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Compression Cheatsheet

Welcome to your "**Audio Compression Cheatsheet!**"

If you're new to audio production or just looking to brush up on your knowledge of audio compressors, this guide is for you.

Compressors are a vital tool in the audio engineer's toolkit, allowing you to shape the dynamic range of an audio signal and bring certain elements of a mix to the forefront.

However, with so many parameters and options available on the market, it can be overwhelming to understand **how each one functions and how they can be used effectively**.

In this guide, we'll go over the most common parameters found on audio compressors, the different types of compressors, and provide tips and tricks for using them to achieve the desired results.

Whether you're a beginner or an experienced audio engineer, I trust that you'll find this cheat sheet useful in your audio mixing journey.

Before jumping into the meaty stuff, let's start with the basics.

Understanding the Parameters

In this module, we'll go over the most common parameters found on audio compressors.

Threshold: The threshold parameter determines the level at which the compressor begins to reduce the level of the audio signal.

Anything above the threshold will be affected by the compressor, while anything below it will pass through unaffected.

Setting the threshold too low will result in the compressor applying too much gain reduction, while setting it too high will result in little to no effect.

Ratio: The ratio parameter determines the amount of gain reduction applied to the audio signal once it crosses the threshold.

A ratio of 2:1 means that for every 2 dB the signal exceeds the threshold, the compressor will reduce the level by 1 dB.

Higher ratios will result in more aggressive gain reduction, while lower ratios will result in more subtle compression.

Attack: The attack parameter determines how quickly the compressor responds to the audio signal once it crosses the threshold.

A fast attack time will result in the compressor clamping down on the signal almost immediately, while a slower attack time will allow the signal to exceed the threshold for a brief moment before the compressor kicks in.

The attack time can be used to control the punch and impact of individual instruments or vocals in a mix.

Release: The release parameter determines how quickly the compressor returns to its normal gain reduction after the signal falls below the threshold.

A fast release time will result in the compressor quickly returning to its normal gain reduction, while a slower release time will allow the signal to remain at a lower level for a longer period of time before returning to its normal level.

The release time can be used to control the sustain and sustain of individual instruments or vocals in a mix.

Knee: The knee parameter determines how smoothly the gain reduction is applied once the signal crosses the threshold.

A "hard knee" will apply the gain reduction sharply once the threshold is crossed, resulting in a more abrupt and noticeable effect on the audio signal.

This can be useful for controlling sudden transients or for achieving a more punchy and aggressive sound.

A "soft knee," on the other hand, will apply the gain reduction more gradually as the signal approaches and crosses the threshold, resulting in a more subtle and transparent effect.

This can be useful for more subtle dynamic control or for preserving the natural character of the audio signal.

The knee parameter can be useful for fine-tuning the compressor's response to the audio signal and achieving the desired amount of gain reduction and character.

It is worth noting that not all compressors have an adjustable knee parameter, and the available options may vary depending on the specific compressor being used.

Makeup gain: The makeup gain parameter is used to compensate for the loss of level caused by the gain reduction applied by the compressor.

By increasing the makeup gain, the overall level of the compressed signal can be brought back up to match the level of the original signal.

