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Important Safety Instructions

Terminals marked with this symbol carry electrical current of sufficient magnitude to constitute risk of electric shock.

Use only high-quality professional speaker cables with ¼" TS or twist-locking plugs pre-installed. All other installation or modification should be performed only by qualified personnel.



This symbol, wherever it appears, alerts you to the presence of uninsulated dangerous voltage inside the enclosure - voltage that may be sufficient to constitute a risk of shock.



This symbol, wherever it appears, alerts you to important operating and maintenance instructions in the accompanying literature. Please read the manual.

**Caution**

To reduce the risk of electric shock, do not remove the top cover (or the rear section).

No user serviceable parts inside. Refer servicing to qualified personnel.

**Caution**

To reduce the risk of fire or electric shock, do not expose this appliance to rain and moisture. The apparatus shall not be exposed to dripping or splashing liquids and no objects filled with liquids, such as vases, shall be placed on the apparatus.

**Caution**

These service instructions are for use by qualified service personnel only.

To reduce the risk of electric shock do not perform any servicing other than that contained in the operation instructions. Repairs have to be performed by qualified service personnel.

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this apparatus near water.
6. Clean only with dry cloth.
7. Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.

9. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding-type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.

10. Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.

11. Use only attachments/accessories specified by the manufacturer.



12. Use only with the cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid

injury from tip-over.

13. Unplug this apparatus during lightning storms or when unused for long periods of time.

14. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

15. The apparatus shall be connected to a MAINS socket outlet with a protective earthing connection.

16. Where the MAINS plug or an appliance coupler is used as the disconnect device, the disconnect device shall remain readily operable.



17. Correct disposal of this product: This symbol indicates that this product must not be disposed of with household waste, according to the WEEE Directive (2012/19/EU) and your national law. This product should be taken

to a collection center licensed for the recycling of waste electrical and electronic equipment (EEE). The mishandling of this type of waste could have a possible negative impact on the environment and human health due to potentially hazardous substances that are generally associated with EEE. At the same time, your cooperation in the correct disposal of this product will contribute to the efficient use of natural resources. For more information about where you can take your waste equipment for recycling, please contact your local city office, or your household waste collection service.

18. Do not install in a confined space, such as a book case or similar unit.

19. Do not place naked flame sources, such as lighted candles, on the apparatus.

20. Please keep the environmental aspects of battery disposal in mind. Batteries must be disposed-of at a battery collection point.

21. Use this apparatus in tropical and/or moderate climates.

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1. Introduction

Welcome to Finalizer!

Finalizer is a next generation mastering environment for Mac and Windows computers.

Developed by TC Electronic, the Finalizer software builds on a long tradition of dynamic processing, expertise in audio measuring and acclaimed innovations in metering.

Our commitment to designing the best tools for music mastering goes back more than 20 years, and many of our developments have become industry standards.

From our studio stalwarts like the System 6000, to the original Finalizer hardware unit (one of the world's first mastering solutions designed for semi-pro and pro studio owners), and modern studio classics like the Clarity M hardware meter, we want your music to sound its best.

With Finalizer and our powerful range of groundbreaking and award-winning real time mastering tools, you have everything you need to take your music and your mastering to the next level.

The game-changing visual approach to mastering presented by Finalizer lets you view your tracks, like you've never seen them before, with the dynamics, loudness and spectrum across your entire song in a single view.

This is Finalizer. Get ready to revolutionize your music production!

2. Getting Started

How to get the Finalizer application up and running.

Step 1: Install iLok

If you have not used iLok before, then the first step is to create an iLok user account and install the PACE iLok License Manager on your computer.

<https://www.ilok.com/#!license-manager>



Step 2A: Get your free license

The second step is to enter your iLok User ID in the field in the link and activate it in the iLok License Manager app.

To get a 14-day demo license for the Finalizer Desktop App, please use the link below.

<https://finalizer.com/freetrial/>

Step 2B: Buy and activate

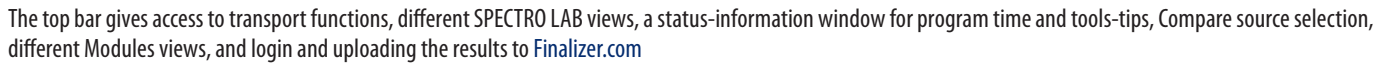
You can buy the Finalizer App iLok license via the link below.

<https://finalizer.com/buy-finalizer/>

Step 3: Download App

The final step is to download the Finalizer App to your Mac or PC. Pick your operating system below and simply follow the instructions during installation. Then you are good to go, and to get started mastering your heart out!

Link to Downloads: <https://finalizer.com/downloads/>



Top Menus

- File: save, save as and other file operations, print to file, and upload operations
- Edit: undo and redo operations
- Modules: various Module operations
- View: toggle various views

Click on this logo to visit the Software Update page of the Preferences Menu.

- Note: If there is a software update available, an "!" will be shown on the logo.

Standard DAW transport functions. The specific keyboard commands may be set up in the Keyboard Shortcuts page of the Preferences Menu. The buttons are as follows:

- Rewind
- Forward
- Go to the start of current selection (or Stop, if currently playing)
- Play
- Toggle looping of the full track or the region in the timeline

SPECTRO LAB

Spectral and dynamics views. Choose from these three options: (More details are given in the SPECTRO LAB section below)

- Spectral Dynamic Contour, SDC
- Real-Time Spectrum, RTS
- Average Spectral Curve, AVG

Status Information window

- Playhead and region time information
- Status information
- Useful tools-tips

Compare

Select which track or source to play back. This is also reflected in the SPECTRO LAB, Timeline, and Master Meter section.

- A is the prepared source track
- B is the resulting track, processed with all modules
- REF is a reference track, selected from a list of user-added reference tracks

Modules

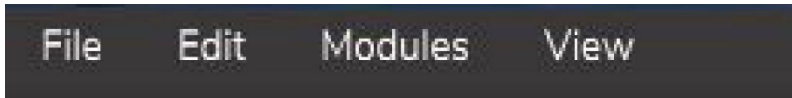
Select which module views to open.

- Edit view - all parameters and local meters for the processing modules
- Modules List will show the processing chain
- Library will show the list of module and module chain presets

Finalizer.com

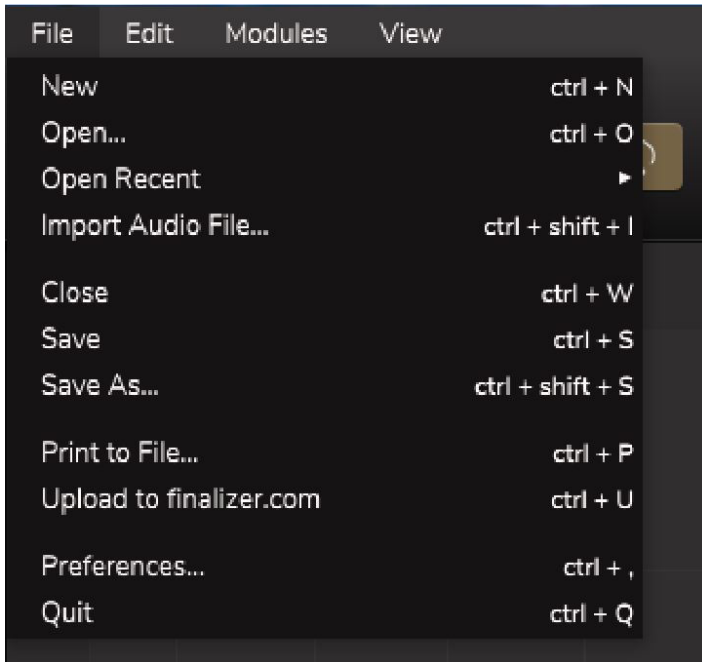
- Upload the processed track to Finalizer.com for comparison against classic and current hits and the status of streaming services.
- Takes you to the Cloud page of the Preferences Menu, where you can log in to the website, and upload the final processed file.

4. Top Menu



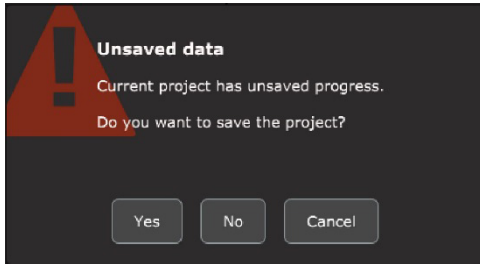
4.1 File

Click here to view the File drop-down menu. This allows projects to be created, opened, closed, saved, and audio files imported, and preferences to be edited.

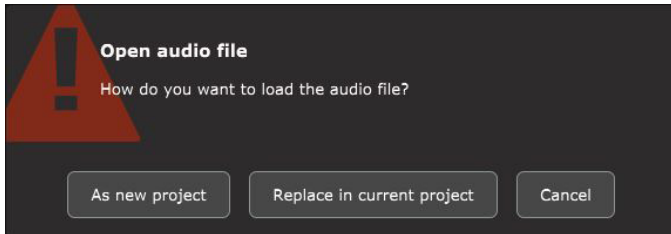


- New: start a new project
- Open: open an existing project
- Open Recent: view and select from a list of recent projects
- Import Audio File: import an audio source file
- Close: close the current project
- Save: save the current project, using the same filename
- Save As: save the current project, using a new filename
- Print to File: render and export the current project master output file to disk
- Upload to Finalizer.com: uploads the current project master output file to your account on Finalizer.com, for comparison against music genres and current hits
- Preferences: open the "General" page of the Preferences menu. On Mac the Preferences is found in the Finalizer drop down menu.
- Quit: exit the Finalizer

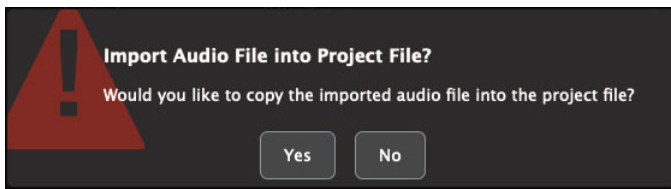
Note: An “Unsaved data” reminder is displayed if a current project has not been saved, before you can open another project. Caution: If not saved, then any unsaved changes will be lost.



A similar warning appears before a new audio file can be loaded:

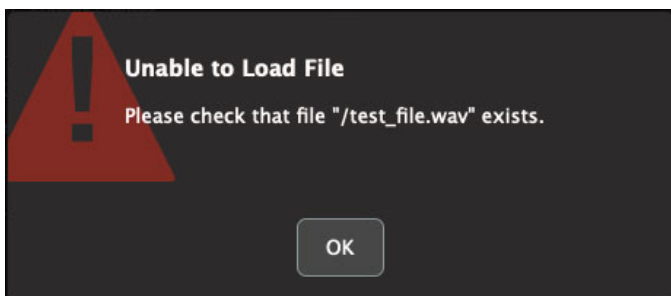


Note: When importing an audio source file into the Finalizer, you will be asked if you want to copy the audio source file into the Finalizer project file. If you answer no, the Finalizer project file will point to the audio source file and you should be careful not moving this file from its location unintentionally.



If you export a new version of your mix audio file from your DAW and overwrite the Finalizer audio source file, it will not automatically be reimported into the Finalizer project while the application is running. You will have to reopen the project or restart the Finalizer application.

The following message will be shown if the audio source file used in the project is missing:

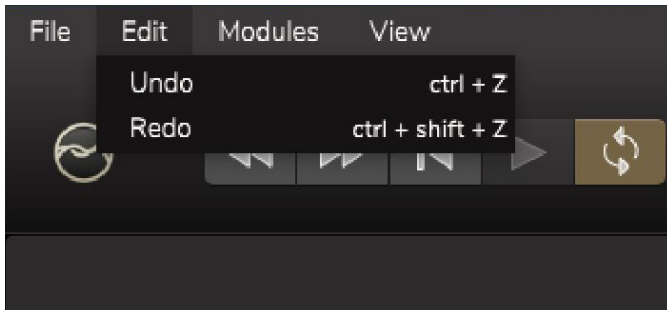


4.2 Edit

Click [here](#) to view the Edit drop-down menu. This allows the use of undo and redo on current operations.

The Finalizer features a rather comprehensive Undo/Redo system.

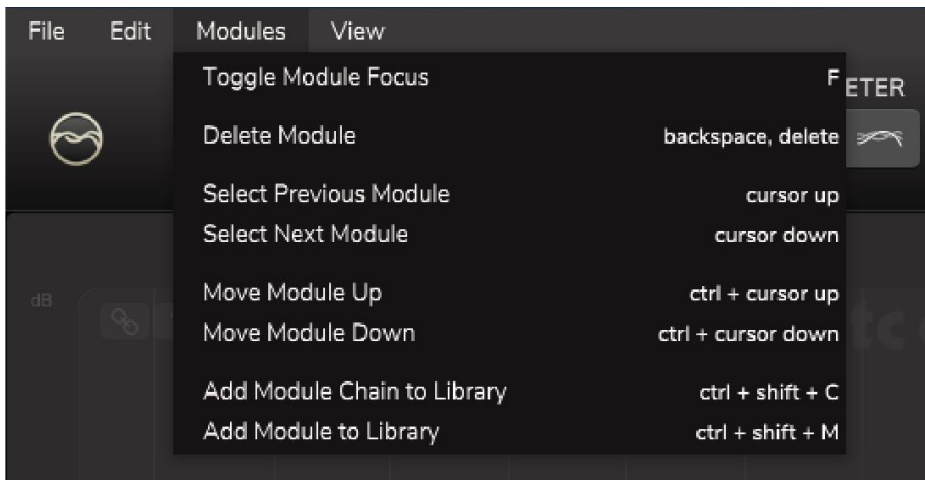
- All relevant parameter changes that affect the processing can be undone or redone
- The undo/redo stack is unlimited
- The undo/redo stack is not saved in the project and it is reset when the project is closed. This way your steps are not visible to partners you may share the project file with.



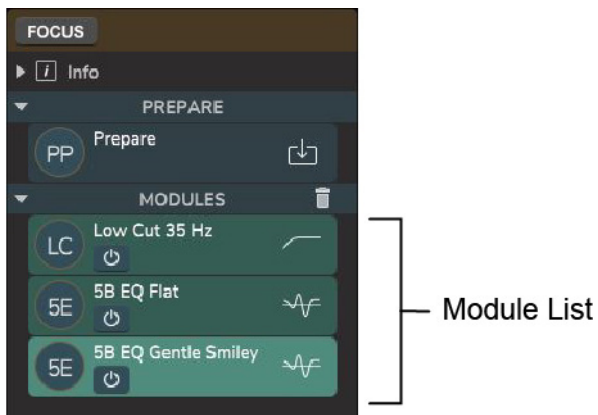
- Undo: undo the last command
- Redo: redo the last command

4.3 Modules

Click here to view the Modules drop-down menu. This will allow the Module List to be edited, such as removing modules, selecting the previous or next modules in the list, or changing the order of the modules in the list.

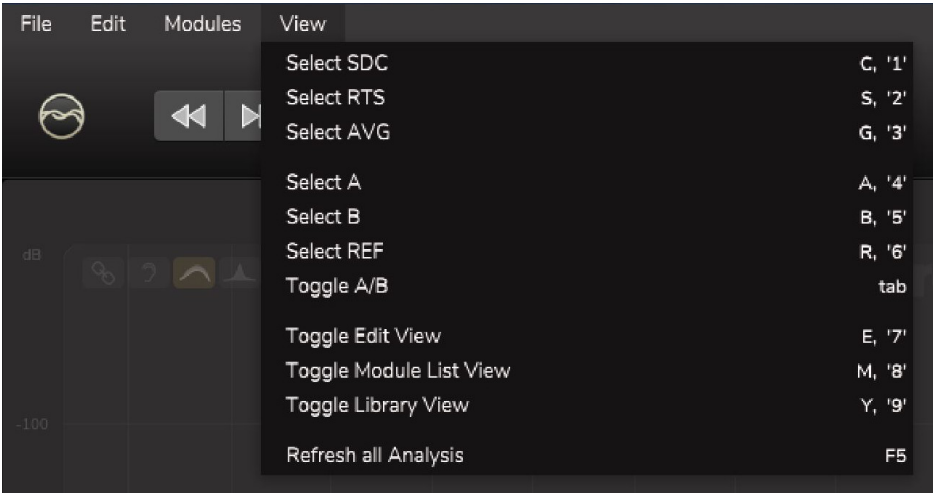


- Toggle Module Focus: when focus is enabled, the selected module is the last module to be processed as the following modules including the Limiter are bypassed
- Delete Module: remove the selected module from the Module List
- Select Previous Module: select the preceding module in the Module List
- Select Next Module: select the next module in the Module List
- Move Module Up: move the selected module up in the Module List order
- Move Module Down: move the selected module down in the Module List order
- Add Module Chain to Library: add the current list of modules and Limiter (except Prepare and Export) module to the Library as a Module Chain. You may want to rename it before adding it.
- Add Module to Library: add the selected module to the Library. You may want to rename it before adding it.

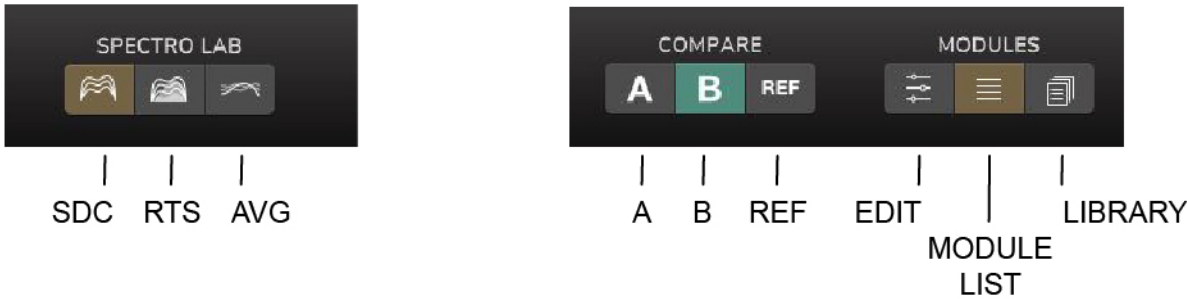


4.4 View

Click here to see the View drop-down menu. This will allow the various views to be turned on or off. Keyboard shortcuts are also shown on the far right.



- Select SDC: select the Spectral Dynamic Contour in the SPECTRO LAB
 - Select RTS: select the Real Time Spectrum in the SPECTRO LAB
 - Select AVG: select the Average Spectral Curve in the SPECTRO LAB
 - Select A: select A (prepared source)
 - Select B: select B (processed)
 - Select REF: select REF (the selected Reference file)
 - Toggle A and B monitoring: select either A (prepared source) or B (processed)
 - Toggle Edit View: turn on/off the parameter Edit View
 - Toggle Module List View: turn on/off the Module List View
 - Toggle Library View: turn on/off the Library View
 - Refresh all Analysis: will refresh all background analysis for the SPECTRO LAB, full track descriptors in the Master Meter section and the Loudness Compensation
- Note: The Toggle selections in the VIEW menu are just the same as using the three SPECTRO LAB buttons, the three COMPARE buttons, and the three MODULES buttons. Keyboard shortcuts are provided to access these commonly used functions.



5. Compare

Comparing the effect of each change to the track is essential to mastering. The following details of the COMPARE section describe how to select which audio source to be viewed and played back.



The Compare section is where to select which track/source to playback, and this is also reflected in the SPECTRO LAB, Timeline and Master Meter sections. Thus, there is always a correspondence between what you hear and what you see.

- **A** is the prepared source track after potential sample rate conversion and loudness normalization defined in the Prepare module
- **B** is the resulting track processed with all modules that are enabled
- **REF** is a chosen reference track from the list of reference tracks. Up to 20 Reference tracks can be loaded

Note that each of these sources has a different colour button, and this corresponds to the colour of the curves in the SDC, RTS, and AVG displays, and in the horizontal timeline display.

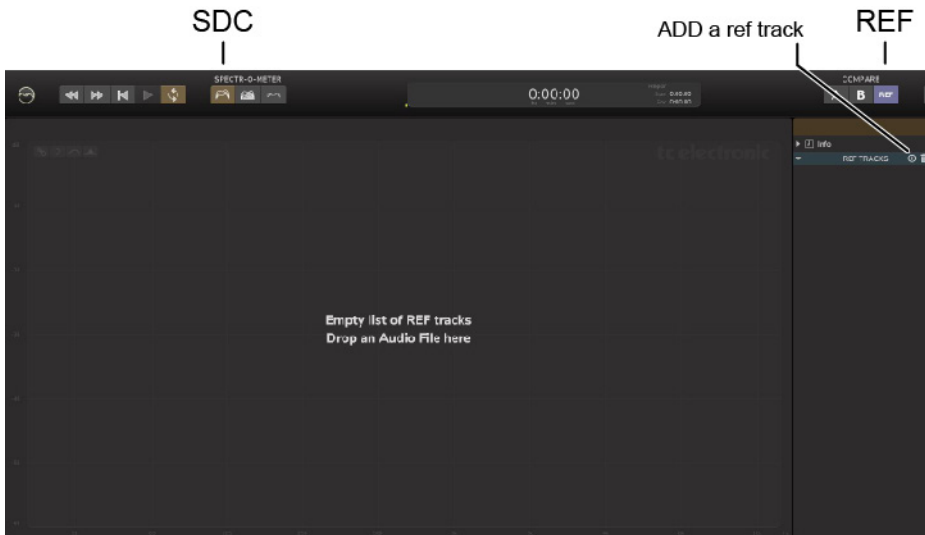
Tips:

- Use the Loudness Compensation in the Monitor Section for comparing at equal loudness level without the need for manually setting gains.
- Alternatively, you may want to use the gain per REF track – the REF Track Trim, in case you want to override or fine-tune the automatic Loudness Compensation.
- A region can be defined for source track (A/B) and for each REF track. This enables playback looping of the defined region and the SPECTRO LAB views are now only showing analysis of the defined region as opposed to the full track.
- Using the Focus function, the effect of a single module can be assessed, rather than the entire module chain.

5.1 Using REF

The REF button allows a quick comparison of the current work, compared to your favourite reference tracks or related album tracks. The measurements on the selected REF track are reflected on all the SPECTRO LAB views (SDC, RTS, and AVG).

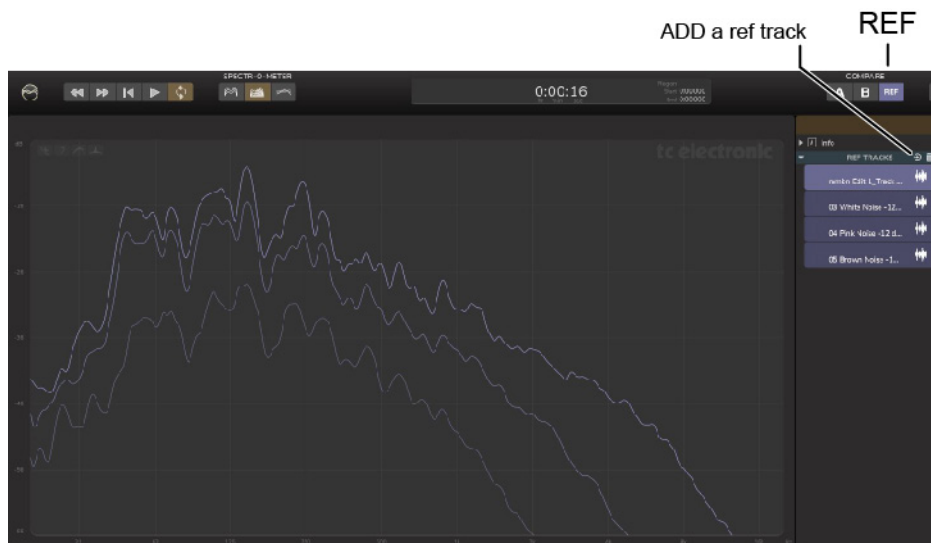
- The first time REF is used, the display will show that the list of reference tracks is empty.



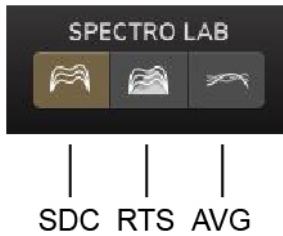
- Reference tracks can be added either by dragging them and dropping it onto the SPECTRO LAB area, or by pressing the "+" in the REF TRACKS area to the right of the display. As you add reference tracks, they will appear in the REF TRACKS list. Tracks can also be deleted from the list by selecting the trash can icon next to the "+" button.



- If several REF tracks have been added, select one track by clicking on the desired track in the REF TRACKS list, and its name in the list will be highlighted, and the track will appear in the display as well as being played back.



6. SPECTRO LAB



The Finalizer features a very useful meter and work bench approach for mastering: The SPECTRO LAB!

The SPECTRO LAB is designed to give full overview of your track, both spectral- and dynamics-wise and via background calculations continually updating the views while you playback and work in real-time. Additionally, most of the processing modules you add to the project have their own representation in the SPECTRO LAB view. Thus, the SPECTRO LAB is a combined full track audio meter and processing tool laboratory that will assist you in making fast and precise mastering decisions. But remember, still ears first!

This unique mastering tool includes 3 views, selectable one at a time:

- Spectral Dynamic Contour (SDC)
- Real Time Spectrum (RTS)
- Average Spectral Curve (AVG)

For each meter view, the horizontal axis shows the standard audio frequency range from 20 Hz to 20 kHz. The vertical axis shows the signal level from 0 dB (digital full-scale) down to -60 dB.

Each meter can show either the source signal (A), the processed signal (B), or the selected reference track (REF). A, B, and REF are selected in the COMPARE section of the top line.

In the examples that follow, a new project has been created and an audio file has been added.

6.1 Real time and full track audio processing

The SPECTRO LAB will show full track analysis (SDC and AVG) as well as real time measurement (RTS). This combination makes the SPECTRO LAB a truly unique tool for mastering, and will complement your ears and help you make decisions faster and with more accuracy. Any processing changes are automatically reflected in the full track views.

This real time/full track approach has these benefits:

- Adjust the processing and listen to the audio results in real time, like you are used to
- Get continually-updated full track SDC and AVG views. You will see how all your adjustments affect the full track spectrally and dynamically
- Get continually-updated full track descriptors: Track Loudness, True-Peak Max, and PLR (Peak-to-Loudness, describing the dynamics of the track)
- Easily compare the source track, processed track, and reference tracks by using the COMPARE buttons (A, B, or REF)

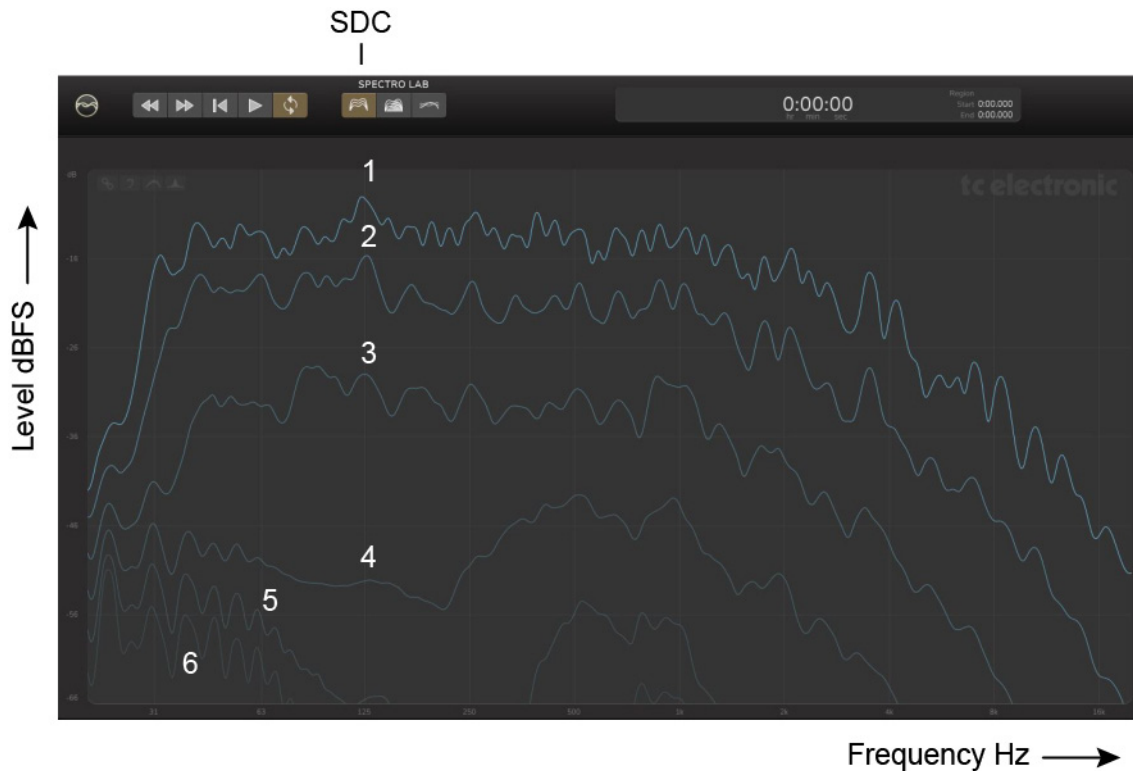
Note: the calculations can be reset by pressing F5, but will normally be updated automatically.

6.2 Spectral Dynamic Contour (SDC)

The Spectral Dynamic Contour gives an overview of the full track, both spectrally and dynamically. This is a brand-new and highly useful approach to metering for mastering, and the amount of visual feedback is comprehensive. While your ears are the most important instrument, relevant visual feedback will support what you hear and help you in choosing precise and fast solutions.

The SDC will help you identify how a processing change, intended for fixing a local issue, will affect the whole audio file. It will show how a dynamic process may affect lower levels than expected due to settings of attack and release times. And you will get useful insight when comparing against related album tracks and genre-specific reference tracks.

Six contour curves are represented, as shown below.



Key

The SDC curves show the level at each frequency as follows:

1. The maximum signal level at each frequency. This typically occurs a small amount of time in the track
4. The level at each frequency is below this line 50% of the time in the track (median). This is the 'typical' level of that frequency
6. The softest signal level in the track, at each frequency

The six SDC contour curves together show the spectrum and the dynamics of the full track, both of which are essential when mastering music.

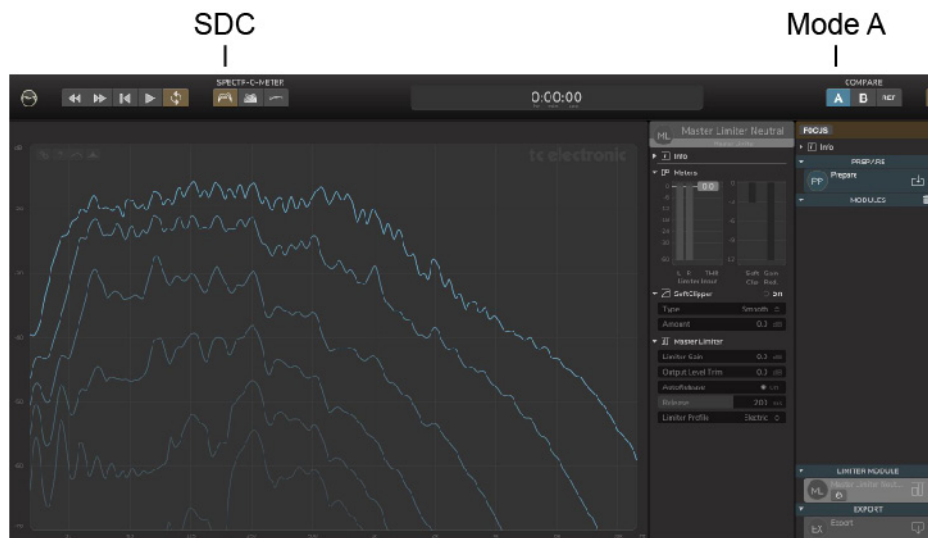
The X-axis is the frequency, corresponding to the frequency bands each 1/6th octave wide, that the SDC is based on. The Y axis shows the levels of the energy distribution in each frequency band. At a given frequency, the higher the SDC curves, the more energy is in that band. The closer together the curves are, the less dynamic the content is, in that band.

The SDC curves are affected by the Loudness Compensation in the Monitor section. For example, if the Loudness Compensation turns the level down, the SDC curves are also lowered accordingly. "What you hear is what you see."

6.2.1 Examples of SDC

The following pages show some examples of using the SDC with A, B, and REF.

SDC in A Mode (prepared source track)



In this example, the prepared source file is displayed, showing the spectral and dynamic content and its six contour curves. No effects (modules) are shown, as this is the pre-processed “before” source file. This includes the initial Level Normalization and Sample Rate Conversion, if applied (both located in the Prepare module). Note that the curves have the same colour as the “A” button, and the top curve is brighter.

SDC in B Mode (processed track)

1. No processing modules except the Limiter



In this example above, the processed output is shown, but no processing modules have been inserted yet, only the final Limiter module is in the chain. Note that the curves have the same colour as the “B” button, and the top curve is brighter.

2. SDC in B mode, example with one processing module included



In this example, the “Bell Damp Mids” EQ module was inserted into the Module List, and note that the processed output has a slight dip in levels at the frequency of the filter, compared to the previous picture.

Difference Toggle

To avoid having to switch between the prepared source signals (A mode) and the processed signals (B mode), to see the difference between them, select the Difference button in the top left corner of the graph as shown. Select it again to turn the difference display off, and just show the B mode curves again. Note that the Difference button is only selectable from the B mode display (as B represents the processed track).

Note that the difference between A and B is also affected by the setting of the Loudness button in the Monitor section in order to “see what you hear”.

Difference on/off (difference between A and B)



The Loudness Compensation will align A and B in loudness. This is great for hearing fine spectral and dynamic differences, and at the same time it also makes the SDC difference highlight the processing performed, while ignoring the overall loudness difference between A and B. Typically the Loudness Compensate yields a smaller and more relevant difference between A and B – both when comparing by listening and via the SDC.

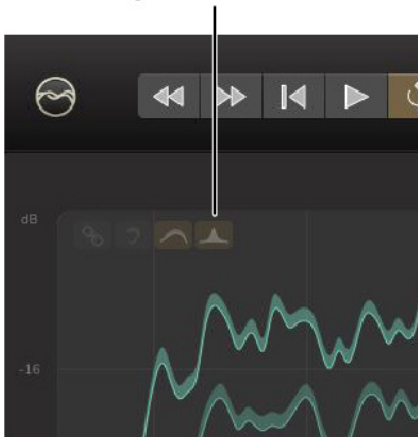
Tips for working with the SDC

- Closely-spaced curves indicate low dynamics in that specific frequency/level range. This may be due to a dominating instrument having little dynamics due to the sound structure, or due to a well-rehearsed and consistent playing style, or it may be due to significant dynamics compression.
- The upper SDC curves can show content that “stick out” of the mix. It may be useful to examine if this is intentional, or if it could need a bit of help, for example by using the Dynamic EQ.
- The SDC Difference will show the combined effect of the processing modules in the chain. This is based on a time/frequency-analysis of the entire track, so it is great to give an overview of the processing performed, and how it affects the track.
- Selecting a Region will trigger a new SDC that applies only to that region. This is useful for ‘zooming in’ on a certain passage in the track, and investigating its spectral and dynamic properties.

EQ Curve Overlay Toggle

The EQ curve corresponding to the EQ modules (not the dynamic modules) can be shown as an overlay on top of the SDC. To always see the EQ curve overlaid on the graph, select the button in the top left corner of the graph as shown. Select the button again to turn the overlay off. This button is not available in REF mode, or if the selected Module does not feature an overlay.

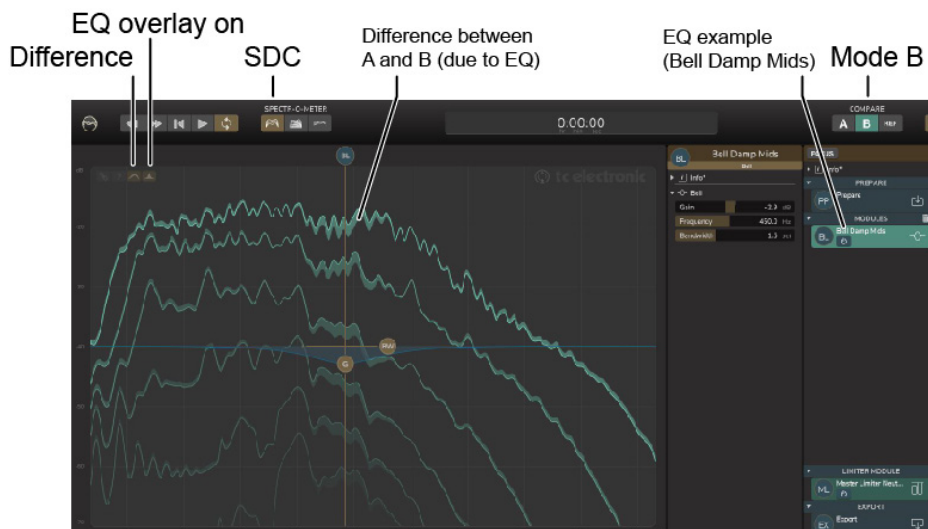
EQ overlay on/off



When the EQ overlay is on, the EQ curve will be displayed and remain, as shown in the example below. Note: If this EQ overlay is off, the EQ curve will be shown momentarily if the mouse is moved close to the EQ controls (BL, G, and BW in this example).



In the example below, the Difference button is on, and so is the EQ overlay. The thicker filled areas show exactly the spectral and dynamic changes between the prepared source A and processed B, caused by the application of the Bell Damp Mids module. All SDC curves are affected equally, as the EQ will affect all signal levels (as opposed to a dynamic module).

