1 Parameter Modulation

1.1 The Concept

Parameter modulation is a technique which takes REAPER's routing, channel splitting and sidechaining capabilities to extraordinary new levels. You should probably not attempt this section unless you already have a sound grasp of these concepts. If necessary, turn back to the section **More REAPER Routing Examples** and work through it again.
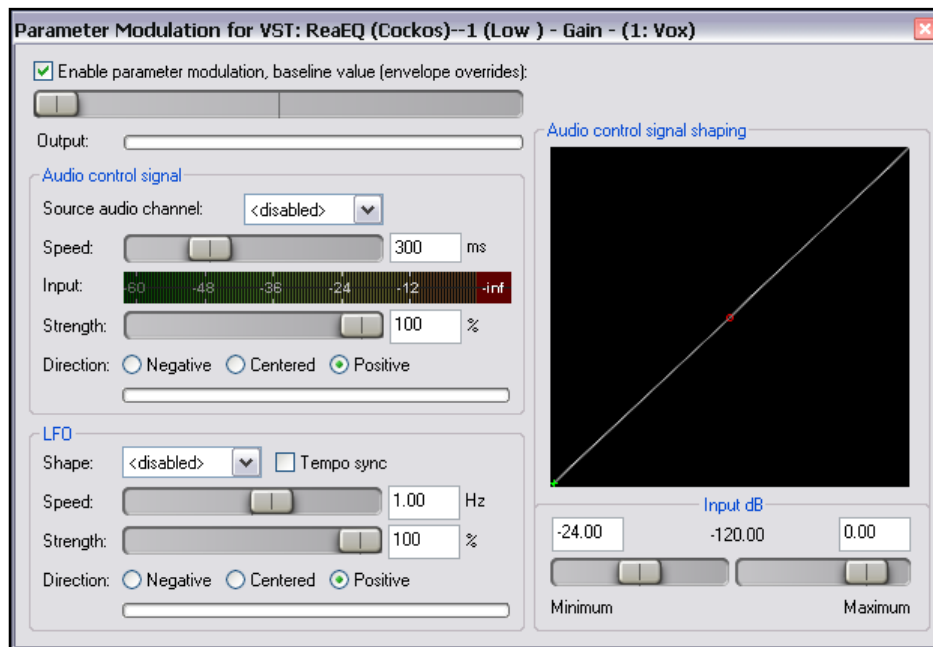
Parameter modulation at its simplest means using the volume level on one track to control the behaviour of one or more FX parameters on the same track or a different track or number of tracks. Don't worry if this doesn't quite make sense yet. The concepts of what this is and how it works will become clearer after you have worked through some examples.

One simple example might relate to the application of a chorus plug-in to a guitar or bouzouki track. Suppose that we wish to vary the wet/dry balance of the chorus throughout the track. We could, of course, accomplish this with the use of automation envelopes. However, this might involve quite a lot of work. Now take this idea a step further. Suppose that we wish to define a relationship between the instrument's volume and the wet/dry mix, so that as the volume increases the mix becomes drier, and vice versa. Rather than have to create a series of envelopes for our chorus plug-in, we can use parameter modulation to ensure that these parameters will respond automatically to changes in volume.

Incidentally, this particular example can create an interesting effect of space and distance on the instrument, but as with the other examples in this section, that is not the main point of the exercise. The main point is to show you how parameter modulation is set up and used. It's then up to you to use and apply it in ways that you find appropriate for your own mixes.

1.2 The Interface

Illustrated below is an example of the Parameter Modulation window. The table below that explains the main settings, what they do and how they are used. We will then go on to work through some examples to show you how parameter modulation can be used.

