EC24 SEPIA

4 Stage Series Dynamics Module
User Manual

Revision 1.2
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Welcome

On behalf of Langstrath Audio, thank you for your purchase of this EC24 SEPIA.
We hope you find it as versatile and powerful as we have designed, developed and tested it to be.

Tom
Although Langstrath is a relatively new company the design specification for the EC24 has been in evolution throughout many years of touring both as a FOH engineer and FOH tech.
It could so easily have remained a daydream floating around in my head if it hadn't been for a chance encounter with my co-founder in our local pub.
I would also like to thank all the sound engineers and artists I have had the privilege of working with, learning from, and being inspired by over the last thirty years.
I considered trying to name everyone but it would be an impossible task and inevitably I would miss someone so I will leave it as just saying thank you, you know who you are.

Barry
I've been interested in, and experimented with, electronics since before I started school.
Some of my earliest electronic projects were audio, including supporting amateur concerts with simple mixers and amplifiers.
While my professional career took a path through university lecturing and industrial design of satellite systems (I became a "rocket scientist"!), I continued my hobby interest in "high-end" audio.
The chance to advance this interest - particularly partnering with such a renowned professional as Tom - was irresistible. I'm delighted to have found someone to work with who has similar interests and uncompromising standards - reflected in Langstrath Audio products. We're very pleased with the result and I'm sure you will be, too.

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1 Introduction

The Langstrath Audio EC24 is a 4-stage series dynamics module that combines a 100% analogue audio signal path ensuring zero latency coupled with the power and convenience of digital control thanks to the SEPIA platform.

The EC24's design specification has been informed by decades of live sound experience and has been realised in such a way that it offers a full range of dynamics processes within one module.

The EC24 features the following dynamics processes:

Enhancer

- Provides 2 separate processor modes: Primary and EXP/Gate
- Primary mode provides a "source enhancer" for seamless reduction of stage noise and spill
- EXP/Gate mode with powerful additional timing controls for shaping percussive sources
- Separate Enhancer Low and High pass sidechain filtering with 3 frequency settings

C-Comp

- Provides transparent compression with variable knee and hold times
- Extensive range of attack and release times
- Unique opposite exponential transition release shape
- Separate High pass sidechain filter with 3 frequency settings
- Mix control to allow parallel compression

F-Comp

- Provides 3 "Feature" compression modes inspired by classic designs: Opto, Diode, and Mu
- Each mode offers different control parameters tailored to the style of compression
- Separate High pass sidechain filter with 3 frequency settings
- Mix control to allow parallel compression

Limiter

- Ensures ultra-fast limiting to catch unexpected program transients
- Includes controls for threshold, attack, release, and ratio
- Use as an end stop limiter or for adding crunch to the "front end" of audio material
- Mix control to allow parallel limiting

Master Section

- Adjusts input gain, output gain, and process mix control.
- Displays input and output levels and processing attenuation with a 6-bargraph meter section.
- Controls for advanced routing and side chain functions

SEPIA Integration

The EC24 is a product designed specifically for the SEPIA Environment, as such it makes full use of the platforms extensive flexible analogue routing options and advanced digital control.

- All control and setting instantly recallable via SEPIA host software
- Save settings/scenes and recall them instantly using the SEPIA host software
- External sidechain can be routed to any of the four dynamics processes using the module Split return
- Split function allows external analogue devices to be inserted between Processes in 3 different positions
- Sidechain gang utilises split send and returns for stereo linked operation

1.1 Important Safety Notes

- Only use this product with a SEPIA host device.
- Do not open or attempt to repair the unit.
- Keep out of reach of young children.
- Avoid exposing the unit to liquids, extreme temperatures, or direct sunlight.

1.2 Getting Started

Please scan or follow the link to download the SEPIA Getting Started Guide

https://karno.com/sepia-support/QSG

1.3 Acknowledgements

The Langstrath Audio EC24 User Interface control knobs make use of an adaptation of “Dark Volume Knob”, by Voicu Apostol, licensed under CC by 4.0.
Please refer to the Langstrath Audio website for further details.

2 User Interface

2.1 User Interface Windows

Figure 2.1 EC24 User Interface (Enhancer Process Selected)

For ease of navigation the EC24 user interface is split into a left-hand Process window and right-hand Master panel. The content of the process window changes to display the controls of the currently focused process. While the master window always displays an overview of the current processing being applied to source material and the input and output levels giving the user an overview of the EC24's operation at any moment in time.

2.2 Process Window

Figure 2.2 EC24 Process Window (Limiter Process Selected)

To make operation as straightforward as possible, each process window has its parameter controls colour coded to allow the user to clearly see which process controls they are accessing.