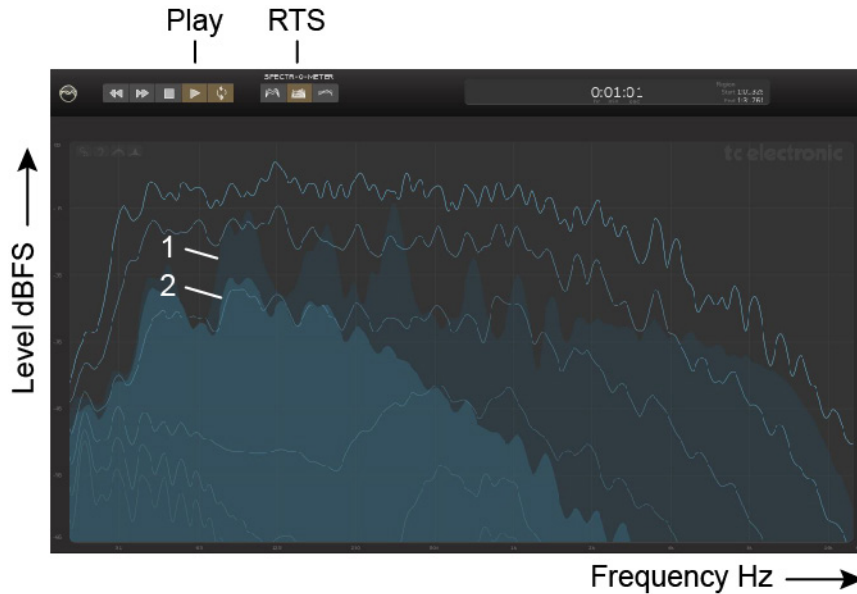


6.3 Real Time Spectrum (RTS)

The RTS is a highly detailed version of well-known and popular spectrum analyzers, and shows a real-time spectrum behind the full track Spectral Dynamic Contours (SDC), described in the previous section. The RTS features shows two curves: a real-time peak analysis, and a moving-average real-time RMS analysis shown in the lower filled curve.

In addition to being an important and useful tool, by supporting your ears and decisions in the mastering process, the RTS can also complement the SDC curves: the RTS will show the relation between what you hear now and the properties of the full track. Thereby you can determine exactly what instruments and passages in the track correspond to which peaks in the contour lines of the SDC.

You will for example, see that the RTS Peak curve over the time of your track will “describe” the SDC top curve, while the lower RTS curve will often tend to move around the 3rd to 5th SDC curve.



Key

1. The upper filled curve is a real-time peak analysis
2. The lower filled curve is a moving-average real-time RMS analysis

The peak level analysis of the RTS is also based on an RMS level analysis and should not be confused with the True-Peak level of the Main Meter section.

The RTS will show which parts of the current content (at the playhead location) correspond to a specific part of the full track Spectral Dynamic Contours.

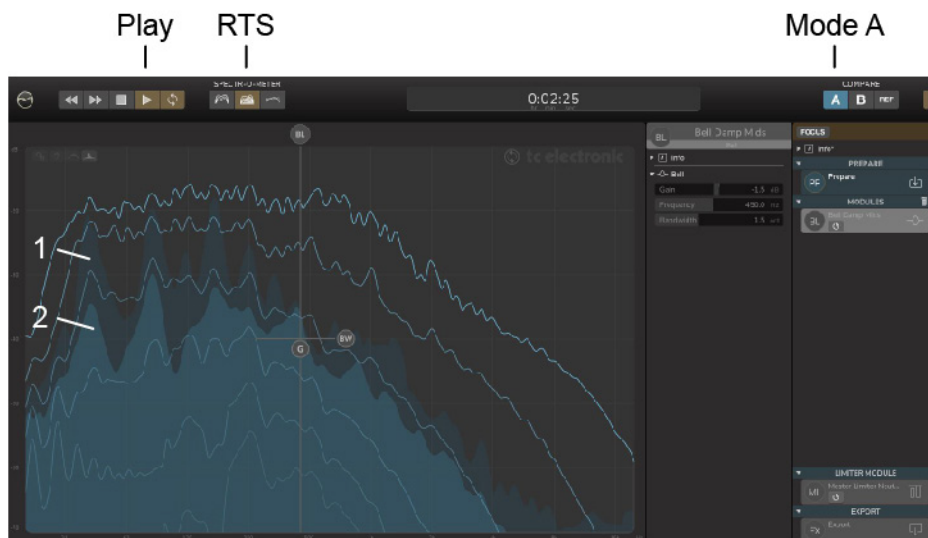
Note that if the track is not playing, then only the SDC curves will be displayed.

The RTS (and SDC) curves are affected by the Loudness Compensation in the Monitor section. For example, if the Loudness Compensation turns the level down, the RTS (and SDC) curves are also lowered accordingly. “What you hear is what you see.”

6.3.1 Examples of RTS

The following pages show some examples of using the RTS.

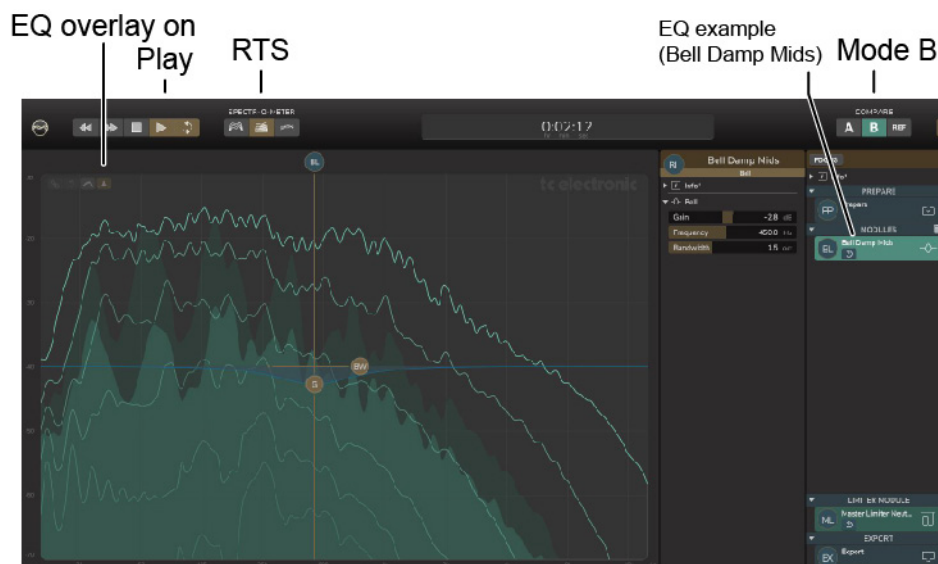
RTS in A Mode (prepared source track)



In the example above, the prepared source A is displayed, with the top filled-curve showing the real-time peak analysis, and the lower filled-curve showing a moving-average real-time RMS analysis. These two moving curves are overlaid on the SDC spectral and dynamic content and its six contour curves. No EQ effects are shown, as this example is the prepared source file. Note that the two filled RTS curves have the same colour as the "A" button, and as this is happening in real time, the RTS curves are only shown when the track is playing.

RTS in B Mode (processed track)

1. RTS in B mode, example with one optional processing module included

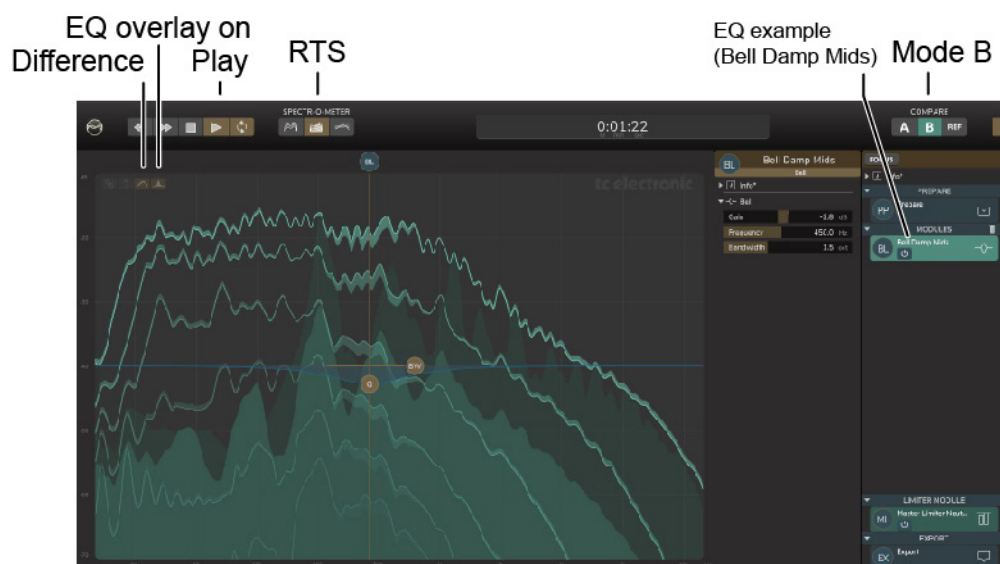
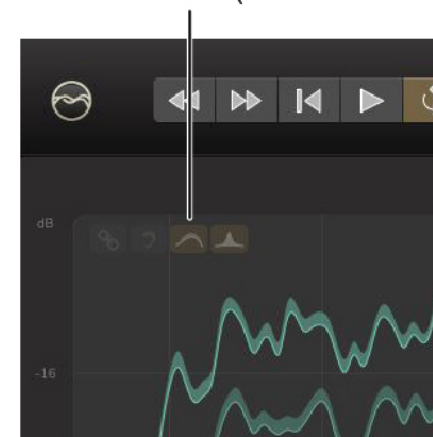


In the example above, the Bell Damp Mids EQ module was included in the Modules List, and the processed output shows a dip in levels at the frequency of the filter. Note that the two filled curves and SDC curves have the same colour as the "B" button.

2. RTS in B mode, Difference ON

The Difference button affects the six SDC curves, as described previously for the SDC, and does not affect the two RTS filled curves. It is used to view the difference between source track (A mode) and the processed track (B mode). Select it again to turn the difference display off. Note that the Difference button is only selectable from the B mode display.

Difference on/off (difference between A and B)

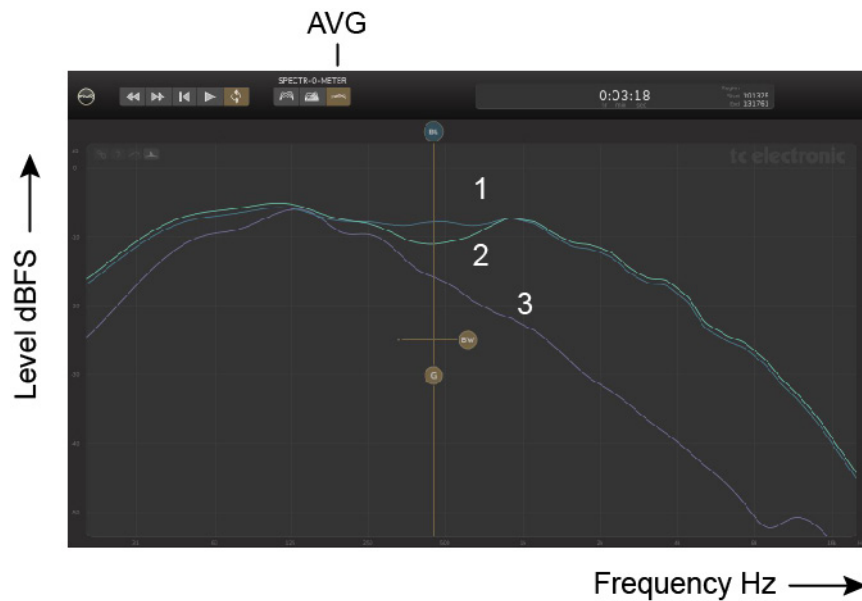


In the example above, the Difference button is on, and so is the EQ overlay. The two filled curves of the RTS and the SDC curves are affected by the controls of Bell Damp Mids EQ module. The filled areas of the SDC curves show exactly the spectral and dynamic changes between the source A and processed B, caused by the application of the Bell Damp Mids EQ module. If the display gets too “busy” to visualize clearly, it may help to turn off the EQ overlay once the EQ controls are set, and turn off the Difference toggle in the RTS view.

6.4 Average Spectral Curve (AVG)

AVG is the average energy for each frequency, calculated across the full track. This is very useful for comparing against reference tracks, for example within the same music genre and related album tracks.

All the tracks are loudness normalized during the analysis, which makes it easy to compare the spectrum only. The AVG curves are not affected by the Loudness Compensation in the Monitor section.

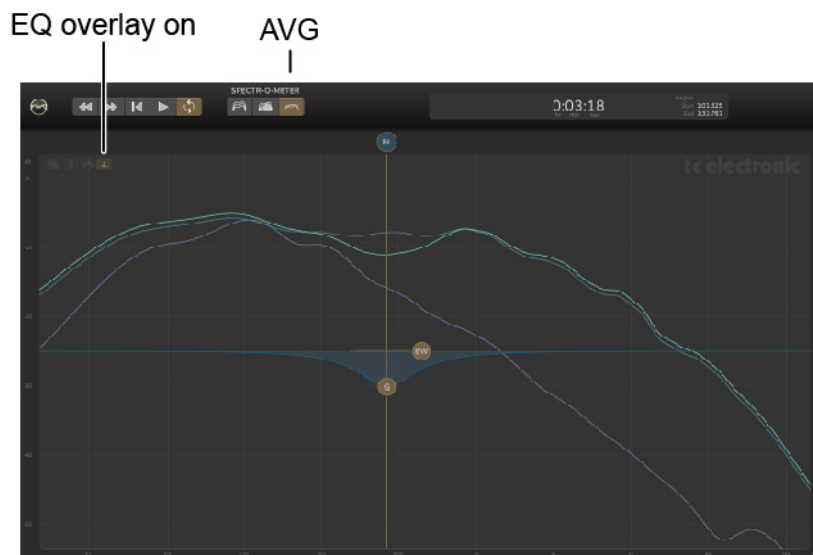


Key

1. The prepared source track (A)
2. The processed track (B) with the effects of the various processing modules
3. The Reference track imported to the project. All imported Reference tracks will be shown. The selected Reference track will be highlighted.

Note that the line colour is the same as the COMPARE buttons, A, B, and REF

The EQ overlay can be turned on or off in the AVG display.



The example above shows the "Bell Damp Mids" EQ controls and curve. Note that there is a dip in the B mode curve that corresponds to the lower setting of the Gain control "G." If no EQ or other processing modules are applied, then the top two curves (A mode and B mode) will be nearly identical.

Note:

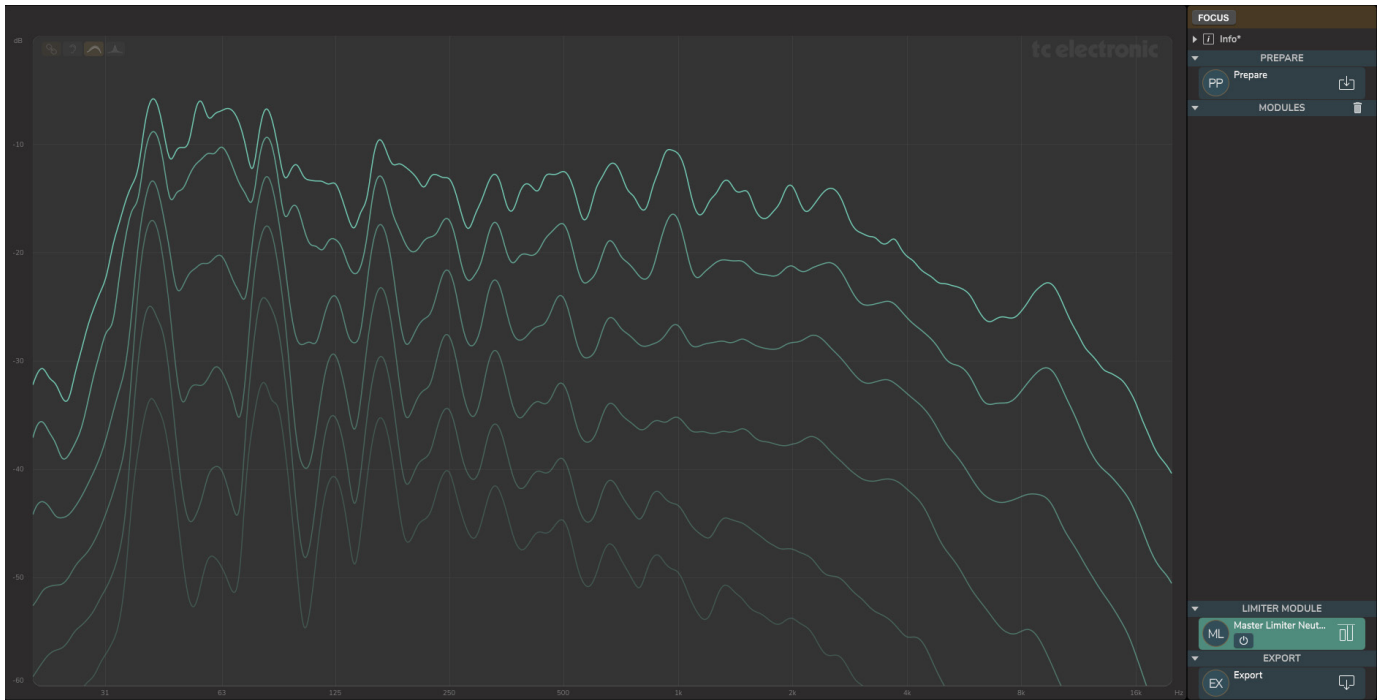
- It is important to notice the "nearly identical" A and B in the example above. A spectral change, like with a subtracting EQ, will reduce energy in the affected frequency band. Due to the loudness normalization built into the AVG view, this EQ results in an overall level increase at all other frequencies than the affected band. But that is also how we would hear it and therefore highly relevant when making mastering decisions.
- As "all songs are different" due to the specific instruments being played, the song structure and the mix, it is recommended that you do NOT use the AVG spectrum with an "EQ Match" or "Assimilation" approach. The AVG is however, very useful in a broader view versus related album tracks, or in view of a specific music genre, or to highlight issues with tonal balance. It may hint at an issue worth checking.

6.5 SPECTRO LAB In Depth

In this chapter we will dig into how the SPECTRO LAB views in the Finalizer will help you analyze your audio and assist you in making accurate and fast mastering decisions. But remember, while the SPECTRO LAB may be a very strong tool and make you see what you hear – always ears first when making decisions!

6.5.1 Spectral Dynamic Curves (SDC)

The SDC will create the spectrum view (level vs frequency), which includes the six Spectral Dynamic Contours which together describe the full track, as described in the SDC section. On the other hand, the RTS will show the peak and RMS levels in real-time.



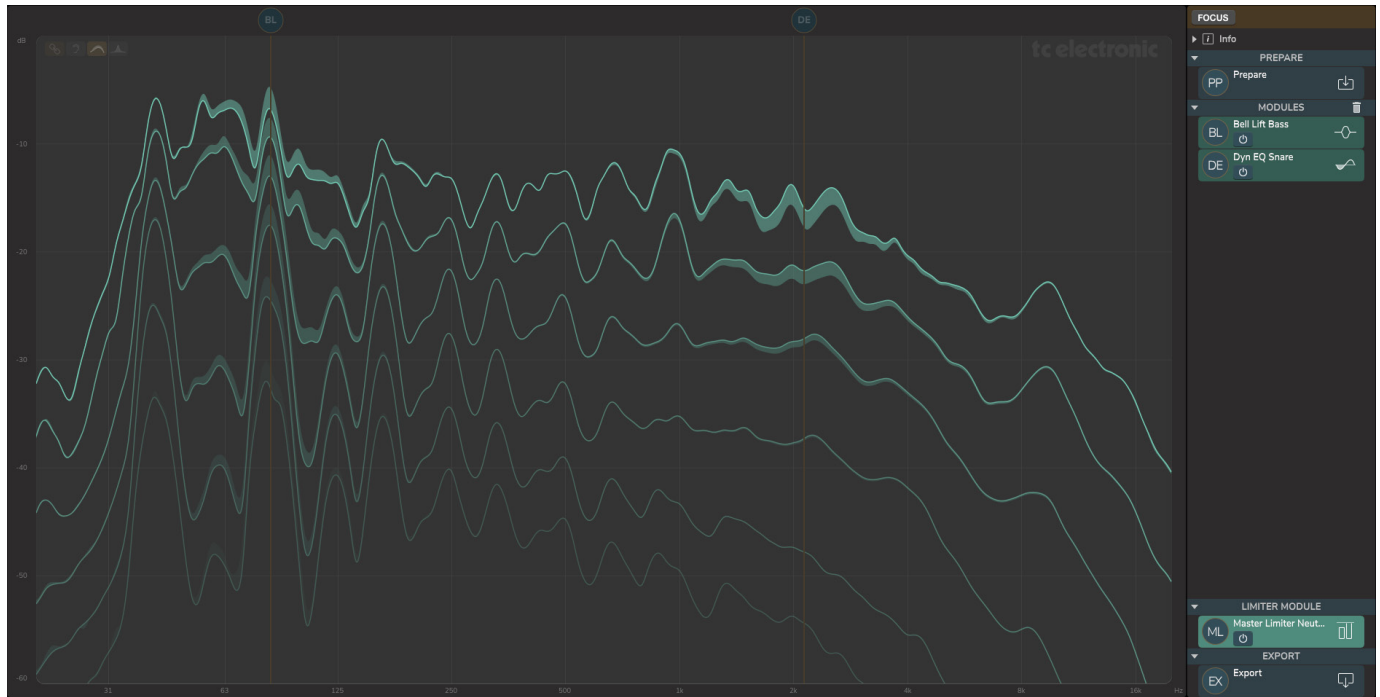
The spectral dynamic contours (SDC) show the spectral and dynamic content of the audio file and provide a number of relevant things to the mastering process.

There are no firm rules or limits as such to require what the SDC of a well-mastered music track should look like. Certain music genre may have more dynamics than other genres. And similarly with regards to the spectrum.

An example of an unmastered audio track is shown above.

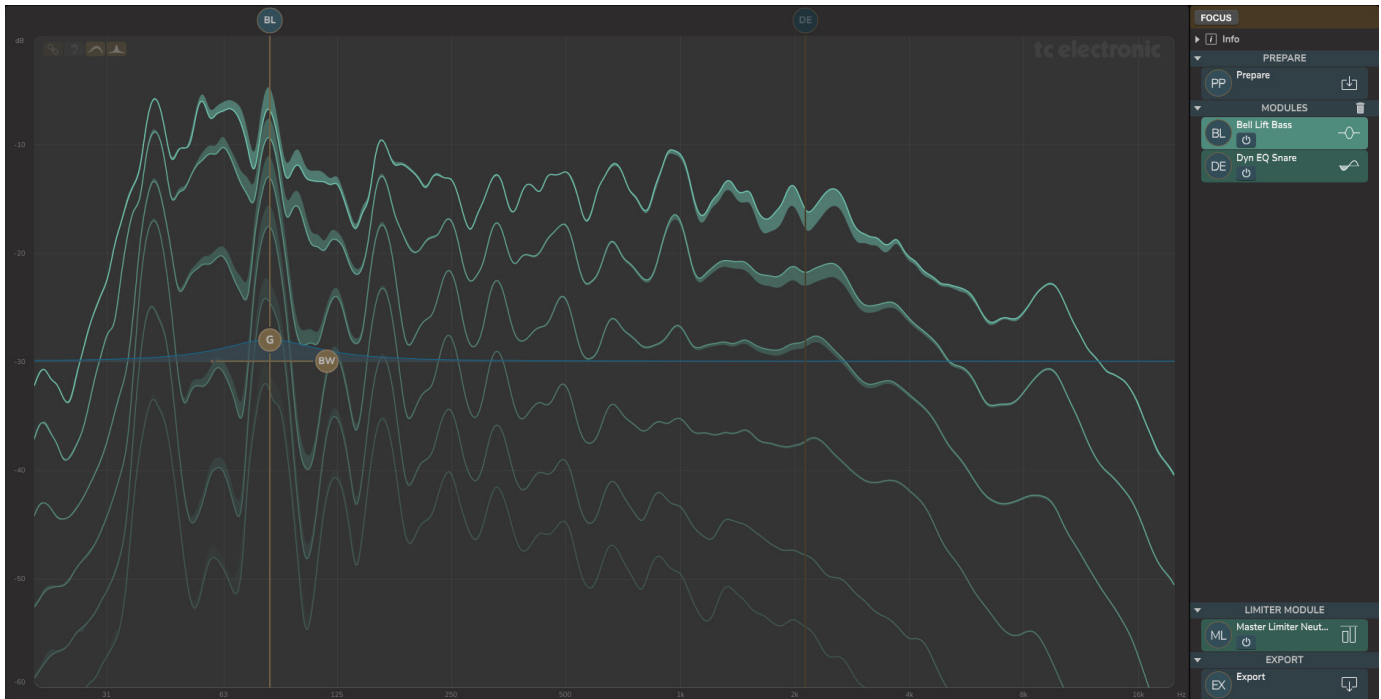
- The file is an unmastered Electro-Rock track with a “drone” dominated structure - one note/chord from start to end. The fundamental note and harmonics/sub-harmonics are clearly visible.
- As the contour curves are fairly closely spaced at the drone harmonics (40, 80, 160 Hz), we see that these frequencies in the mix have relatively little dynamics. The reason for this can be both the sound structure, the way it’s played or the compressors and limiters applied in the mix. As it is Electro-Rock the amount or maybe lack of dynamics may be just perfect for the genre.
- From about 1 kHz and up the curves are spaced fairly evenly, which tells us that there is clearly more dynamics in this part of the spectrum than at the drone harmonics.
- At about 9 kHz there is a peak mainly at the 2-3 highest dynamic contours and from listening it’s clear that the Hi-hat is the dominating instrument. This is evident, when switching the RTS on.
- At 400 Hz to 1.2 kHz there are some peaks mainly at the highest levels in the mix and they come from the lead vocal. It may be worth checking whether these peaks stick out in the mix and could need a bit of compression or dynamic EQ.
- It should of course also be checked if the low-end energy translates well to other playback systems from ear-pods/headphones to large speaker systems. The SDC indicates that a lo-cut EQ may be relevant.

After adding two processing modules the SPECTRO LAB will look like this:

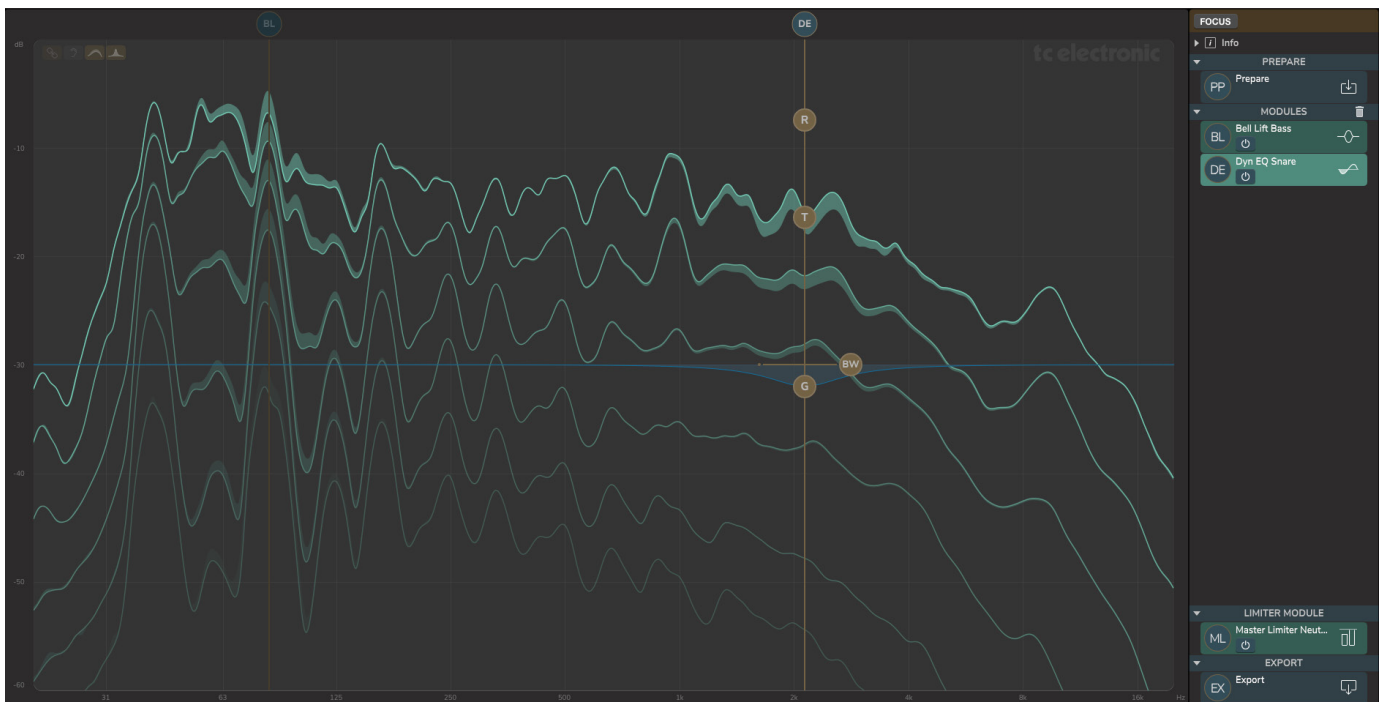


- Note that we are looking at the full, processed track (B). The Difference toggle is enabled such the curves are “filled” corresponding to how the modules have affected the result, i.e. the difference between A to B.
- In this case a Bell EQ at 80Hz and a Dynamic EQ at 2.1 kHz have been inserted.
- The Spectro Dynamic Curves show that the 80 Hz Bell EQ affects all 6 curves equally. This is because an EQ affects all levels in the signal equally within its frequency band.
- For the Dynamic EQ centered at 2.1 kHz, mainly the upper curves are affected. As the Dynamic EQ is compressing the levels above the specific threshold in the specific frequency band, this will be heard and shown on the highest levels of the track.
- Note that the Attack and Release times will affect how lower levels in the track may also be affected by a dynamic module. A long Release time will make the Dynamic EQ more gradually release its gain-reduction, hence affecting other parts of the track below its threshold. Only listening can determine the appropriate Release time, but the SDC will always reveal the effect it has.

When the Overlay is activated and the EQ module is selected, we see the EQ overlay curve has an area identical to the Difference areas on the SDC curves. Although the SDC knows nothing of the particular EQ, it has analyzed its effect on the track. Note the EQ controls are also available in the SPECTRO LAB view:



Selecting the Dynamic EQ will display its overlay curve. The max gain-reduction curve, as well as its controls that are available in the SPECTRO LAB view:



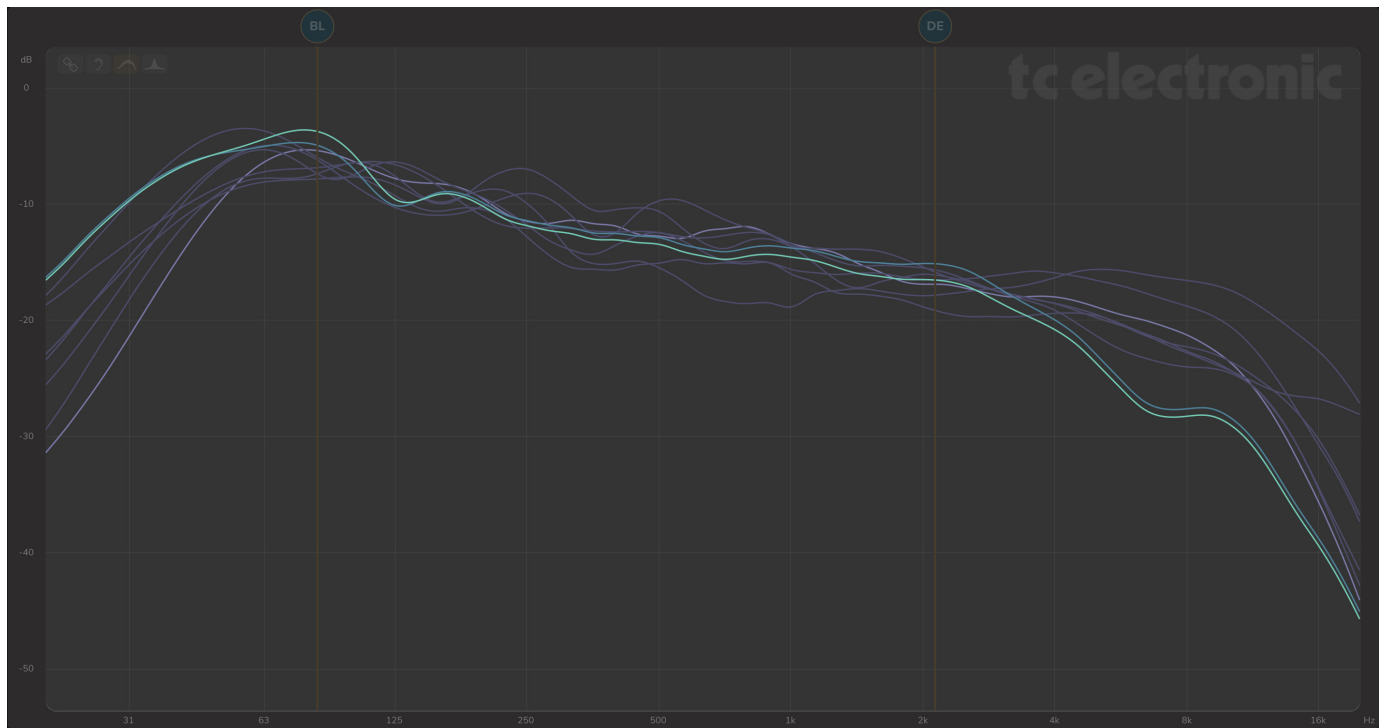
In this spectrum domain, the processing modules can be selected and their effect on the levels at different frequencies can be seen easily.

6.5.2 Average Spectrum Curve (AVG)

Further analysis on the example from above can be done with the Average Spectrum Curve (AVG) in the SPECTRO LAB. We can see A (prepared track, blue) and B (processed track, green) and how they differ due to the EQ and Dynamic EQ inserted above.

In the AVG view all traces are loudness normalized so we only compare spectrum, not potential loudness difference also. This is why A and B are different beside the EQ and Dynamic EQ changes.

In this example, 7 tracks supposed to end up on the same album have been imported as reference tracks in Finalizer and they all show up (magenta) on the AVG view. One of the reference tracks is selected and it is highlighted.



So what can we see in the AVG view?

- First of all, there is clearly a shared spectral tendency on the 8 tracks but there are also differences.
 - For example from about 6 kHz and up on the song we are working on (green).
 - It is also the track with the most bass energy at 80Hz
 - And it has the softest roll-off when looking at the low end around 20 Hz.
 - So the track is a good deal darker than the rest, but that is also how it's composed, mixed - and sounds by the way, don't forget! So it may very well be perfect, but it's worth digging further into when making mastering decisions.
- All the other tracks can be examined the same way. For example investigating why they are different and making sure that this is actually intended. Observations on the reference tracks:
 - Some have a good deal more energy at high frequencies
 - Some have peaks at 250 and 500 Hz
 - One of them has a dip from 500 Hz to 1 kHz
 - Are any of these observations hindering a great experience when listening to the full album?
 - Are all the tracks presenting themselves as good as possible?
 - And are they taking the roles they are supposed to on the combined album?
- Further that they all will translate well on multiple playback systems.
- And that they perform well against relevant other reference tracks from the same music genre.

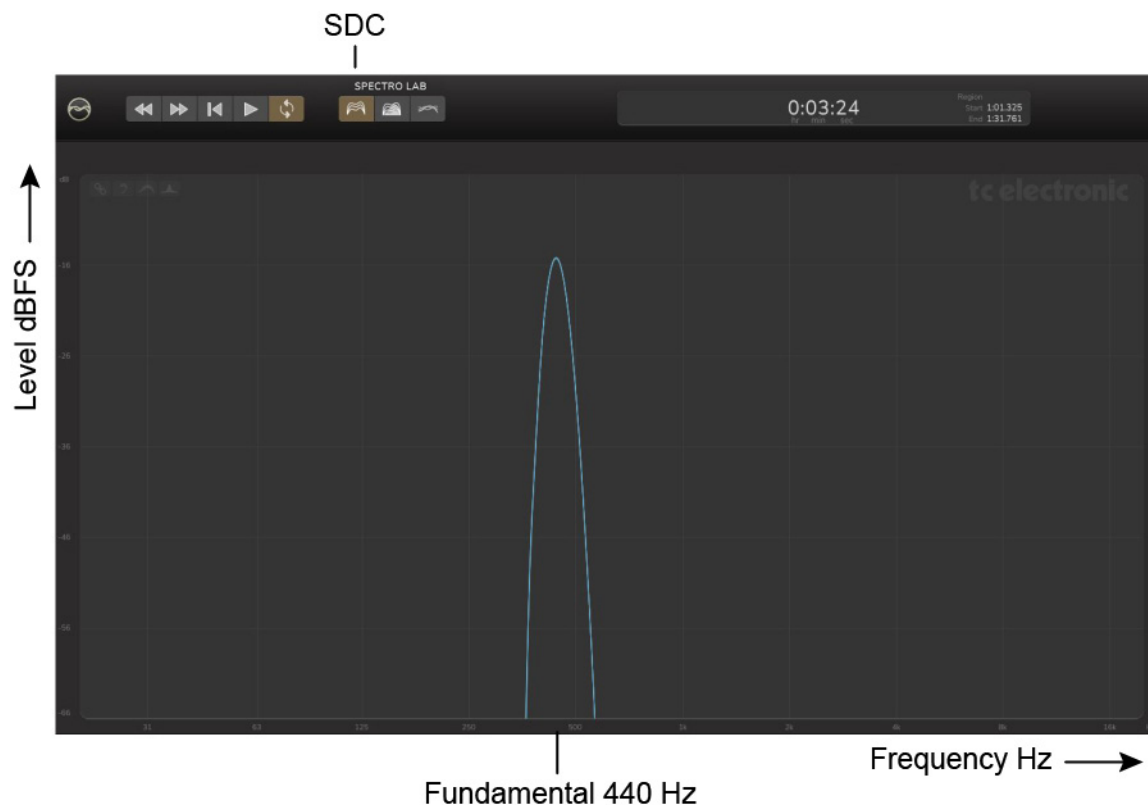
6.5.3 Resolution

The frequency resolution on all SPECTRO LAB views (SDC, RTS, and AVG) is based on a constant-Q analysis. This makes it easier to see details in the whole frequency spectrum as compared to many other real time analyzers which have too little information in the bass range and too much information in the treble range ('grass'). A constant-Q representation is also much closer to the "frequency analysis" known from psychoacoustics to be performed by the cochlea in the inner ear.

Note that all of the spectral views take the track length into account, so a double-length track, for example, is not shown with an approximately 3 dB higher level.