Item	Description
Enable parameter modulation, baseline value	This sets a default value for the specified parameter that is to be modified.
Source audio channel	This specifies which audio channel(s) – for example, 1/2 or 3/4 – contain the audio signal that is used to control the specified parameter.
Attack and **Release**	These two factors determines the speed with which changes in the level of the incoming signal will be applied to the parameter. They work in a similar way to Attack and Release on a compressor. Setting a low attack speed will cause the parameter modulation to respond rapidly to changes in volume in the source audio channel, a higher speed will cause a greater delay to occur. A low release speed will cause the modulation to be adjusted rapidly as the volume then falls. A higher speed will hold the modulation for a longer period before doing so. Generally speaking, the higher the attack and the release settings the more gradual will be the parameter modulation response. The lower these settings, the more sensitive and immediate will be the response.
Strength and **Direction**	These determine the nature and the intensity of the relationship between the incoming audio signal and the parameter being controlled. For example, set to 100% positive as the incoming audio signal increases and decreases, so will the parameter being controlled. At 50%, the relationship will still be positive, but more moderate. A setting of 100% negative means that as the incoming audio signal increases, the parameter being controlled will decrease, and vice versa. At 50%, the relationship will still be negative, but more moderate. At 0%, the effect will be completely neutral.
LFO	These settings can be used to modify the parameter modulation using an LFO shape such as sine, square or triangle.
Input dB	This determines the threshold at which the incoming audio signal will be applied to the parameter being controlled. The lower the threshold setting, the more aggressively the parameter control will be applied.

1.3   Defining a Parameter for Modification

After adding a plug-in to a track's FX Chain, you can specify which parameter(s) you would like to be modified. Follow this sequence:

1. Displaying the track's **Envelopes/Automation** window.

2. Click on the **Mod** button (as shown right) for any parameter or parameters that you wish to have modified by an audio signal.

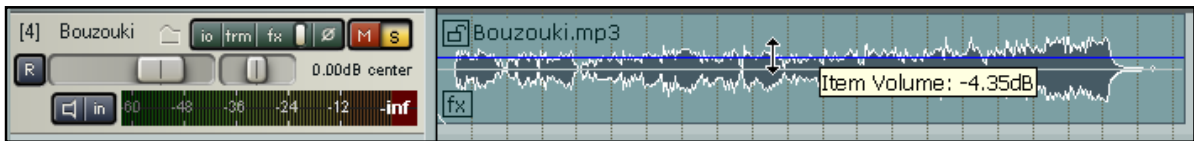3. Close the Envelopes/Automation window when finished.
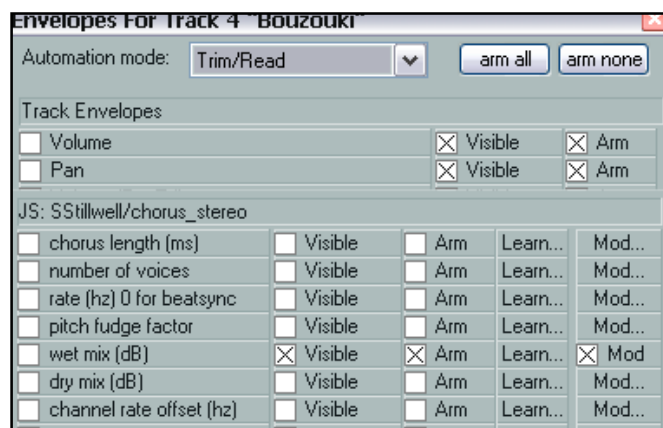
1.4   Controlling an FX Parameter on the Same Track

In this first example, we will insert a plug-in such as chorus into a track's FX chain, then use that track's audio signal to control the way that plug-in behaves.

Example

1. Open the file **All Through The Night** and save it as **All Through The Night MOD1**.

2. Solo the **Bouzouki** track. For the purpose of this example, this is the only track that is needed.

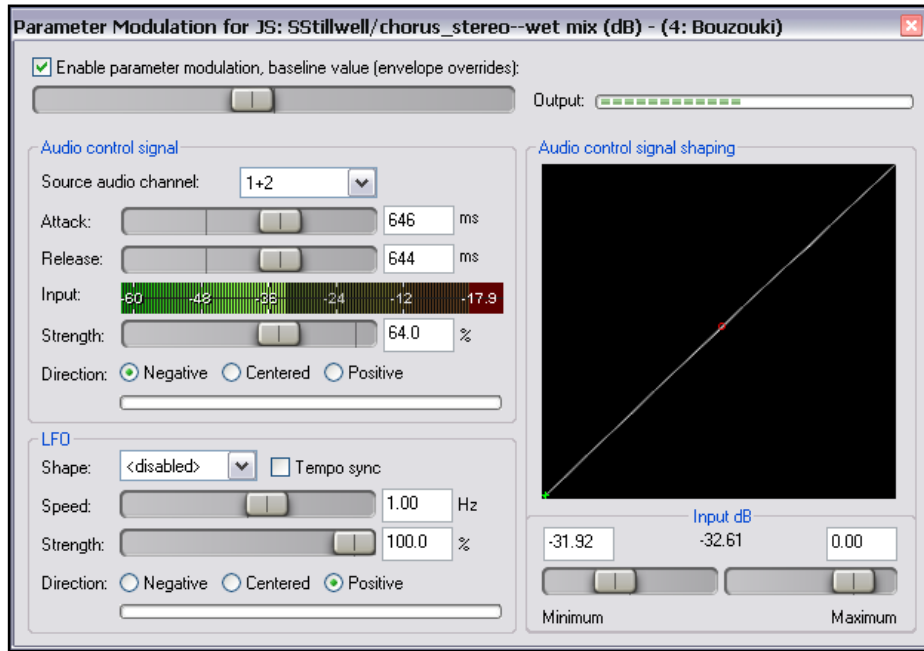3. Pan the track dead centre and lower its volume a little, as shown below.