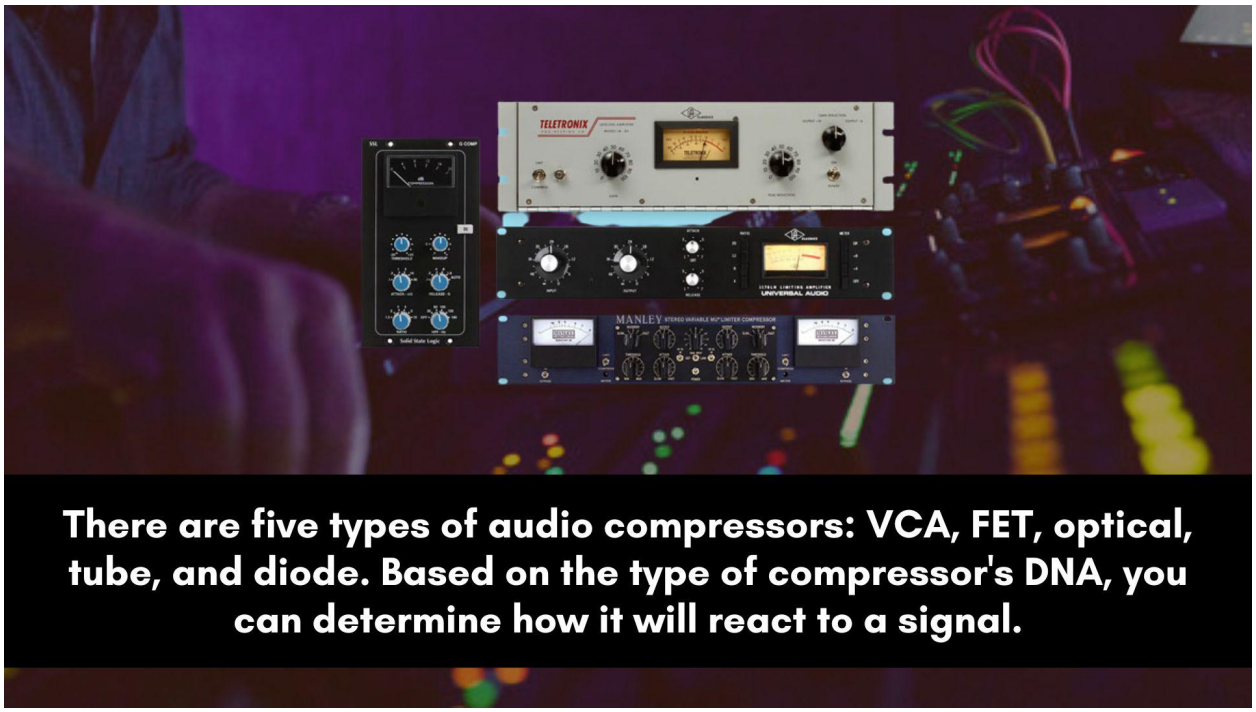
It is important to adjust the makeup gain carefully, as boosting the gain too much can result in distorted or oversaturated audio.

In addition to these core parameters, many compressors also offer additional features such as sidechain capability, which allows the compressor to be triggered by a separate audio signal, and various types of processing (e.g., optical, FET, VCA), which can affect the character and tone of the compression.

Using these parameters effectively can take some trial and error, but with practice and experimentation, audio compressors can become a powerful tool for shaping the dynamic range and character of a mix.

So, these are the most common compressor parameters and their functionalities.

Different Types of Compressors



It can be devastating to not understand the differences between compressors and how to choose the right one for a given task.

In this module, we will go over the most common types of audio compressors and their characteristics **to help you make an informed decision when selecting a compressor** for your mixing needs.

FET (Field Effect Transistor) Compressors

FET compressors work by using field effect transistors (FETs) in their gain reduction circuits.

These transistors are controlled by the audio signal, allowing the compressor to respond quickly to transients and apply gain reduction in a precise and controlled manner.

The fast attack and release times of FET compressors make them particularly **well-suited for controlling percussive sounds, such as drums and other percussion**.

The punchy, aggressive character of FET compressors can also be useful for adding definition and presence to vocals and other lead instruments.

These compressors offer a range of available parameters, from subtle and transparent to aggressive and punchy, making them versatile tools for a variety of applications.

VCA (Voltage-Controlled Amplifier) Compressors

VCA compressors work by using voltage-controlled amplifiers (VCAs) in their gain reduction circuits.

These amplifiers are controlled by the audio signal, allowing the compressor to respond quickly to transients and apply gain reduction in a precise and controlled manner.

The fast attack and release times of VCA compressors make them particularly **great for controlling transients while preserving the natural character of the audio signal**.

The transparent, precise gain reduction of VCA compressors can also be **useful for achieving a natural, uncolored sound on vocals and other lead instruments**.