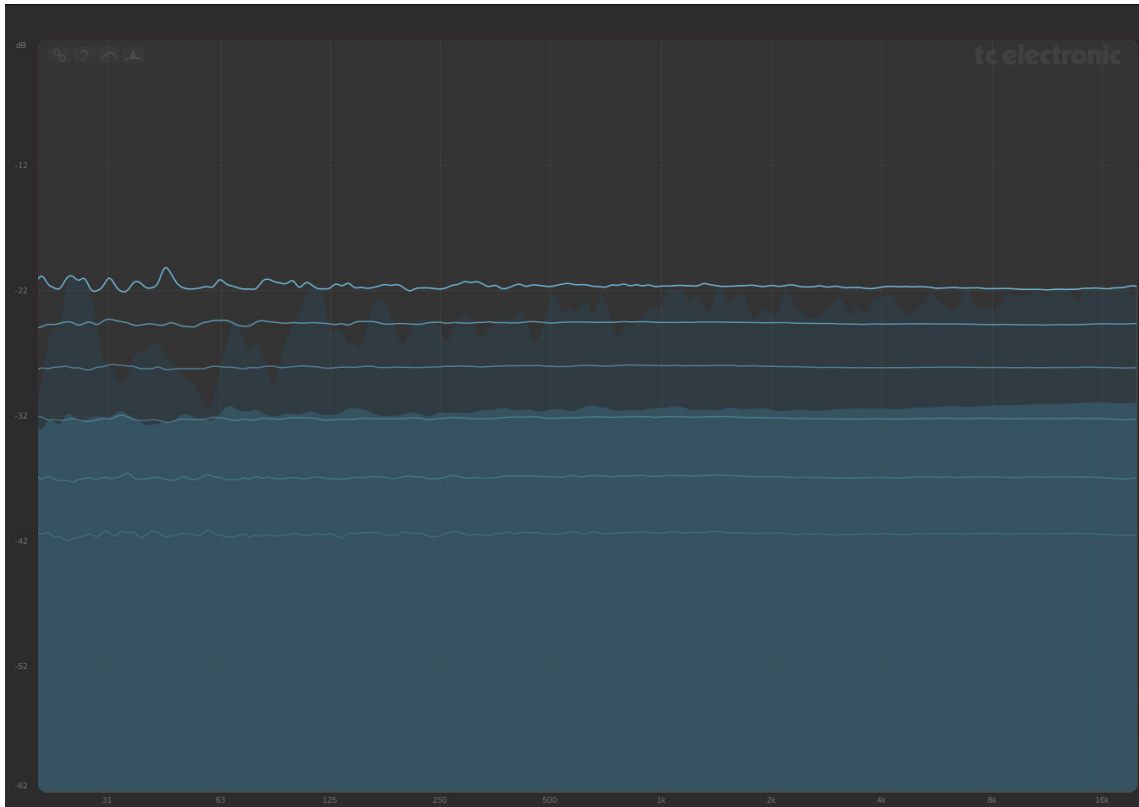
6.5.4 SDC display using a Sinewave Source

The examples below show the SPECTRO LAB views for some simple input signals such as a constant sine wave or pure tone. Further examples are shown using pink noise and brown noise sources, clearly showing the spectral dynamic contour (SDC) curves.



Because the pure tone, in this example, is constant throughout the track, all the level contours of the SDC collapse into the same curve. The shape of the tone in the SDC corresponds to the 1/6th octave frequency resolution employed by the SDC analysis.

6.5.5 SDC and RTS display using a Pink Noise Source

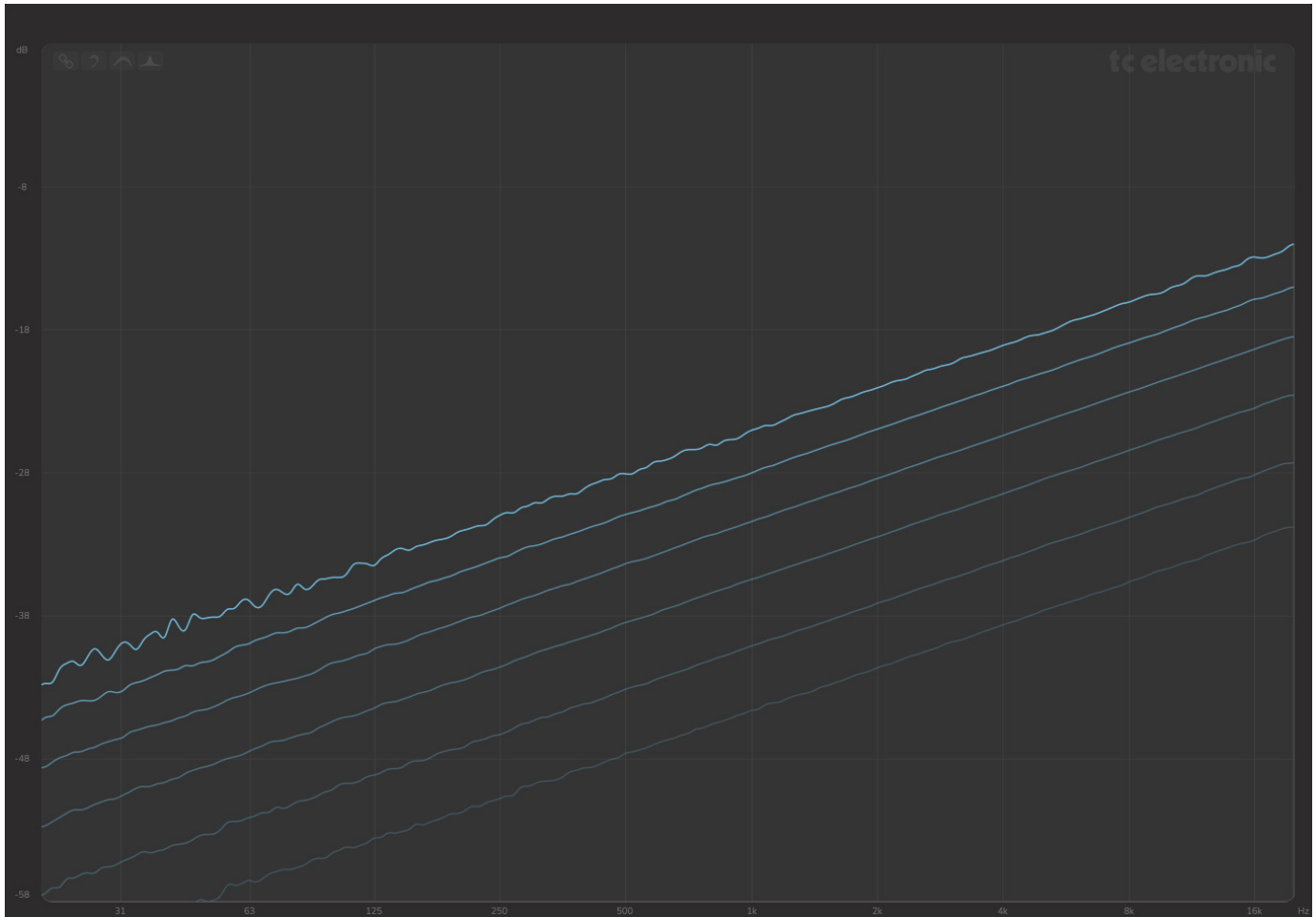


The spectrum of a pink noise signal is essentially flat, in a Constant-Q analysis. That is caused by the pink noise or $1/f$ noise having a power spectral density (energy per frequency interval) that is inversely proportional to the frequency of the signal.

Due to the stochastic nature of the noise, it will have signal at many different levels, hence the spread of the SDC curves. The curves appear 'noisy' in the low end, due to the 'imperfect' statistics of the relatively short test signal.

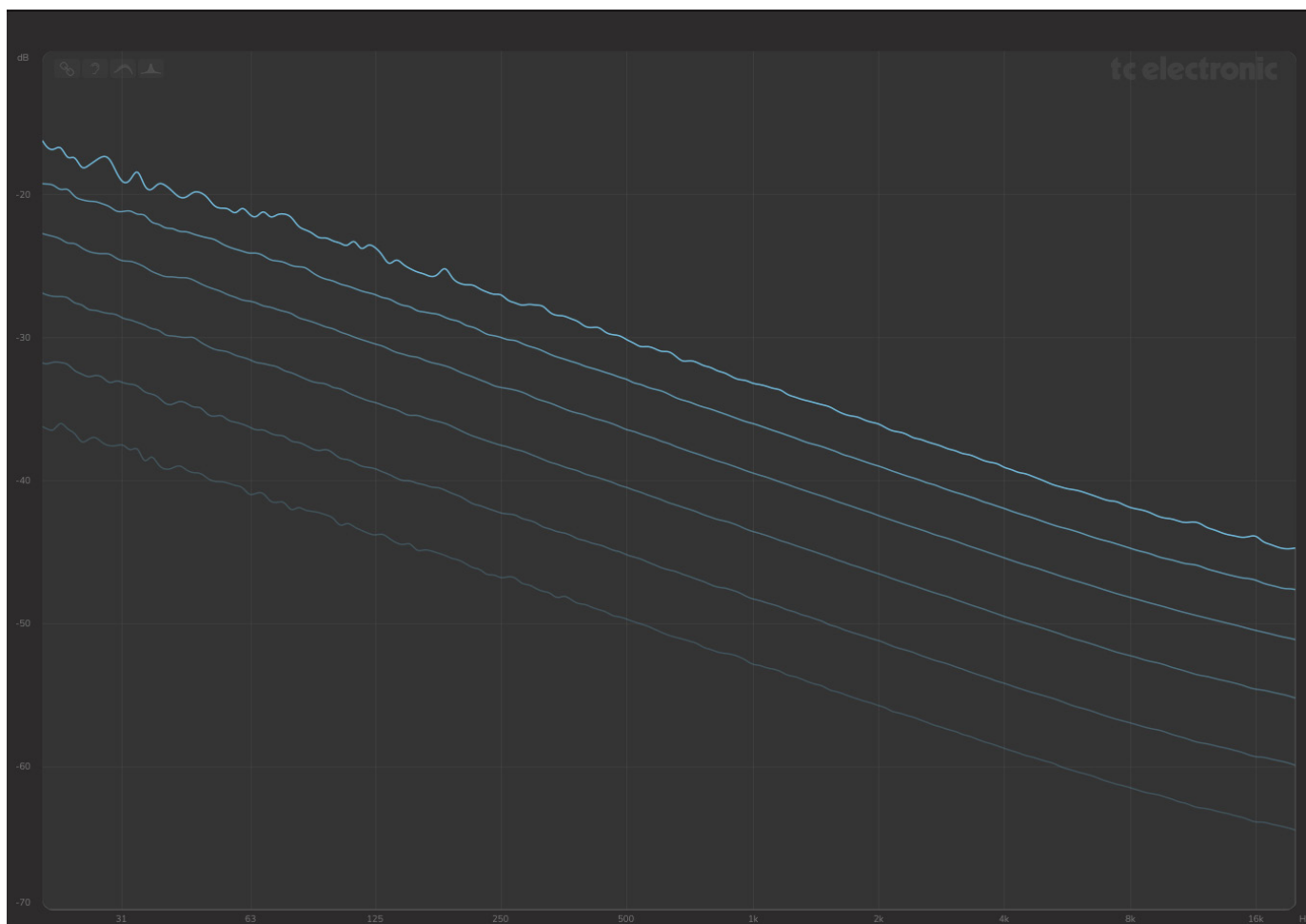
6.5.6 SDC display using a White Noise Source

EN



In contrast to the pink noise, a white noise has more high-frequency energy. Even though this type of random signal is very common, its spectrum is actually less similar to the spectrum of music than pink noise. The SDC clearly shows the different spectrum of the noises.

6.5.7 SDC display using a Brown Noise Source

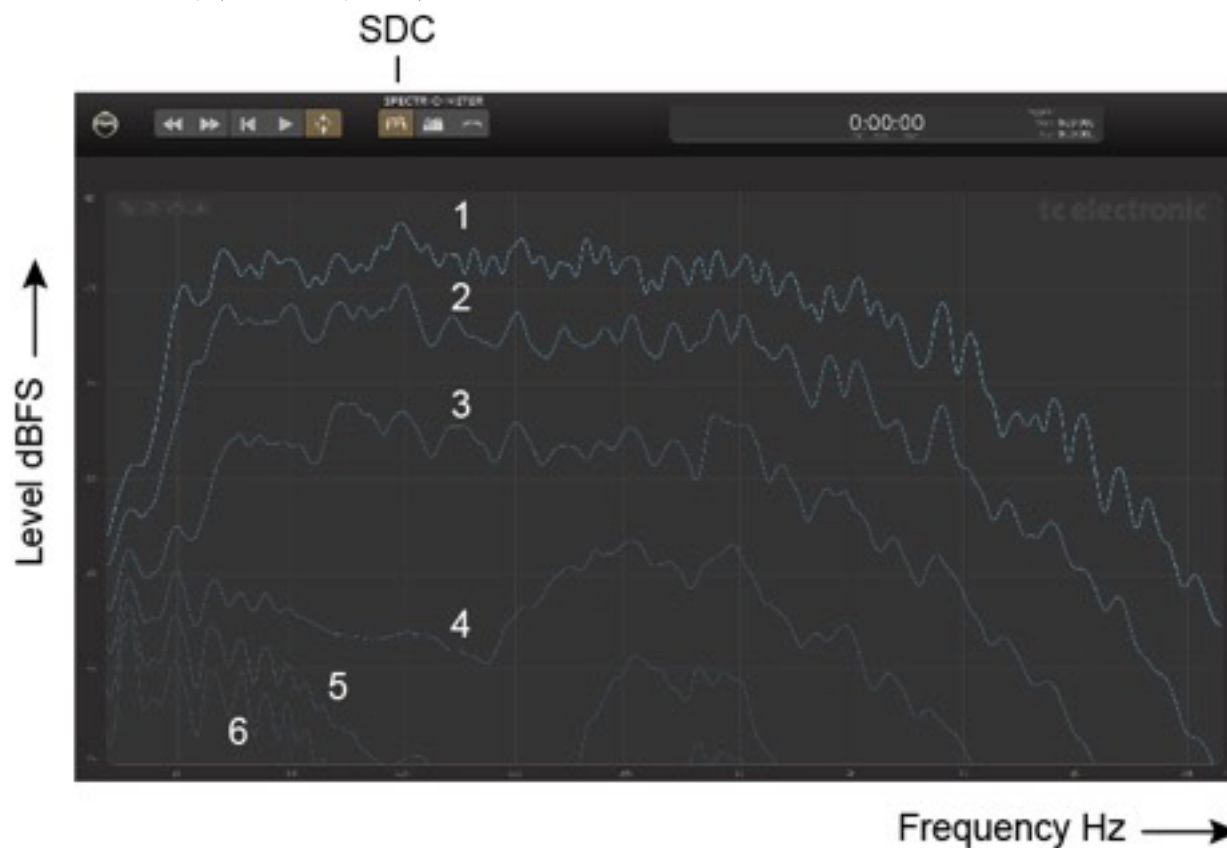


Brown noise, on the other hand, has more low-frequency energy than pink noise. Compared to most music Brownian noise sounds dull, as illustrated by the low-level highs.

6.5.8 Algorithm

For the curious or technically minded among you, the SDC curves are calculated in this way:

- The track is split up into a number of frequency bands, each 1/6th of an octave wide
- The signal levels of each band are measured, throughout the full track
- The signal levels for each band are then divided up into the time-percentage ranges and the level below which the signal is, for example 50% of the time, is found (4th curve from the top)
- The calculations are repeated for the other five percentages
- The results are displayed as the six Spectral Dynamic Contour curves



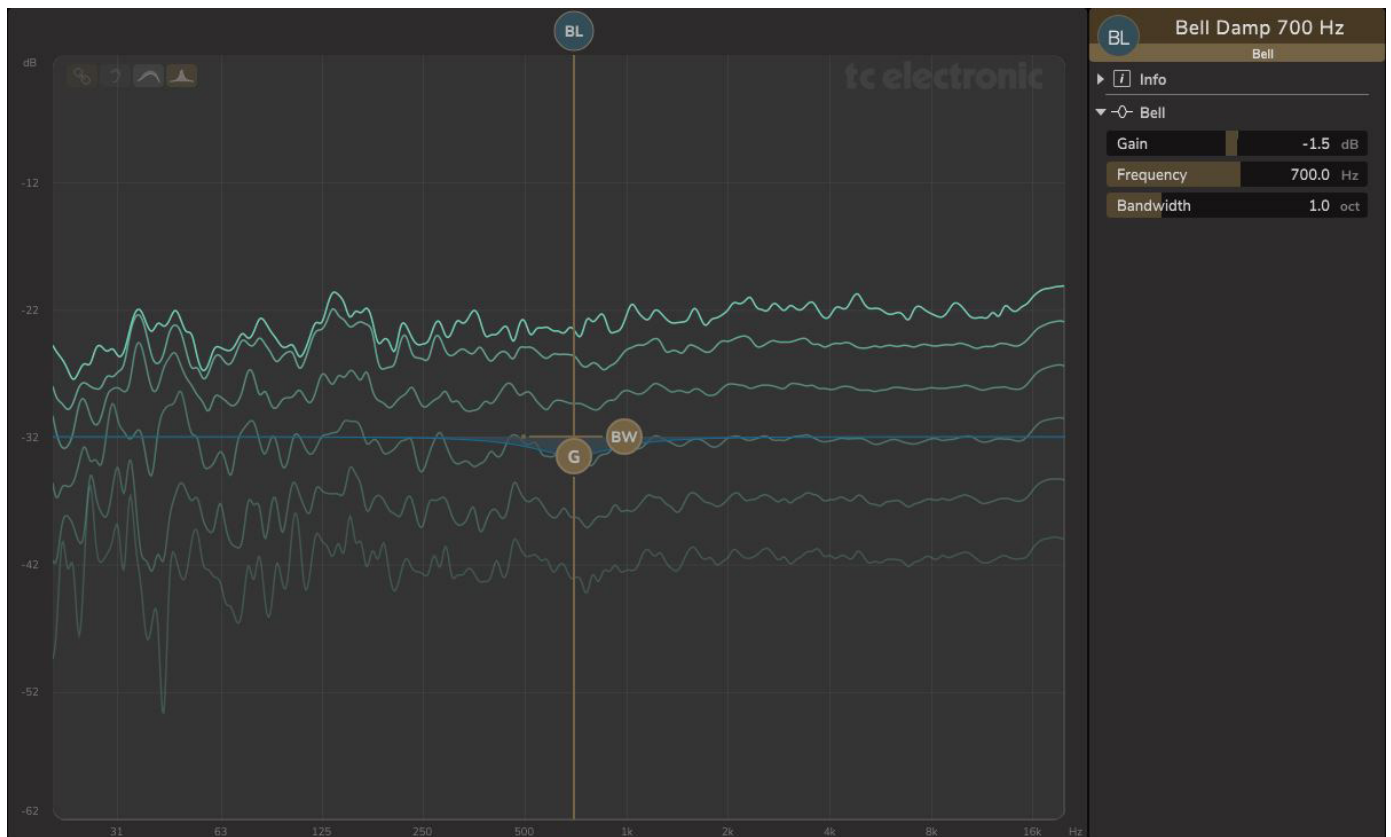
For example, curve 4 shows what level the signal below for 50% of the time, for each frequency.

Specifically, the six SDC curves show the level percentiles at each frequency as follows:

- 100% (maximum level)
- 98%
- 83%
- 50% (median)
- 21%
- 8% (softest level)

The percentage values have been carefully and intelligently chosen to show equal and usefully-spaced contour curves in the SDC, suitable for many genres of music. Signals below the 8% percentile bottom curve are usually not relevant for typical music mastering applications. The top curve at 100% should be regarded as the highest level reached during the full track, in each frequency band.

7. Processing Modules



The SPECTRO LAB will also show visual representations of frequency and level processing modules from the Modules List. This is where the SPECTRO LAB shows its full potential.

In the example above, the gain, frequency and bandwidth parameters of a bell curve EQ are directly available in the SPECTRO LAB view for easy access and adjustment. Modules that are addressing dynamics of the full frequency band (for example a full band compressor, Limiter and Stereo Width) are not overlaid on top of the curves, because they affect the whole frequency range. The Full Band Compressor is shown in the right side of the SPECTRO LAB when loaded in the Modules List.

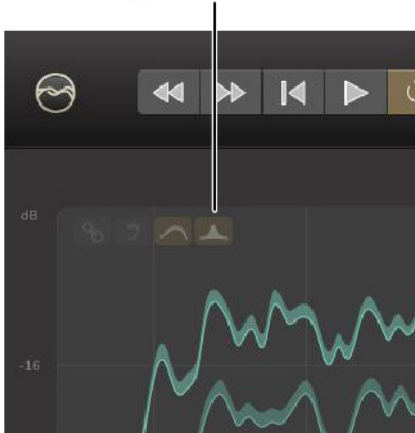
7.1 EQ Modules

In the simple example above, for the EQ module BELL DAMP 700 Hz, adjustments to the settings can be made as follows:

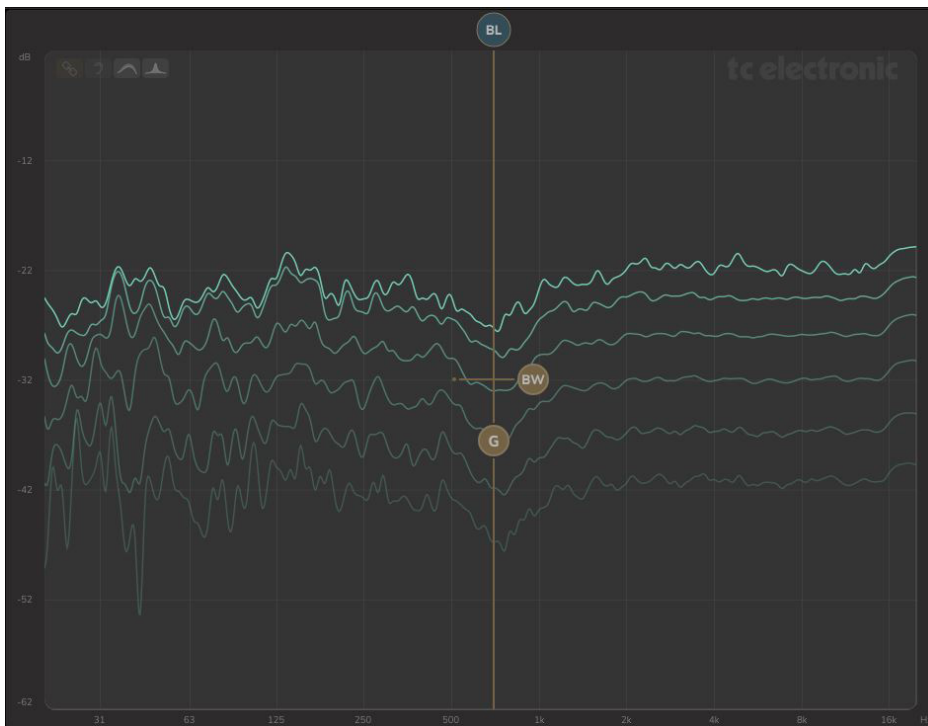
- Frequency change: click and drag the top ball (BL, abbreviation for Bell) and move it left and right to change the frequency
- Gain change: click and drag the (G) ball and move it up and down to change the gain
- Bandwidth change: click and drag the (BW) ball and move it left and right to change the width

Notes: As mentioned earlier in this manual, the EQ overlay curve can be turned on or off using the EQ overlay toggle button near the top left of the display. The button will be slightly highlighted in colour when engaged.

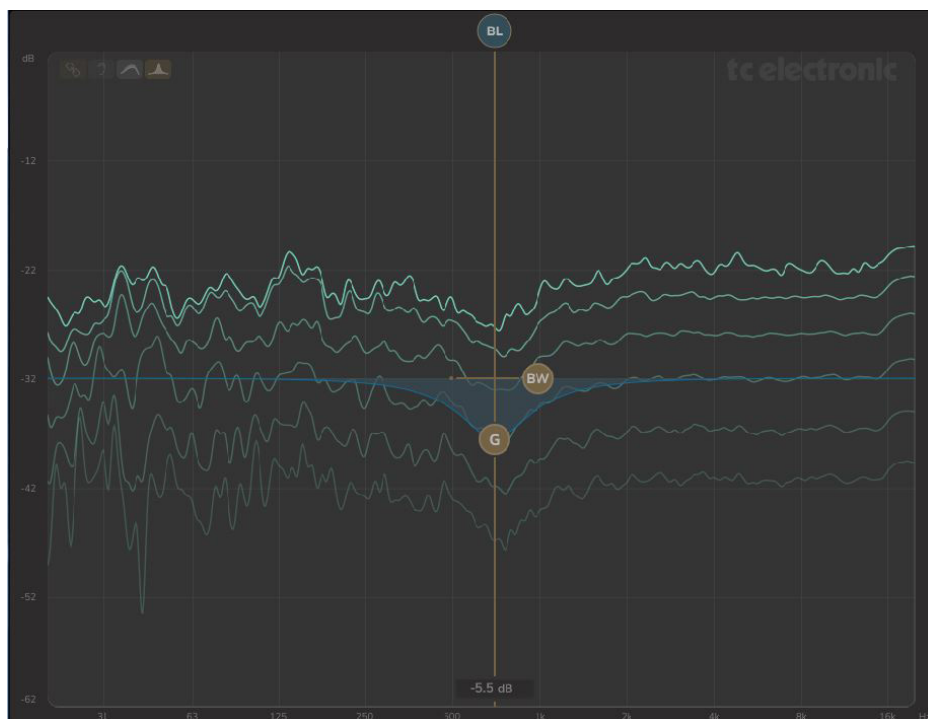
EQ overlay on/off



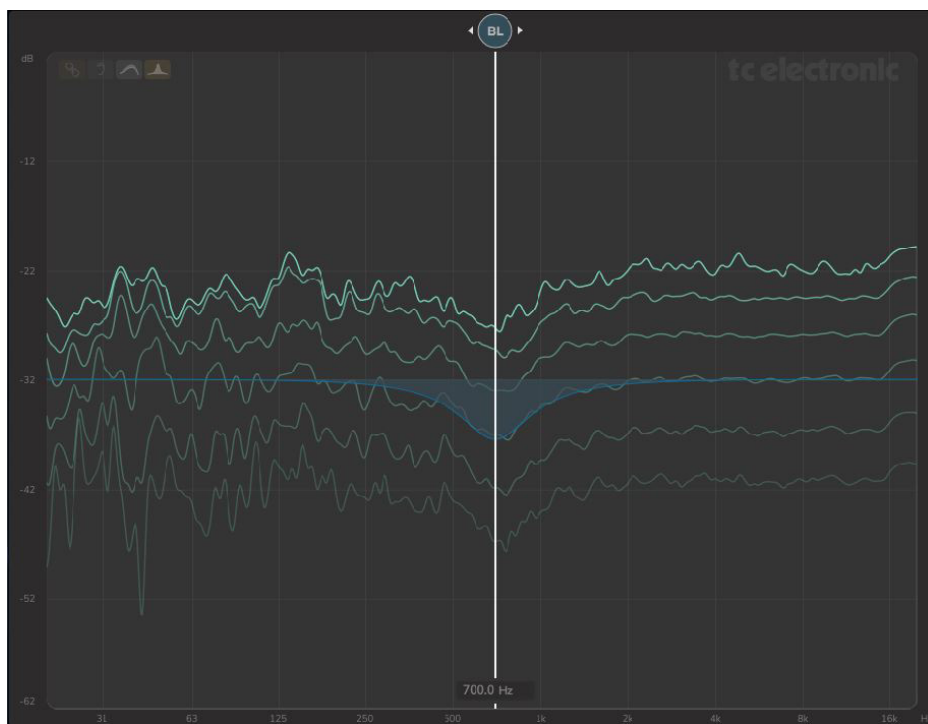
If the EQ overlay is off, then the display will be similar to this example:



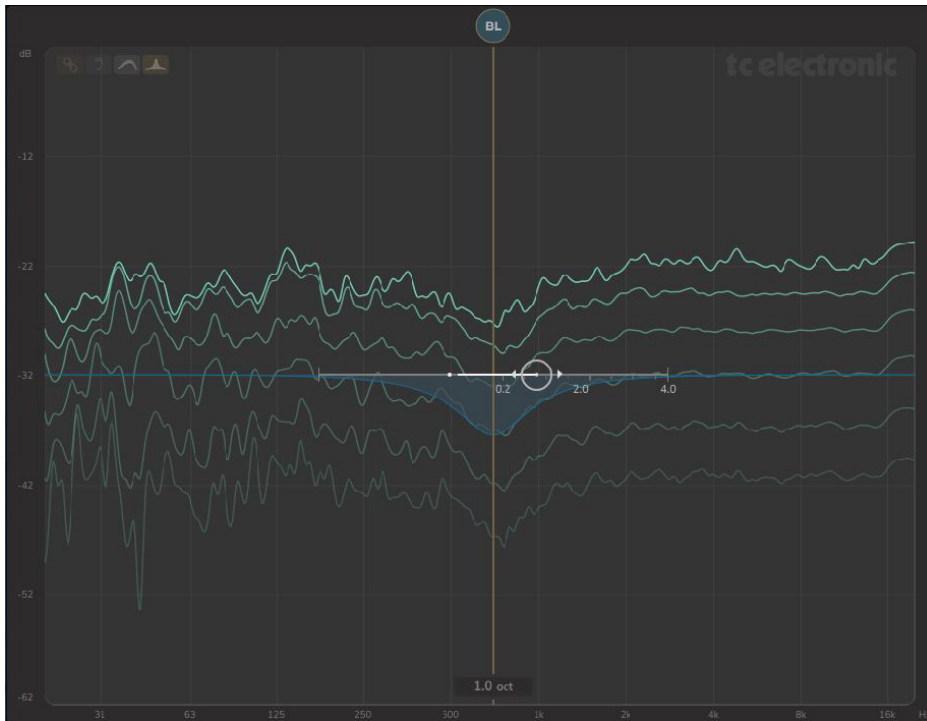
Note that with the EQ overlay OFF, the EQ overlay will also appear momentarily if you move the mouse near to any of the control balls. The current value of that control will also be shown at the bottom, in the example below, it shows -5.5 dB as the Gain value.



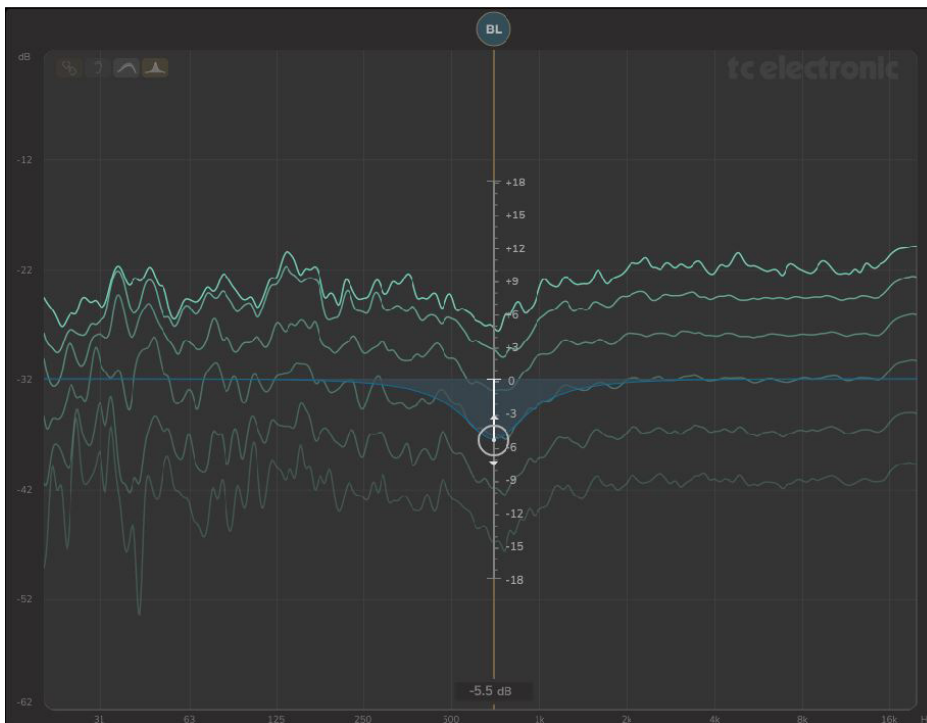
To change the frequency, click and drag the top ball BL, and the current frequency will also be shown at the bottom (700.0 Hz in this example):



To change the bandwidth, click and drag the BW ball and the current width (in octaves) will be shown at the bottom (1.0 octave in this example). A draggable ball is also available in the left side of the highlighted line. A horizontal bar shows the range (4.0 octaves):

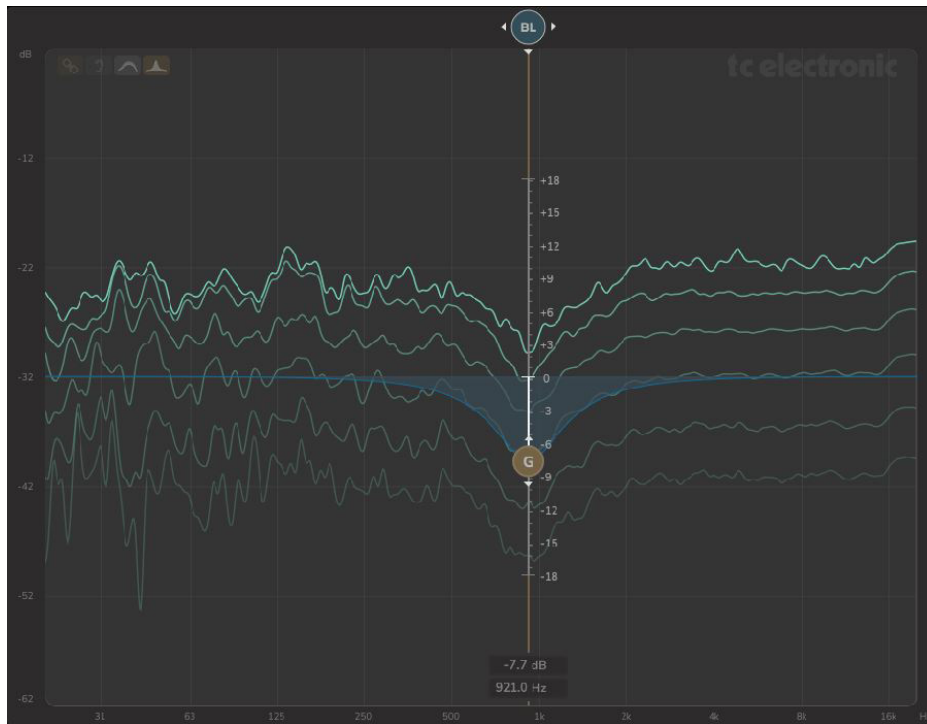


To change the gain, click and drag the G ball and the current gain will be shown at the bottom (-5.5 dB). A vertical line shows the overall gain adjustment range from +18.0 to -18.0 dB.



If Ctrl is held down while you click and drag a control, then two parameters can be changed at the same time. For example:

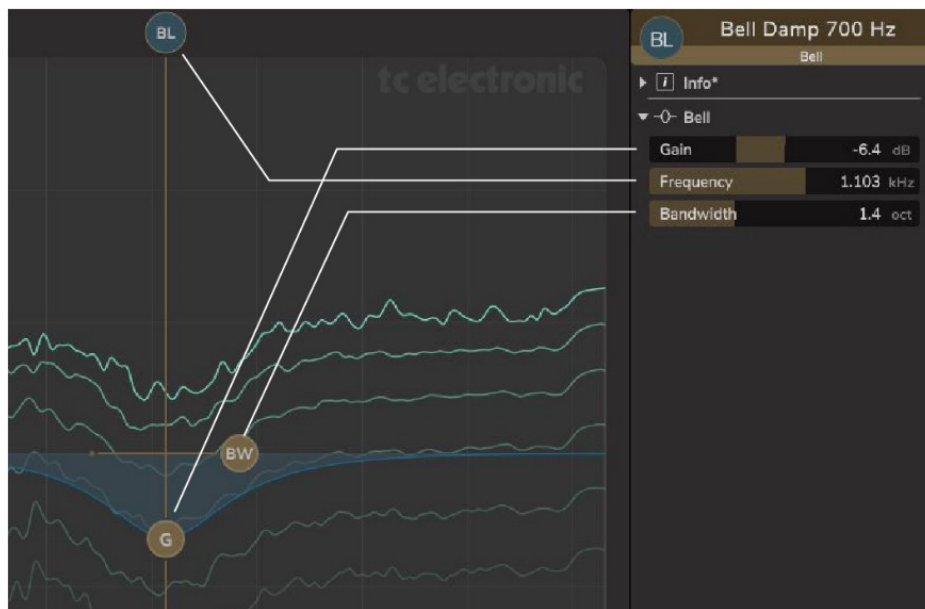
- To change the frequency and gain at the same time, hold Ctrl and click and drag the BL ball or the G ball, left and right (to change frequency) and up and down (to change gain). Note that the current frequency and gain values are both displayed at the bottom.



- To change the bandwidth and gain at the same time, hold Ctrl and click and drag the BW ball left and right (to change width) and up and down to change gain. Note: this can also be done by pressing Alt and dragging the G ball.

Further Notes:

- The EQ overlays and the control balls allow for easy and quick adjustments to be made to the settings of a module. The Module EDIT View can also be used to make the same adjustments. One advantage is that exact numerical values can be entered in the text area for each control. Some parameters can only be adjusted in the EDIT View.



Other Modules

So far, we have shown one of the simpler Bell EQ modules as an example of using the SPECTRO LAB Control Sticks to adjust the module parameters in the graphical interface. The following sections show some of the other modules, and how they appear overlaid on the SPECTRO LAB.