4. Insert the **JS: Sstillwell/chorus_stereo** plug-in into this track's FX chain, and set the various parameters as shown below.

5. Now display the **Envelopes/ Automation** window for this track, and click on the **Mod** button for the Chorus parameter **wet mix (dB)**.
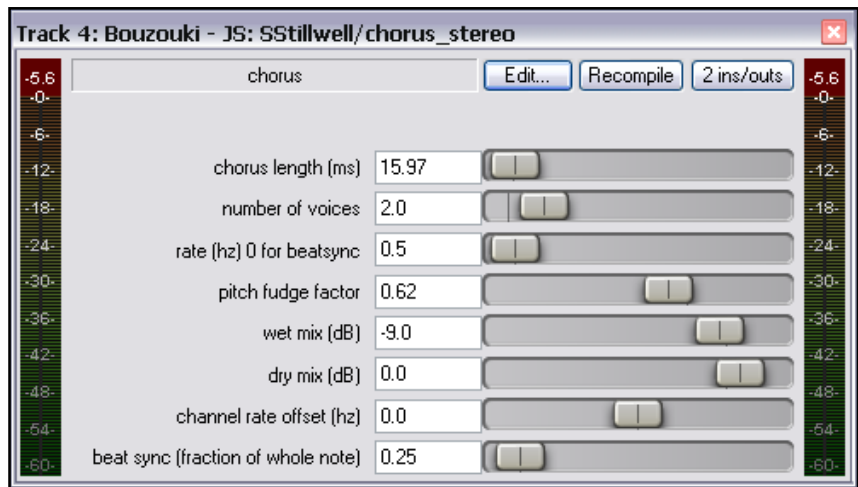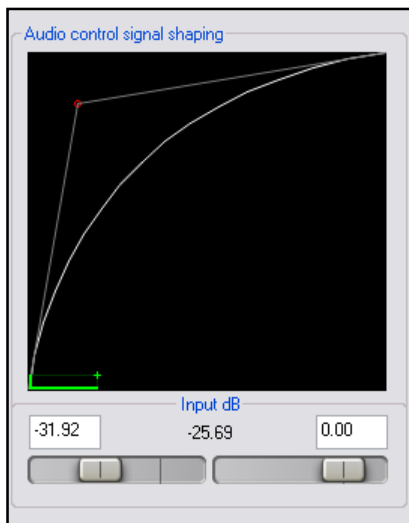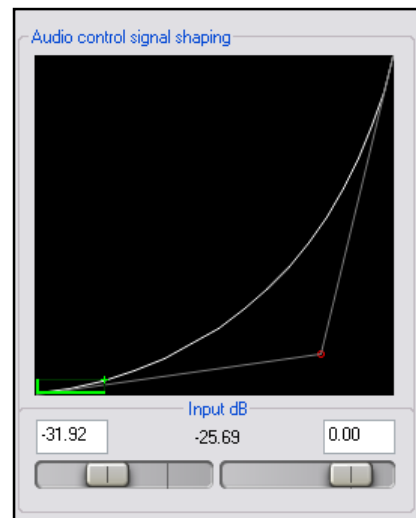
6. When the **Parameter Modulation** window is displayed select **1+2** as the **Source audio channel** and ensure that the option to **Enable parameter modulation, baseline value** is enabled.

7. Start and stop play. This is sometimes necessary to activate the parameter modulation. Now experiment with sliding the baseline value fader left and right. As you do so, you will see the **wet mix** fader in the Chorus plug-in window will be faded down and up. When you have finished, restore it to about **−9 dB**.