Opto (Optical) compressors

Opto compressors work by using a light-dependent resistor (LDR) in the gain reduction circuit.

The LDR is controlled by the audio signal, allowing the compressor to respond more slowly to transients and apply gain reduction in a smooth, subtle manner.

The slower attack and release times of Opto compressors make them particularly **appropriate for controlling sustained sounds, such as bass and other sustained instruments**.

The smooth, subtle compression of Opto compressors can also be useful for adding depth and warmth to a variety of sounds.

Opto compressors are a useful tool for adding depth and warmth to sustained instruments and vocals or for subtle dynamic control on a variety of sounds.

Tube Compressors aka Vari-Mu

Tube compressors work by using vacuum tubes in their gain reduction circuits.

These tubes are controlled by the audio signal, allowing the compressor to apply gain reduction in a smooth, subtle manner.

The warm, harmonically rich sound of Tubes is often sought after by audio engineers looking to add depth and character to their audio.

Tube compressors are **a useful tool for adding depth and warmth to a group of sounds or the entire mix**, or for adding character and color to a variety of sounds.

They are mostly used to add what's known as "glue compression." You can also use them on individual sounds, but I wouldn't recommend them on lead sounds. They'll work better on background sounds.

Diode Compressors

Diode compressors use a pair of diodes in their gain reduction circuits, resulting in fast, aggressive compression with a distinct character.

They are often used on drums and other percussive instruments to add punch and impact.

These are hardly used in modern music. You'll never even hear people mention them.

Digital Compressors

Digital compressors are implemented using digital signal processing algorithms and are known for their precise control and wide range of available parameters.

They are **often used in a variety of applications, from subtle dynamic control to heavy and creative sound design**.

In addition to these common types of compressors, there are also many hybrid designs that combine elements of different types of compressors to offer a unique combination of characteristics.

Ultimately, the right compressor for a given task will depend on the specific needs and desired sound of the audio being processed.

Experimenting with different types of compressors and understanding their characteristics can help you find the right tool for the job.

Why Mixing Engineers Use Compression

There are different reasons why compressors are used in a mixing session.

They could be used to fix problems, creatively, or just to add color.

Let's dissect all these different scenarios.

Fixing Problems

A compressor can be used to fix various problems in a mix. Things such as dynamic control, tone shaping, frequency inconsistencies, musking, muddiness, harshness, etc.

All these issues can be fixed in many ways, but **compressors work best if the audio material is dynamic**. These are sounds that keep changing in volume or frequency response.

The great thing about using compression is that a compressor will affect the sound only when the problem occurs. This keeps the sound organic without changing its character and timbre.

A good example is when you're trying to reduce boxiness on a vocal track.

If that problem frequency only occurs during the verse, using a static EQ will make the voice sound thin during the chorus.

But if you use a dynamic EQ or multiband compressor, **these tools will only reduce the boxy frequencies when they cross a certain threshold**.

So there are many situations where a dynamic controller will be the better choice over a static one.

Creative Techniques

There aren't many creative ways to use a compressor, at least that I know of. Nonetheless, there are a couple of ways that you can use dynamic tools in a creative way.

One of the ways is by **sidechaining time-based effects such as reverb and delay**. In a dense mix, this technique can be used to avoid reverb or delay clutter.

However, when you're mixing a slow ballad song, you can use sidechaining to let all the transients of the vocal go through and only affect the decay. By playing around with the release parameter, you can determine how long you want the reverb to sustain.

This gives you much more flexibility as compared to just using the pre-delay parameter on a reverb unit.

You can use the same technique for the delay effect.

Compression can be used in various creative ways to **add movement and excitement to a static mix** as well.

Static, sustained chords can sound more exciting with sidechaining. This also adds movement to a boring static sound.

These days, you can also use an LFO tool or a dedicated "pumping effect" plugin to achieve the same results.

