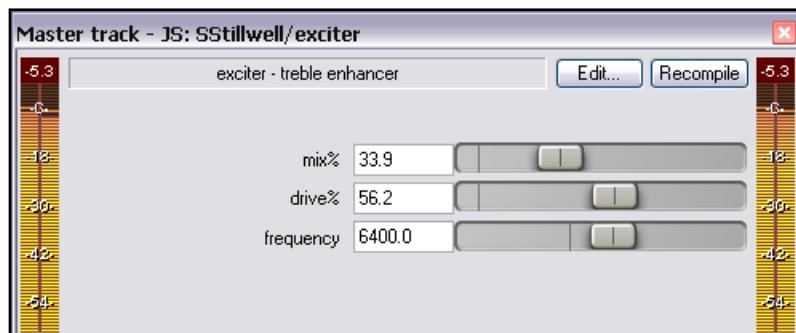
As you become a little more confident, you might wish to begin to explore some of the other plug-ins that can be effectively applied to the Master Track if the mix requires it. Two general word of caution though.

1. *Don't try to use the Master Track FX Chain to fix up errors in your basic mix.* A muddy guitar, for example, should be fixed at source, not in the Master Track.
2. *The order in which you place your FX will make a difference.* Experimenting with different orders can produce interesting results, but never place anything after your Master Limiter (except an analytical tool such as the Goniometer or a dithering plug-in if you are using one – this will be discussed shortly).

9.2.1 Exciters

An exciter can be used to add more top end to a mix if you feel that it needs more air. It offers more options and more subtle control than you can achieve by simply adding a high shelf band to your EQ plug-in.

REAPER includes two basic Exciters, one from SStillwell (shown above) and the other from LOSER.



In addition, you might also wish to explore LOSER's **Compciter**. As its name implies, this nifty plug-in combines the characteristics of an Exciter with some of the characteristics of a Compressor.

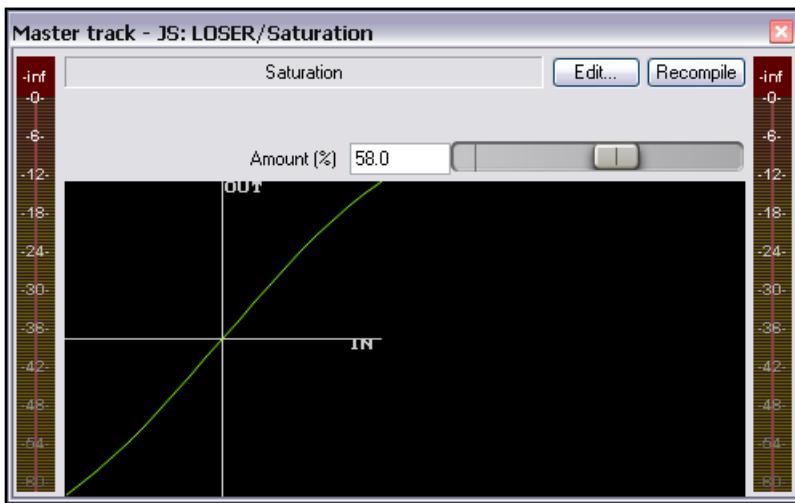
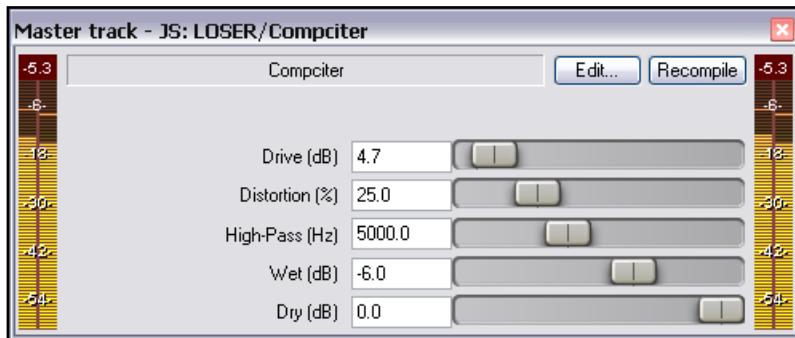
When using an Exciter, start with the default settings, then try making adjustments, in turn to the various parameters.