8. Set the various items in the **Parameter Modulation** window as shown below (next page) and play the track. You should notice the **wet mix** element of the chorus being faded down for louder notes and passages and back up for quieter notes and passages.

9. Now experiment! You should find that:

    *   Moving the **Attack** and **Release** faders left will result in the wet mix chorus fader movements becoming more jerky. Moving them right should make them smoother.

    *   Moving the **Strength** fader (negative) above 0% will cause the wet mix chorus fader to be faded up for louder notes and down for quieter ones. Selecting positive reverses this.

    *   Moving the **Input dB** fader left will lower the threshold at which the parameter modulation is applied. Moving it right will raise the threshold.

10. When you have finished experimenting, restore the settings to those shown below.

Parameter Modulation for JS: SStillwell/chorus_stereo--wet mix (dB) - (4: Bouzouki)

☑ Enable parameter modulation, baseline value (envelope overrides):

Output:

Audio control signal

Source audio channel: 1+2

Attack: 646 ms

Release: 644 ms

Input: -60   -48   -36   -24   -12   -17.9

Strength: 64.0 %

Direction: ⦿ Negative ○ Centered ○ Positive

LFO

Shape: <disabled>   ☐ Tempo sync

Speed: 1.00 Hz

Strength: 100.0 %

Direction: ○ Negative ○ Centered ⦿ Positive

Audio control signal shaping

Input dB

-31.92   -32.61   0.00

Minimum   Maximum

11. This instrument becomes significantly louder as the song progresses. By the end of the song, there is very little chorus being applied to the bouzouki.

12. Now play the song again. Drag hold of the handle on the graph, and use your mouse to drag it to the position shown on the right. Notice that the movements of the wet mix fader now become restricted to a more modest range.

13. Now drag hold of the handle on the graph, and use your mouse to drag it to the position shown below. Notice that the movements of the wet mix fader now become exaggerated.

Audio control signal shaping

Input dB

-31.92   -25.69   0.00

Audio control signal shaping

Input dB

-31.92   -25.69   0.00

14. Restore the graph to its original position when you have finished experimenting.

15. Save and close the file.

1.5   Dynamic Compression

In this next example, you will use parameter modulation to dynamically adjust the settings to compress a vocal track in such a way that the threshold will automatically be lowered during the louder passages. This gives you a more precise control over the compressor's operation than would otherwise be possible.

Example

1. Open the file **All Through The Night** and save it as **All Through The Night MOD1A**.

2. In the Track Control Panel, set volume and panning levels for the various tracks and the Master as shown on the right.

3. Insert an instance of **ReaComp** into the FX Chain for the **Vox** track.

4. Set the **Threshold** to about −9 or −10 and the **Ratio** somewhere in the range from 3:1 to 4:1. Set **Knee** size to around 15dB.

5. Set the **Wet** gain to about +3dB.

6. As you play the song, adjust the settings to suit. One possible set of suitable parameter values is shown below.

7. Notice as you play the track that during the louder vocal passages the compressor doesn't do quite enough. This is where we might wish to use the track's own volume level to control some parameters. In this example, we will do this with the threshold only, but it could also be done with the ratio if you wished to.