Adding Color

In some instances, compressors can be used as coloration boxes. This can be done in various stages. From recording to mixing to mastering, we do it all.

During recording, a vocal can go through a particular compressor to add a certain character to it.

Even though the compressor is not applying any compression, **some compressors just add attitude and balls** to a flat vocal recording.

In mixing, you'll usually see top engineers such as MixedbyAli (who mixed for Kendrick Lamar) have a vocal pass through an LA-2A compressor. The compressor will not affect the vocal; it will only add character.

In some cases, Ali does this with a Distressor plugin. So, a compressor can be a better choice to add character than a saturation or distortion unit.

This is done because over the years, vocals, guitars, drums, etc., were compressed using certain pieces of gear all the time, and people are now used to that sound.

Where to Add a Compressor in Your Signal Chain

With so many options available and so many places to insert a compressor in a signal chain, it can be hard to understand where to add a compressor for the best results.

In this module, we'll go over **the most common places to add a compressor in a signal chain** and provide tips and tricks for using compressors effectively at each stage.

Compress Before or After EQ

The order in which you apply compression and EQ can have a significant impact on the sound of your audio.

In general, **applying EQ before compression is recommended** because EQ can affect the dynamic range of the audio and the compressor will react to those changes.

For example, boosting a frequency range with EQ will increase the level of that frequency range, which could cause the compressor to react differently than if the EQ were not applied.

Applying compression before EQ can also affect the effectiveness of the EQ.

For example, if you apply compression to a heavily compressed audio signal, the compressor may further reduce the dynamic range, making it difficult to boost or cut specific frequencies with EQ.

However, there are always exceptions to the rule, and sometimes it can be useful to apply compression after EQ, depending on the desired effect.

For example, if you want to add punch and definition to a specific frequency range, you might try applying EQ to boost that range and then applying compression to add punch and definition to the overall sound.

In conclusion, it's generally recommended to apply EQ before compression, but there may be situations where applying compression before EQ can be useful.

Experimenting with the order in which you apply these processors can help you achieve the desired results.

Compress Before or After Saturation

In general, **it's recommended to apply saturation after compression**, because saturation can affect the dynamic range of the audio and the compressor will react to those changes.

Applying saturation before compression can also affect the effectiveness of the compressor.

For example, if you apply saturation to a signal with a lot of high-frequency content, the compressor might not be able to react as effectively to transients in the low-frequency range.

There are always exceptions to the rule, and sometimes it can be useful to apply saturation before compression, depending on the desired effect.