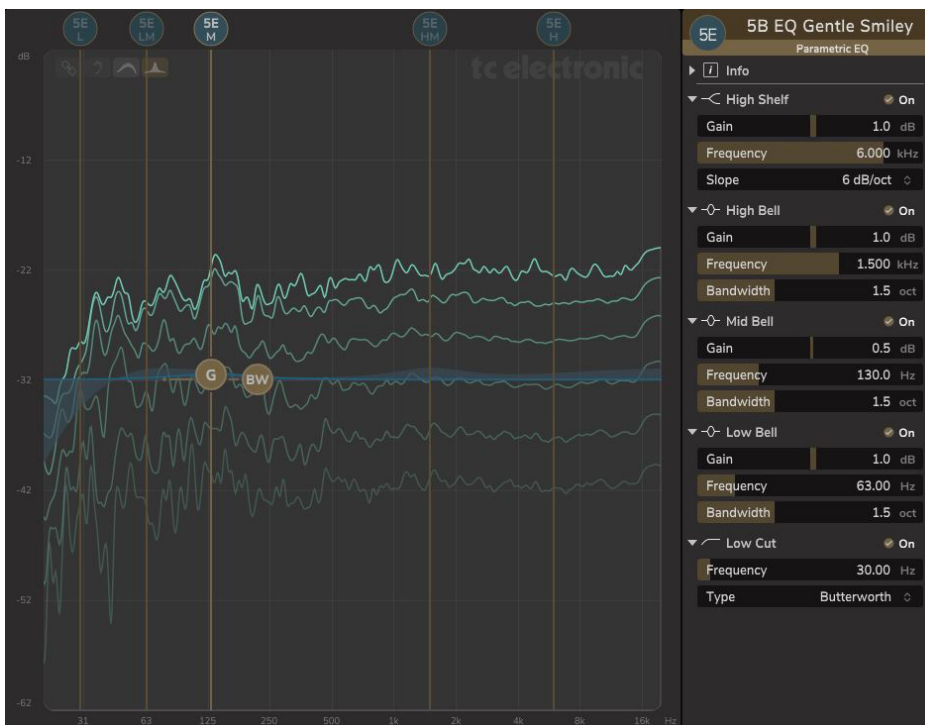
7.2 5-Band EQ Modules

5B EQ Gentle Smiley is used in this example, and the details that follow apply to all other presets for the five-band EQ module. The five bands are represented by vertical lines at each frequency band, and a ball at the top labeled as follows:

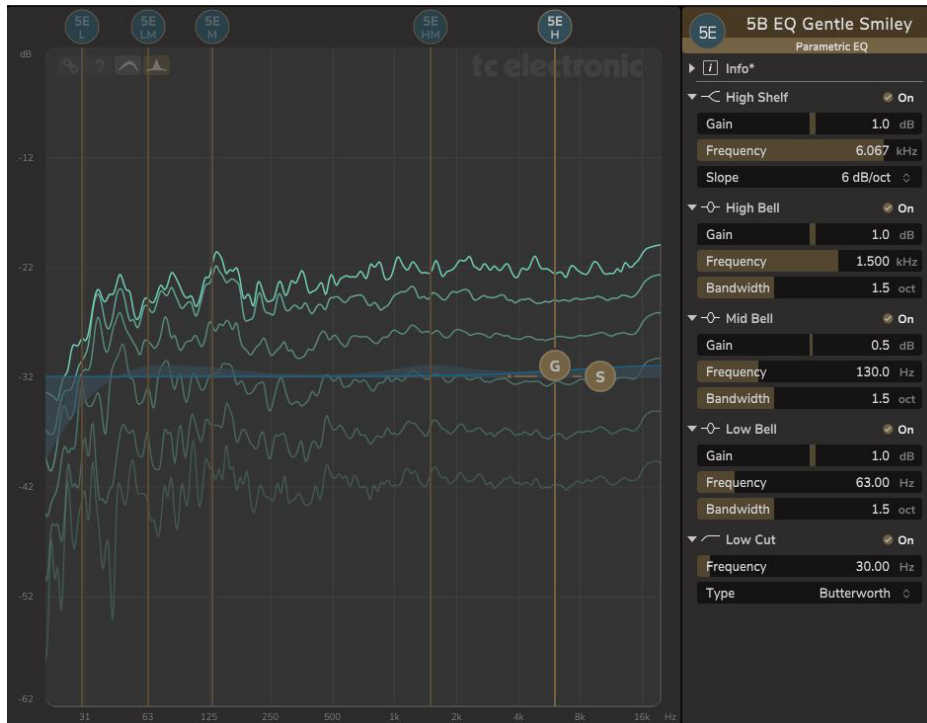
- 5E L (low), a low cut filter
- 5E LM (low-mid), a peaking/bell EQ
- 5E M (mid), a peaking/bell EQ
- 5E HM (high mid), a peaking/bell EQ
- 5E H (high), a high shelving EQ

The low-mid, mid, and high-mid, have adjustable parameters as shown in the previous examples of the Bell EQ: Frequency, Gain, and Bandwidth. If the top ball of each of these is clicked, then the G ball and BW ball will appear.

The 5E L is a low-cut filter, and its frequency can be adjusted by dragging the 5E L top ball. Its type can be selected from Butterworth or Bessel curve in the Low Cut section at the bottom of the Module EDIT View for this module.

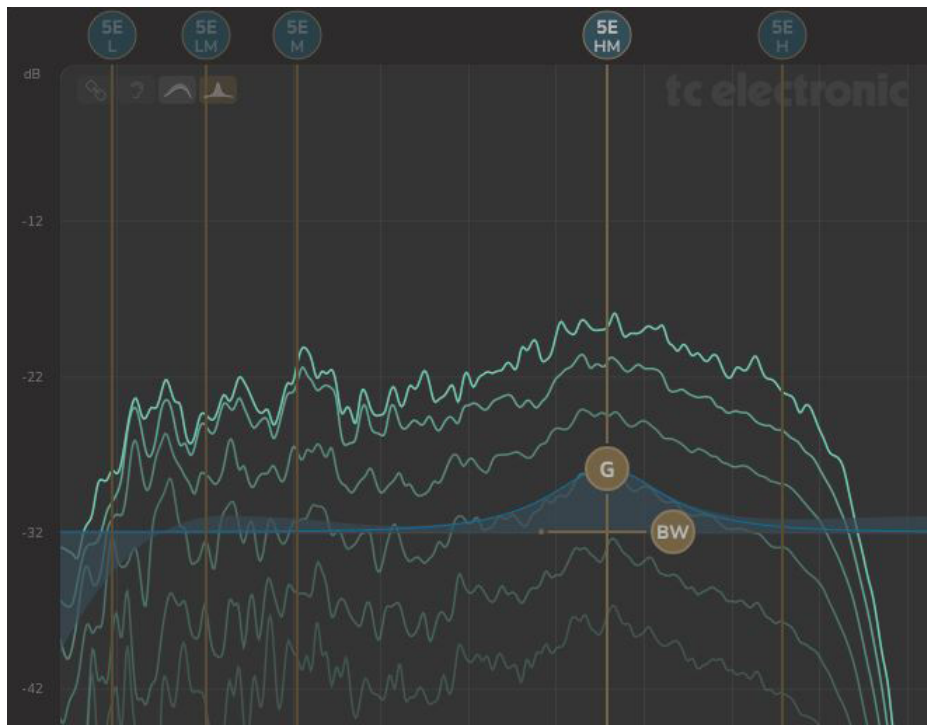


The 5E H is a high-shelving EQ, and its parameters are gain, frequency, and slope.



The gain and frequency can be adjusted as shown previously for the bell EQs, and the shelving slope can be selected using the S ball from 3, 6, 9, or 12 dB per octave.

Note: the EQ overlay for the multi-band EQ shows a shaded area above and below the “flat” level. This is the combined total EQ curve for all the active EQ bands. There is also a brighter blue line that shows just the EQ of the band being adjusted.



7.3 Low Cut and High Cut Modules

The Low Cut and High Cut EQ modules have two parameters:

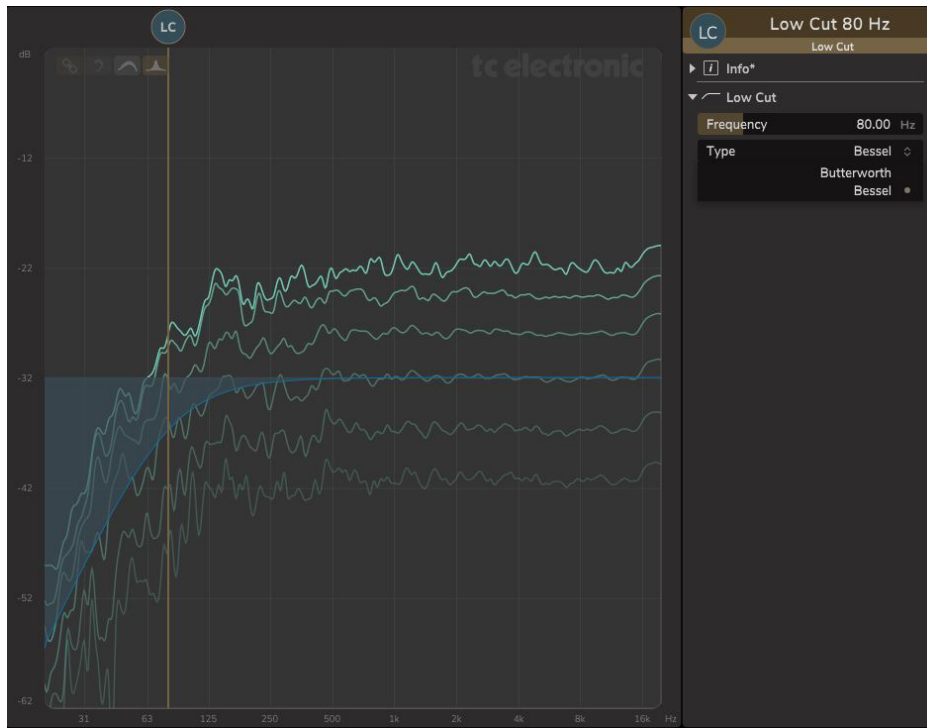
- Cutoff frequency
- Type of filter, either Bessel or Butterworth

Low Cut modules reduce the level of the frequency range below the cutoff frequency, with a roll-off determined by the filter type.

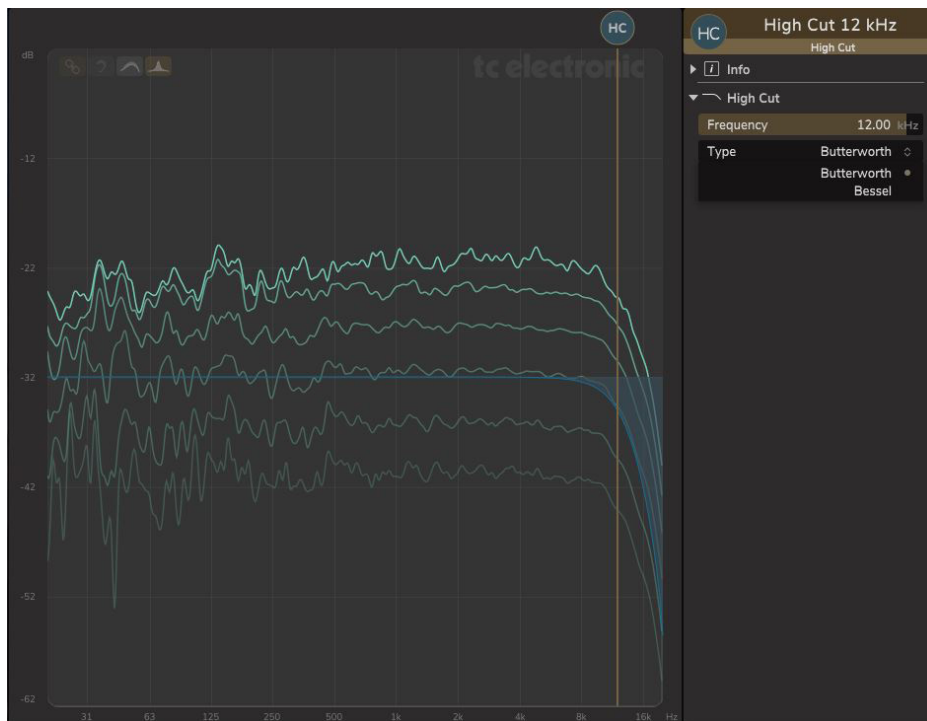
High Cut modules reduce the level of the frequency range above the cutoff frequency, with a roll-off determined by the filter type.

- Frequency can be adjusted by dragging the LC (low cut) or HC (high cut) top ball, or by using the frequency control in the Module EDIT View.
- Filter type can be selected from Butterworth or Bessel in the type section of the Module EDIT View.

The example below is the Low Cut 80 Hz module, set to a Bessel filter type:



The example below is the High Cut 12 kHz module, set to a Butterworth type:



7.4 Low Shelf and High Shelf Modules

The Low Shelf and High Shelf Modules each have three parameters:

- Frequency
- Gain
- Slope

Low Shelf EQ allows the level of the frequency range below the shelf frequency to be cut or boosted by an amount set by the gain control, with a slope width set by the slope control.

High Shelf EQ allows the level of the frequency range above the shelf frequency to be cut or boosted by an amount set by the gain control, with a slope width set by the slope control.

- Frequency can be adjusted by dragging the LS (low shelf) or HS (high shelf) top ball, or using the frequency control in the Module EDIT View.
- Gain can be adjusted by dragging the G ball, or using the gain control in the Module EDIT View. The range is +18.0 dB to -18.0 dB.
- Slope can be adjusted by dragging the S ball, or using the slope control in the Module EDIT View. The selections are 3, 6, 9, or 12 dB per octave.

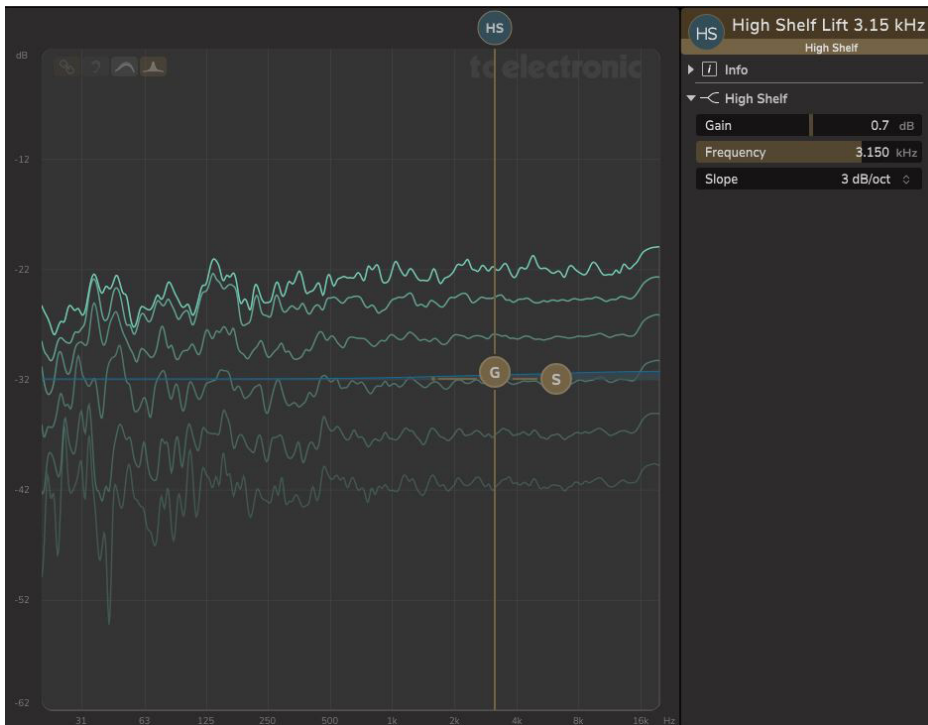
As with other modules, if Ctrl is held down while you click and drag a control, then two parameters can be changed at the same time. For example:

- To change the frequency and gain at the same time, hold Ctrl and click and drag the LS or HS ball, or the G ball, left and right (to change frequency) and up and down (to change gain).
- To change the slope and gain at the same time, hold Ctrl and click and drag the S ball left and right (to change slope) and up and down to change gain. Note: this can also be done by pressing Alt and dragging the G ball.

The example below is a Low Shelf module:



The example below is a High Shelf module:



7.5 Dynamic EQ Modules

The Dynamic EQ Module has seven parameters:

- Frequency
- Bandwidth
- Threshold
- Maximum Gain Reduction
- Ratio
- Attack
- Release

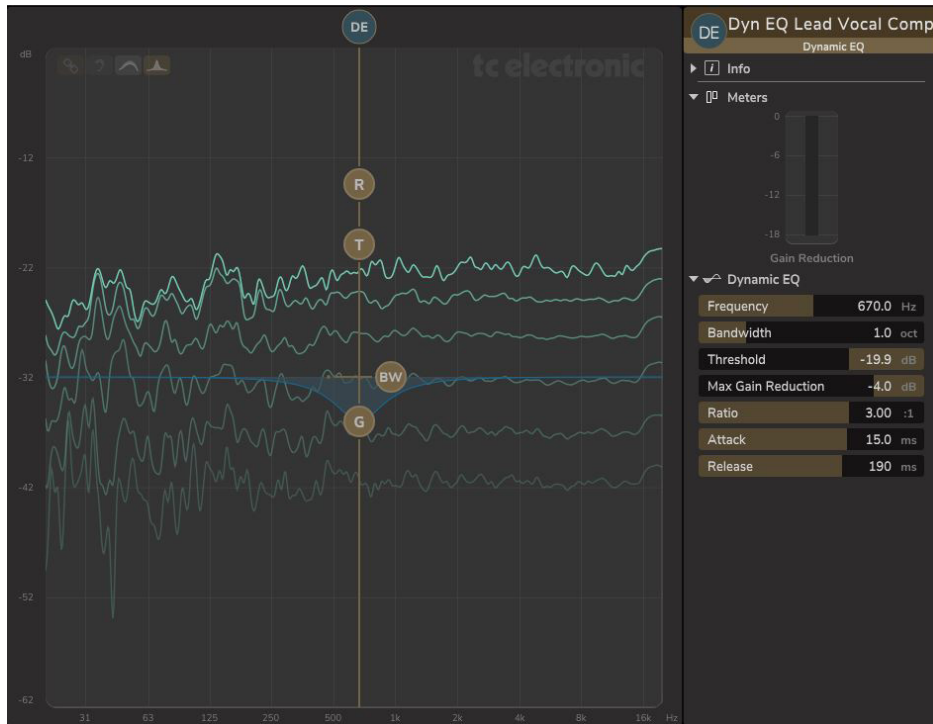
The Dynamic EQ can be regarded as a compressor that operate at definable Bell EQ frequency band, set by the frequency, bandwidth, and maximum gain reduction controls, with familiar compressor controls of threshold, ratio, and attack and release times.

- Frequency can be adjusted by dragging the DE (Dynamic EQ) top ball, or using the frequency control in the Module EDIT View.
- Bandwidth can be adjusted by dragging the BW ball, or using the bandwidth control in the Module EDIT View. The range is 0.2 to 4.0 octaves.
- Threshold level can be adjusted by dragging the T ball, or using the threshold control in the Module EDIT View. The range is 0.0 to -60.0 dB.
- Maximum gain reduction can be adjusted by dragging the G ball, or using the maximum gain reduction control in the Module EDIT View. The range is 0.0 to -18.0 dB.
- Ratio can be adjusted by dragging the R ball, or using the ratio control in the Module EDIT View. The range is from 1.00:1 to infinity:1.
- Attack and Release times can only be adjusted using their respective controls in the Module EDIT View. The adjustment range is 0.1 to 200 ms (attack) and 5 to 1500 ms (release).

As with the other modules, if Ctrl is held down while you click and drag a control, then two parameters can be changed at the same time. For example:

- To change the frequency and gain reduction at the same time, hold Ctrl and click and drag the DE or G ball, left and right (to change frequency) and up and down (to change gain reduction). Note that the current frequency and gain values are displayed at the bottom.
- To change the bandwidth and gain at the same time, hold Ctrl and click and drag the BW ball left and right (to change bandwidth) and up and down to change gain reduction. Note: this can also be done by pressing Alt and dragging the G ball.

The example below is the Dyn EQ Lead Vocal Compressor module:



7.6 Compressor Modules

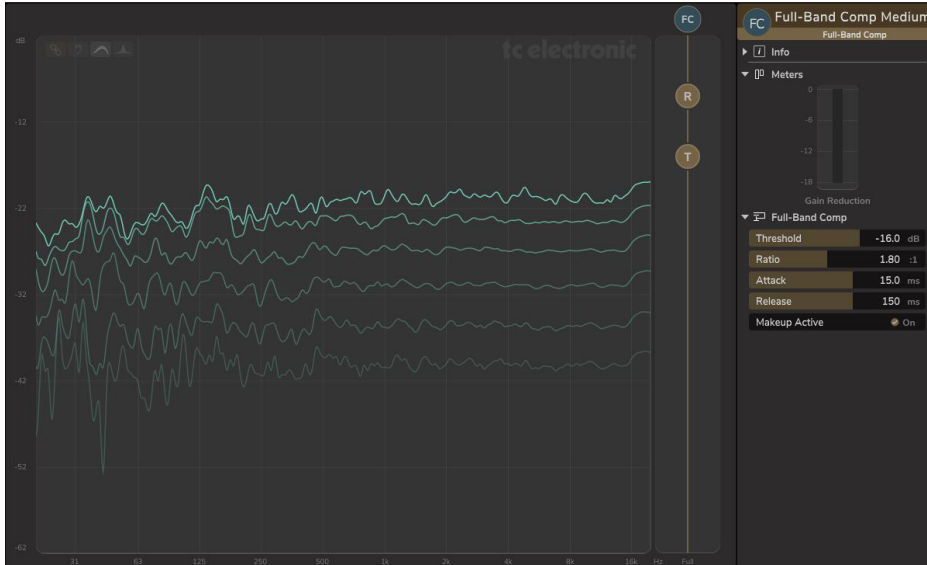
There are three types of Compressor Modules available:

- Full Band RMS Compressor (FC)
- Three Band, TC Legacy, Compressor (3C)
- Five Band, Modern Style, Compressor (5C)

Compressors operate to reduce the signal level once the Threshold level has been reached, at a reduction rate set by the Ratio control. Attack time is the time it takes for the gain reduction to begin once the threshold has been reached. Release time is the time it takes for the compression to be lifted once the signals dip below the threshold level. Makeup gain can be added to make up for the overall loss of level caused by the compressor action.

Full band RMS compressor modules (abbreviation = FC)

The example below is one of the full band compressor modules. Note that all the factory supplied full band compressor presets have the same controls as shown, just at different adjustment settings.



Controls for the full band compressor are not overlaid on top of the SPECTRO LAB curves, because they affect the whole frequency range. Ratio (R), and Threshold (T) controls are shown next to the right edge of the SPECTRO LAB.

The full band RMS compressor module has the following controls:

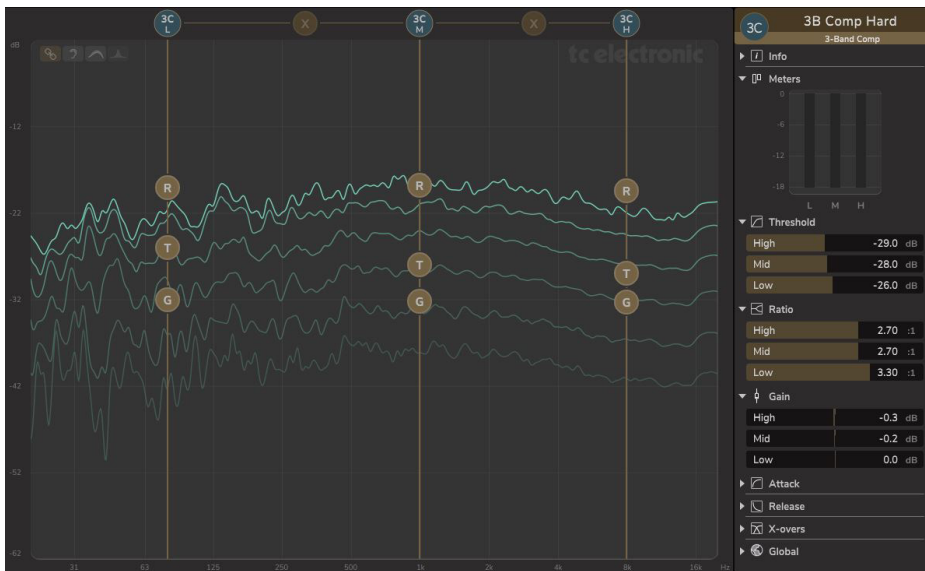
- Threshold (T)
- Ratio (R)
- Attack
- Release
- Makeup gain on/off

These controls can be adjusted as follows:

- Threshold level can be adjusted by dragging the (T), or using the threshold control in the Module EDIT View. The range is +10.0 dB to -60.0 dB.
- Ratio can be adjusted by dragging the (R), or using the ratio control in the Module EDIT View. The range is from 1.00:1 to infinity:1.
- Attack and Release times can only be adjusted using their respective controls in the Module EDIT View. The adjustment range is 0.1 to 100 ms (attack) and 10 to 1000 ms (release).
- Makeup Active On/Off is selectable only in the Module EDIT View

3 Band, TC Legacy, compressor modules (abbreviation = 3C)

The example below is one of the 3 band compressor modules. Note that all the factory supplied 3 band compressor module presets have the same controls as shown, just at different adjustment settings.



The 3 band compressor modules have the following controls:

- Linking/unlinking of Threshold (T), Ratio (R), Gain (G), Attack, and Release controls between bands
- Crossover Frequency (X) for low crossover and high crossover
- Threshold (T)
- Ratio (R)
- Gain (G)
- Attack
- Release
- Makeup gain on/off
- Band Solo on/off

Linking/unlinking of Threshold (T), Ratio (R), Gain (G), Attack, and Release

The 3 band compressor modules allow parameters to be linked as follows:

- Adjusting the Threshold (T) in one band will adjust the Threshold in the other bands.
- Adjusting the Ratio (R) in one band will adjust the Ratio of the other bands.
- Adjusting the Gain (G) in one band will adjust the Gain of the other bands.
- Adjusting the Attack or Release times in one band will adjust them in the other bands.

Linking/unlinking procedure:

- In the top left corner of the SPECTRO LAB display is a link/unlink button. (It only works in the 3 band or 5 band compressor modules.)
- Press this button to link these controls between bands. (The link button will be slightly highlighted when on).
- If the controls are linked, then dragging one gain (G) control, for example, will move all 3 gain controls.
- Press this button again to unlink these controls between bands, so the parameters can be adjusted independently in each band.
- As a further clue to whether the controls are linked, if all three Control Sticks / bands are highlighted (that is 3C L, 3C M, and 3C H) and control balls are shown, then they are linked.

Note:

- Shortcut: Ctrl (Win) / CMD (Mac) + I will link or unlink all bands.

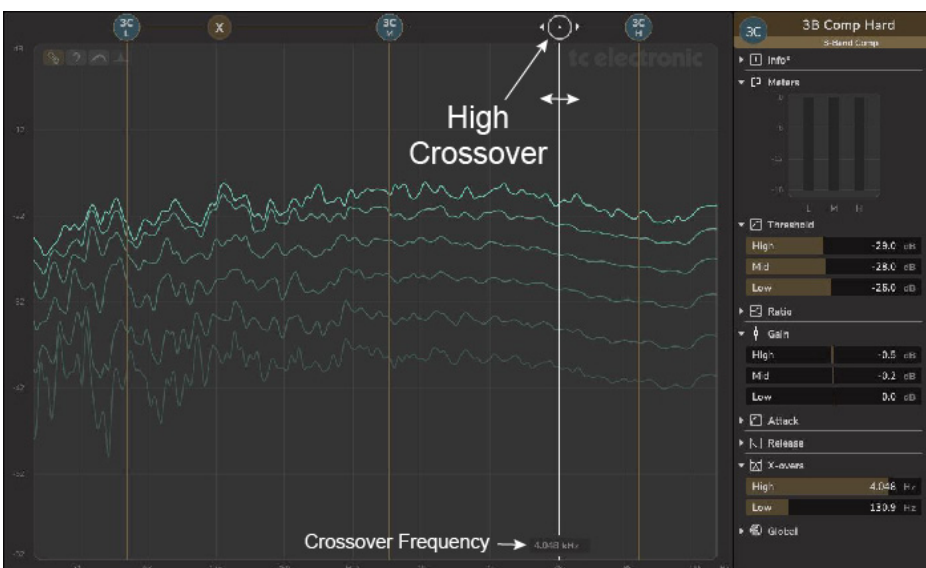


As an alternative to the Link/Unlink button:

- Click on a (3C L), (3C M), or (3C H) ball and the respective stick/band will be highlighted. Any current linking will be removed.
- To link to another band, press Ctrl while clicking on the (3C L), (3C M), or (3C H) ball of the other stick. In this way, two bands can be linked, and this is something that you can't do with the Link/Unlink button (which links all three).
- You may also press Shift while clicking "start" and "end" band balls to select a range of bands. This may be extra useful with the 5 Band Compressor.
- When linked in this way, the Link on/off button turns off.
- Note that any current links will be unlinked if another (3C L), (3C M), or (3C H) ball is selected (unless Ctrl is still being held down).

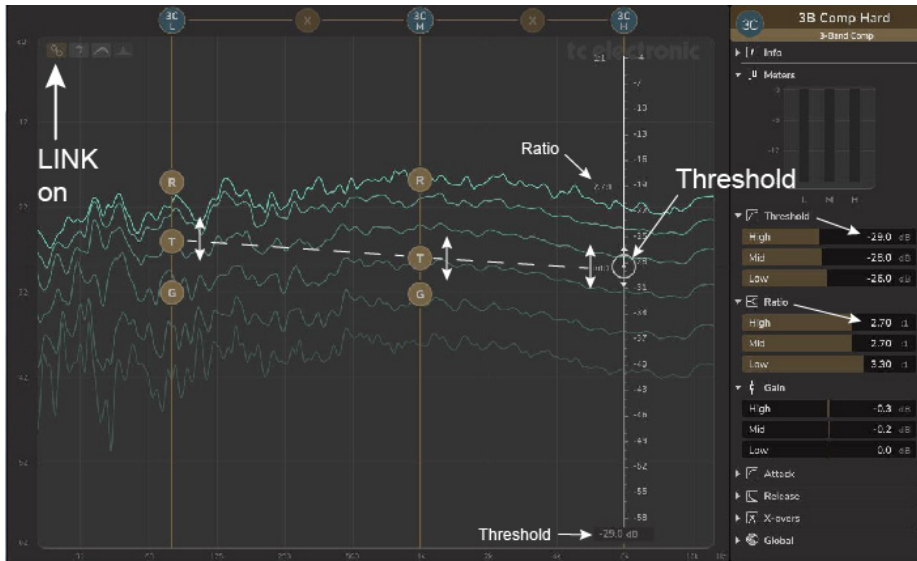
Crossover Frequency

- The low and high crossovers (marked X) determine the frequency range of the compressor's 3 bands. Adjust the crossovers by dragging the low and/or high (X) balls, or using the low and high crossover frequency controls in the Module EDIT View. As the 2 crossovers are adjusted, the position of the 3 Control Sticks (3C L) low band, (3C M) medium band, (3C H) high band, will adjust automatically to remain centered within each band.
- Dragging the (3C L) ball has the same effect as adjusting the low crossover.
- Dragging the (3C H) ball has the same effect as adjusting the high crossover.
- Dragging the (3C M) ball adjusts both the low and high crossovers at the same time, while keeping the same separation in octaves.
- Holding Ctrl and dragging the (3C L), (3C M), or (3C H) balls, or a (G) ball, allows the Gain (G) and crossover frequency to be adjusted at the same time. If the 3 (G) balls are linked, then the adjustment affects all 3 gain controls.
- The low crossover frequency adjustment range is between 40.00 Hz and 5.000 kHz.
- The high crossover frequency adjustment range is between 80.00 Hz and 10.00 kHz.
- The minimum band width is 1 octave



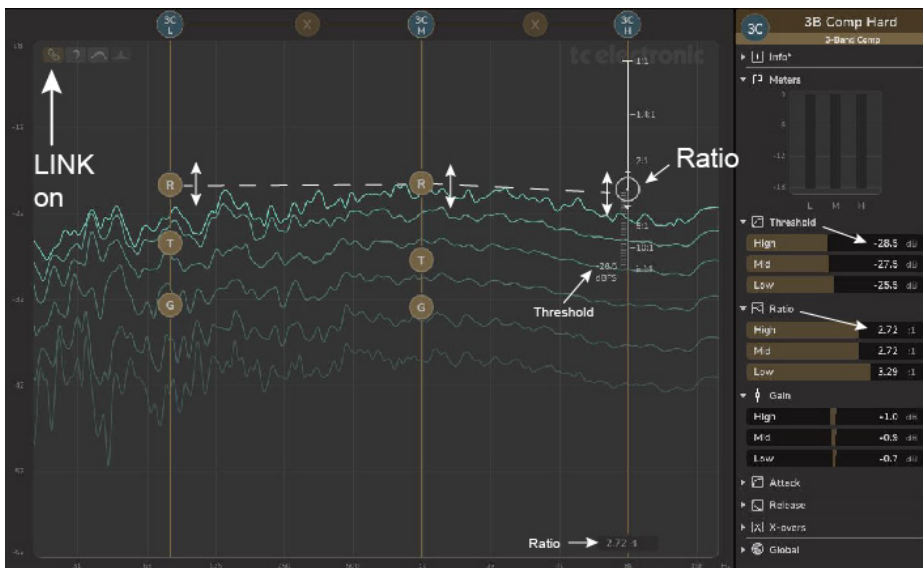
Threshold

- Threshold level can be adjusted by dragging the (T) control, or using the threshold control in the Module EDIT View. The adjustment range is +10.0 dB to -60.0 dB.
- Note that when the threshold (T) is adjusted, the physical position of the ratio (R) control in the graph will also move, but its actual value will not change; it will remain the same for all threshold levels, unless adjusted by the ratio controls.
- During threshold adjustment using the (T) control, the vertical scale that appears will show the dB levels, and the current ratio of that band.
- As mentioned before, when Control Sticks / bands are linked, all threshold controls can be adjusted at the same time.



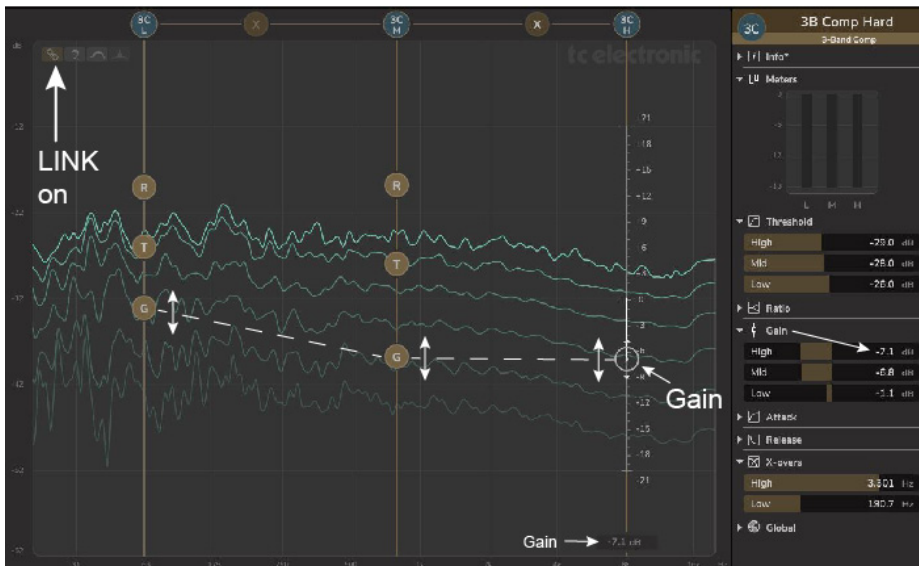
Ratio

- Ratio can be adjusted by dragging the R ball, or using the ratio control in the Module EDIT View. The range is from 1.00:1 to infinity:1.
- The vertical scale that appears when adjusting Ratio equals 1 dB/div. if ratio is 1:1. If Ratio is 1:2 the scale will show 0.5 dB/div. indicating the output signal compression.
- When Control Sticks / bands are linked, all ratio controls can be adjusted at the same time.



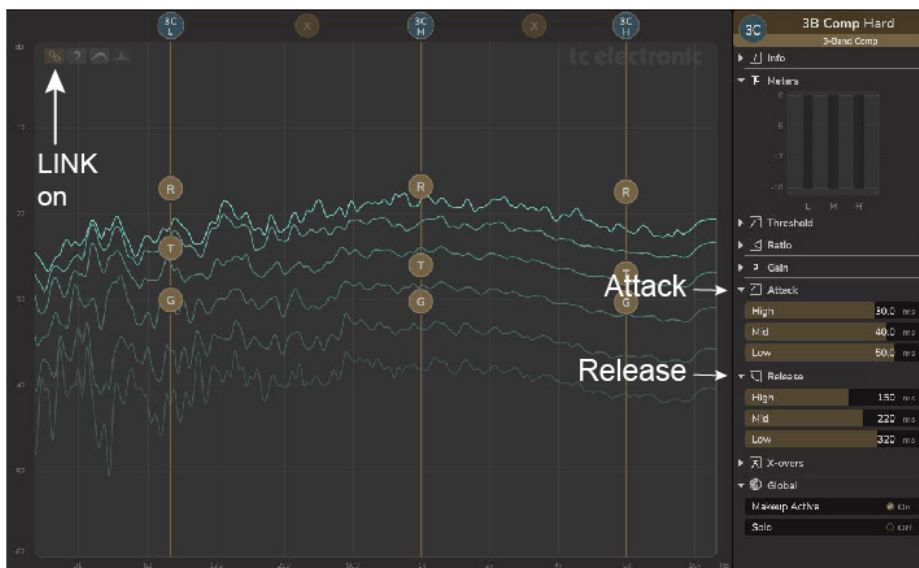
Band Gain

- Band Gain can be adjusted by dragging the (G) control, or using the gain control in the Module EDIT View. The range is from +21.0 dB to -21.0 dB.
- The gain control adjusts the overall level of the band, independent of the compressor threshold and ratio settings.
- Gain and crossover frequency can both be adjusted at the same time by pressing Ctrl while adjusting the (G) control.
- When Control Sticks / bands are linked, all gain controls can be adjusted at the same time.



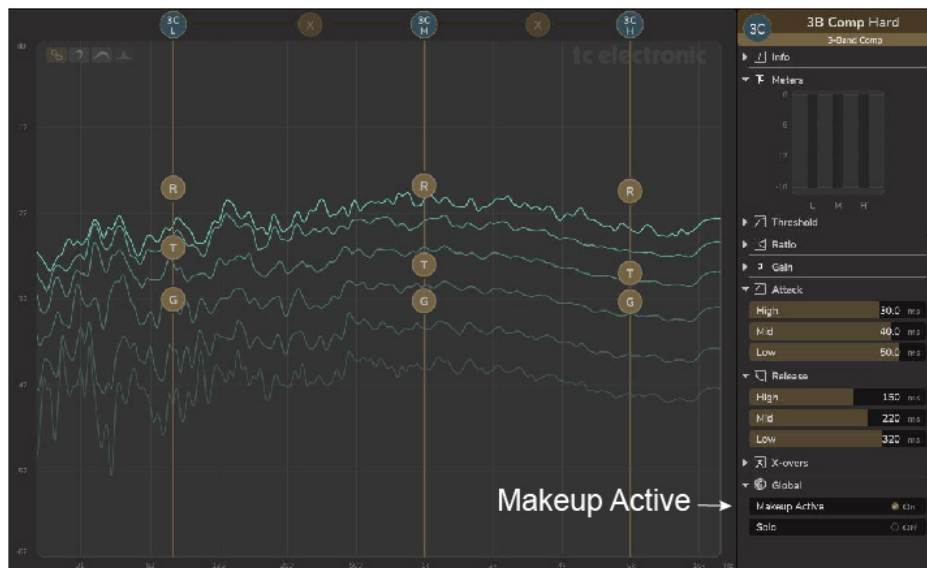
Attack and Release

- Attack and Release times can only be adjusted using their respective controls in the Module EDIT View. The adjustment range is 0.1 to 100 ms (attack) and 10 to 1000 ms (release).
- When Control Sticks / bands are linked, all attack controls can be adjusted at the same time, and so can all release controls.