8. We are now going to create parameter modulation automation to control the threshold of this compressor.

9. Open the **Envelopes/ Automation** window for the Vox track.

10. Click on the **Mod** button for **VST ReaComp – Thresh**.
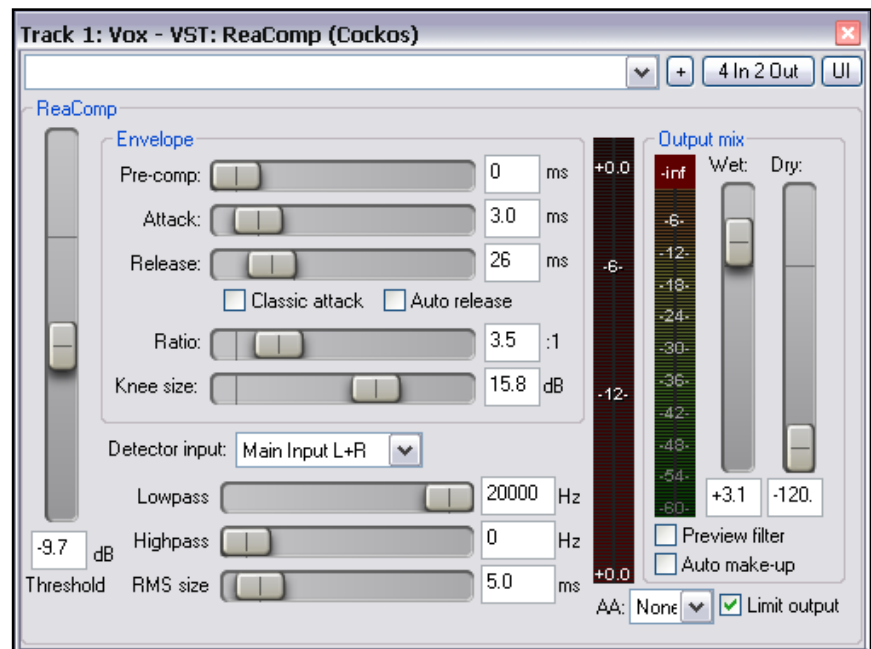
11. Study the suggested settings shown below and adjust your settings accordingly as you play the song.

12. Notice in particular how the attack and release setting levels, the shape of the curve and the Input dB settings all help prevent the threshold from being adjusted too radically.

13. This is an excellent example for learning how the various Parameter Modulation controls work. Be prepared to experiment with these settings to see if you can produce a better outcome.
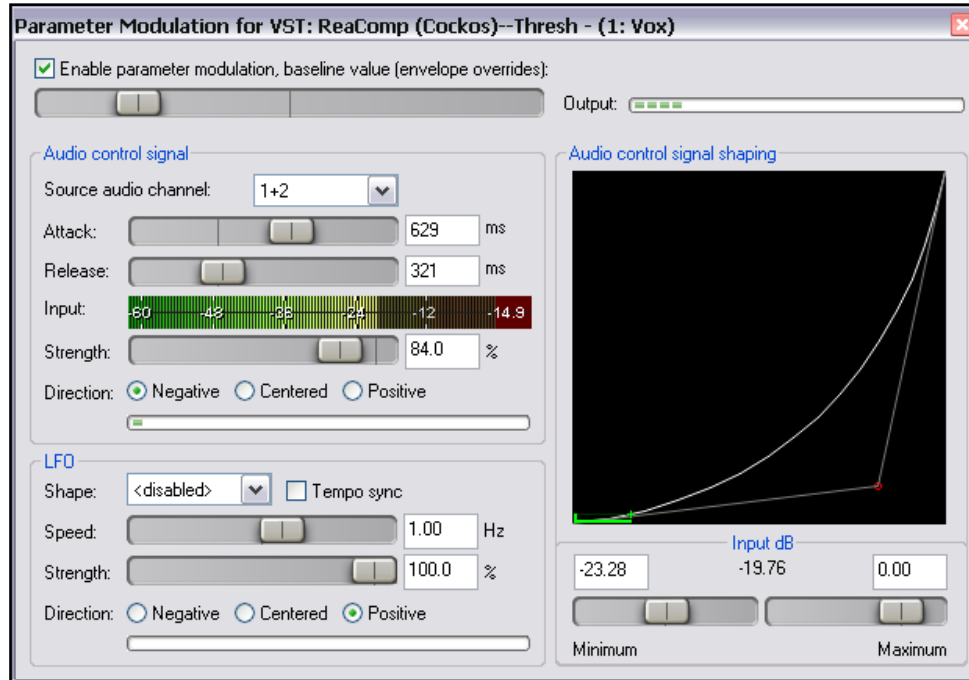
14. Save and close the file when finished.

Note: *When you are using Parameter Modulation you should be prepared to tweak the various parameters carefully. Sometimes even the slightest change to a parameter value can significantly change the result.*

1.6   Bypass Mode

Whenever you create a parameter modulation window, a small box is added next to its name in the Envelopes/Automation window. This can be used to enable any of your parameter modulations, or set them to bypass mode (in which case they are of course ignored) as you wish.

Inn the example shown on the right, parameter modulation settings exist for both the Threshold (Thresh) and Ratio parameters. You can see that the Thresh modulation is currently enabled, but the Ratio modulation has been set to bypass. In addition:

- Clicking on the **Mod** button for an item where parameter modulation already exists will cause that window to be opened so that you can view and/or edit the settings.