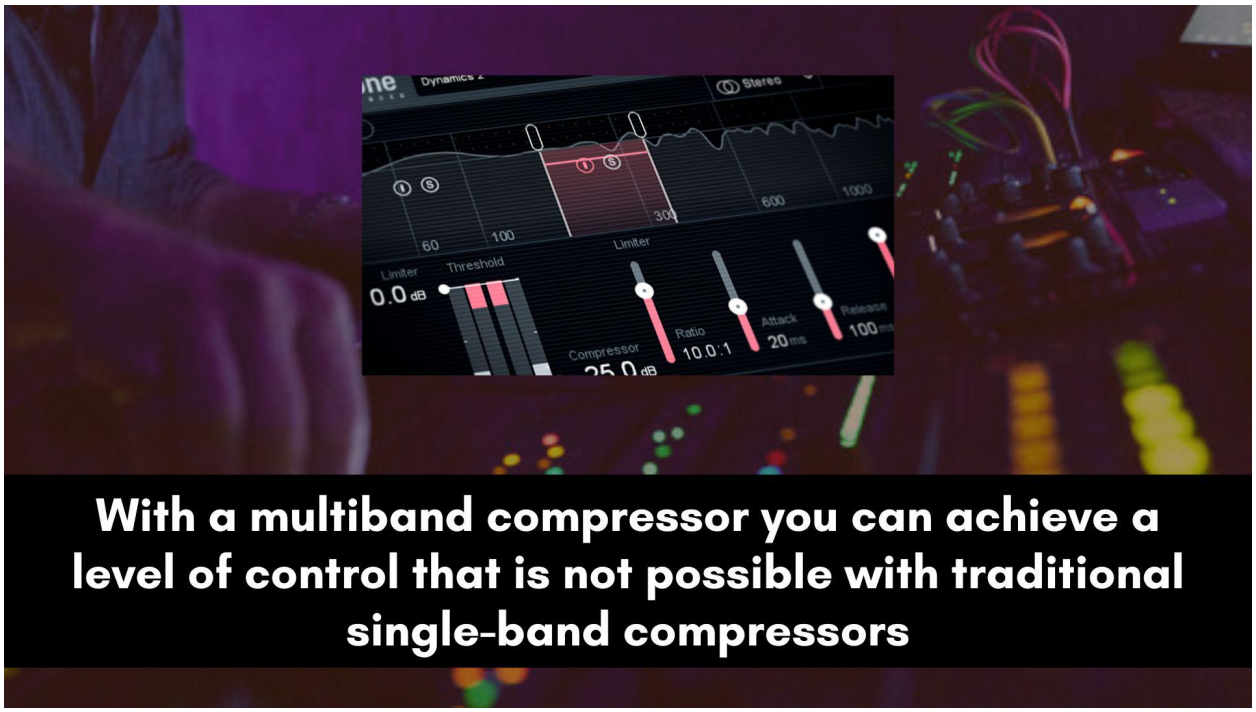
For example, if you want to add punch and definition to a heavily distorted signal, you might try applying compression to the distorted signal before adding saturation to the overall sound.

However, it's generally recommended to apply compression before saturation, but there may be situations where applying saturation before compression can be useful.

Add Effects Before or After Compression

It's recommended to **apply time-based effects after compression**, because time-based effects can affect the dynamic range of the audio and the compressor will react to those changes.

Multiband Compression



By dividing the audio spectrum into separate frequency bands and applying compression to each band independently, **you can achieve a level of control that is not possible with traditional single-band compressors**.

To use multiband compression effectively, it's important to understand how it works and how to adjust the various parameters available.

Most multiband compressors allow you to adjust the crossover frequencies, which determine the boundaries between the different frequency bands.

It's important to set these frequencies carefully, as they will have a big impact on how the compressor reacts to the audio signal.

In addition to the crossover frequencies, you can also adjust the threshold, ratio, attack, and release for each frequency band.

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These parameters work in the same way as they do for traditional single-band compressors, but by adjusting them for each frequency band independently, you can achieve a level of precision that is not possible with single-band compressors.

There are many situations where using a multiband compressor can be useful in audio production. Some examples include:

Taming Specific Frequency Ranges

If you have a sound that has too much energy in a specific frequency range, you can **use a multiband compressor to apply more compression to that frequency band** and bring it under control.

For example, if you have a vocal track with sibilant high frequencies that are too prominent in the mix, you can use a multiband compressor to apply more compression to the high-frequency band, taming the sibilance without affecting the overall level of the vocals.

Adding Punch and Definition to Specific Frequency Ranges

If you want to **add punch and definition to a specific frequency range**, you can use a multiband compressor to apply more compression to that particular frequency band.

For example, if you want to add punch and definition to the low end of a bass guitar, you can use a multiband compressor to apply compression to the low frequency band while leaving the higher frequency bands unaffected.

Controlling Dynamic Range in Specific Frequency Ranges

If you have a sound with a wide dynamic range in a specific frequency range, you can use a multiband compressor to control the dynamic range of that frequency band without affecting the rest of the audio.

For example, if you have a cymbal track with a wide dynamic range, you can **use a multiband compressor to apply more compression to the high-frequency band**, controlling the dynamic range of the cymbals without affecting the overall level of the track.

Enhancing the Character of Specific Frequency Ranges

You can use a multiband compressor to enhance the character of specific frequency ranges by applying more compression to those ranges.