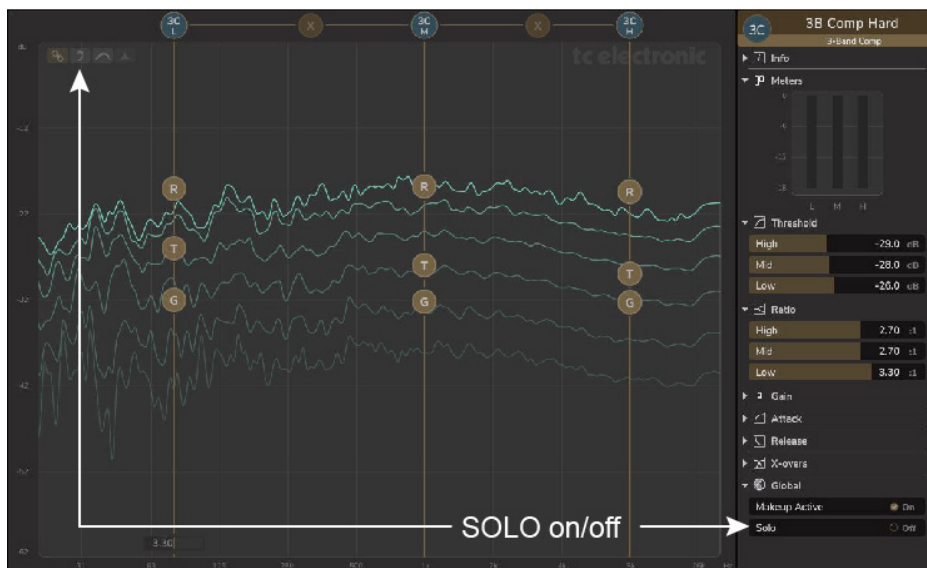
Makeup Gain On/Off

- Makeup Active On/Off is selectable only in the Module EDIT View Global setting.



Band Solo On/Off

- Band Solo On/Off allows the selected compressor bands to be auditioned/soloed. It can be selected either by the Solo button in the top left corner, or in the Module EDIT View Global setting.



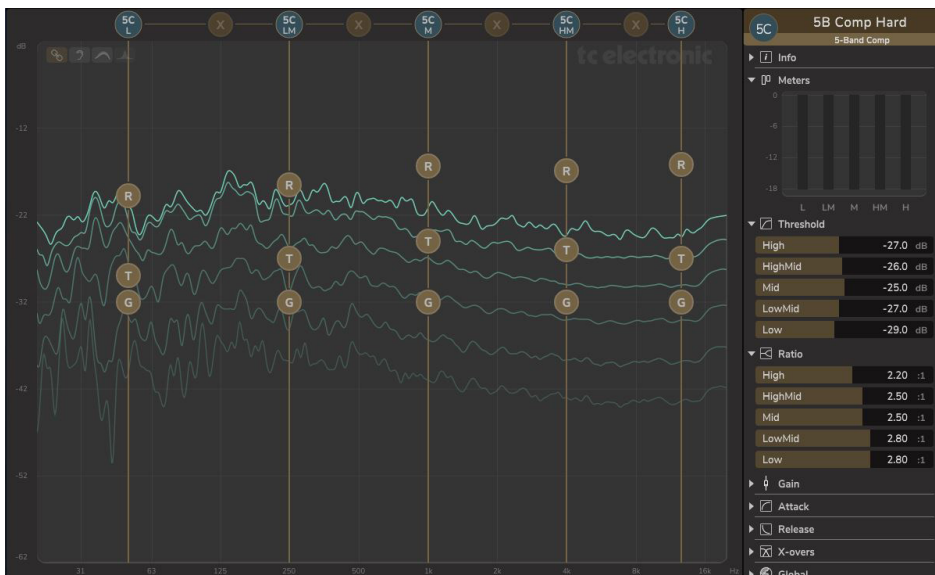
- The Band Solo can also be turned on/off from the Solo/Audition button from the Compressor Module. This may be convenient if Solo has been activated on a Module that is currently not selected like shown here:



5 Band, Modern Style, compressor modules (abbreviation = 5C)

The example below is one of the 5 band compressor modules. Note that all the factory supplied 5 band compressor module presets have the same controls as shown, just at different adjustment settings.

Please see the details described above for the 3 band compressor, as the operation of the 5 band compressor modules is much the same.



5 band compressor modules have the following controls:

- Linking/unlinking of Threshold (T), Ratio (R), Gain (G), Attack, and Release controls between bands
- Crossover Frequency (X) for low, low mid, high mid, and high crossovers
- Threshold (T)
- Ratio (R)
- Gain (G)
- Attack
- Release
- Makeup gain on/off
- Band Solo on/off

The frequency of the four crossovers that define the five bands, can be adjusted through the following frequency ranges:

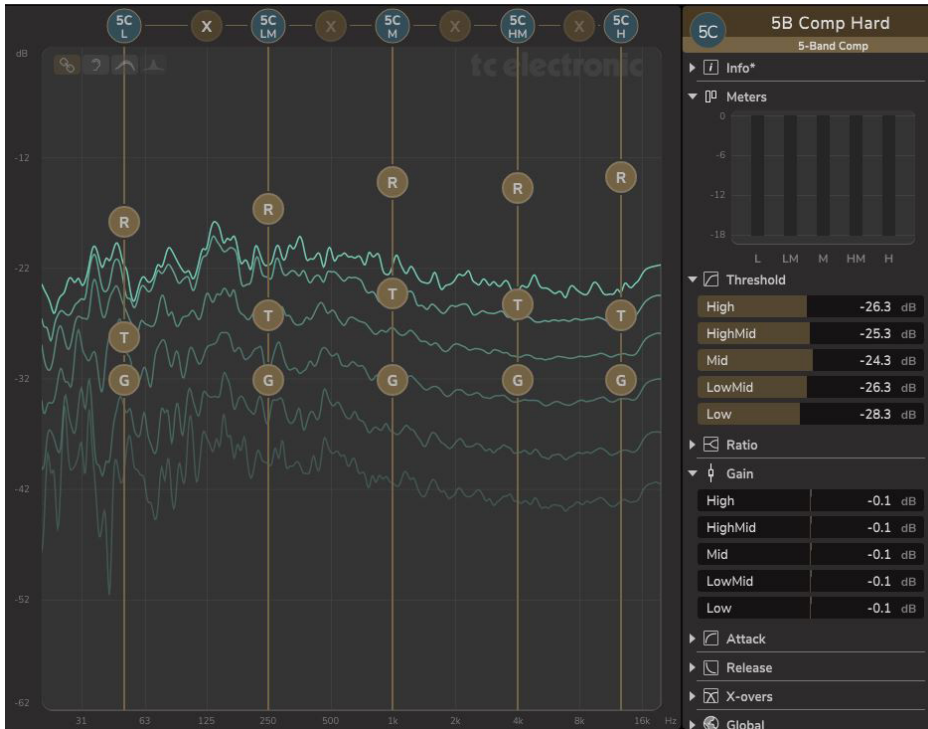
- Low: 40.00 Hz to 1.250 kHz
- Low Mid: 80.00 Hz to 2.500 kHz
- High Mid: 160.0 Hz to 5.000 kHz
- High: 320.0 Hz to 10.00 kHz
- The minimum band width is 1 octave

The abbreviations of the 5 bands are:

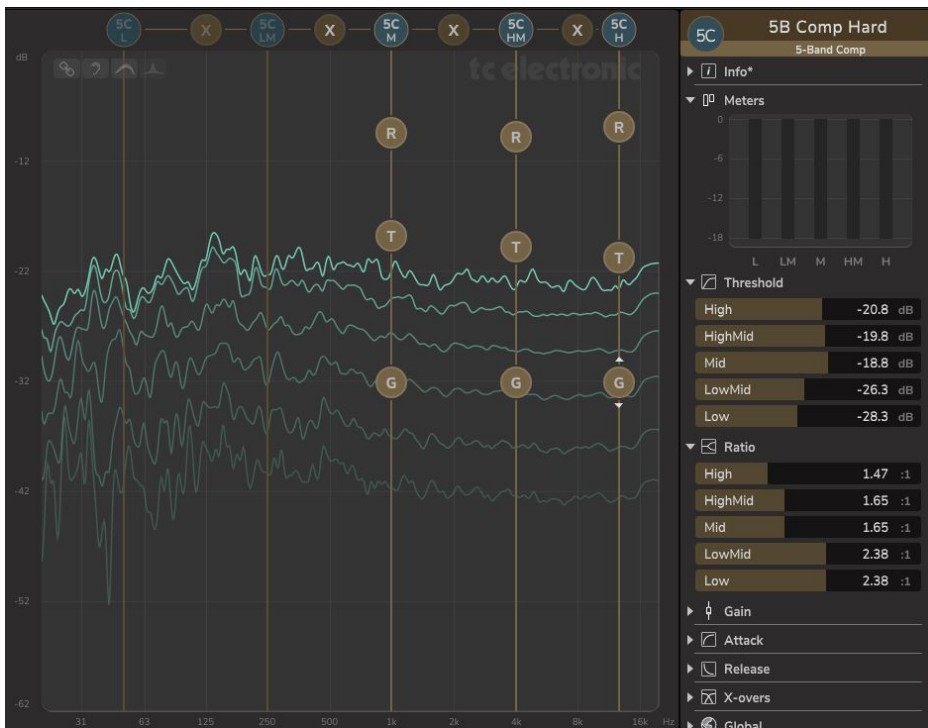
- 5C L (low)
- 5C LM (low mid)
- 5C M (mid)
- 5C HM (high mid)
- 5C H (high)

Linking/unlinking of Threshold (T), Ratio (R), Gain (G), Attack, and Release controls between bands can be done just like the 3 band compressor modules, by:

- Pressing the Link button to link all five Control Sticks / bands.
- Again, if five Control Sticks / bands with their control balls are highlighted, then all bands are linked.

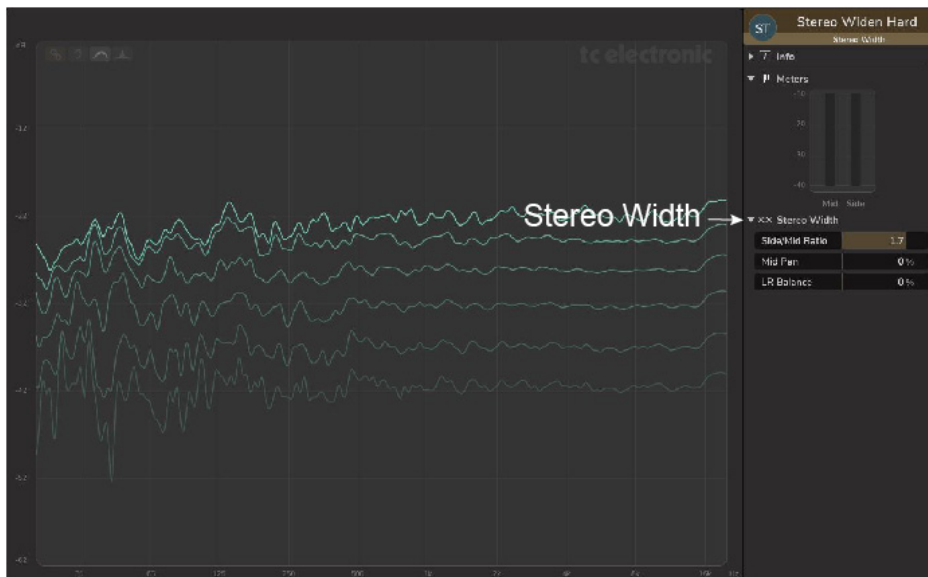


- Selecting any of the top controls (5C L, 5C LM, 5C M, 5C HM or 5C H) while holding down Ctrl, will allow selection of just those Control Sticks / bands, and their controls are linked.
- You may also press Shift while clicking "start" and "end" band balls to select a range of bands.
- In the example below, the (5C M, 5C HM and 5C H) top controls were clicked while holding down Ctrl, and so these are linked.



7.7 Stereo Width modules

The example below is one of the stereo width processing modules. Note that all the factory supplied stereo width module presets have the same controls as shown, just at different adjustment settings.



Stereo width processing modules have the following controls:

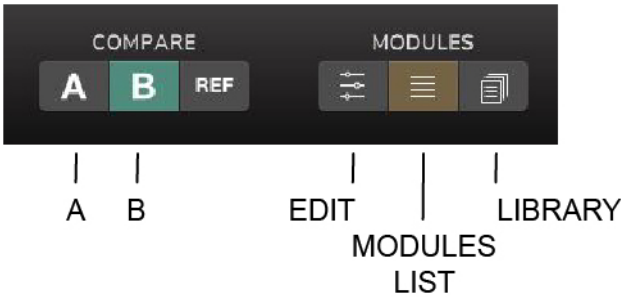
- Side/Mid Ratio
- Mid Pan
- LR Balance

As the stereo width module controls affect the full band, there are no Control Sticks in the SPECTRO LAB views, and the controls are adjustable only in the Edit View section

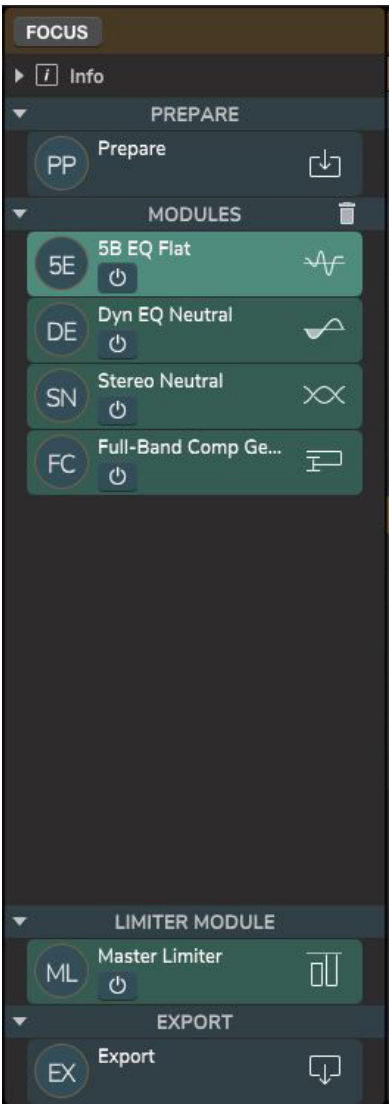
- Side/Mid Ratio has an adjustment range from 0.0 to 2.0.
 - At ratio 0.0 the output is pure Mid signal = mono
 - Ratio 1.0 is the original Side/Mid ratio
 - At ratio 2.0 the Side signal is gained 6 dB compared to the Mid signal
 - The Side/Mid parameter is intelligently loudness compensated, there are no major loudness changes when adjusting the Side/Mid ratio with most music mixes.
- Mid Pan has an adjustment range from Left 50% to Right 50%
 - The Mid Pan parameter will pan the Mid signal only. This can be used if the lead vocal, bass, snare/bass drum is slightly off center.
- LR Balance has an adjustment range from Left 50% to Right 50%
 - This will affect the left/right channel gains.

8. Processing Chain

The Finalizer processing chain is shown in the Module List View. This can be toggled on and off using the middle button of the MODULES section in the top right of the Finalizer application.



The example below shows a typical Modules List View



The processing chain has four main components:

1. First comes the PREPARE module, where the original source file details are shown, and where options can be selected for sample rate, SRC Filter type, and Level Normalization in order to prepare the track for the mastering job.
2. Second comes the MODULES section, a list of selected processing modules chosen from the library.
3. Third comes the LIMITER module which shows the Limiter module selected from the library. Only one Limiter is allowed in the chain.
4. Last comes the EXPORT module, where the final output options are selected, such as format, bit depth, sample rate, SRC filter type, dither, and filename options.

The Module List also shows how the audio is processed serially from top to bottom.

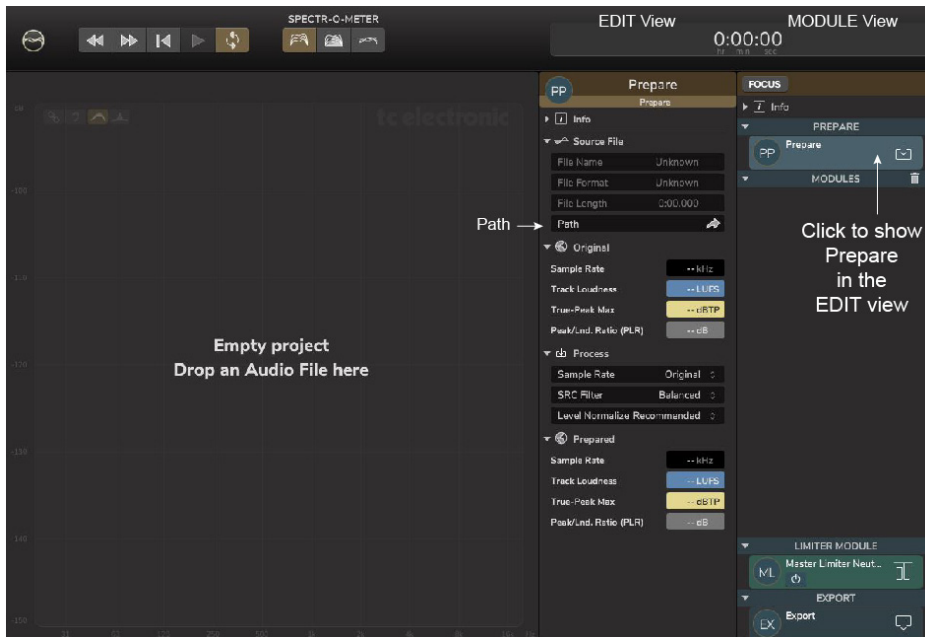
The available optional modules and their operation have been described in the SPECTRO LAB section above. The following sections describe the Prepare, Limiter, and Export modules.

8.1 Prepare Module

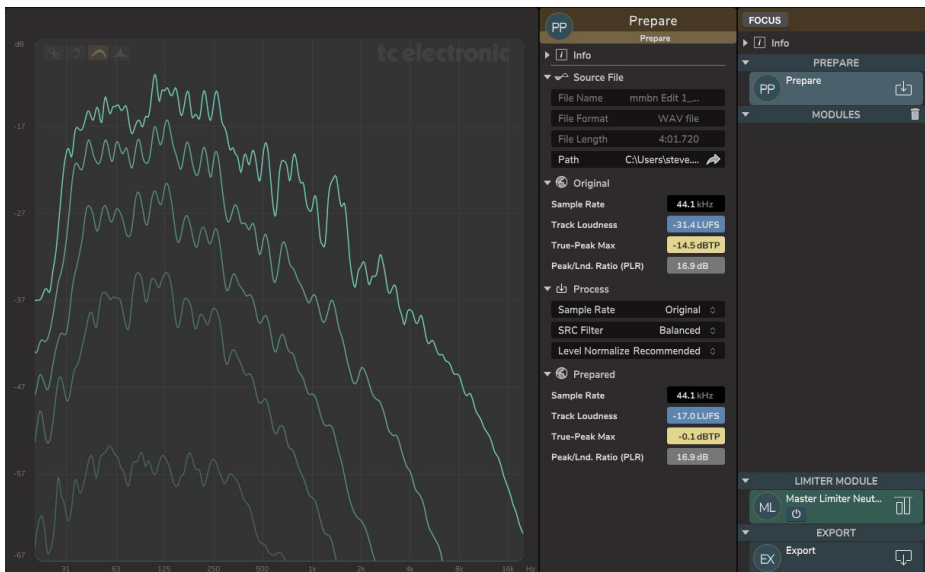
Initially, with no audio file loaded, the display will look like the example below.

The Prepare EDIT View is shown when the Prepare section is highlighted in the MODULE LIST View.

To load an audio file to work on, use the Path menu in the Source File menu of the Prepare Module, or use the File menu in the top line, or use Drag and Drop from the Finder / File Explorer, as described previously.



The example below shows an audio file loaded into the Finalizer



The Source File section shows the following details:

- Filename
- File Format, with options: WAV or AIFF
- File Length
- Path, where the file is stored on the computer

Note: When importing an audio source file into the Finalizer you will be asked if you want to copy the audio source file into the Finalizer project file. If you answer no, the Finalizer project file will point to the audio source file and you should be careful not moving this file from its location unintentionally.

If you export a new version of your mix audio file from your DAW and overwrite the Finalizer audio source file, it will not automatically be reimported into the Finalizer project while the application is running. You will have to reopen the project or restart the Finalizer application.

The Original section shows the following details:

- Sample Rate
- Track Loudness in LUFS
- True-Peak Maximum in dBTP
- Peak/Loudness Ratio in dB

The Project Preparation Process section has these available options for pre-processing the original audio file to make it ready for mastering:

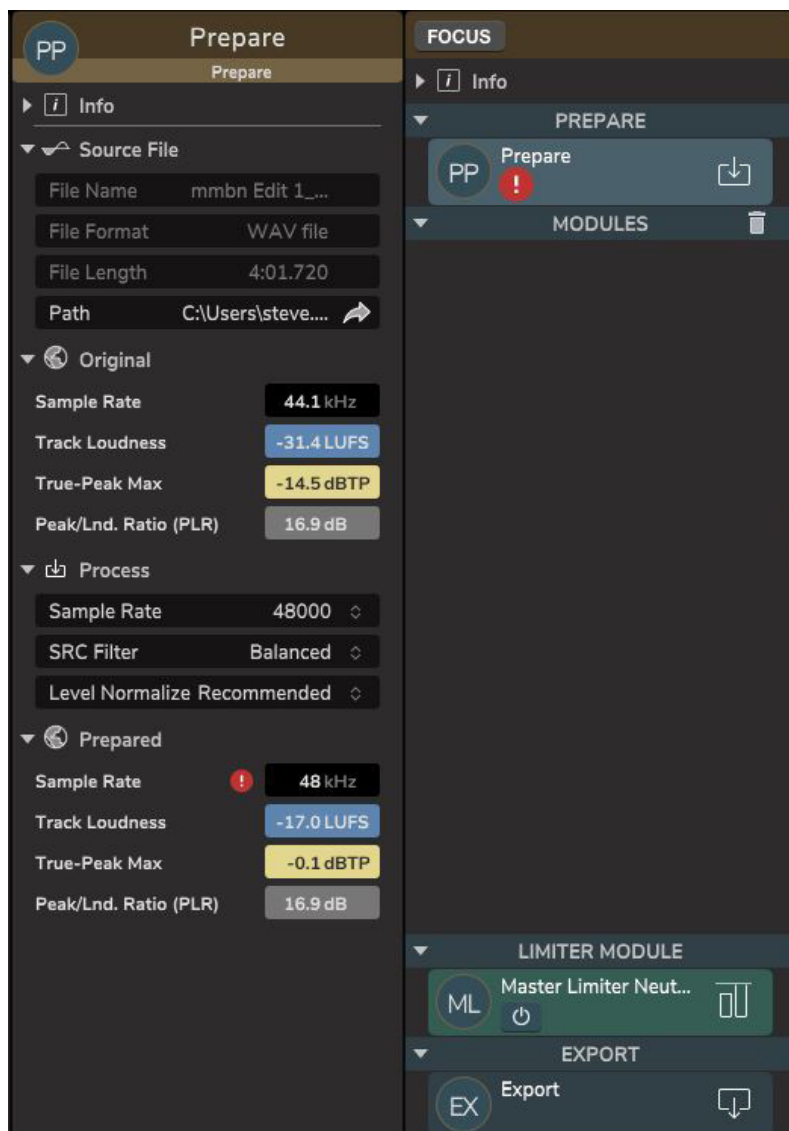
- Sample Rate, with options: Original, 44.1 kHz, and 48 kHz. Note that Finalizer currently processes at 44.1 or 48 kHz, so e.g. a 96 kHz must be sample rate converted.
- SRC Filter, with options: Short, Balanced, and Steep
- Level Normalize, with options: Original, -12, -16, -20 LUFS, and Recommended. "Recommended" will take the Peak-to-Loudness ratio into account when setting a suitable Normalization Level. See the Algorithms In Depth for further details on setting the Level Normalization.

The Prepared section shows the following results, after the original file has been pre-processed:

- Sample Rate
- Track Loudness in LUFS
- True-Peak Maximum in dBTP
- Peak/Loudness Ratio in dB
- Notes: the Track Loudness value in the Prepared section is affected by the Level Normalize option in the Process section. It will be the same value as the original, if "Original" is selected, or it will be -12, -16, or -20 LUFS if these are selected, or a Recommended value.

Note: The EDIT View and MODULE LIST View will show a Warning if there is an error in the Preparation processing.

In the example below, there was an error with the sample rate. It turns out the requested sample rate was incompatible with the output playback device.



8.2 Limiter Modules

The transparent and upsampling True-Peak Limiter module is placed at the end of the processing chain, but before the Export section. The Limiter is not added to the Modules area, but appears in the Limiter Module area. There can only be one Limiter module in operation.

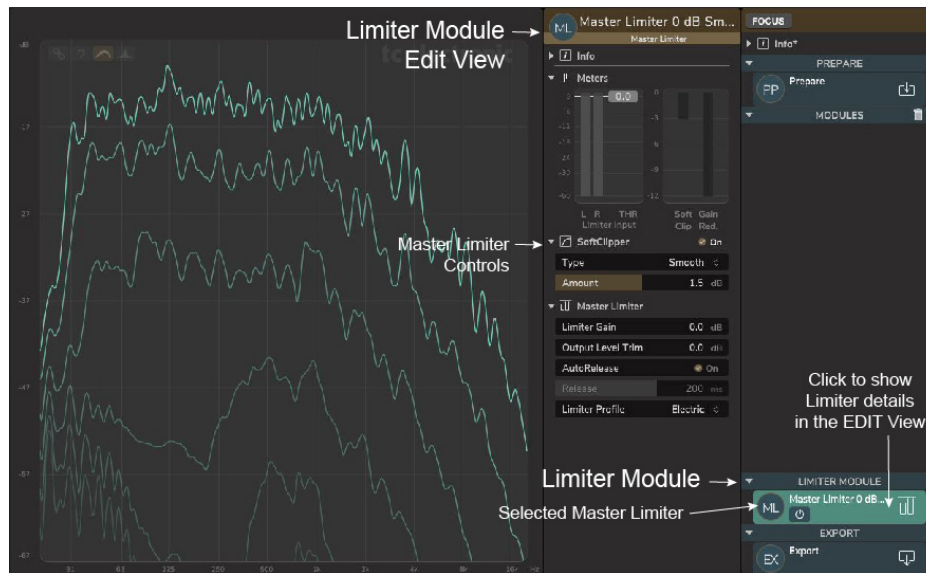
There are two main types of limiter modules available in the Library:

- Master Limiters (ML)
- Loudness Limiters (LL)

The conventional Master Limiter has Input Gain and Output Trim (output gain). Alternatively, you can choose the all-new Loudness Limiter module, which, based on the background analysis, automatically sets the Limiter Input gain and threshold to hit a definable full track loudness level, for example to fit modern streaming services like iTunes.

Both Limiter types include a flexible and delicate SoftClipper. There are three available options from soft, smooth, and hard, and the Amount control sets how much peak reduction the SoftClipper will do at its maximum across the full track.

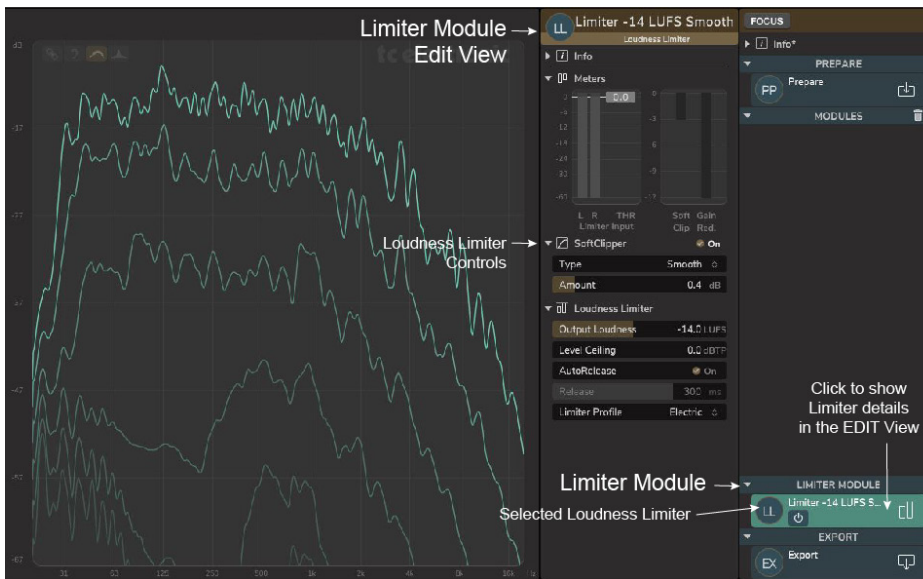
The example below is one of the Master Limiter modules:



The Master Limiter controls are as follows:

- SoftClipper On/Off
- SoftClipper Type, selections Soft/Smooth/Hard
- SoftClipper Amount, range 0.0 to 5.0 dB
- Limiter Gain, range 0.0 dB to +15.0 dB
- Output Trim Level, range -5.0 dB to 0.0 dB
- Auto Release, On/Off
- Release, 20 ms to 1000 ms
- Limiter Profile: selections Electrical/Acoustic/Classical

The example below is one of the Loudness Limiter modules:



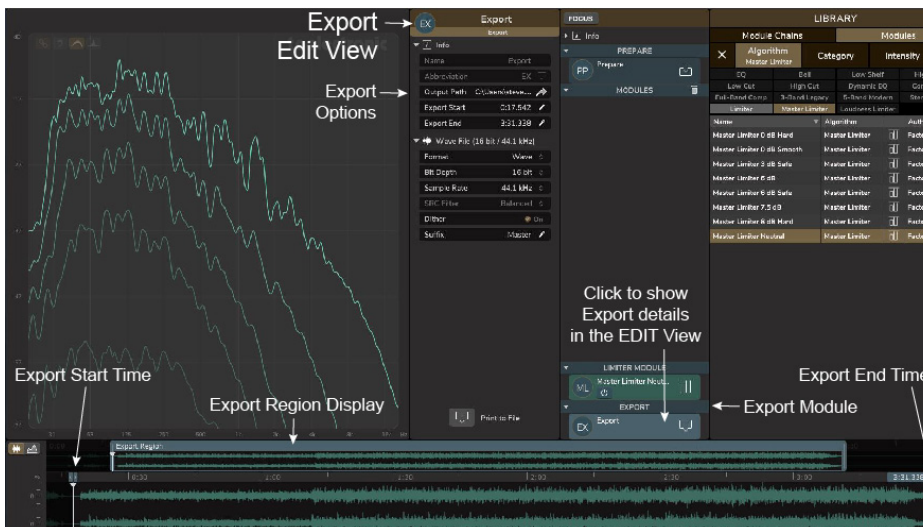
The Loudness Limiter controls are as follows:

- SoftClipper On/Off
- SoftClipper Type, selections Soft/Smooth/Hard
- SoftClipper Amount, range 0.0 to 5.0 dB
- Output Loudness, range -21.0 dB to -6.0 dB LUFS
- Level Ceiling, range -5.0 dB to 0.0 dBTP
- Auto Release, On/Off
- Release, 20 ms to 1000 ms
- Limiter Profile: selections Electrical/Acoustic/Classical

8.3 Export Module

The Export module allows you to export the final output file to your computer.

The Export module is at the bottom of the MODULE List view, after the Limiter module. Click on it to bring up all the Export details and options in the EDIT View, as shown in the example below:

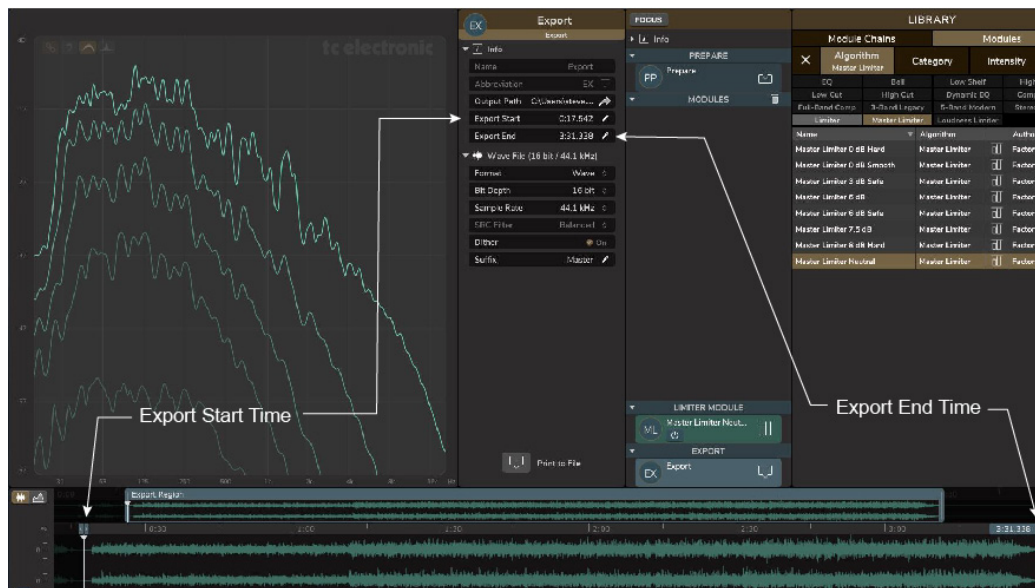


The Export options are as follows:

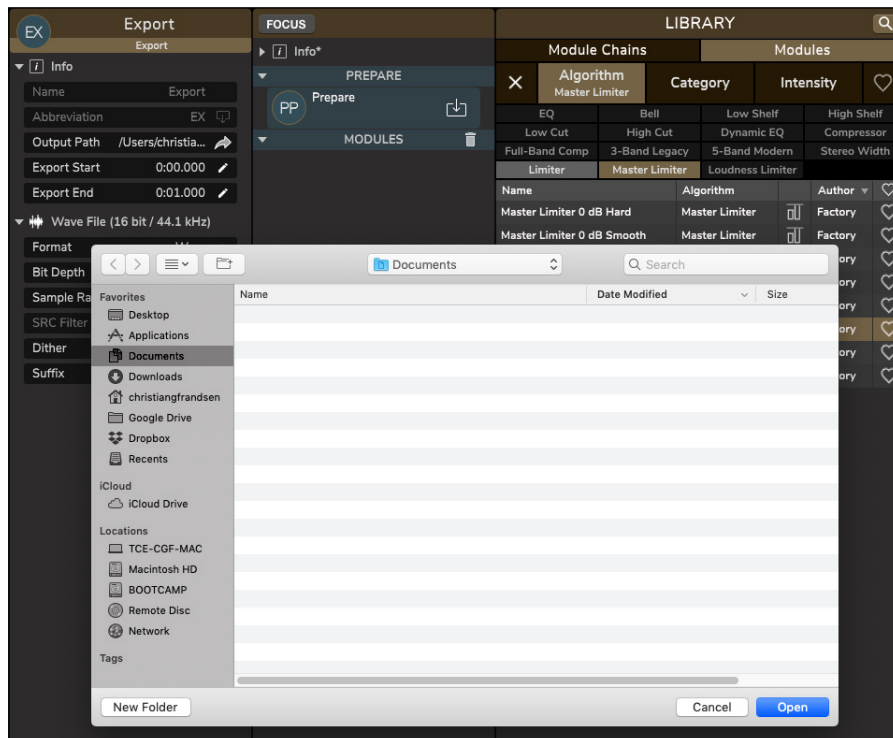
- Output Path, the location on your computer where you would like to store the file
- Export Start, the beginning time of the track to be exported

- Export End, the end time of the track to be exported
- Audio file format, options: WAV, or AIFF
- Bit Depth, options: 16 bit or 24 bit
- Sample Rate, options: 44.1, 48, 96, 192 kHz. If the export sample rate is identical to the project sample rate, no Sample Rate Conversion will be added.
- SRC Filter, options: Short, balanced, Steep
- Dither, options: On/Off
- Suffix, to add text to the filename. The default text is “_Master” added to the original filename, and this can be changed by typing in the desired text in this Suffix area.

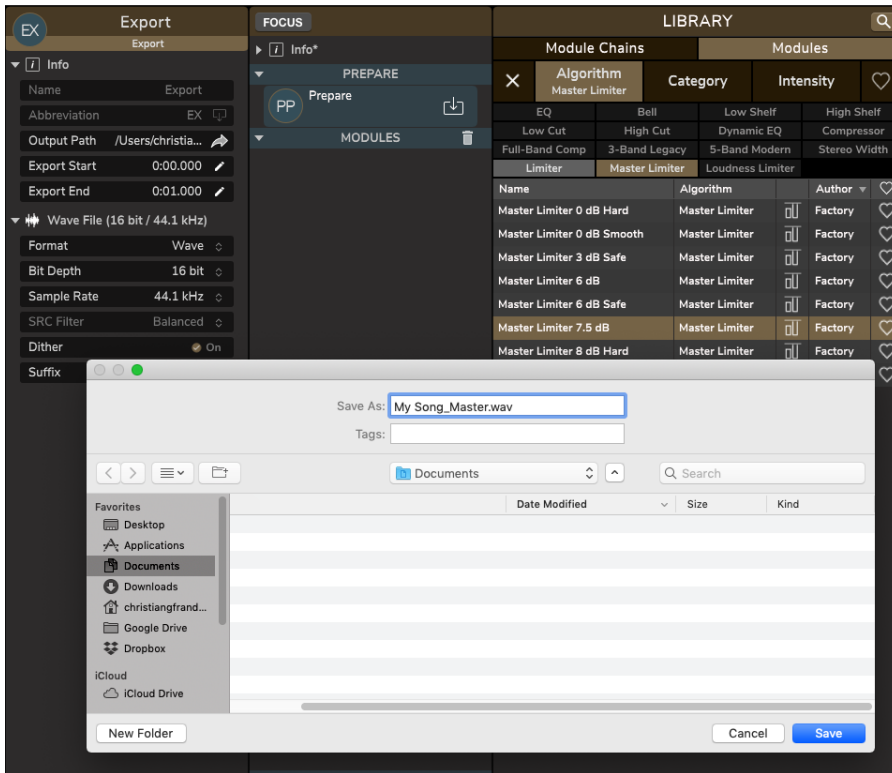
Notes: the export start time and end times can be chosen by dragging the left hand and right hand vertical bar, respectively, in the track display, until they are in desired start and end positions on the track. The export start and end times can also be entered in the text box of the Export Start and Export End current numerical values.