- To delete a parameter modulation window altogether, simply set its **Source audio channel** to **disabled** and close the window.
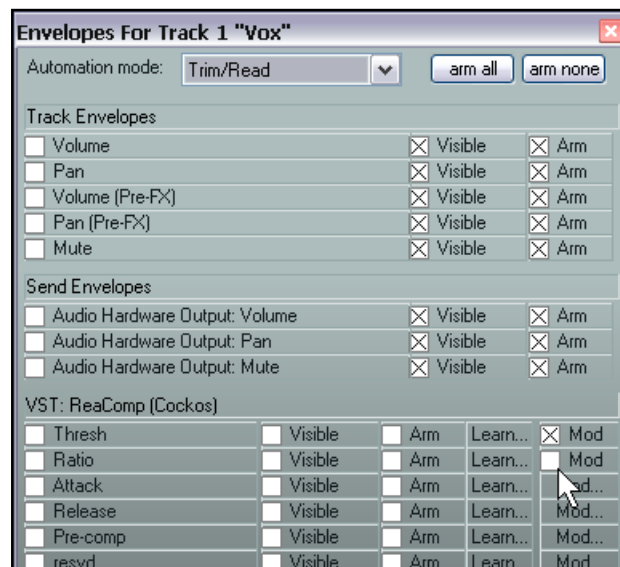
1.7   Controlling FX Parameters on a Different Track

This next example is slightly more complex than the previous two examples. In this case, we will use the audio signal from one track (a vocal track) to shape the sound of an instrument submix (that is, a folder track containing several instruments). This will be done in such a way as to cause the instruments to appear to pull back slightly during the vocal passages.

Example

1. Open the file **All Through The Night** and save it as **All Through The Night MOD2**. There are a number of preparatory steps that need to be taken to set this project up.

2. Immediately below the **Vox** track, create a new track and name this track **Instruments**. Make this a track folder and enclose the guitar and bouzouki tracks within this folder.

3. Adjust the volume and pan faders for the Master and various tracks as shown on the right,

4. Add an instance of **ReaComp** to the Bouzouki track. This is needed only because the volume of this instrument increases quite significantly as the song progresses. We wish to pull this back a little.

5. Set a threshold of around –15dB and a ratio of around 10:1. This will ensure that the track is only slightly compressed for most of the song and more severely compressed near the end.

6. Select the Instruments folder and display its Routing window. Set the number of channels to 4 and add a receive from the Vox track to channels 3/4 (as shown below).
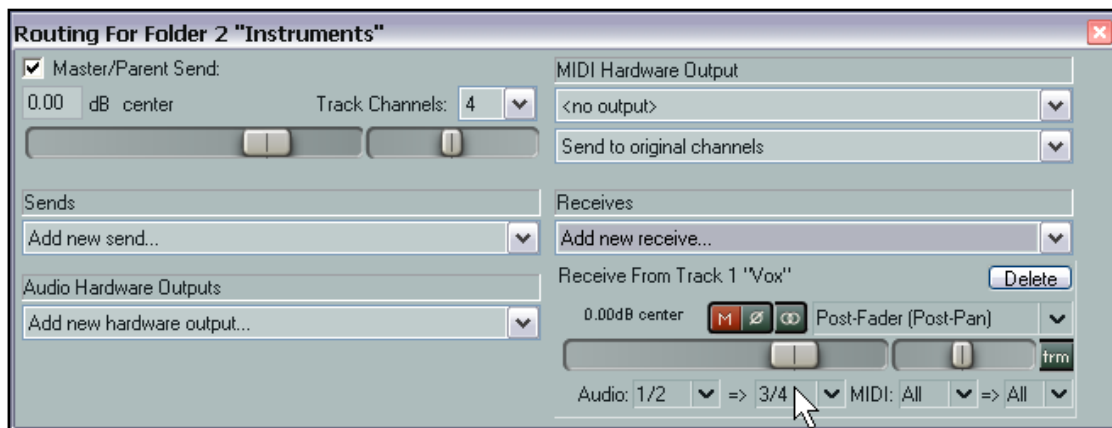
7. Open the FX Window for the Instruments folder and add an instance of **ReaEQ**. Make sure that your settings include a frequency type Band at about 300 Hz with a bandwidth of about 1.00 and a frequency type Band at about 4,000 Hz also with a bandwidth of about 1.