The four different process windows share some common controls which are laid out as in the same relative position whenever possible. Common controls that are unique to the EC24 are discussed in more detail here. Controls for each process are discussed in detail in the relevant process chapter later in this manual.

2.3 Process Select Buttons

Figure 2.3 EC24 Process Select Buttons

The process displayed by the Process window is determined by selecting the appropriate process button: Enhancer, C - Comp, F - Comp or Limiter, at the bottom centre/right hand side of the process window.

2.4 Level Meter/Threshold Control

The EC24 Threshold knob is common to all process windows and provides a compact way of displaying the threshold level, the input level of the signal being fed into the process and the amount of attenuation being applied to the signal by the process. The sharing of a common scale allows the three different parameters to be combined into a single accurate and intuitive control that provides the user with excellent control and feedback.

2.4.1 Threshold Control

Figure 2.4 EC24 Threshold Control (Enhancer Process Selected)

The threshold control is continuously variable form +20 dBu to - 40 dBu. In conjunction with level and attenuation LEDs, it allows the user to reduce the threshold level towards the input signal and immediately see the process react.
The range of the threshold control defines the maximum attenuation that the EC24 can provide: therefore for an input sign al of +20dBu, selecting a threshold of - 40dBu will set the process to attenuate the signal by 60dB. The process “IN” buttons determines if the process is active or not.

2.4.2 Outer LED Level Ring

Both displays consist of 61 LEDs which each represent 1 dB steps. The outer input level ring represents dBu specifically and displays blue LEDs for input levels from - 40 to +4 dBu, yellow LEDs for +5 to +16dBu and red LED’s from +17dBu to +20dBu. The red LEDs have been chosen to give a warning of the approach of input clipping, which is useful for trimming the input gain to place dynamic signals within a useful operating window; however, the EC24 can handle input levels of +22 dBu before significant clipping occurs

2.4.3 Inner LED Attenuation Ring

The inner ring display process attenuation in dB with an LED colour that matches the process colour to make it clear which process window the user is currently controlling. When the process is disengaged the attenuation colour changes to grey to make it obvious that the process is not active. This is useful for auditioning gain reduction by eye, before engaging the process. It also helps to reduce the possibility of the user erroneously thinking that they have the process switched in.

2.4.4 Multiple Select Button

Throughout the process windows multiple selection buttons are deployed to indicate selected functions or parameter values. Pressing the button steps the value selected downwards with a final press either deselecting the control and switching it off, or toggling round to the first value.
For example, in the case of the Sidechain High-pass filter button shown, pressing the button when 200Hz is selected would switch off the high pass filter and all the LEDs would go out.

2.5 Master Window

The Master window is always in view and gives an overview of the current attenuation level of the separate processes.

Figure 2.5 EC24 Master Section

2.5.1 Input Control

Provides adjustment of the input gain by ±20dB before the signal is fed into the dynamics processing stages of the EC24.

2.5.2 Output Control

Output Control Provides adjustment of the output stage of the EC24 by ±20dB post dynamics processing stage.

2.5.3 Mix Control

Mix Control Allows the user to mix non-processed input signal with the processed signal. The non-processed signal is taken pre-input gain and mixed with the processed signal post-output gain. As a result, when the mix control set to 0% the EC24 is effectively bypassed. Please see section 7 Audio Signal Path for further details.

2.5.4 Master ”In” Button

Switches the EC24 input gain, output gain, and dynamics processes out of circuit.
When switched out, the EC24 behaves in the same way as having the mix control set to 0%. All four attenuation meters will display grey when the master In button is disengaged.

2.5.5 External SC ”In” Button

Figure 2.6 EC24 Master Section External Sidechain Mode

When the EC24 is being used in normal configuration within the SEPIA software, the insert return point of the module slot may be used as an external side chain feed for any of the EC24 dynamics processes.
The EXT SC button (External Side Chain) acts as a master engage switch which enables the user to quickly disable any external sidechain routing for AB comparisons.
The EXT SC is a “soft” button, in that its function changes when the Split and Gang functions within the SEPIA software are engaged. Please see below.

2.5.6 Sidechain Process Select LEDs

When a process is set to use the external sidechain the corresponding LED above the process's master attenuation meter lights to give the user visual feedback.
The Sidechain Process Select LEDs are only visible in the default SEPIA configuration and are replaced with Split point indicators in "Split Mode" and hidden in "Gang Mode".