The Drive setting plays a large role in determining how aggressively the plug-in is applied. It pays to be especially gentle here. Too much of this can pump your mix up too loud.

The Frequency or High-Pass setting will determine the frequency threshold used by the Exciter. For example, using the example shown above, the Compciter gain (drive) would be applied to all frequencies above 5,000 Hz.

9.2.2 Saturation

Adding saturation to a mix can enhance its qualities of warmth, and help create a mellow feeling.



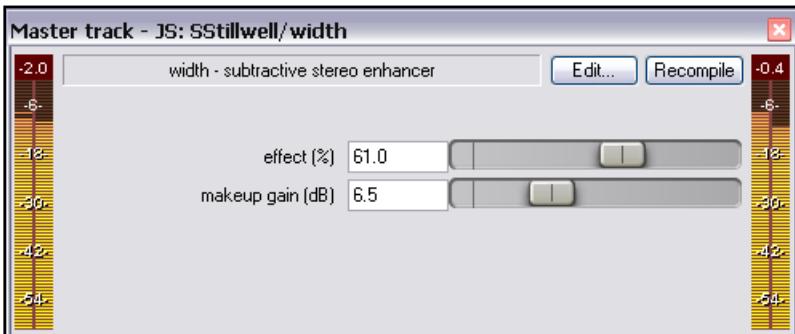
If you want to try it out, add this plug-in to your Master Track of **RosesBloom PSEUDO MASTER 1**. Try placing it immediately after the **ReaEQ** plug-in and start with a setting around 50% to 60%.

9.2.3 Width

Last but not least in this section, SStillwell's clever little **Width** plug-in definitely merits a mention.

Try it if you find that the other stereo enhancers seem to generate almost too much separation between the different parts.

Because it works subtractively, you may find that this particular plug-in will give you the extra stereo spread and clarity that you are seeking, but without the excess separation.



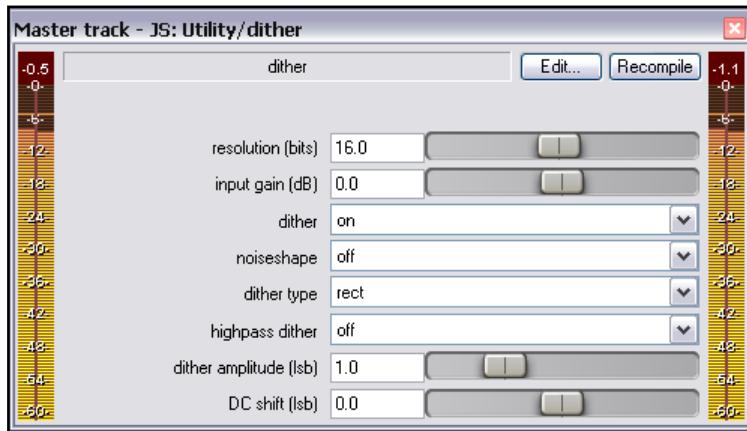
Example

For an example of some of these plug-ins in action, open the file **Pelverata Frost PSEUDO A**. Save it as **Pelverata Frost PSEUDO B**. Set all FX in the Master Track initially to bypass, then reintroduce them one at a time. Later, experiment with adjusting the settings on the various Master FX Chain plug-ins.

9.3 Dithering

If you are intending to produce an audio CD from your material, then your mix will need to be rendered as a stereo WAV file at 44100 Hz and 16 bit. Most probably you will have recorded it at 24 bit WAV format, with a sampling rate of 44100 Hz, 48000 Hz or 88200 Hz.

In this event, it is advisable to add dithering at the very end of your Master plug-in chain. In short, dithering is a process that makes the transition from 24 bit down to 16 bit sound better, giving you a smoother conversion.