Clicking on the arrow in the Output Path area, will bring up the Finder / File Explorer as shown (Mac version):



When everything is set as desired, and the start and end times are good, and you are ready to save the file, press “Print to File” and the Export window will appear (Mac version shown):

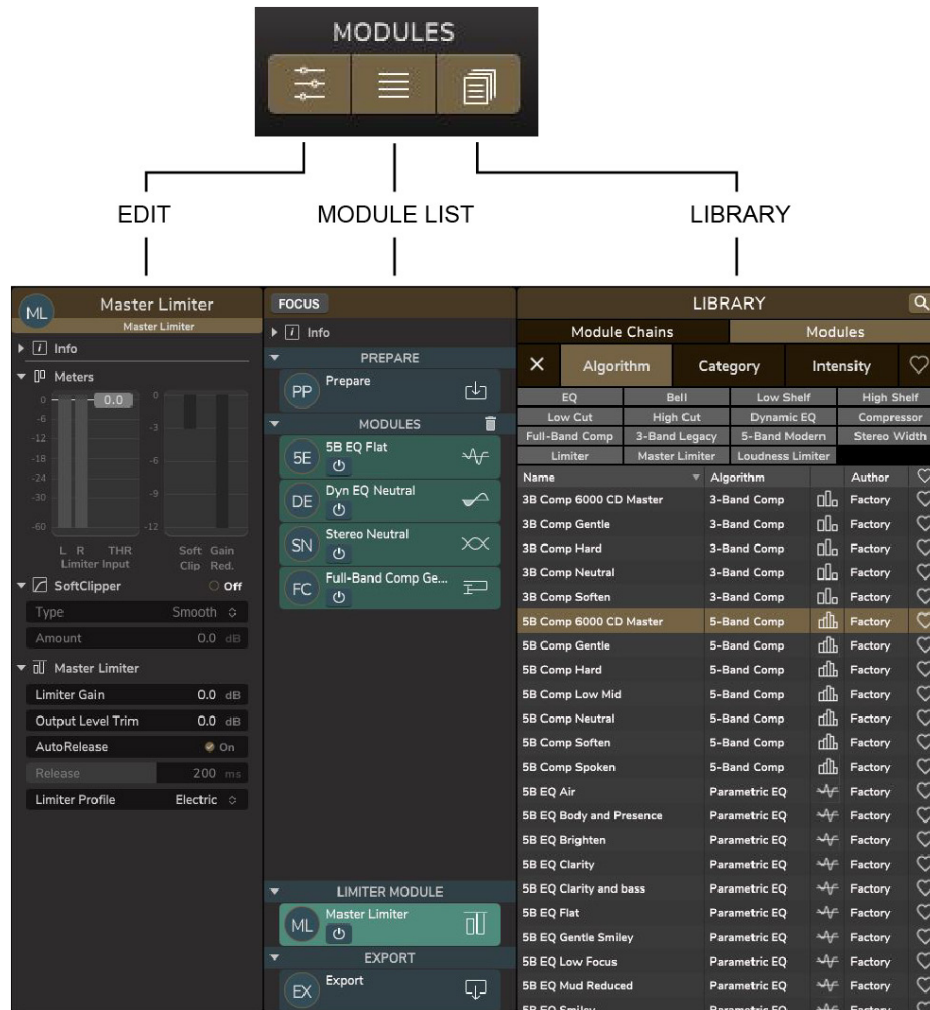


You can change the file location and filename here, if desired.

Select “Save” to save the file, and it will be saved with the filename and in the file location specified.

9. Module List

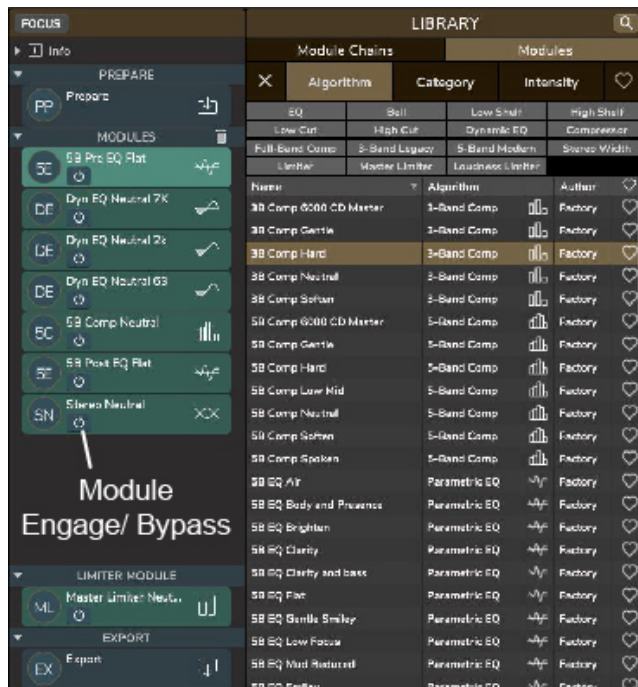
Select the Module List by clicking the middle button of the three MODULES buttons at the top of the display.



In the B Mode (processed track), you can add as many processing modules as needed for the mastering job.

- Modules can be dragged and dropped from the Library into the Module List, or double-click on a module in the Library and it will appear after the selected Module in the Module List.
- Alternatively, use the Modules menu in the top left corner of the application, as described previously, to add, delete and otherwise work with the modules.
- The Module List view shows the serial processing order of the different modules in the project.
- Each module can be bypassed or engaged using the “power button.” The module will turn grey and it will have no effect on the audio while bypassed.
- Modules that feature Solo/Audition, like Multiband Compressors, will have an available Audition button in the Module List.

- The Module order can be changed by dragging and dropping.
- Remove a module using the key command Backspace/Delete.

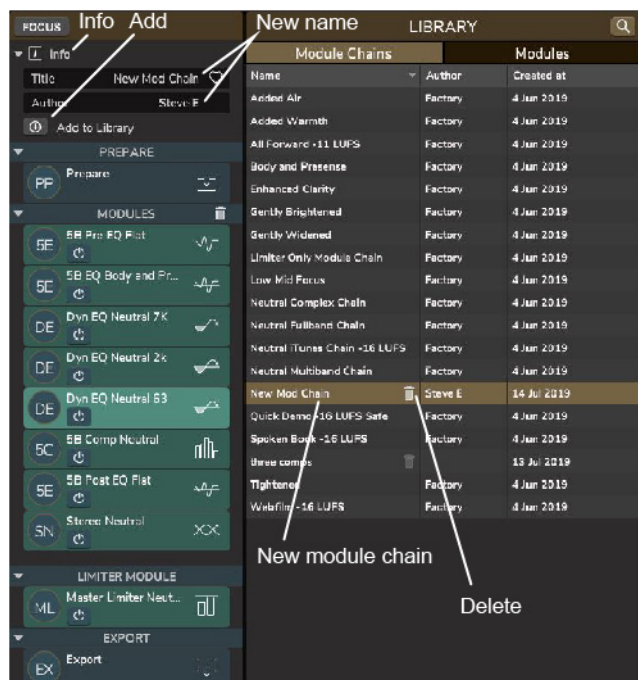


9.1 Saving a Module Chain

When you have created a good list of modules for a project, you can save it in the Library as a new Module Chain. It can then be recalled by clicking on it in the Module Chains list.

- Using the Info menu at the top of the modules list, save the current processing chain as a preset with a new title and author name. Default name is User. When logged in to Finalizer.com your name will appear as preset Author.
- The new preset module chain will include the current list of modules in the list, including their settings, and the current Limiter module, but it does not include the Prepare or Export modules.
- The new preset will appear in the list of Module Chains in the Library, for later recall.
- It can be deleted using the trash can symbol in the Module Chains List.
- If you make any changes to an existing Module Chain, then an asterisk will appear next to the Info* as a reminder that something has changed.

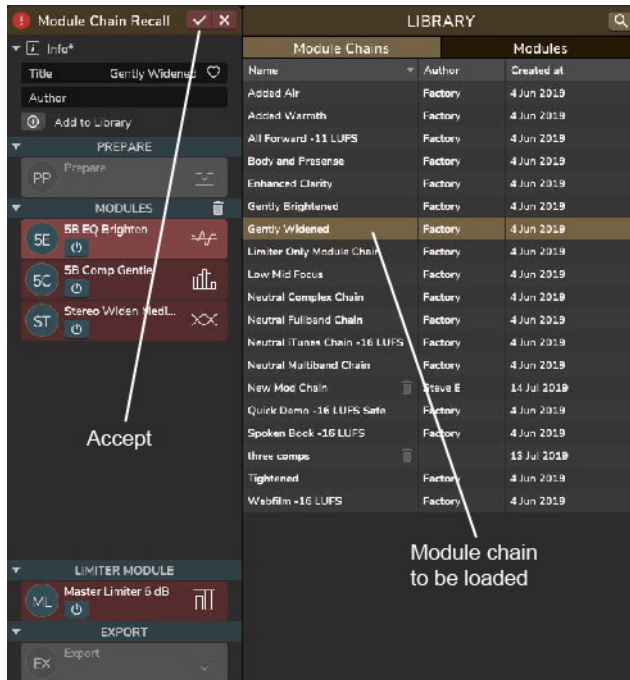
Tip: Saving your current Module Chain and recalling it in Preview mode from the Library, can be a way to compare it against other Module Chains when different processing approaches are being evaluated.



9.2 Recalling a Module Chain

To recall a factory or user module chain:

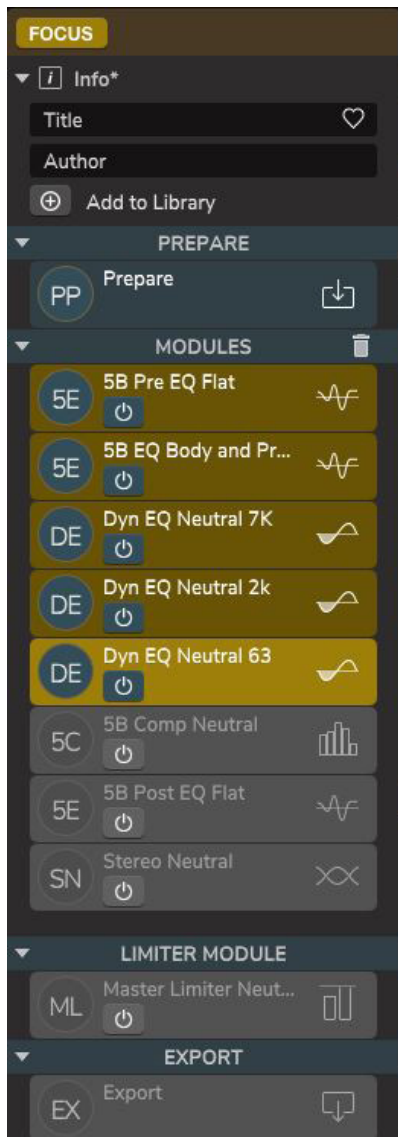
- Double-click on the desired module chain shown in the list of module chains in the Library. Now you can listen to the chain in Preview mode without needing to wait for the background calculation to finish the SPECTRO LAB measurements.
- To accept the module chain recall, click on the “Tick” as shown, or X to cancel. Note that the previous module list including the Limiter module will be removed and the new module chain added. Prepare and Export settings remain the same. After accepting the chain the SPECTRO LAB measurements will be performed and shown.



9.3 Using Focus

With the Focus button at the top of the Modules List View, you can bypass the modules after the selected module in the processing chain. Note that the Limiter module may become bypassed and the monitor output could possibly send out +0 dBTP signals and potentially be clipping in the following monitor chain.

- In the example below, the Dyn EQ Neutral 63 module was first highlighted, before pressing Focus.
- All modules below this module, including the Limiter module will be bypassed while Focus is engaged. This allows you to audition the effect of the first five modules only.



There are 3 modules that are always present in the Modules List: Prepare, Limiter and Export. Of these, there are only presets for the Limiter in the Library and the Module Chain project presets does not include the Prepare or Export settings either.

9.4 Prepare Module

The process is initiated by the Prepare module where you set the project sample rate and choose the high quality SRC sample rate conversion filter for the source file, if needed.

In the Prepare module you also set the Normalization Level on the source file so it fits the dynamic range of the monitor playback channel well.

9.5 Export Module

The processing chain ends with the Export module where you set the output file format, Bit Depth, Sample Rate and filter, Dither and a Suffix, plus the path to where the file is saved. You will be prompted to set the file name.

9.6 Finalizer has Infinite Headroom

Unlike an analog chain, or many DAW-based solutions, or cross-brand plugin-setups, the Finalizer has true infinite signal headroom. Therefore there is no risk of any unintentional clipping or distortion anywhere inside the application, from source file to file export. Normally, one of the Limiters is enabled at the end of the chain, taking care of adjusting the overall level and loudness, and preventing clipping in the exported file.

There is also no need for adjusting a lot of gains in the chain to ensure that all processing modules are fed optimally. We have removed all unneeded gain parameters to obtain a fast and solid workflow.

For keeping a constant and calibrated monitoring level while working, please refer to the Level Normalization in the Prepare module, the Loudness button in the Monitor section and the REF or UNITY buttons in the Monitor section.

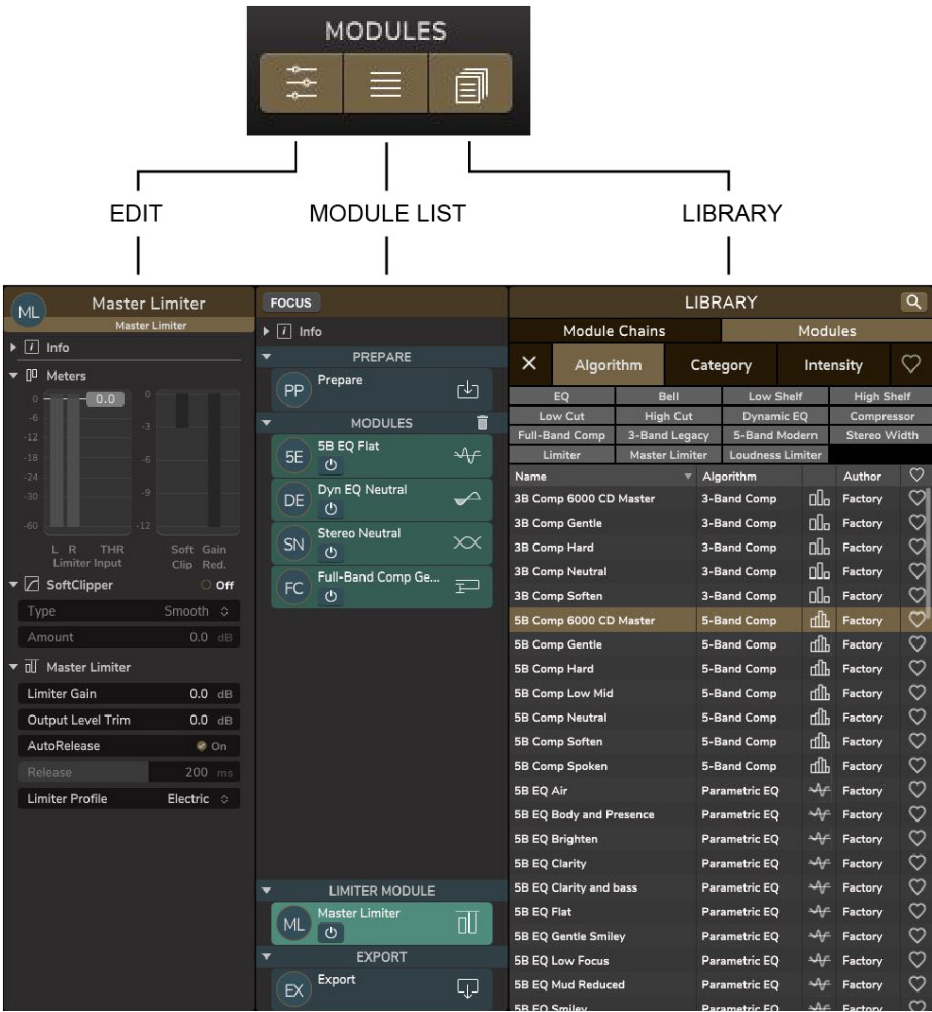
Note:

- The Monitor output has no explicit limiter, so if the Limiter in the processing chain is temporarily bypassed (by using Focus or the Limiter's bypass button), you may feed a too-hot signal to your monitor output, exceeding 0 dBFS. This may make the monitor output chain distort. In this case, the Red overload dot in the Monitor section will light up. The red dot is reset by mouse-clicking on it.

A temporary solution may be to reduce the output level of the Finalizer via the Fader Gain in the Monitor section. If you run into clipping in the monitor path multiple times, you may also consider lowering the Normalization Level in the Prepare module and this way reserve better margin in the monitor path while you work.

10. Library

Select the Library View by clicking the right button of the three MODULES buttons at the top of the display.



The Library has two main sections:

- Modules, which are the factory and user preset modules that may be individually selected and added to the Module List View.
- Module Chains, which are factory and user presets that bring up a group of modules into the Module List View. Excluding the Prepare and Export modules.

Library: Modules View

LIBRARY				
Module Chains		Modules		
X	Algorithm	Category	Intensity	Heart
EQ	Bell	Low Shelf	High Shelf	
Low Cut	High Cut	Dynamic EQ	Compressor	
Full-Band Comp	3-Band Legacy	5-Band Modern	Stereo Width	
Limiter	Master Limiter	Loudness Limiter		
Name	Algorithm	Author	Heart	
3B Comp 6000 CD Master	3-Band Comp	Factory	Heart	
3B Comp Gentle	3-Band Comp	Factory	Heart	
3B Comp Hard	3-Band Comp	Factory	Heart	
3B Comp Neutral	3-Band Comp	Factory	Heart	
3B Comp Soften	3-Band Comp	Factory	Heart	
5B Comp 6000 CD Master	5-Band Comp	Factory	Heart	
5B Comp Gentle	5-Band Comp	Factory	Heart	
5B Comp Hard	5-Band Comp	Factory	Heart	
5B Comp Low Mid	5-Band Comp	Factory	Heart	
5B Comp Neutral	5-Band Comp	Factory	Heart	
5B Comp Soften	5-Band Comp	Factory	Heart	
5B Comp Spoken	5-Band Comp	Factory	Heart	
5B EQ Air	Parametric EQ	Factory	Heart	
5B EQ Body and Presence	Parametric EQ	Factory	Heart	
5B EQ Brighten	Parametric EQ	Factory	Heart	
5B EQ Clarity	Parametric EQ	Factory	Heart	
5B EQ Clarity and bass	Parametric EQ	Factory	Heart	
5B EQ Flat	Parametric EQ	Factory	Heart	
5B EQ Gentle Smiley	Parametric EQ	Factory	Heart	
5B EQ Low Focus	Parametric EQ	Factory	Heart	
5B EQ Mud Reduced	Parametric EQ	Factory	Heart	
5B EQ Smiley	Parametric EQ	Factory	Heart	

Library: Module Chains View

LIBRARY		
Module Chains		Modules
Name	Author	Created at
Added Air	Factory	4 Jun 2019
Added Warmth	Factory	4 Jun 2019
All Forward -11 LUFS	Factory	4 Jun 2019
Body and Presense	Factory	4 Jun 2019
Enhanced Clarity	Factory	4 Jun 2019
Gently Brightened	Factory	4 Jun 2019
Gently Widened	Factory	4 Jun 2019
Limiter Only Module Chain	Factory	4 Jun 2019
Low Mid Focus	Factory	4 Jun 2019
Neutral Complex Chain	Factory	4 Jun 2019
Neutral Fullband Chain	Factory	4 Jun 2019
Neutral iTunes Chain -16 LUFS	Factory	4 Jun 2019
Neutral Multiband Chain	Factory	4 Jun 2019
New Mod Chain	Steve E	14 Jul 2019
Quick Demo -16 LUFS Safe	Factory	4 Jun 2019
Spoken Book -16 LUFS	Factory	4 Jun 2019
Three Comps	Steve E	14 Jul 2019
Tightened	Factory	4 Jun 2019
Webfilm -16 LUFS	Factory	4 Jun 2019
























The Library View can be expanded or simplified using the “magnifying glass” in the top right, to zoom in or out.

- In the expanded view of the Library Modules View as shown above, all details are shown, with 5 columns: preset module name, algorithm type, algorithm logo, author, and favorites. The Modules tab or Module Chains tab can be selected.
- In the simplified view, as shown below, just 2 columns are shown: preset name, and algorithm logo (or author for Module Chains). This is just for the list of modules or module chains that were in the current expanded view. So if it was showing a list of Module Chains, it will change to just 2 columns of Module Chains. Click the magnifying glass again to return to 5 columns.



Library Modules View

The view below shows the complete list of available modules; use the right hand scroll bar to reach all the modules in the list.

LIBRARY 				
Module Chains		Modules		
X	Algorithm	Category	Intensity	♥
EQ	Bell	Low Shelf	High Shelf	
Low Cut	High Cut	Dynamic EQ	Compressor	
Full-Band Comp	3-Band Legacy	5-Band Modern	Stereo Width	
Limiter	Master Limiter	Loudness Limiter		
Name	Algorithm		Author	♥
3B Comp 6000 CD Master	3-Band Comp		Factory	♥
3B Comp Gentle	3-Band Comp		Factory	♥
3B Comp Hard	3-Band Comp		Factory	♥
3B Comp Neutral	3-Band Comp		Factory	♥
3B Comp Soften	3-Band Comp		Factory	♥
5B Comp 6000 CD Master	5-Band Comp		Factory	♥
5B Comp Gentle	5-Band Comp		Factory	♥
5B Comp Hard	5-Band Comp		Factory	♥
5B Comp Low Mid	5-Band Comp		Factory	♥
5B Comp Neutral	5-Band Comp		Factory	♥
5B Comp Soften	5-Band Comp		Factory	♥
5B Comp Spoken	5-Band Comp		Factory	♥
5B EQ Air	Parametric EQ		Factory	♥
5B EQ Body and Presence	Parametric EQ		Factory	♥
5B EQ Brighten	Parametric EQ		Factory	♥
5B EQ Clarity	Parametric EQ		Factory	♥
5B EQ Clarity and bass	Parametric EQ		Factory	♥
5B EQ Flat	Parametric EQ		Factory	♥
5B EQ Gentle Smiley	Parametric EQ		Factory	♥
5B EQ Low Focus	Parametric EQ		Factory	♥
5B EQ Mud Reduced	Parametric EQ		Factory	♥
5B EQ Smiley	Parametric EQ		Factory	♥

The Modules View has five main tabs along the top. These allow you to filter the selection of modules, instead of having to search through the complete list each time:

- X: select this to return the Algorithm, Category, and Intensity tabs to their top level
- Algorithm: select this to show the available algorithm types as shown in the smaller grey buttons:
 - EQ: Bell, Low Shelf, High Shelf, Low Cut, High Cut, Dynamic EQ
 - Compressor: Full-Band Comp, 3-Band Comp, 5-band Comp
 - Stereo Width
 - Limiter: Master Limiter, and Loudness Limiter,

- Category: select this to show the available types of module:
 - Spectral, Bass/LF, Treble/HF, Vocals, Dynamics, Spatial, and Limiter
- Intensity: select this to show the available module intensities:
 - Soft, Medium, Hard, and Neutral,
- Favorites (Heart), select this to show or hide any modules previously marked as favorites. Favorite modules are marked with a solid heart in the last column.
- Note: the selection of the Algorithm type, Category, and Intensity act together in a cumulative manner. For example, if you select an Algorithm type “EQ”, and a Category of Bass/LF and select an Intensity, of “Soft,” you will see just those EQs that are bass-related, and with soft intensity. Click on X to reset the search.

LIBRARY				
Module Chains		Modules		
X	Algorithm EQ	Category Bass/LF	Intensity Soft	Heart
Soft		Medium	Hard	Neutral
Name	Algorithm		Author	Heart
Bell Lift Bass	Bell		Factory	
Bell Lift Warmth	Bell		Factory	
Lo Shelf Damp 120 Hz	Low Shelf		Factory	
Lo Shelf Damp 315 Hz	Low Shelf		Factory	
Lo Shelf Lift 315 Hz	Low Shelf		Factory	
Lo Shelf Lift 60 Hz	Low Shelf		Factory	
Low Cut 20 Hz	Low Cut		Factory	
Low Cut 35 Hz	Low Cut		Factory	

The 5 columns of the Modules List are as follows:

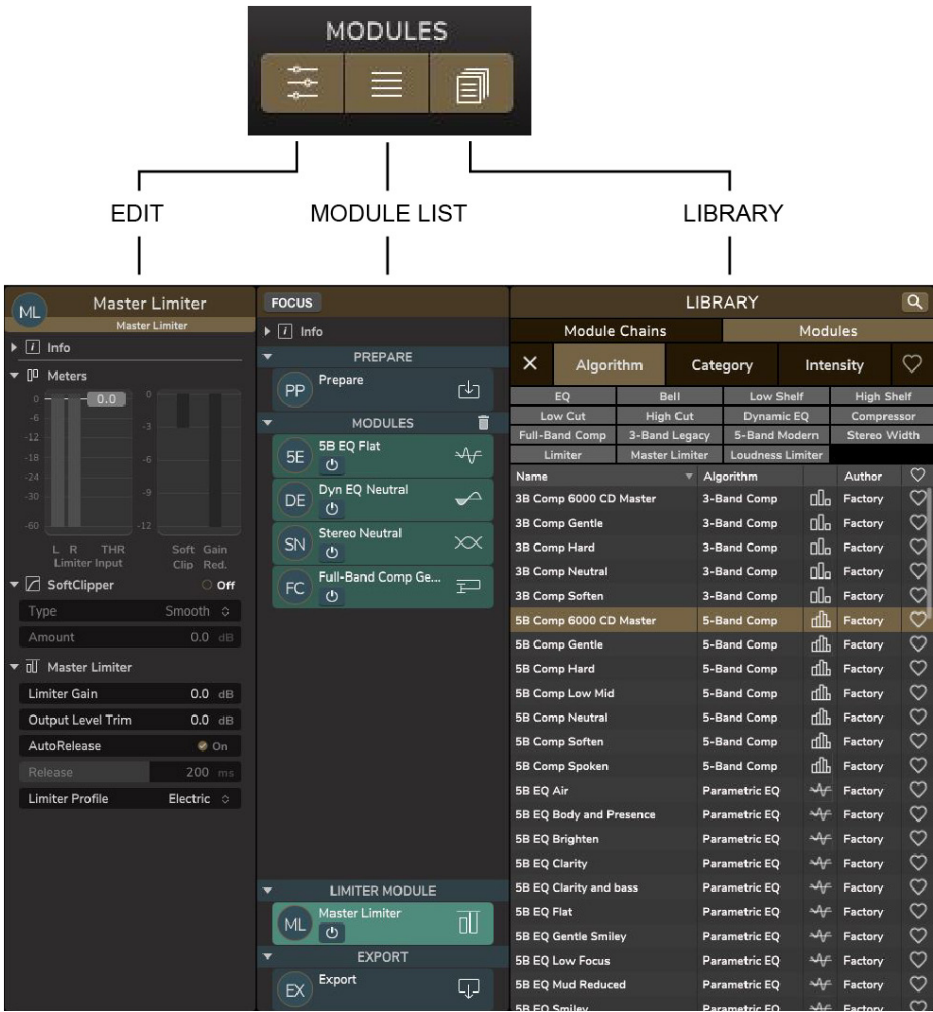
- **Name:** The Module name given by the factory or the user for a user module preset.
- **Algorithm:** The type of algorithm used by the module.
- **Algorithm Logo:** Each algorithm has a simple logo to help with identification. (The logo also appears next to the name of each module present in the Module List view.)
- **Author:** Either "Factory," or a name specified by the user when a factory module is modified and saved as a User module. When logged in to Finalizer.com your name will appear as preset Author when you save modules.
- **Heart:** Click on the heart, and the module will be marked as a favorite (solid heart) for easy location.
- **Note:** the order in the list can be changed by clicking in the top row, next to Name, Algorithm, Author, and Heart. A small triangle will appear, showing the up or down direction.

LIBRARY				
Module Chains		Modules		
X	Algorithm	Category	Intensity	Heart
EQ	Bell	Low Shelf	High Shelf	
Low Cut	High Cut	Dynamic EQ	Compressor	
Full-Band Comp	3-Band Legacy	5-Band Modern	Stereo Width	
Limiter	Master Limiter	Loudness Limiter		
Name	Algorithm		Author	Heart
3B Comp 6000 CD Master	3-Band Comp		Factory	Heart
3B Comp Gentle	3-Band Comp		Factory	Heart
3B Comp Hard	3-Band Comp		Factory	Heart
3B Comp Neutral	3-Band Comp		Factory	Heart
3B Comp Soften	3-Band Comp		Factory	Heart
5B Comp 6000 CD Master	5-Band Comp		Factory	Heart
5B Comp Gentle	5-Band Comp		Factory	Heart
5B Comp Hard	5-Band Comp		Factory	Heart
5B Comp Low Mid	5-Band Comp		Factory	Heart
5B Comp Neutral	5-Band Comp		Factory	Heart
5B Comp Soften	5-Band Comp		Factory	Heart
5B Comp Spoken	5-Band Comp		Factory	Heart

Click here
to change
the order

11. Edit View

Select the Edit View by clicking the left button of the three MODULES buttons at the top of the display.



The Edit View shows the details of the module currently highlighted in the Module List View.

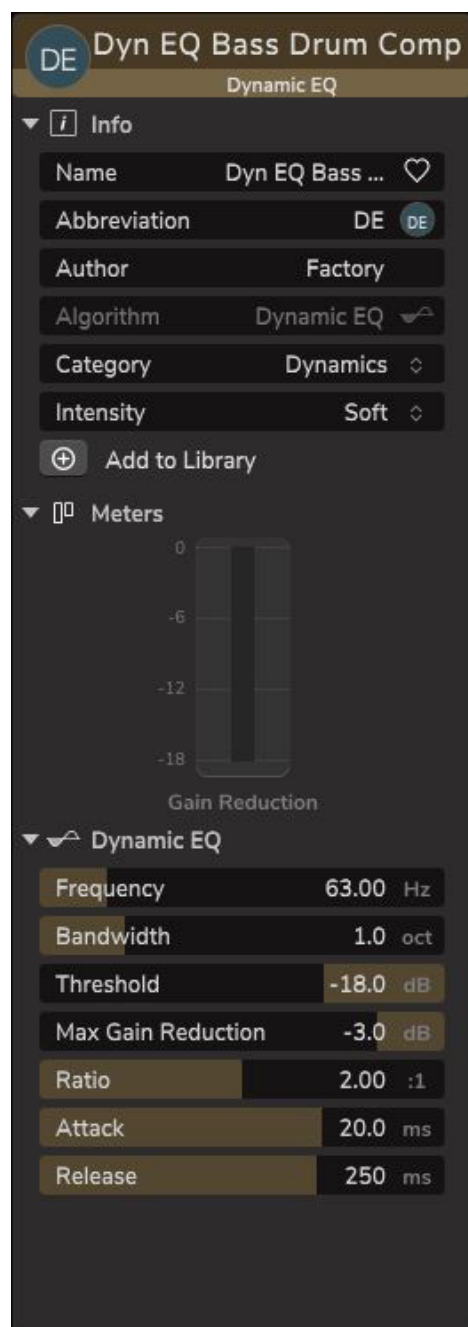
In the example above, the Master Limiter is highlighted, and so its details are shown in the Edit View.

The details of each module type and its controls shown in the SPECTRO LAB Control Sticks and in the Edit View are explained in the sections above regarding Processing Modules and Module Chain.

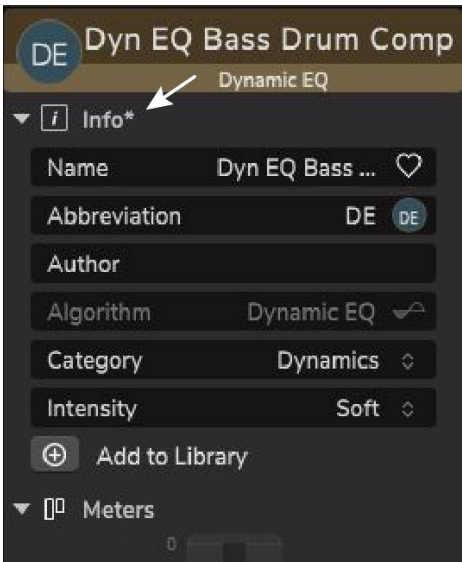
In addition to the module controls described, the Edit view also shows various meters, depending on the module algorithm type, and the Info section allows you to save modules in the Library.

11.1 Saving a Module in the Library

The Info menu in the Edit View of a typical module is shown below:



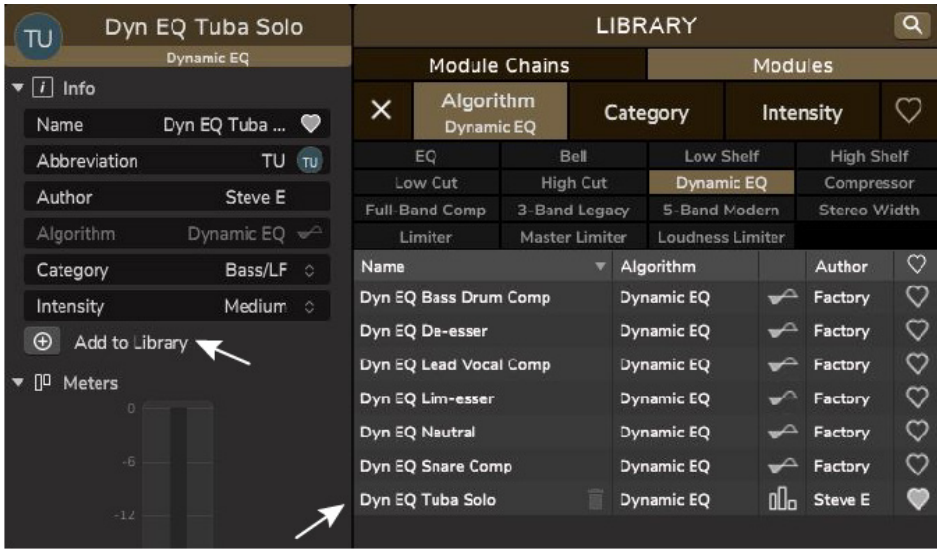
If you change any of the parameters of the module, an Asterisk will appear next to “Info*” to act as a reminder that you are no longer listening to a factory or saved user setting, but one that has changed.



Once the module is fine tuned to your liking, you can save it in the Library as a user preset module, using the Info menu area of the Edit View shown above as follows:

- Name: Enter the name for your new module, and click on the Heart if you want to add it as a favorite.
- Abbreviation: Enter the new one or two-letter abbreviation, and the ball will also change.
- Author: Enter your name here. Default name is User. When logged in to Finalizer.com your name will appear as preset Author.
- Algorithm: This name cannot be changed, as the new module is a modified version of the original algorithm, and not a new type.
- Category: Select a category if the new module fits another category better, now it has been changed. The options are Spectral, Bass/LF, Treble/HF, Vocals, Dynamics, Spatial, and Limiter. Setting the Category will help you find the preset at a later point using the Library Category filtering.
- Intensity: Select an intensity if the new module fits another intensity better, now it has been changed. The options are Neutral, Soft, Medium, and Hard. Setting the Intensity will help you find the preset at a later point using the Library Intensity filtering.
- Click on “Add to Library” and the new module will appear in the Library’s list of modules.

The example below shows a new Dynamics EQ module saved in the Library (as a favorite):



Note: User preset modules can be deleted by clicking on the “trash can” next to the new module’s name in the Library list. Factory presets cannot be deleted.

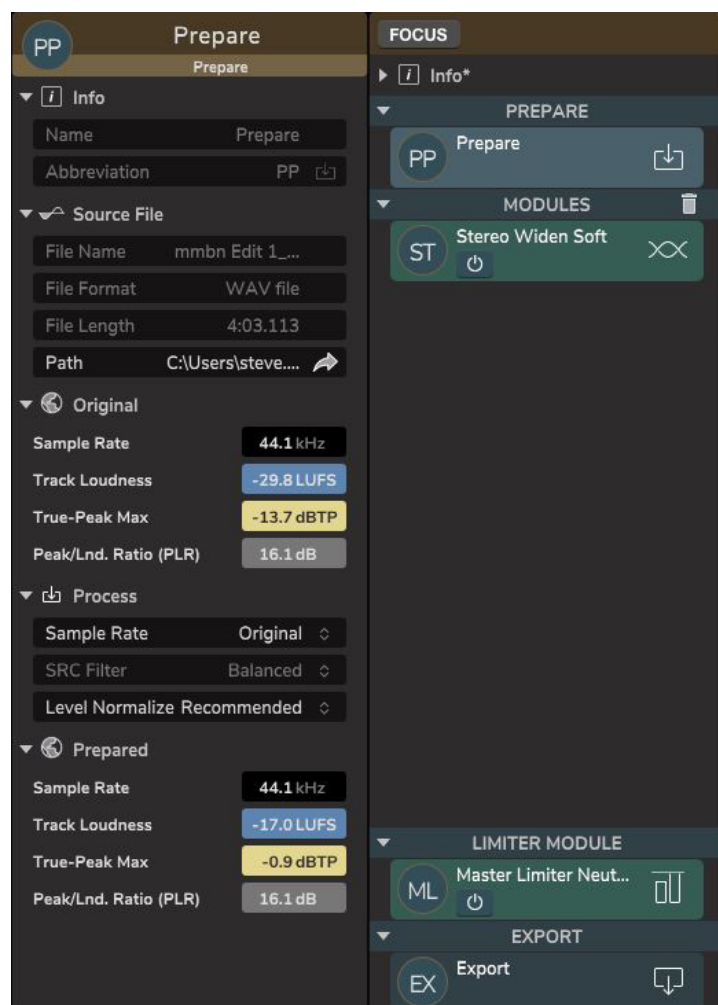
12. Algorithms in depth

In this section we provide some further details of the algorithms in the processing modules. For details on the SPECTRO LAB, refer to the SPECTRO LAB In Depth chapter.