    In the example shown below, these are bands 2 and 4. We are going to use the audio signal from the Vox track to control the gain on both of these bands.

8. Make sure that for now the gain settings for all bands is set at 0.0 (as shown below).

9. We are now going to use parameter modulation to ensure that audio signal from the vocal track drives down the gain level of the instrument mix for bands 2 and 4.

This will have the effect of helping the vocal to just float over the instruments a little.

10. Open the Envelopes / Automation window for the **Instruments** folder. Click on the Mod button for **2 (Band) Gain**. By then setting the **Source audio channel** to channels 3/4 we will ensure that the gain level for Band 2 is controlled by the incoming signal from the vocal track. A suggested set of values for the various items is shown below.
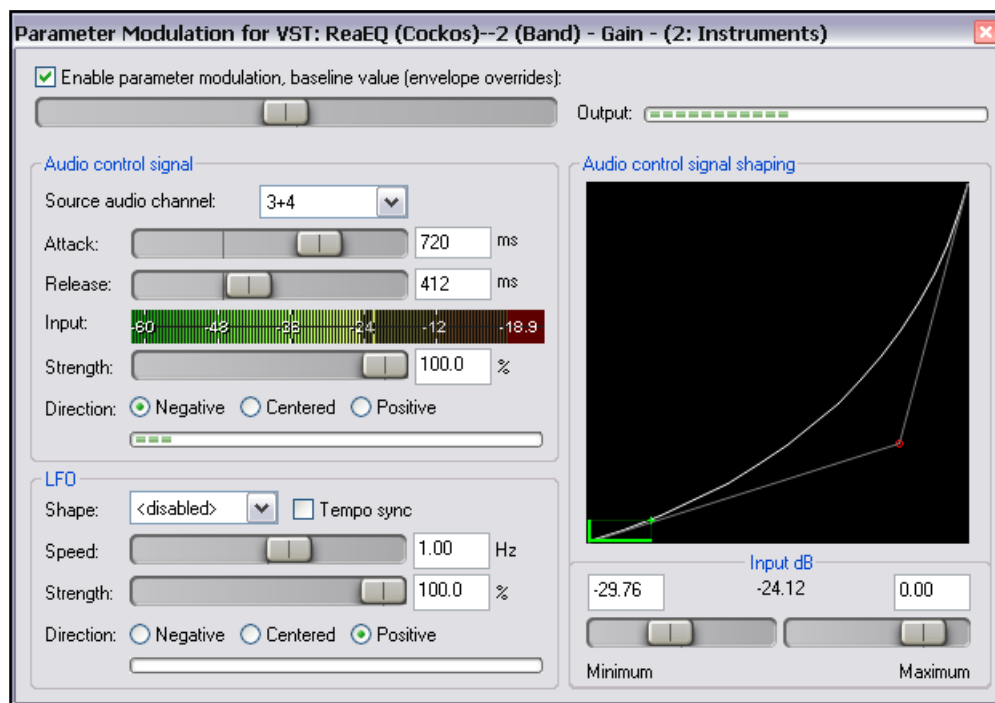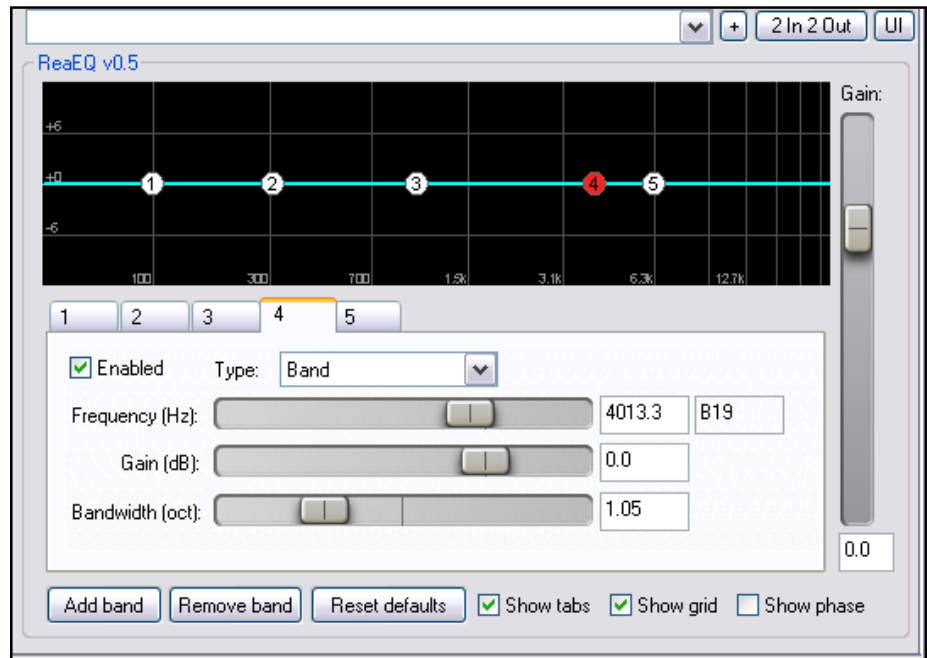
11. Now create another Parameter Modulation window, this time for **4 (Band) Gain** and set the various items as shown below.