REAPER supplies a number of dithering plug-ins, any of which can be used if you wish. The **JS: Utility/dither** shown above is suitable for this purpose. Until such times as you know more about mastering, including dithering, your safest option is to accept the default settings, making sure that **16 bit** resolution is selected.

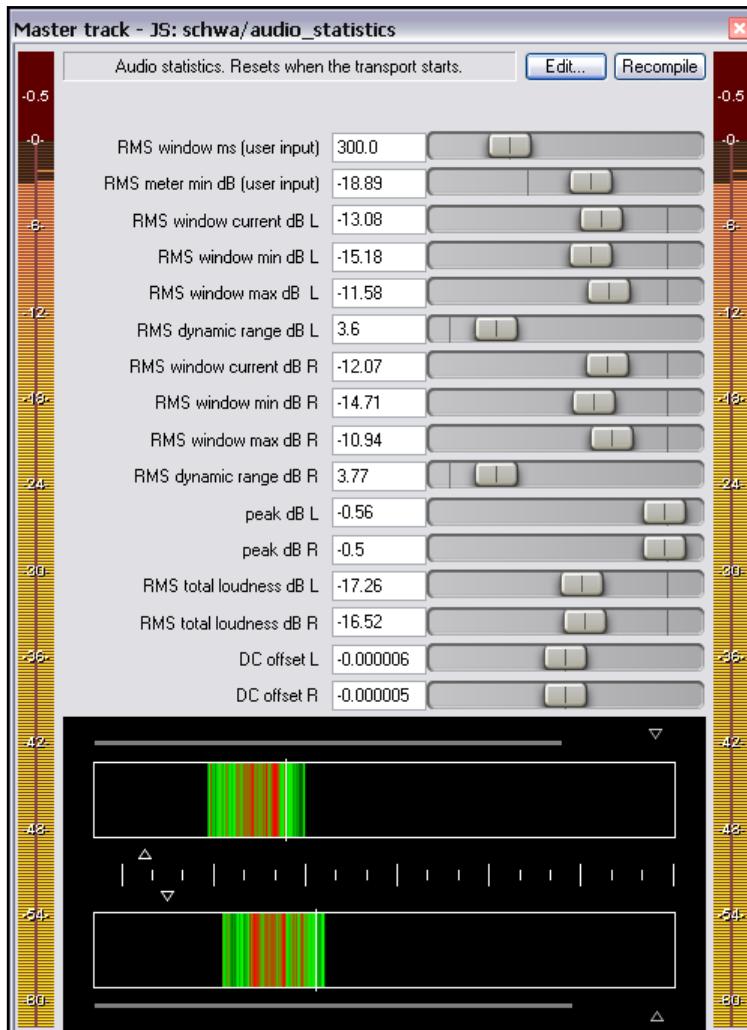
In order to facilitate download speed, the media items used in our sample projects have all been recorded in OGG format. Nevertheless, for illustration purposes a dithering plug-in has been added at the end of the FX Chain in the Master Track of the file **RosesBloom MASTER A**.

9.4 Schwa's Audio Statistics

Placed at the end of your Master Track FX Chain, this wonderful plug-in gives you a wealth of analytical information, including:

- RMS dB readings
- Peak dB readings
- DC Offset

This plug-in gives Sound Forge / Wavelab- style audio statistics on your output. The meter at the bottom gives a graphical display of the dynamic range of the audio material. The display shows peak level (the outer triangles), current level (the thin lines), a colour map of how long the audio spends at each RMS volume (narrower color map = less dynamic range), and total RMS volume of the whole audio piece (the inner triangles).



9.5 Rendering Your Mix

You will need to render your mix before you can publish it, for example as an Audio CD or an MP3 file. This topic is dealt with extensively in the *REAPER User Guide*. Please refer to that document for further information.

9.6 Burning an Audio CD

This topic is dealt with extensively in the *REAPER User Guide*. Please refer to that document for further information.

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