For example, if you have a guitar track that you want to sound more aggressive and punchy, you can use a multiband compressor to **apply more compression to the mid-frequency range**, enhancing the character of the guitar.

Fixing Imbalances in a Mix

If you have a mix that is unbalanced and certain elements are too loud or too quiet, you can **use a multiband compressor to fix these imbalances** by applying more or less compression to specific frequency ranges.

For example, if the vocals are too quiet in the mix, you can use a multiband compressor to apply more compression to the mid and high frequency ranges of the vocals, bringing them up in the mix.

Mastering

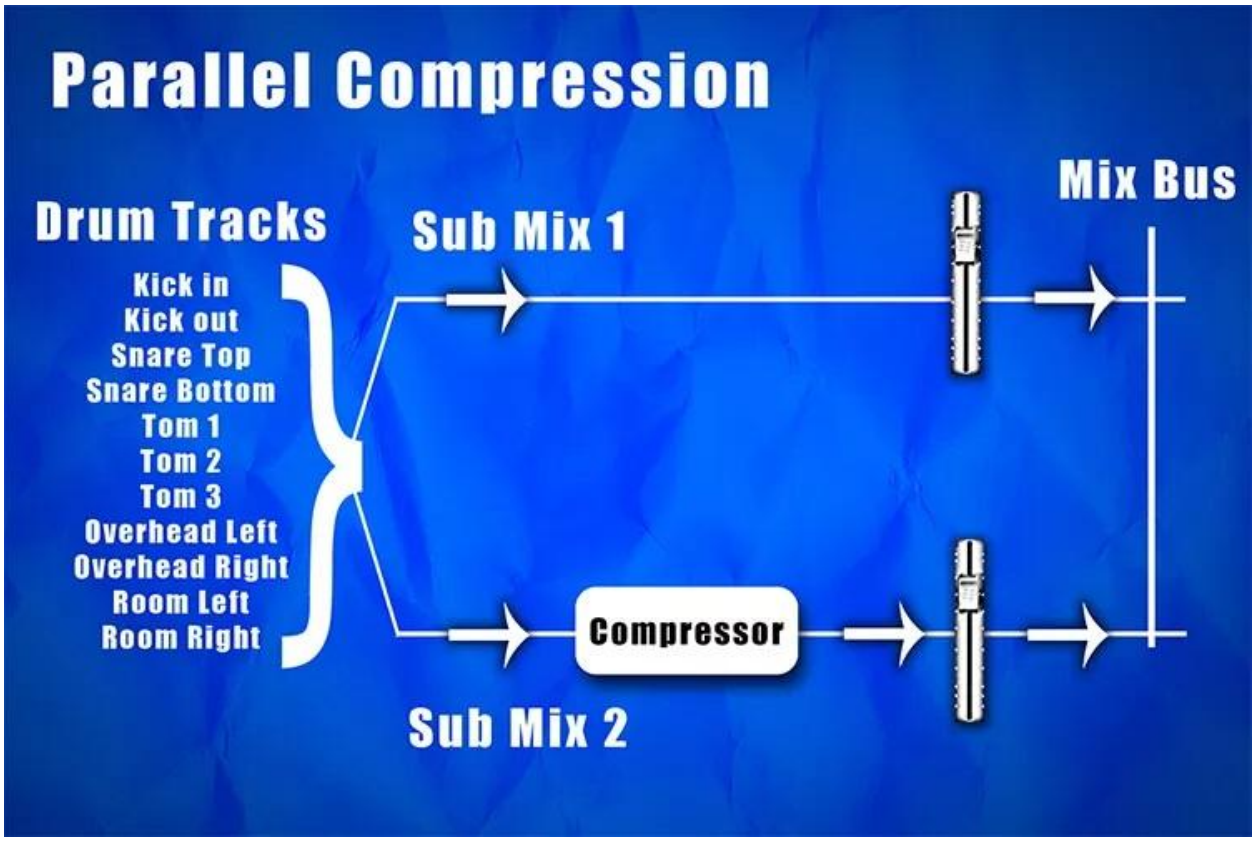
Multiband compressors can also be useful in the mastering stage of audio production.