12. As you play the song, you should be able to see the changes being made to the EQ levels. The gain in bands 2 and 4 should vary between about 0dB and −3dB. If you wish, tweak the frequency and bandwidth setting for bands 2 and 4 to see where this modulation is at its most effective.
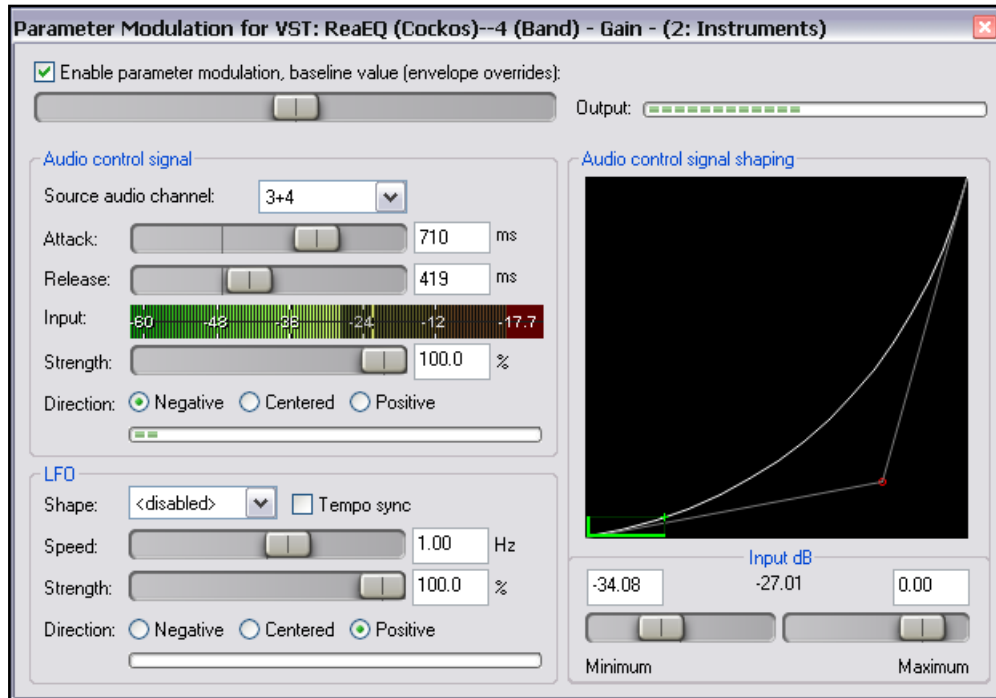
13. You may need to make an adjustment to the volume on the Vox track, possibly adding dynamic compression to this track, in order to get the best results.

14. Save the file when finished.

1.8   Further Applications

This section has introduced you to just a few basic examples to help you understand what REAPER's parameter modulation is and how it can be used. In doing so we have barely scratched the surface.

Here are some other points to keep in mind:

- With parameter modulation, the signal from any track can be used to control parameters on any other. For example, the signal from an audio track can be used to control parameters on a synthesizer, and a synthesizer's output can be used to control signals on an audio track.

- If you are familiar with working with synthesizers synthesizers and low frequency oscillators, you may have developed an understanding of different types of waveforms such as sine, square and triangle. You can use these LFO shapes in your parameter modulation.

- Other applications for parameter modulation are limited only by your needs, your creativity and your imagination. For example, with this technique you are able to use the audio signal from one track (or group of tracks) to control specific parameters on a noise gate on another track (or tracks).