12.1 Prepare

The Prepare module is always included in Finalizer projects, and its job is to prepare the source track for its mastering. The Prepare module settings are saved in Finalizer project files, but are not saved in the Module Chains to the Library.

Click on PREPARE in the Module List View, to bring up the details in the Edit View.



Parameters include:

- **Info Section:** The name of the Module (Prepare) and its abbreviation (PP) and logo.
- **Source File Section:** The file name of the current audio source file, its audio format (WAV for example), file length (minutes, seconds), and the path where it is stored.
- **Original Section:** The original sample rate in kHz, original source file measurements: Track Loudness in LUFS, True Peak Max in dBTP and PLR (Peak to Loudness Ratio) in dB.
- **Process Section:**
 - **Sample Rate:** This is the project sample rate and can be either identical to the source file (original) or be forced to 44.1 or 48 kHz. The project sample rate is also shown in the Monitor Out Section in the top right of the screen.
 - **SRC Filter:** If the project sample rate is identical to the source file's sample rate, the Sample Rate Conversion Filter is not applied. When the project sample rate is different than the source file sample rate, a High-Quality FIR conversion filter is applied. This filter features virtually infinite headroom and no noise or L-R imbalance. Available filter settings are, depending on the desired frequency response:
 - **Steep:** is defined by a very steep response towards Nyquist, that is, a "brickwall" filter
 - **Short;** has the lowest filter order of the three, and has very little pre-ringing
 - **Balanced:** is a balanced filter design between the two above. When in doubt, this is a good default setting
 - **Level Normalize:** This is where you "pre-gain" the source file to set an appropriate working level. The gain is set using the background analysis, so it can be automatically normalized (Level Normalize) to a specific full track loudness level. This is a very nice way to work, and it fits the overall approach of a constant and calibrated monitoring level perfectly.

The available normalize settings are:

- **Original:** will keep the source file as it is and not add a pre-gain to it.
- **-12, -16, -20 LUFS:** will normalize the source file to the chosen full track loudness level. A dynamic track may be normalized to -20 LUFS and a less dynamic mix may be normalized to -12 LUFS.
- **Recommended:** will choose the loudness level (between -12 to -20 LUFS) that fits the source track best, while leaving headroom for all peaks, and making it optimally fit the monitor output path.
- **Prepared Section:** This shows the resulting source file measurements after SRC and Normalize processing. The resulting Prepared loudness and True-Peak level can also be seen in the Master Meter A-section.

Note: Should you experience temporary clipping in the monitor output path, you can eliminate this using the Monitor output Fader. If you experience multiple or nearly continuous clipping in the monitor path, you may consider lowering the Normalize Level in the Prepare module and this way reserve more margin in the monitor path while you work.

12.2 Parametric EQs

The Parametric EQs feature a high resolution, double precision, infinite headroom, IIR filter implementation, with these available forms:

Single band parametric EQ

- Bell
- Low shelf
- High shelf
- Low cut
- High cut

Parameters include:

- **Frequency:** 20.00 Hz to 20.00 kHz
- **Gain:** -18.0 to +18.0 dB
- **Bandwidth:** 0.2 to 4.0 Octaves (Bell)
- **Slope:** 3, 6, 9, 12 dB/oct, (High Shelf and Low Shelf)
- **Filter Type:** Butterworth or Bessel (High Cut and Low Cut)

5 band parametric EQ is a set of 5 EQs that are typically useful in a project.

- Low cut
- 3X Bell
- High shelf
- Band On/Off

Parameters include:

- Frequency: 20.00 Hz to 20.00 kHz
- Gain: -18.0 to +18.0 dB
- Bandwidth: 0.2 to 4.0 Octaves (3X Bell)
- Slope: 3, 6, 9, 12 dB/oct, (High Shelf)
- Filter Type: Butterworth or Bessel (Low Cut)

TC Electronic has a long history of making high-end EQs for mastering. Beside the original Finalizer, introduced in 1995, the Mastering 6000, TC1140, TC1128 and EQ Station are among the most famous products featuring high-end EQs.

Use the Parametric EQs in Finalizer to fine-tune the tonal balance of the mix. The Finalizer EQs, due to high resolution, double precision and infinite headroom, are very transparent and can be used with both broad and surgical settings that are ideal for manipulating the balance of the frequencies. All filters are well-behaved both at low frequencies and near the Nyquist rate.

12.3 Single Band Dynamic EQ

The single band Dynamic EQs feature a high resolution, double precision, infinite headroom, IIR filter implementation with the following available parameters:

- Frequency: 20.00 Hz to 20.00 kHz
- Bandwidth: 0.2 to 4.0 Octaves
- Threshold: 0.0 to -60.0 dB
- Max gain reduction: 0.0 to -18.0 dB
- Ratio: 1.00:1 to Infinity:1
- Attack: 0.1 to 200 ms
- Release: 5 to 1500 ms
- Gain reduction meters: 0.0 to -18.0 dB

Note that the Dynamic EQ features Ratio as well as Max gain reduction, which adds to making the Dynamic EQ an even more flexible and precise tool.

With most common Equalizers, correcting gain imbalances in program material will result in subtle yet undesirable changes to the spectral balance of the rest of the track. Dynamic EQ for Finalizer is no such equalizer. Utilizing high resolution, double precision and infinite headroom, the dynamic EQ delivers very accurate and flexible equalization. This is especially interesting for mastering purposes since the original sound character of the processed material can be maintained.

The Dynamic EQ employs a dynamic linear phase filter, which means that even though the filter changes continuously over time, this does not produce any phase artifacts.

The possibilities are:

- Better control over dynamic signals and “critical” material
- Removal of annoying hisses in vocal recordings
- Correct musical instrument volume imbalances in a mix
- Dynamic Loudness Control
- Enhance or sweeten a mix

12.4 Full Band Compressor

This full-band RMS compressor covers the complete frequency range, and it is a downward compressor, where material over a certain Threshold will be more and more affected by the compressor, as set by the Ratio. Enabling makeup-gain will automatically compensate for the attenuation by the compression, thereby making it easier to focus on the change in dynamics.

The attack time and the amount of compression can have a big effect on how the compression will affect the sound and the punch of the music. Further features are: High resolution, double precision, infinite headroom.

Parameters include:

- Threshold: -60.0 to +10.0 dB
- Ratio: 1.00:1 to Infinity:1
- Attack: 1.0 to 100 ms
- Release: 10 to 1000 ms
- Makeup gain: on/off
- Gain reduction meters: Range 0.0 to -18.0 dB

12.5 3 Band Compressor, Legacy TC style

The 3 band compressor is a refinement of the legendary MD3 dynamics processor from our System 6000. High resolution, multiband dynamics processing, has been a trademark of TC Electronic for more than two decades. Splitting audio into frequency bands before compressing, tremendously helps to fight 'breathing' and spectral intermodulation artifacts. Our algorithms are designed with the headroom to do so without introducing split- and recombination filter anomalies, and can be used for level optimization, mix assistance, or discreet spectral balancing as required.

The filter bank employed is perfectly recombining. This means that even though the audio signal is split into 3 bands, the signal ends up exactly as it started when the bands are summed (assuming no compression). Further features are: high resolution, double precision, infinite headroom.

The 3 band compressor is a downward compressor, where material in each band, going over a certain Threshold will be more and more affected by the compressor, as set by the Ratio control.

Makeup gain will compensate for the attenuation introduced by the compression. The makeup gain takes into account the spectral energy distribution of music, such that the makeup gain applied will also reduce spectral discoloration that could result from multi-band compression without makeup gain. If makeup gain is OFF, a similar effect can be achieved manually using the Band gain of the bands.

Parameters include:

- Linkable controls: Threshold, Ratio, Gain, Attack, Release
- Threshold: -60.0 to +10.0 dB
- Ratio: 1.00:1 to Infinity:1
- Gain: -20.0 to +20.0 dB
- Crossover frequency:
 - 40.00 Hz to 5.000 kHz (Low)
 - 80.00 Hz to 10.00 kHz (High)
- Attack: 1.0 to 100 ms
- Release: 10 to 1000 ms
- Makeup gain: on/off
- Solo: on/off
- Gain reduction meters: Range 0.0 to -18.0 dB

12.6 5 Band Compressor, Modern TC style

This is a completely renewed 5-band dynamics algorithm, with a refined dynamic precision behavior and Linear Phase crossover filter design. It is an extension to the TC Electronic multiband dynamics processor history which includes the MD4 algorithm from System 6000.

High-rate calculations provide the extra benefit of very low inter-modulation distortion and precise handling of transient details in the signal. The 5 band compressor is a downward compressor with a per-band sidechain, where material over a certain Threshold will be more and more affected by the compressor, as set by the Ratio control. Use this 5 band compressor for the highest degree of transparency in the dynamics processing.

Makeup gain will compensate for the attenuation introduced by the compression. The makeup gain takes into account the spectral energy distribution of music, such that the makeup gain applied will also reduce spectral discoloration that could result from multi-band compression without makeup gain. If makeup gain is OFF, a similar effect can be achieved manually using the Band gain of the bands.

Further features are high resolution, double precision, infinite headroom.

Parameters include:

- Linkable controls: Threshold, Ratio, Gain, Attack, Release
- Threshold: -60.0 to +10.0 dB
- Ratio: 1.00:1 to Infinity:1
- Gain: -20.0 to +20.0 dB
- Crossover frequency:
- 40.00 Hz to 1.250 kHz (Low)
- 80.00 Hz to 2.500 kHz (Low Mid)
- 160.0 Hz to 5.000 kHz (High Mid)
- 320.0 Hz to 10.00 kHz (High)
- Attack: 1.0 to 100 ms
- Release: 10 to 1000 ms
- Makeup gain: on/off
- Solo: on/off
- Gain reduction meters: Range 0.0 to -18.0 dB

12.7 Stereo Width

The stereo width module affects the stereo balance and width of the track, and the controls are adjustable in the Edit View section. The Side/Mid parameter is intelligently loudness-compensated, and there are no major loudness changes when adjusting the Side/Mid ratio with typical music mixes. The Mid Pan will pan and position only the Mid part of the signal between left and right. The L/R Balance should generally be adjusted if there is a clear imbalance between the left and right channel.

Parameters include:

- Side/Mid Ratio: 0 to 2.0 (0 = mono, 1.0 = original, 2.0 = 6 dB increase in side compared to mid signal)
- Mid Pan: -50% to +50% (pan of Mid signal only)
- LR Balance: -50% to +50%

12.8 Limiter

Two alternative types of Limiter are provided: The conventional Master Limiter, and the novel Loudness Limiter. Both types include the versatile Soft-clipper. Both Limiters are based on the transparent True-Peak BW2 algorithm from TC's System 6000.

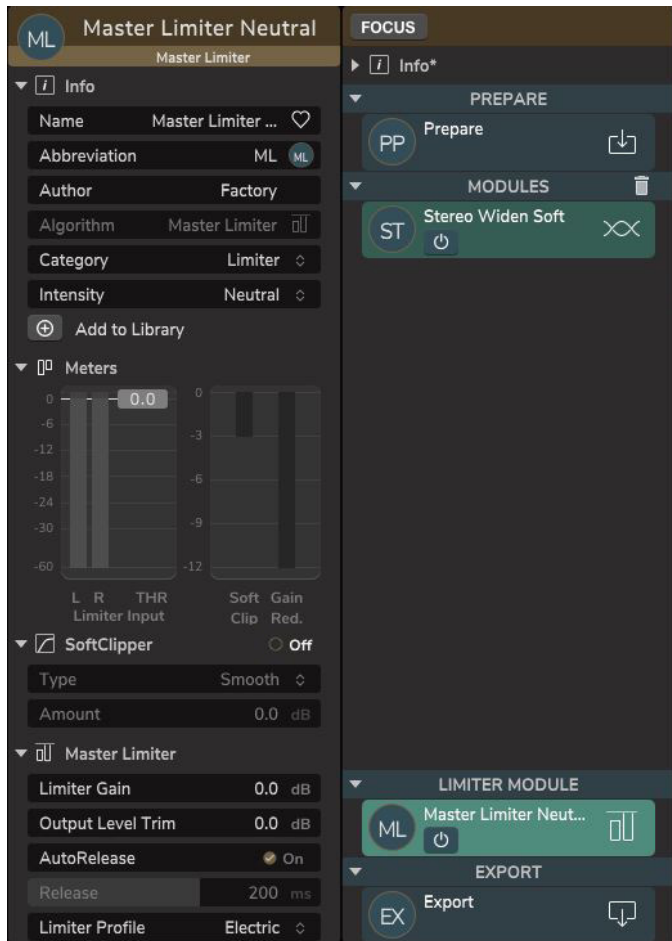
The Master Limiter is a typical approach with input gain to set the amount of limiting, and output gain to set the amount of headroom in the exported file (or 0 dB if no headroom is desired).

The Loudness Limiter is an all-new approach, enabling a workflow suitable for modern streaming services like Spotify, Tidal, and iTunes. Here you set a desired, resulting loudness level, which the Finalizer will automatically aim for, while optimizing tonal balance and dynamics in the mastering process. This innovative feature lets you focus on the sound of your track, and the consequences of different types of processing, while the Loudness Limiter itself automatically applies as much limiting as required to meet the desired loudness level. Thereby the Loudness Limiter leaves as much headroom as possible intact for the transients of your music, which is essential for an open, detailed and punchy sound.

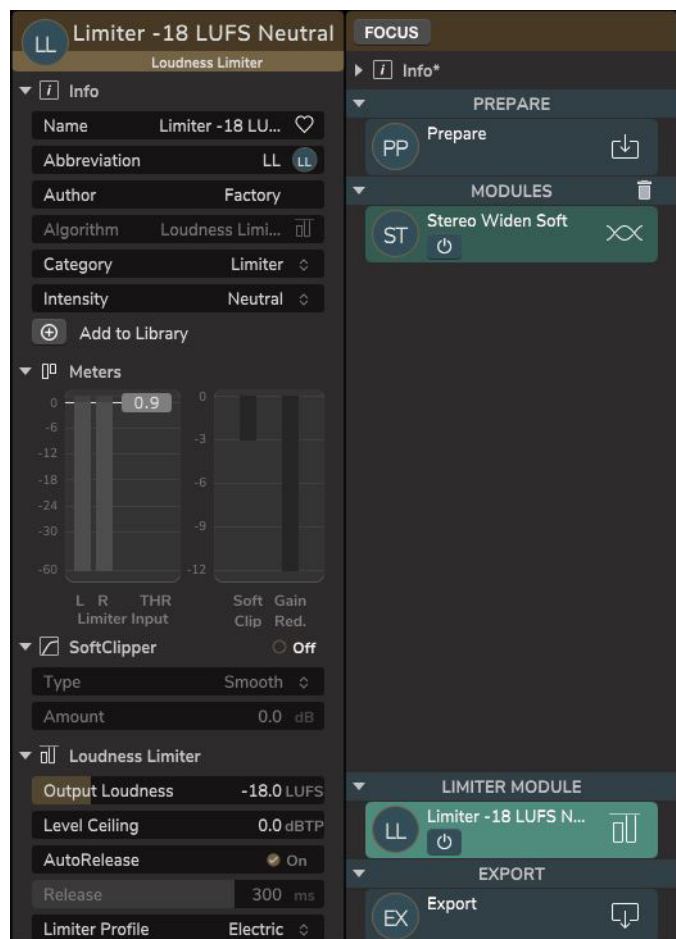
There can be only one Limiter at the end of the processing chain in a project, and the Library includes various Master Limiters and Loudness Limiters to choose from.

Click on the Limiter Module in the Module List View to bring up the details in the Edit View.

The example below shows a Master Limiter Module.



The example below shows a Loudness Limiter Module:



Parameters include:

Softclipper

- On/Off
- Type: Soft, Smooth, Hard
- Amount (the maximum amount based on the full track): 0 to 5.0 dB

Limiter

- Limiter Gain (Master Limiter): 0.0 to +15.0 dB
- Output Loudness (Loudness Limiter): -21.0 to -6.0 LUFS
- Output Level Trim (Master Limiter): -5.0 to 0.0 dB
- Level Ceiling (Loudness Limiter): -5.0 to 0.0 dBTP
- Auto Release: On/Off
- Release time: 20 to 100 ms (applies when Auto Release: Off)
- Limiter Profile: Electric, Acoustic, Classical
- Meters: Limiter Input (-60 to 0 dB, with Threshold), Soft Clip (-3 to 0 dB), Gain Reduction (-12 to 0 dB)

12.8.1 Limiter in Detail

Over the past two decades, as the Loudness Wars have raged, it has become clear the abuse of “loudness maximizers” in mastering can significantly reduce audio quality at the end-listener.

When levels get squashed against the digital ceiling, 0 dBFS, reconstructed intersample peaks in Digital-to-Analog converters and audio file codecs (e.g. MP3 and AAC), may be higher than the level that consumer equipment was designed to handle. We call this level “0 dBFS+”, and often there have been no limiters in music mastering preventing such peaks from happening.

The limiters in the Finalizer are designed:

- 1) to continually measure if your signal is contaminated with 0 dBFS+ peaks
- 2) to remove them

The Finalizer’s combination of the True-Peak and Loudness numerical descriptors – always operating on the full-track signal – provides the best possible support for making optimal decisions of dynamics, head-room and loudness level in your master. As a further aid, the PLR and its corresponding bracket in the Main Meter will provide a tangible indication of how much dynamic compression and limiting you are applying.

The Finalizer cannot prevent destruction of dynamic range from happening at earlier stages in the production process (e.g. at your DAW master bus), but it will detect when this is happening, and issue a warning in the Prepare module.

12.8.2 Precision in Level and Time

The Finalizer limiter operates with extended precision in both level (infinite headroom) and time (5 times oversampling). The Finalizer PPM level meters and descriptors are upsampled in order to identify intersample and 0 dBFS+ peaks on Source track (A), as well as Processed track (B). Therefore, the meter scales are extended to +3 dBFS because excessive level normally falls between 0 and +3 dBFS, and most consumer equipment already exhibits distortion at +0.5 dBFS. When the limiter is turned off, the Finalizer does not protect against 0 dBFS+ peaks from occurring.

When monitoring and listening one final time to the processing of your track, before Export, make sure that:

1. Loudness Compensation is OFF (in Monitor)
2. Unity Gain is enabled (in Monitor), unless you have setup a calibrated Reference Level.
3. Compare is set to “B”, i.e. the processed output
4. Focus Mode is disabled (i.e. the entire processing chain is active).

12.8.3 Soft Clip

Soft Clip is a bandwidth limited distortion effect, not unlike analog tape saturation. Soft Clipping can add loudness to a signal at the price of distortion. You may want to trade a bit of the limiter’s dynamic gain reduction for a bit of soft clipping (which is instantaneous).

The Soft Clipper Amount will intelligently set the threshold of the Soft Clipper, corresponding to the selected Soft Clip Type, so you directly define the maximum amount of soft clipping (in dB) across the full track. This approach prevents any nasty surprises, such as an unexpected high amount of clipping in the last chorus - because it happened to be a little louder.

12.8.4 Operational Hints

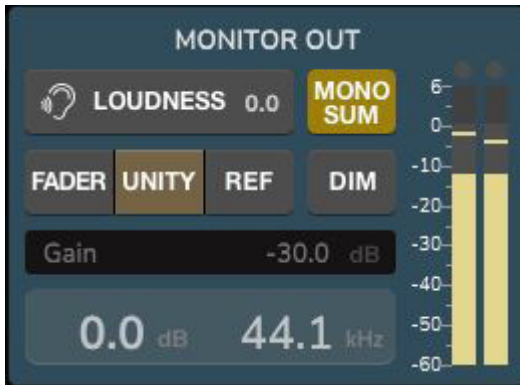
- Master Limiter: Normal operating procedures involve first setting the Limiter Gain in order to reach the desired Output level.
- Loudness Limiter: Set the output Loudness Level and let the Finalizer automatically set the limiter threshold.

Use the Gain Reduction meters in the Limiter Edit View, and your ears, as guidelines to when it is time to stop adding more Limiter Gain, or if the Output Loudness level is maybe set too high. For not-previously limited or -compressed signals, as a rule of thumb, be careful if exceeding 8 dB of gain reduction, if not for artistic reasons. If the signal is already dynamic range compressed, less drastic limiting treatment is indicated.

We recommend fine-tuning the limiter parameters, in combination with parameters of any dynamic compressor earlier in the module chain. Experiment with different Release times, Limiter Profiles and Soft Clip settings to find the type that best compliments the material. When used in combination with the Dynamic Limiter, Soft Clip can produce a louder and denser impression than the dynamic limiter by itself. If mis-used, excessive Soft Clip may lead to an ear-fatiguing sound.

13. Monitor Output

The Monitor Output is different from the audio track Export and Master Meter, in that it features different monitor-only options like a monitor output fader, Dim, Mono Sum, plus the important Loudness Compensation. Audition functionality, such as soloing a band in the multiband compressors, is also only routed to the Monitor Output.



13.1 Monitoring with Loudness Compensation

The only good way to get solid and consistent mastering results is to judge spectral and dynamical differences at an equal loudness level. Otherwise we may initially be drawn to prefer the loudest, which is one of the issues underlying the Loudness War and a route taken only with great caution.

The Loudness button in the Monitor section will automatically make everything (A, B, REF) equally loud and identical to the Prepared Normalization Level while playing back without the need to adjust a lot of gains. The background analysis calculates the correct compensation gains.

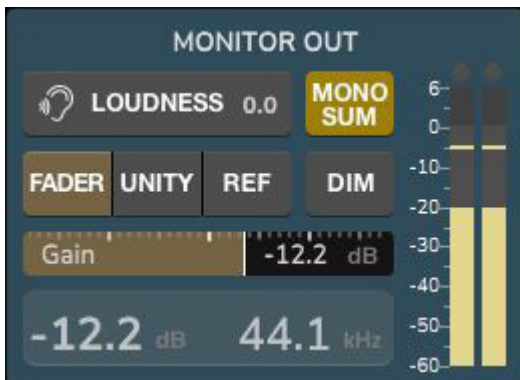
Note that the Loudness compensation only applies to the monitor signal – and the meters and SDC view etc. The Loudness compensation will never affect the processing that is exported to file. Also note that the AVG view is always loudness compensated and is not affected by the Loudness button in the Monitor section.

When you are at the final stage of mastering where you need to compare at the actual and intended output level, you should disable the Loudness Compensation. Now the Reference files have the original loudness level, and the project audio file output level can be defined using the Limiter gain or loudness parameters.

Tip:

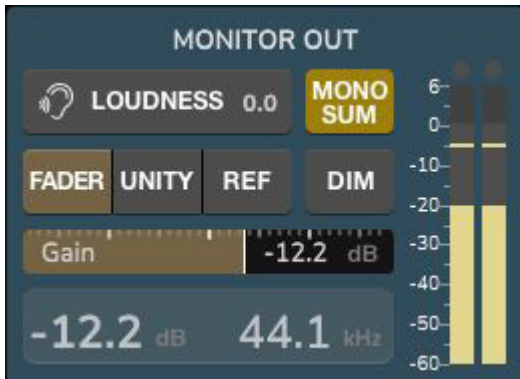
- Calibrated monitoring levels: Using constant and calibrated monitor controller volume settings, will complement the Loudness Compensation, in the strive to do consistent evaluation of your work, based on a constant monitoring Sound Pressure Level.
- The current setting of Loudness Compensation, Mono Sum and so on, in the Monitor Section will never affect what is printed to file with the Export Module.

The example below shows a typical Monitor Output display:

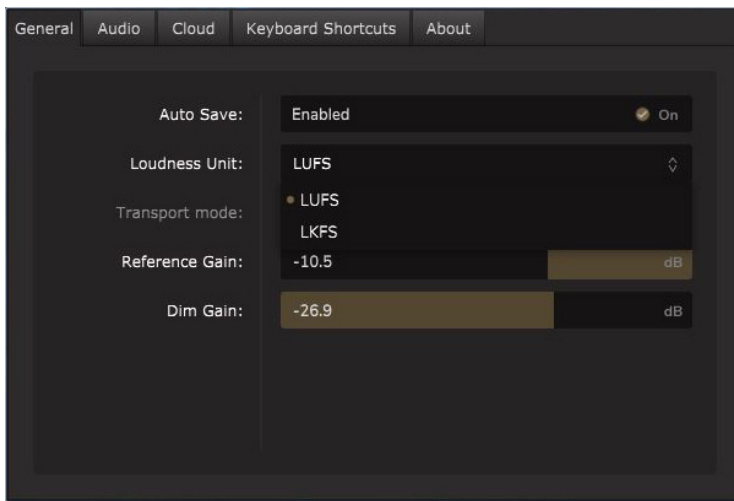


- Loudness Compensation: When activated, all audio including A, B and REF files, are loudness-normalized to the Prepare Module Normalize Level. This is essential for judging all changes made, without the need for fine tuning a lot of gain parameters.
- Mono Sum: will make a mono version of the signal with the same level as its stereo version.

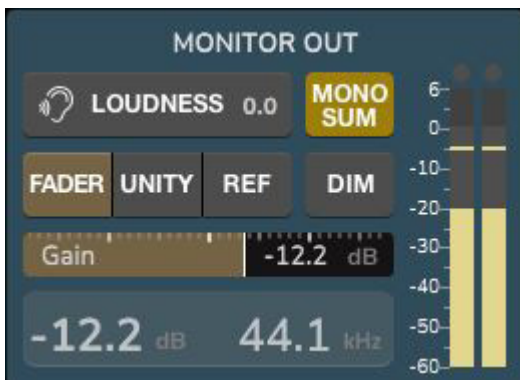
- **Fader:** will enable the monitor output fader parameter if, for example, there is limited access to the monitor volume control. The fader is accessed by clicking and dragging in the horizontal rectangle directly below. The horizontal fader bar and dB value will change as you drag.



- **Unity:** will disable the monitor output fader and make it bit transparent for high quality calibrated monitoring.
- **REF:** will make use of the Reference Gain in the Preferences/General Menu. The Reference Gain may be used for calibrating the monitoring level, if such a parameter is not available in the monitor output chain.
- **DIM:** will turn down the monitor output level by the Dim Gain amount set in the Preferences/General Menu (see below).



- The Gain dB readout at the bottom left of the Monitor Output display shows the current output gain applied, which is a combination of the Loudness Compensation gain, Output Fader gain, REF level and DIM setting.



- The Sample Rate readout shows the project sample rate, which is defined in the Prepare module.
- The PPM meter for the monitor output shows the signal sent to your monitor path. Most of the time it will show signal identical to the Finalizer Master meter but while you work, the Limiter may temporarily be bypassed and output signal may cross 0 dBFS. This is why the scale goes to +6 dB. Above the meter there is a sticky Peak lamp indicating that 0 dBFS has been exceeded. It may be reset by clicking on it.

Note: Should you experience temporary clipping in the monitor output path, you can reduce this using the Monitor output Fader. If you experience multiple or nearly continuous clipping in the monitor path, you may consider lowering the Normalize Level in the Prepare module and this way reserve more margin in the monitor path while you work.

14. Master Meter

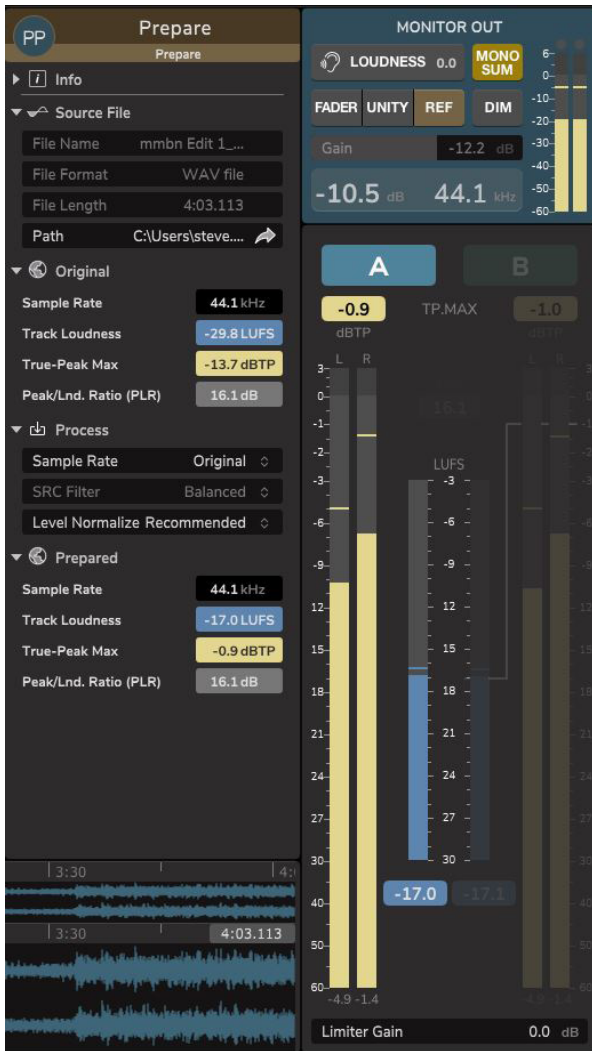
The master meter section includes a combination of real-time metering as well as constantly updated full track measurements.

The B meter *always* reflects what goes into the Output File and not what goes to your monitors, which could be affected by audition settings, for example Band Solo in multiband compressors.

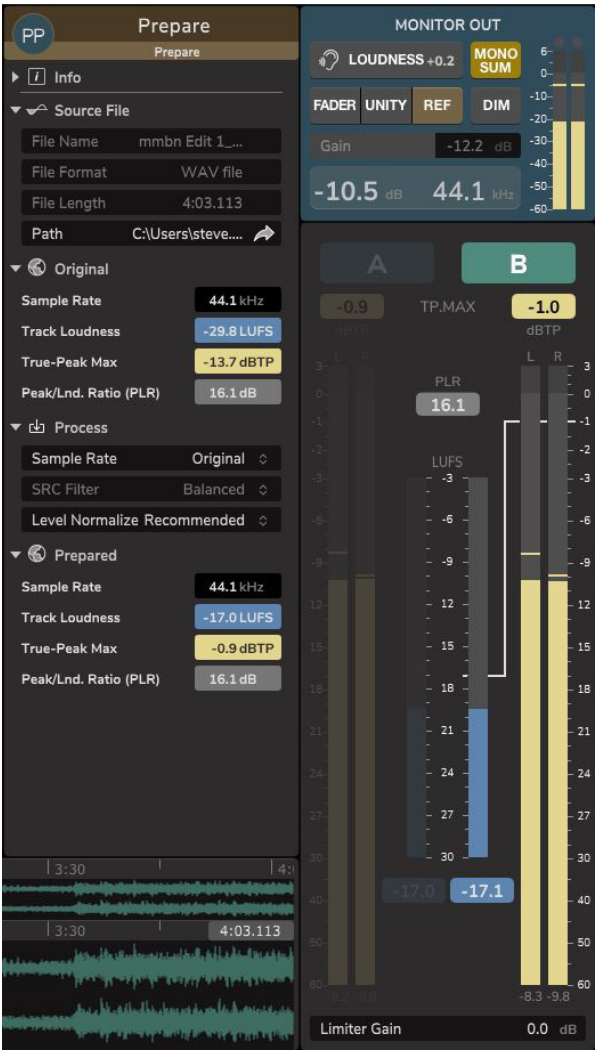
- Real-time True-Peak PPM meters, with high resolution near the top, for A (source), and B (processed file) or REF files. They include peak-hold lines and readouts.
- Real-time Short-term Loudness meters for A (source) and B (processed file or REF files). They include peak-hold lines and readouts.
- The boxes show the constantly updated full track signal descriptors: Track Loudness, True-Peak Max and PLR (Peak-to-Loudness ratio). The PLR is reflected by a white clamp as well.
- At the bottom there is a shortcut to either the Limiter Gain parameter or the output Loudness value, depending on which Limiter type is used. When in REF Compare mode the shortcut will be the selected track's REF Track Trim gain adjustment. This adjustment will be disabled if Loudness is enabled in the Monitor section.

The example below shows a typical A (source file) meter display of two PPM meters in yellow, and the Loudness meter in blue, next to the Prepare Edit View for comparison:

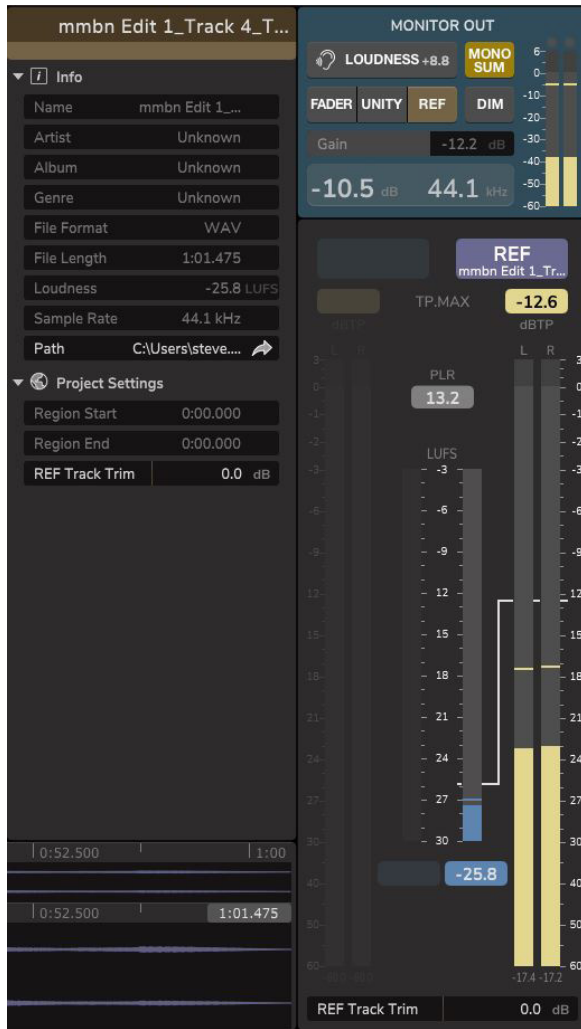
Note that the Prepared Track Loudness value and True-Peak Maximum are shown in the meter display as well as the Prepare EDIT View.



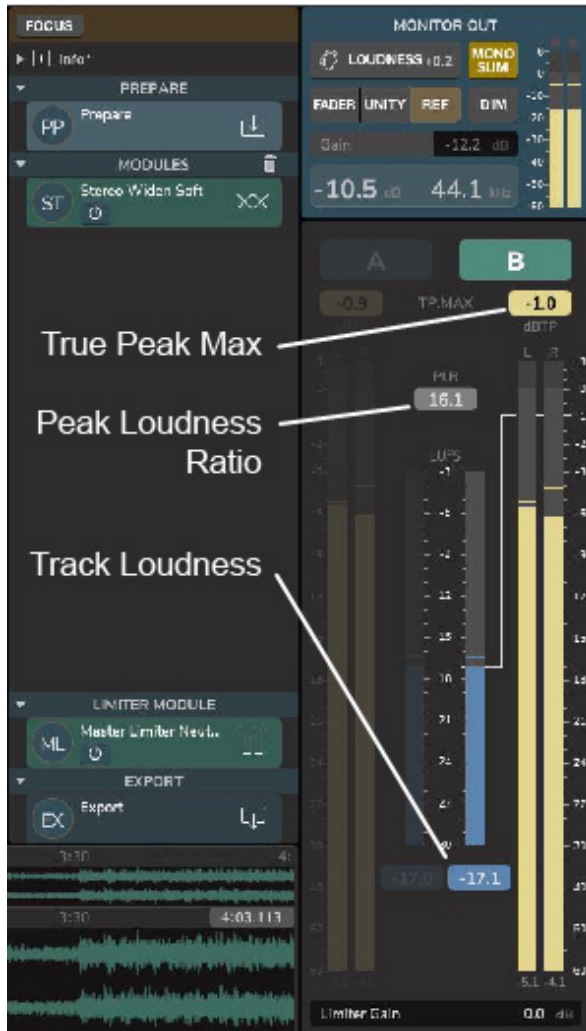
The example below shows a typical B (processed file) meter display, and the Prepare Edit View:



The example below shows a typical REF meter display:



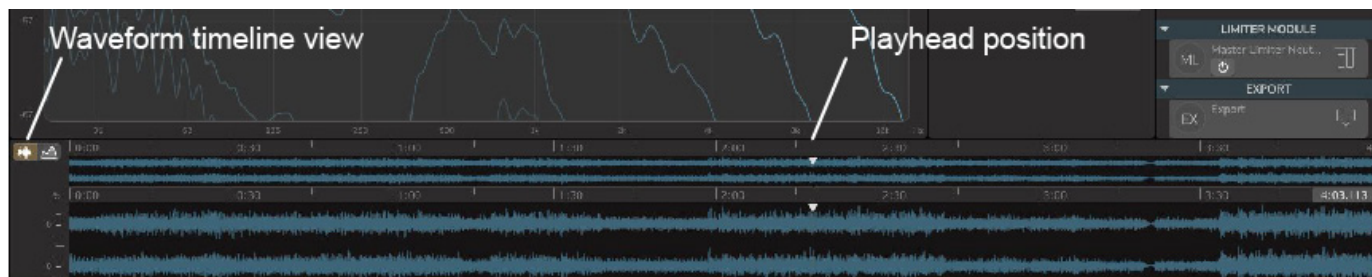
The example below identifies the boxes that show the full-track True-Peak Max, PLR (Peak-to-Loudness ratio), and Track Loudness descriptors. Note the white clamp reflecting the PLR value.



15. Timeline

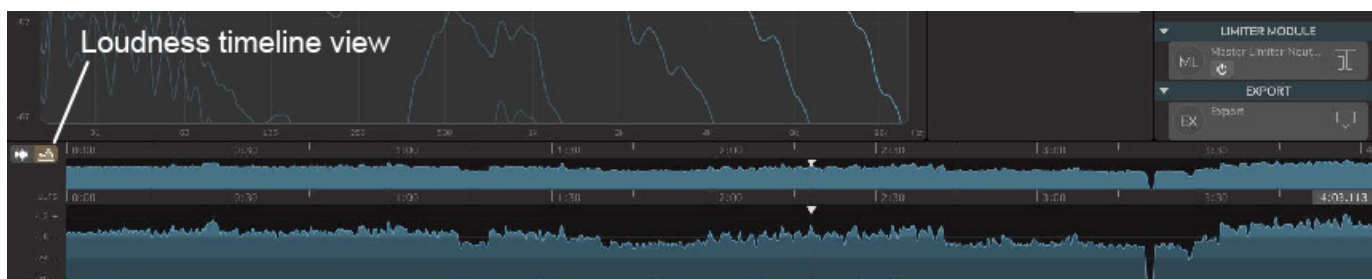
The timeline can show either a standard stereo sample-peak waveform, or a fast Loudness Envelope view. Two buttons next to the timeline allow you to select which timeline to show.