By applying compression to specific frequency ranges, you can **achieve a balanced, cohesive sound across the entire audio spectrum**.

In conclusion, multiband compressors can be useful in a variety of situations in audio production, from taming specific frequency ranges to fixing imbalances in a mix.

Experiment with multiband compression on your own tracks to get a feel for how it can be used to achieve the desired results in your audio production.

Parallel Compression



Parallel compression, also known as "New York compression" or "upward compression," is a powerful technique in audio engineering that **allows you to add punch and definition** to a sound while preserving its dynamic range.

In this module, we'll dive into parallel compression and provide examples of how it can be used effectively in your mixes.

To use parallel compression, you will need to set up a parallel channel in your DAW of choice.

This involves routing the audio signal to two separate channels, one of which will be used for the dry, unprocessed sound and the other for the compressed sound.

You can then blend the two channels together using a mixer or a channel fader to achieve the desired balance between the dry and compressed sounds.

One of the key benefits of parallel compression is that it allows you to add punch and definition to a sound without affecting its dynamic range.

For example, if you have a drum track that you want to sound more punchy and defined, you can use parallel compression to add more punch to the drum track without squashing the dynamic range.

This can help you achieve a more natural, balanced sound in your mix.

Here are a few examples of how you can use parallel compression effectively:

Drums: As mentioned above, parallel compression is a great technique for adding punch and definition to drum tracks.

Set up a parallel channel and apply a heavy amount of compression to the compressed channel. Try a medium-to-slow attack, a fast-to-medium release, over -10dB of gain reduction, and a 4:1 ratio.

Then, blend the dry and compressed channels together to taste.

You can experiment with different compression settings and blend levels to achieve the desired punch and definition.

Vocals: Parallel compression can also be useful for adding presence and clarity to lead vocals.

Create a parallel channel and apply a moderate amount of compression to the compressed channel.

For a good starting point, try a medium-to-slow attack, a fast-to-medium release, over -5dB of gain reduction, and a 4:1 ratio. These settings should keep the vocals well-controlled and consistent.

Adjust the compression settings until you achieve the desired presence and clarity.

Then, blend the two channels to taste. If the effect sounds obvious, you're probably doing it wrong.

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Dynamic Compression

This type of compression will be useful if you're mixing a sound that has a drastic dynamic range (a huge difference between the loud and quiet parts).

Ratio: 4:1 or more
Attack Time: fast to medium (5-15ms)
Release Time: medium (around 20ms)
Gain Reduction: push the threshold until you're affecting everything except the quieter parts of the audio.
Knee: Hard

Tonal Compression

You can use tonal compression when an instrument or voice is not too dynamic but struggling to cut through in the loudest parts of the song.

You can also use this approach if you're working with musicians who want to make things sound natural and keep the human feel.

Ratio: 1.5:1 to 3:1
Attack Time: medium to slow (15ms or more)
Release Time: medium to slow (20ms or more)
Gain Reduction: around -2dB to -3dB
Knee: Soft

Controlling Loud Transients

In some cases, you might find yourself working on a performance that has peaks that become way too loud in certain parts of the song.

You can use an FET compressor like the 1176 to control these loud transients.

You can also use this type of compression if you want to make a sound smoother in the mix or if you don't want it to sound punchy.

Ratio: 5:1 to 8:1
Attack Time: fast (5-10ms)
Release Time: fast (10-20ms)
Gain Reduction: push the threshold to only affect the transients; once you start affecting everything, reduce the threshold. You should only affect the loudest transients.
Knee: Soft

Punchy Compression Settings

When a sound is just flat, you can add some life to it and help it cut through the mix by enhancing the attack.

This will make the instrument or voice punchy and come forward in the stereo image.

Ratio: 3:1
Attack Time: slow (30ms or more)
Release Time: slow (40ms or more)
Gain Reduction: around -2dB to -5dB
Knee: Soft

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