This example below is a typical initial Waveform Timeline view

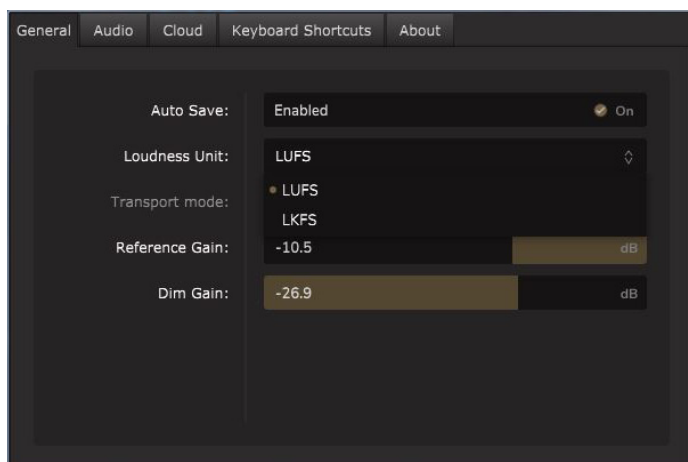


- The Y-axis is in dBFS
- The X-axis is the track time, in minutes, seconds (milliseconds)
- The top timeline pair has a different vertical scale than the lower pair, and is used for setting the region (see next section below for more details). Click and drag in the top pair, and the Region bounding box will appear.
- Click anywhere on the timeline, and the playhead position will move to that point.

This example below is a typical initial Loudness Envelope Time view



- The Y-axis is in LUFS or LKFS (depending on the Preferences setting).
- The X-axis is the track time in minutes, seconds (milliseconds)
- The top loudness envelope has a different vertical scale than the lower envelope.
- The Preferences/General menu allows selection of the Loudness units, either LUFS or LKFS:



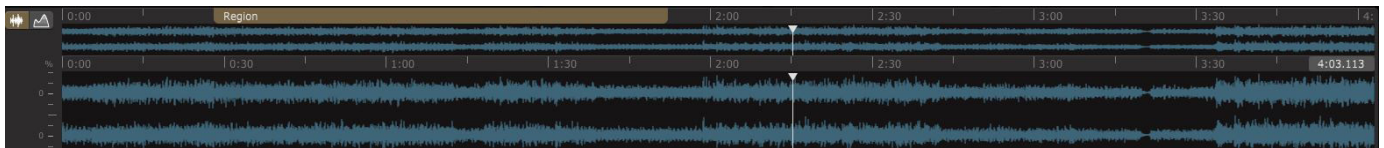
15.1 Timeline Regions

To allow certain sections of the track to be evaluated, instead of the full track, the Finalizer allows you to set up a region of the full track. There is one region covering A and B mode. The SPECTRO LAB measurements will be calculated for the selected region only. This way you may examine a specific region spectrally and dynamically very closely and that may be complementing the two real time RTS meters (peak and RMS) very well.

Click and drag in the upper timeline view, and the Region window will appear.



- The lower timeline will change its horizontal scale to match the start and stop time of the new region. This enables better viewing of the waveform.
- The region's start and stop times can be adjusted either by moving its left and right edges, or by moving the left and right markers in the lower waveform for finer tuning.
- The complete region can also be moved by dragging the region's top horizontal bar left or right.
- Regions for REF files can be set separately from the A/B-region, and different REF files can have different regions.
- To quickly switch from the region back to the full track time, click anywhere in the upper timeline waveform that is outside of the region. Click on the region top bar to return to the region.
- Note that a region cannot be shorter than 1 second.



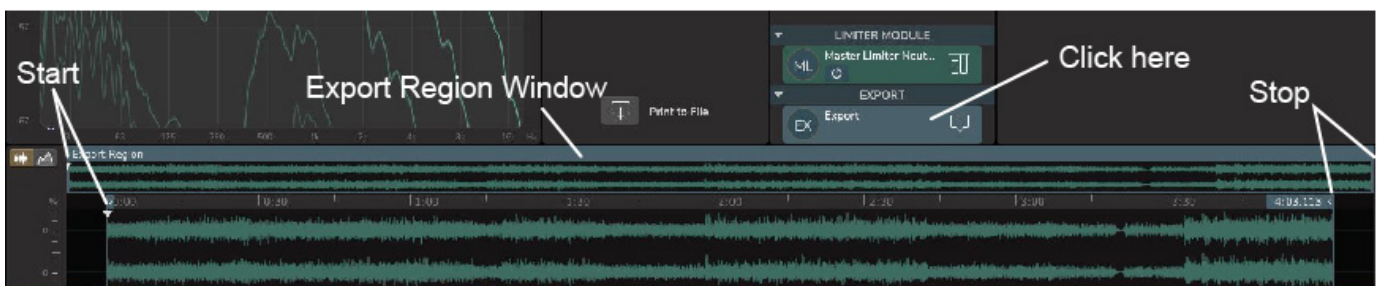
Tip:

- The precision in setting a region may be easier using the waveform view, rather than the loudness view.
- Observe how the SPECTRO LAB curves change as you focus on different time regions of the track.

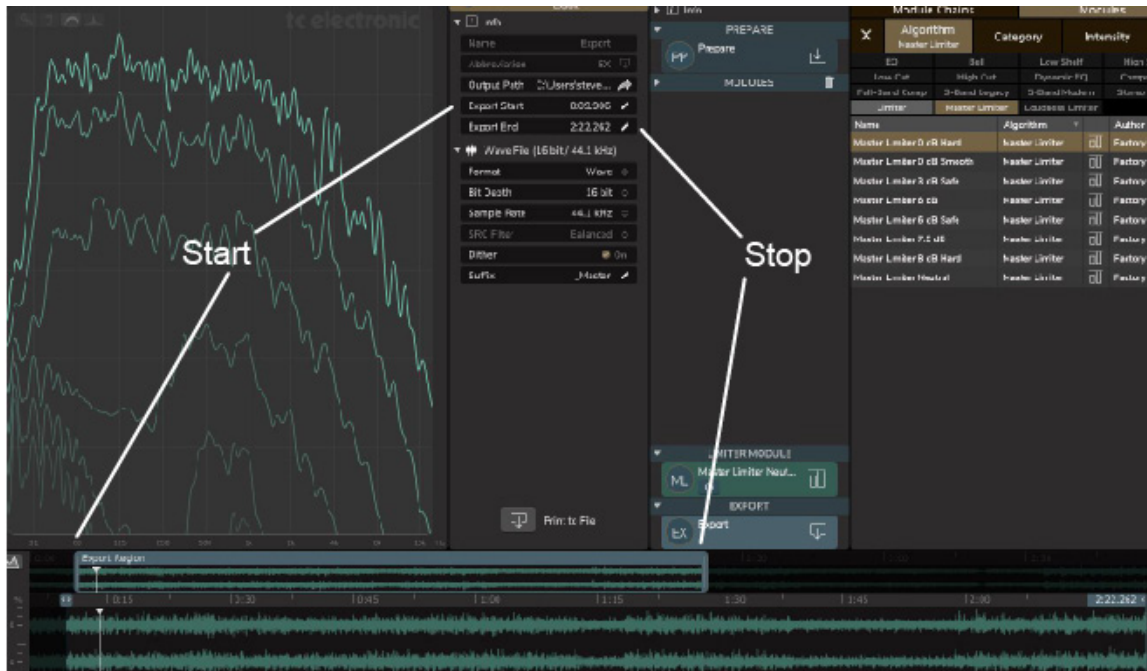
15.2 Export Region

There is a separate Region for setting start and stop times when exporting the mastered track. This region can be set as follows:

- Click on the Export Module at the bottom of the Modules List View.
- The waveform or Loudness timeline will be shown as before, with the upper display showing the "Export Region."



- The operation of the Export Region is the same as the previously-mentioned Region.
- When a file is exported, then it will only export the track between the selected start and stop times.
- The Export Edit View shows details of the Export module including the start and stop times, and you will see the numeric values change as the start and stop markers are moved.
- Start and stop times can be edited numerically also. This may be useful when precision is needed.



16. Reference Tracks

The REF button in the COMPARE section at the top right of the display allows a quick comparison of the current work, compared to your favourite reference tracks. REF tracks will be shown in the SPECTRO LAB views (SDC, RTS and AVG) in the same way as your source (A) and processed (B) file.

Up to 20 Reference tracks can be loaded into a list and used to quickly compare your work.

Note that although a copy of the original audio source file may be included when saving a project, only the links to any reference files are saved, not their original files. Also note that a reference track cannot be loaded until a source track has been loaded and defining project sample rate etc.

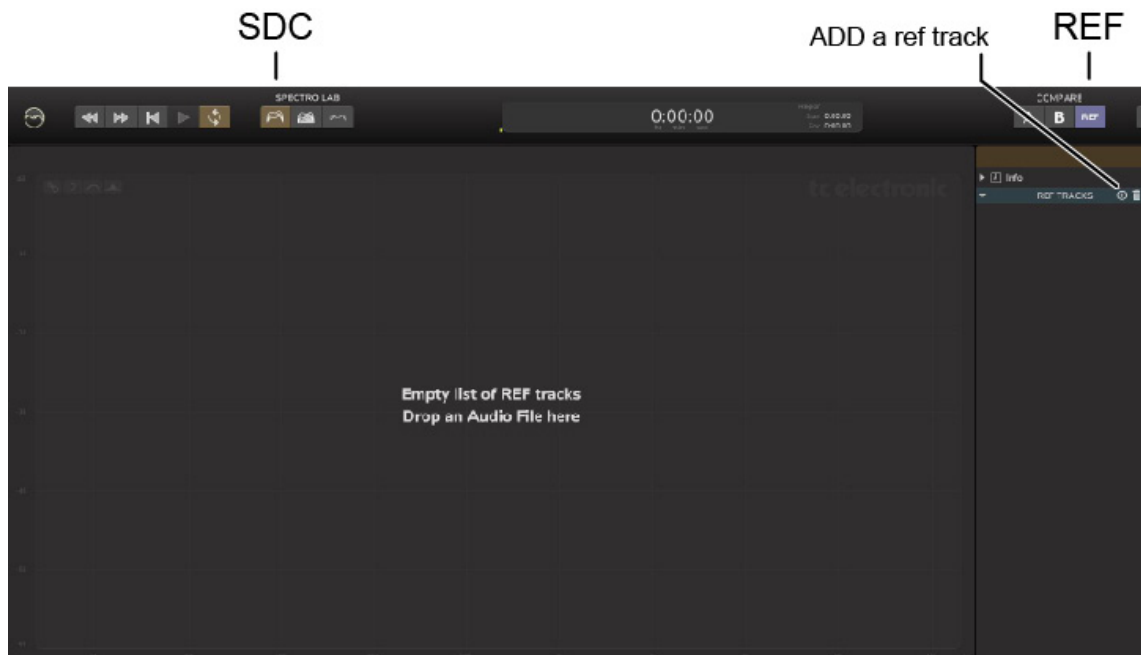


The Compare section is where to select which track/source to playback, and this is also reflected in the SPECTRO LAB, Timeline and Master Meter section. The three buttons make it very easy to switch back and forth between the sources for comparison.

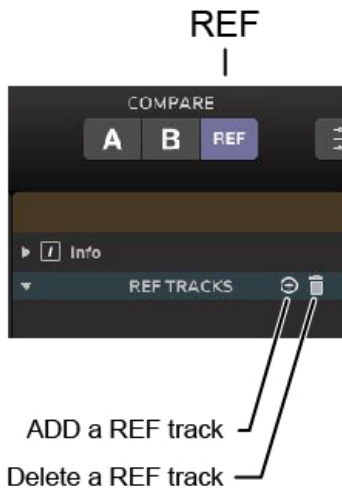
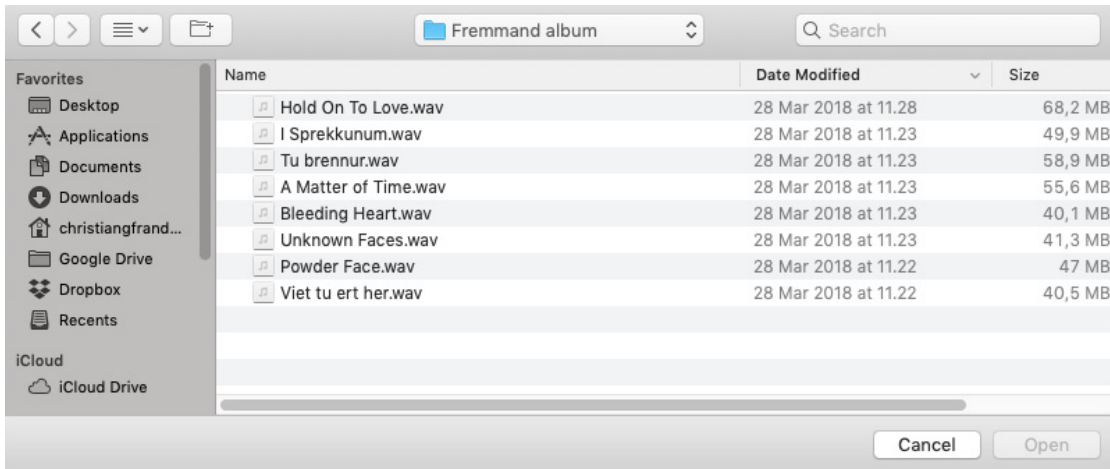
Note that each of these modes has a different colour button, and this corresponds to the colour of the curves in the SDC, RTS, and AVG displays, and in the horizontal timeline display.

16.1 Using REF

- The first time REF is used, the display will show that the list of reference tracks is empty.

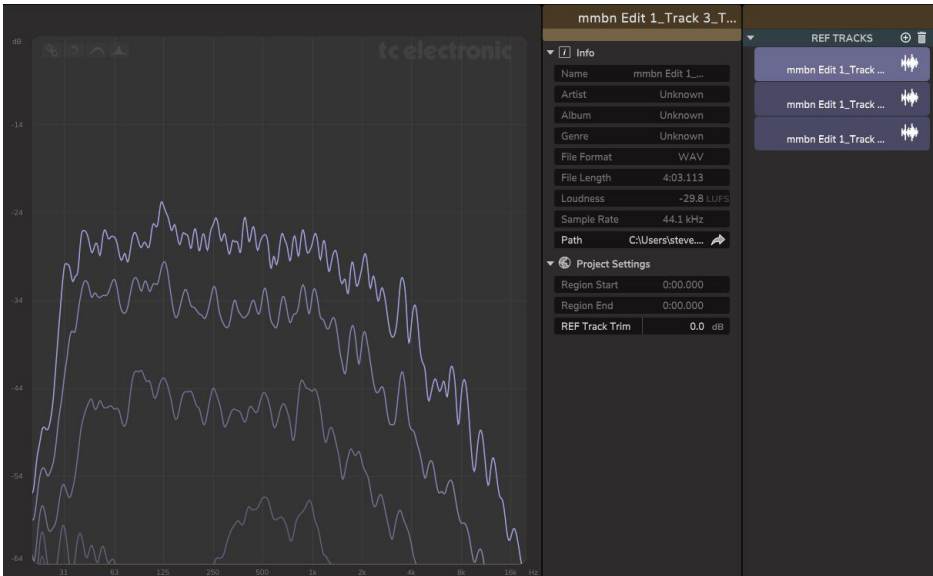


- Reference tracks can be added either by drag and dropping them into the SPECTRO LAB area, or by pressing the “+” in the REF TRACKS area to the right of the display.
- As you add reference tracks, they will appear in the REF TRACKS list.
- Tracks can also be deleted from the list by selecting the trash can icon next to the “+” button or by pressing “Backspace” or “Delete”.
- If you are adding the tracks using the “+” then you will be prompted to browse for the file on your computer. The following is an example of the display that appears. Once selected, the reference file will appear in the REF TRACKS list.

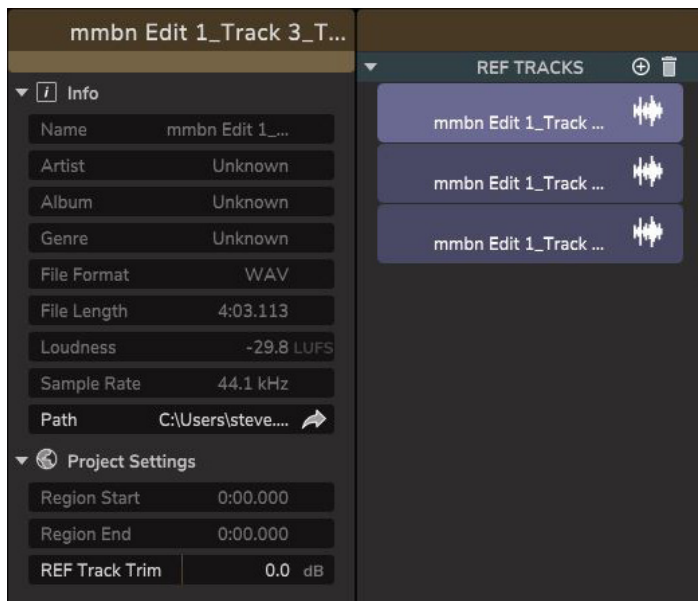


- If several REF tracks have been added, select the track by clicking in the REF TRACKS list, and its name in the list will be highlighted, and the track will appear in the SPECTRO LAB display.

- The current reference track's parameters will appear in the EDIT View. An example of this is shown below:



16.2 EDIT View



The Parameters in the EDIT View of a Reference Track are as follows:

Info

- Name (filename) of reference track
- Artist
- Album
- Genre
- File Format
- File Length
- Loudness
- Sample Rate
- File path
- Note that you can click on the arrow at the right, to enter a new browse window to search for a new ref track and load it in place of the current one

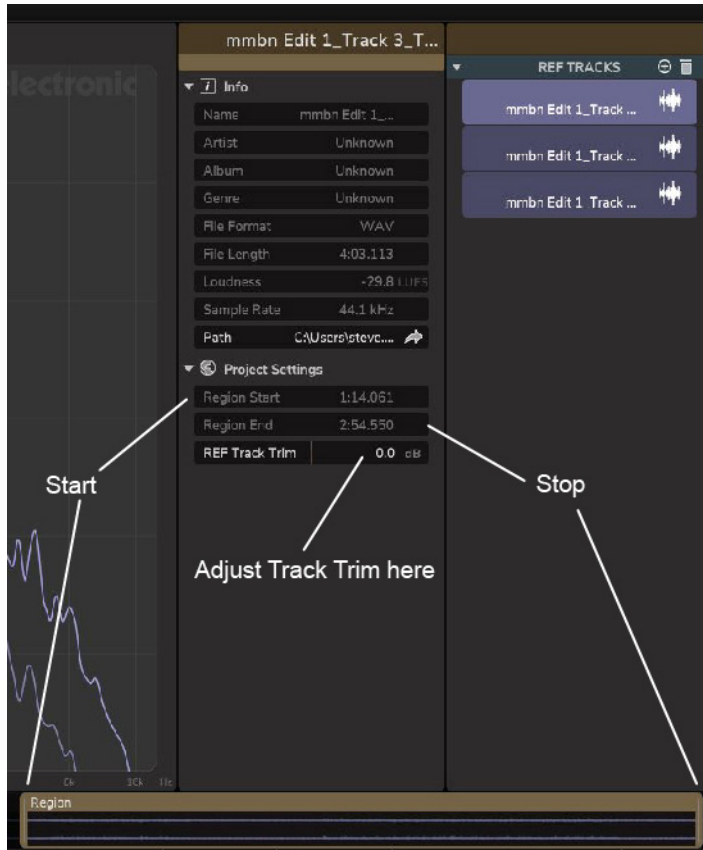
Project Settings

- Region Start (if a region has been set, see below)
- Region Stop (if a region has been set, see below)
- Reference Track Trim

16.3 Regions in Reference Tracks

If you are working on the chorus in the source track and want to compare it to a chorus in the reference file only, it is very useful to set a region in the reference track that can be played back looping.

- The selection or creation of a region for a reference track is done in the same way as the A/B track: click and drag in the top section of the Timeline Display.
- The region start and stop times will then be shown in the Project Settings area as mentioned above, and these times will vary if you adjust the times by dragging the left or right of the region in the timeline display.
- Note that each of the reference tracks can have a different region.



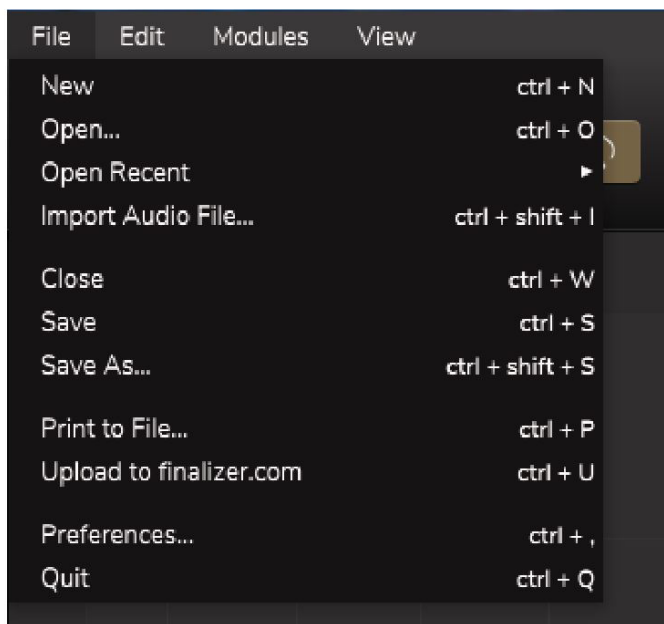
16.4 Reference Track Trim

The manual REF Track Trim gain can be used to compare your work against a reference track at equal perceived level. The reference track can also be aligned automatically with your file by enabling Loudness in the Monitor section.

- Each reference track can be adjusted in level from -10.0 dB to $+10.0$ dB, using the REF Track Trim area of the Project Settings menu.
- The Trim is only available when the Loudness Compensation is turned off in the Monitor Output section.
- Note that each of the reference tracks can have a different trim level.
- The Trim for the selected REF track can also be adjusted using the trim area at the bottom of the Main REF Meter display. (There is just one trim, but it can be adjusted from two areas for convenience.)

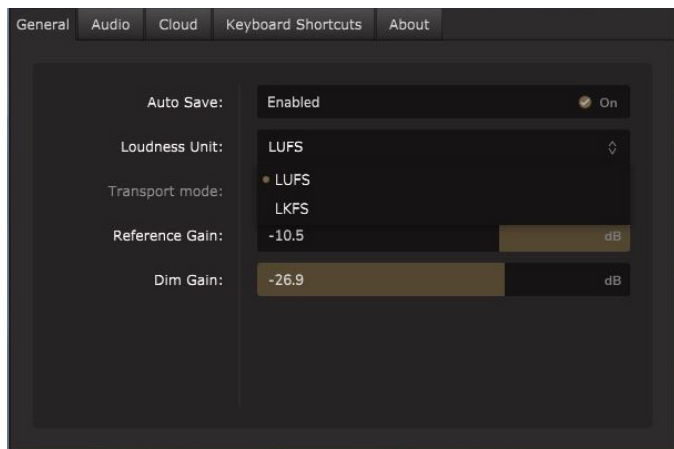
17. Preferences Menu

Click on File in the top left corner of the display to view the File drop-down menu. This allows projects to be created, opened, closed, saved, and audio files imported, and preferences to be edited.



Click on Preferences to open the Preferences menu. It has five tabs along the top that lead to other menu pages : General, Audio, Cloud, Keyboard Shortcuts, and About.

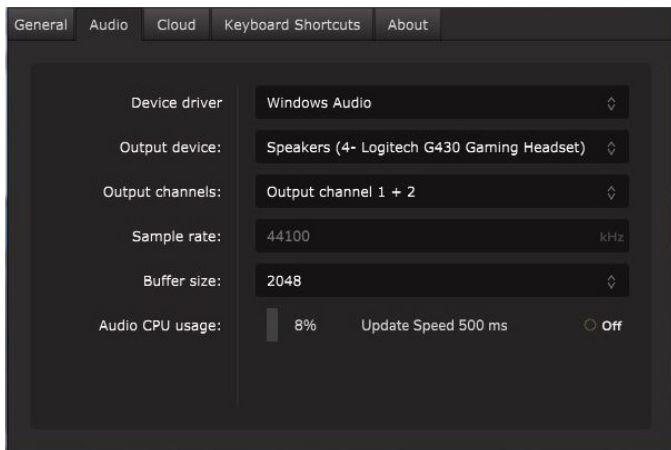
17.1 General Page:



The General Page Parameters include:

- Auto Save: On/Off
- Loudness Units: LUFS or LKFS
- Transport Mode: "Logic transport method" is currently available.
- Reference Gain: Click and drag in this area to adjust the GAIN used in the Monitor Output area. The range is 0.0 to −30.0 dB. It can be used to enable calibrated listening levels in your studio if such a gain is not available in your monitor chain.
- Dim Gain: Click and drag in this area to adjust the amount the output is reduced when DIM is selected in the Monitor Output area. The range is −10.0 to −60.0 dB

17.2 Audio Page:

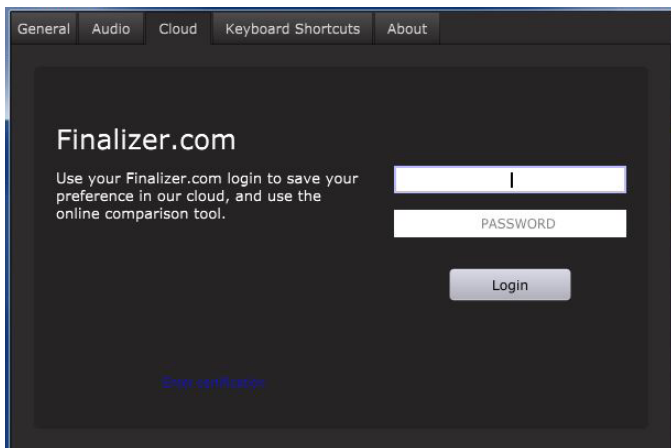


The Audio Page Parameters include:

- Device Driver: CoreAudio, ASIO, Windows Driver
- Output Device: select the available output device
- Output Channels: select the available output channels
- Sample Rate: Original. The sample rate is defined by the Finalizer project and is set in the Prepare module.
- Buffer Size: 256 to 2048. If you experience audio drop-outs during playback, try setting a higher buffer size to relax the constraints on the computer system.
- Audio CPU Usage: Percentage, On/Off

17.3 Cloud Page:

- When you are logged in to your Finalizer.com account, your processed audio file, when you press the Upload button in the top bar, will automatically be encrypted and securely uploaded to the Finalizer Analyzer on www.finalizer.com/analyzer for dynamic and spectral comparison against relevant music genres or streaming services such as iTunes, and Spotify plus Billboard Top 20.
- When logged in, Author will be set to your name on your saved module presets in the Finalizer application.



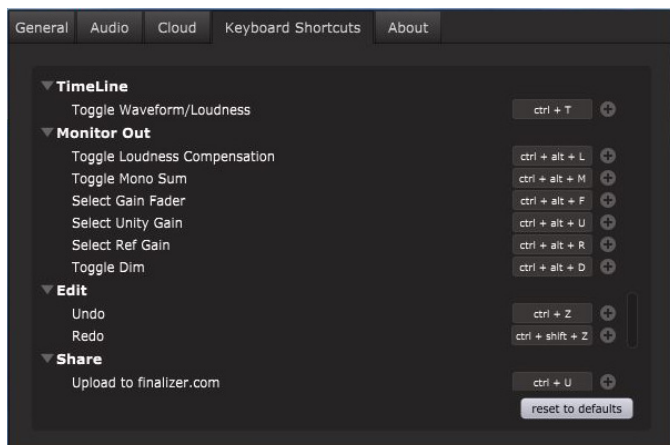
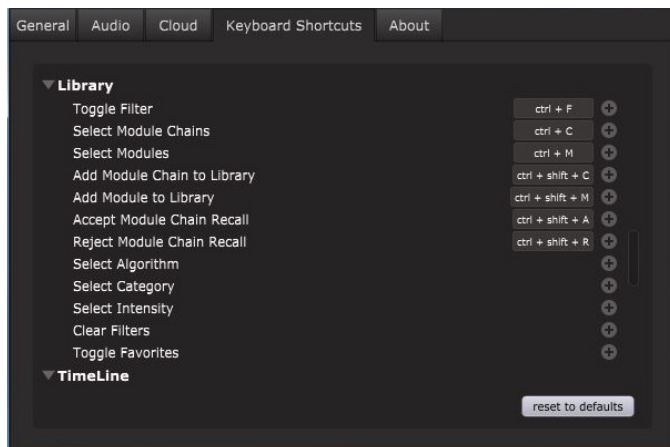
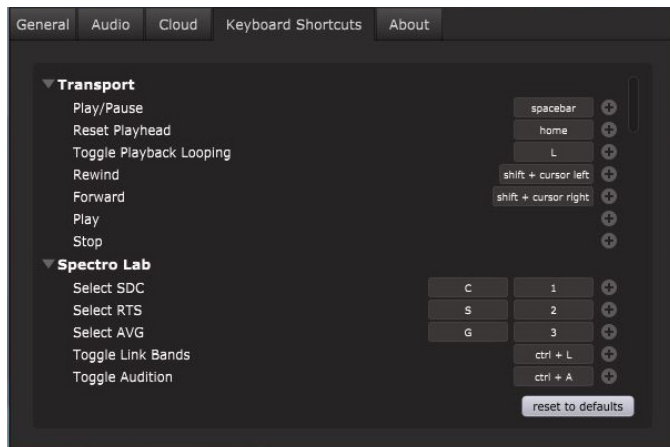
The Cloud Page Parameters include:

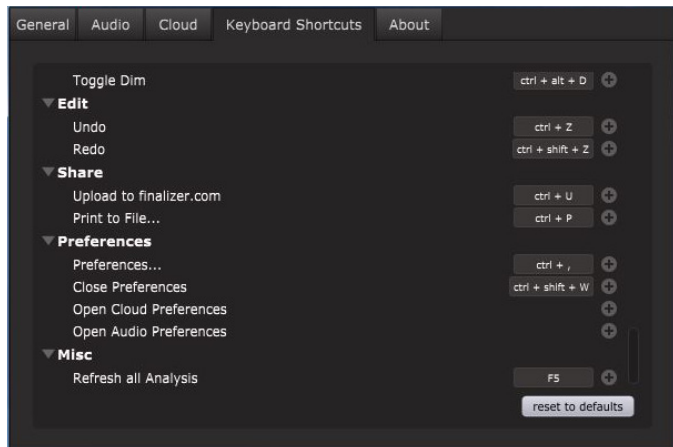
- Enter User Name
- Enter Password

17.4 Keyboard Shortcuts Page:

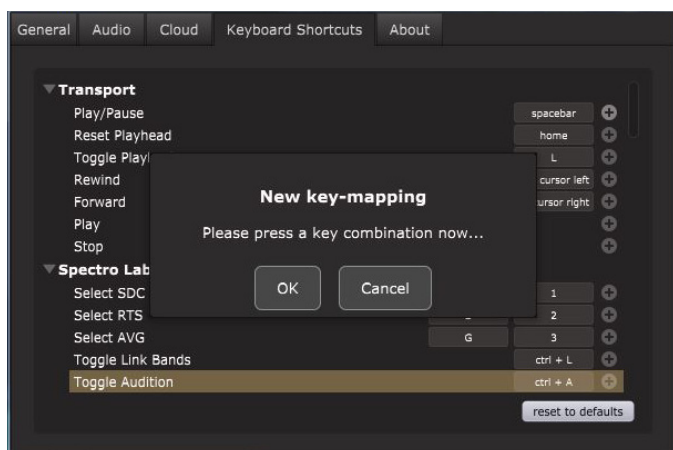
- This page allows you to view all the existing keyboard shortcuts, and to change them and add new ones as required, to fully customize your working environment.
- Use the vertical scroll bar at the right side to scroll down through the list of available short cuts.
- Click on an existing shortcut in the right column, for example “spacebar,” and you will be able to change it to something else, or remove it.
- Click on the “+” and you will be able to add a new shortcut.

The available keyboard shortcuts are shown below:





If you click on a “+” in the right column, then you can press a key or a combination to create a new shortcut of the parameter in the left column. Press OK to confirm the new shortcut.



17.5 About Page:



The About pages shows the following:

- The version number of the currently-loaded software.
- A red warning icon will appear if a new version of the software is available. (This red warning also appears next to the Finalizer Logo in the top left corner of the main display.)
- The version number of the latest available software.
- A list of items that are new in the latest version will be shown.
- Get the Update: click here to download the new version.
- Auto check for updates: The automatic checking for new versions of the software can be enabled, or disabled.

18. Project and Audio files

The Finalizer application is associated with 3 main file types: Source audio file, export audio file and Finalizer project file. These are characterized by the following:

Source audio file

Input File Type: WAV, AIFF, MP3, M4A/AAC, FLAC

Input File Format: 16, 24 bit fixed-point, 32 bit floating-point, 2 channels (stereo)

Input Sample Rates: 32, 44.1, 48, 88.2, 96, 176.4, 192 kHz

Input File Length Max: 12 hours

Export audio file

Export File Type: WAV, AIFF

Export File Format: 16 bit, 24 bit, fixed point, 2 channels (stereo)

Export Sample Rates: 44.1, 48, 96, 192 kHz

Project file

File type: .final

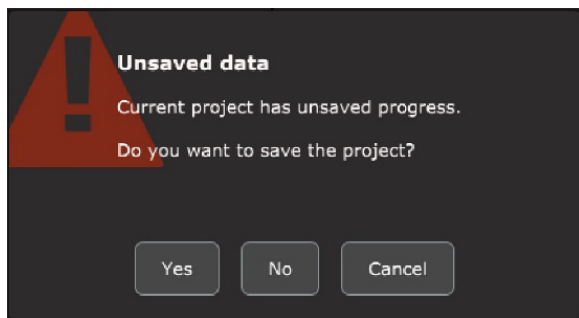
The project file includes:

A copy of the source audio file may be saved in the project file. See options below.

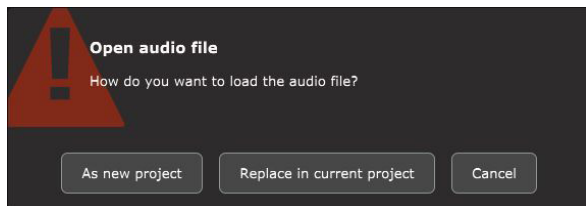
Links to reference audio files

All project, processing and region settings

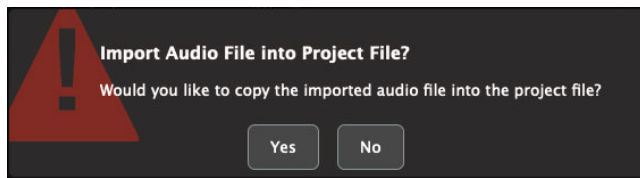
Note: An “Unsaved data” reminder is displayed if a current project has not been saved, before you can open another project. Caution: If not saved, then any unsaved changes will be lost.



A similar warning appears before a new audio file can be loaded:

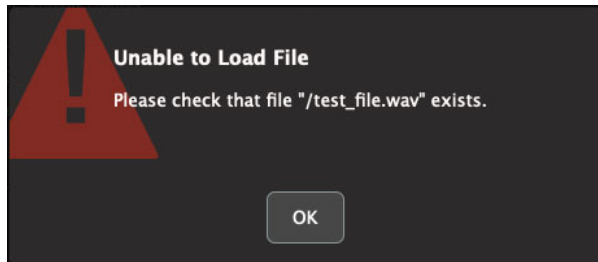


Note: When importing an audio source file into the Finalizer you will be asked if you want to copy the audio source file into the Finalizer project file. If you answer no, the Finalizer project file will point to the audio source file and you should be careful not moving this file from its location unintentionally.



If you export a new version of your mix audio file from your DAW and overwrite the Finalizer audio source file, it will not automatically be reimported into the Finalizer project while the application is running. You will have to reopen the project or restart the Finalizer application.

The following message will be shown if the audio source file used in the project is missing:



19. Specifications

Input File Type:	WAV, AIFF, MP3, M4A/AAC, FLAC
Input File Format:	16, 24 bit fixed-point, 32 bit floating-point, 2 channels (stereo)
Input Sample Rates:	32, 44.1, 48, 88.2, 96, 176.4, 192 kHz
Export File Type:	WAV, AIFF
Export File Format:	16 bit, 24 bit, fixed point, 2 channels (stereo)
Export Sample Rates:	44.1, 48, 96, 192 kHz
Export Dither:	16, 24 bit, Off. TPDF (Triangular Probability Distribution Function)
Sample Rate Conversion:	High-Quality linear phase FIR resampling (Steep, Short, Balanced filter designs) Applies optionally to: Source, Export and Reference files
Processing Sample Rates:	44.1, 48 kHz
Processing Engine:	Double-precision floating point, 64 bit
SPECTRO LAB:	SDC: 1/6 octave filter-bank, Constant-Q, Optimal time/frequency design RTS: 1/6 octave filter-bank, Constant-Q, Real-Time Analyzer with Peak and RMS level AVG: Average Energy, Constant-Q filter bank, Spectral oversampling design
Peak Program Meter:	IEC 60286 compliant, ITU-R BS.1770-4 True-Peak compliant
Loudness Meter:	ITU-R BS.1770-4 Loudness compliant
Patent pending: Spectral Dynamic Contours	

System Requirements

Mac (64 bit)

Minimal: Intel Core 2 Duo, 4 GB of RAM (4 CPU cores, 8 GB recommended)

MacOS 10.12 (Sierra) or later.

CoreAudio compatible sound card.

Windows (64 bit)

Minimal: Intel Core 2 Duo or AMD Athlon 64 X2, 4 GB of RAM (4 CPU cores, 8 GB recommended)

Windows 7, or Windows 10.

Windows Audio and ASIO compatible sound card.