2.5.7 Split Point Button

Figure 2.7 EC24 Master Section Split Mode

When the user “splits” the EC24 in the SEPIA host software the EXT SC button changes its label to Split Point and its function becomes one of incrementing the split send and return point by one process.
The default split point position is between the Enhancer and the C-comp, meaning that the signal will be processed by the Enhancer and then sent via the split point to a module in a different L6 slot or even to an external

piece of hardware via the L6's auxiliary outputs before being returned via the split return to the input of the C-comp.
Pressing the Split Point button will move the split send and return point forward to the next position between the C-Comp and the F-Comp, a further press will move it between the F-Comp and the limiter, and finally the next press will cycle the routing point back to its default position between the Enhancer and the C-Comp.

2.5.8 Split Point Position Indicators

When in "Split Mode" the Sidechain Process Select LEDs are hidden and replaced by triangular Split Point Position indicators, placed between the process's master attenuation meter to indicate the position of the Split send and split return point.
The figure above shows that the default split point position of between the Enhancer and the C-Comp is selected.

2.5.9 Gang "In" Button

Figure 2.8 EC24 Master Section Gang Mode

When the user selects "Gang Mode" in the SEPIA software the "EXT SC/Split Position" button label changes to Gang and its function becomes one of comparing the input signal present at its main input with a second signal present at its split return point and reacting to whichever has the greater amplitude.
It is intended for use when two EC24s are linked together and stereo operation is required rather than "dual mono".
In this configuration the EC24 routed with the left-hand signal sends the signal via its split send to the split return of a second EC24 routed with the right-hand signal and vice versa.
Please see section 7 Audio Signal Path for further details.

2.5.10 Master Metering

Figure 2.9 EC24 Master Section Input, Output and Process Metering Section

The Master Metering section gives and overview of the input and output of the EC24, plus the current attenuation being applied by each process.

2.5.11 Input Meter

The input meter displays the EC24 process input level, post input gain control. However, it also takes into account the position of the master Mix control, so when set to 0% it will display only the input signal being routed to the EC24 pre-gain.
The scale is standard logarithmic with colour allocations matching the Process input meters: Blue for levels of - 40 to +4dBu, Yellow for levels of +5 to +16dBu and Red for levels of +17dBu and higher.

2.5.12 Output Meter

The Output meter displays the EC24 process output level, post output gain control.
However, it also takes into account the position of the master Mix control, so when set to 0% it will display only the input signal being routed to the EC24 pre-gain.

2.5.13 Attenuation Meters

The Attenuation meters display the current process attenuation levels in each Processes signature colour.
The scale is Quasi-Logarithmic, measured in dB and giving focus to attenuation levels below 10dB in order to give the best compromise between visual feedback and UI footprint.
The display colour switches between its signature colour when active, to Grey when the process is disengaged. All four attenuation meters will display Grey when the master In button is disengaged.

3 Enhancer

Figure 3.1 EC24 Enhancer (Primary Mode Selected)

3.1 Enhancer Overview

The EC24 enhancer processor allows the user to optimise the content of the signal being fed into the EC24. Unlike a compressor, it achieves this by applying attenuation to any signal below the threshold level rather than above it.
Typical operation would be to set the threshold above the background noise and signal spill level, so that signals that are not of interest are attenuated. The amount of attenuation is determined by the value of the range control and the rate at which the attenuation is reduced upon the threshold being reached and then reapplied after the signal has fallen below is again is determined by the Attack and Release controls respectively.
The EC24 is designed with two separate modes to allow this attenuating effect to be used in either a seamless way in the Primary Mode or with more options to manipulate the transient shape of the source material in the EXP/Gate mode.
The threshold, sidechain filters, and EXT SC button behave in the same way irrespective of which Enhancer mode is selected.
The other controls behave slightly differently, depending on mode, and are described in the relevant section below.

3.2 Enhancer Controls

3.2.1 ”IN” Control

This is the process engage control and switches the Enhancer into circuit. When disengaged, the process is bypassed, but the gain reduction LED ring still displays the attenuation that would be applied as if the process was active, with the colour changed to Grey.
When the process is active, the Enhancer attenuation is displayed in its signature colour.
This behaviour is also mirrored on the C-Comp attenuation bar graph in the master section.

3.2.2 ”EXT SC” Control

When active, switches the input signal routed to the processor’s level detector from the main audio input signal to the EC24s split return input signal.
The input level meter also changes to show the level of the split return input signal.

3.2.3 Threshold Control

The threshold control (see section 2.4 for more detail) sets the level at which the enhancer will start to reduce attenuation and allow the signal to pass. It has range of -40 to +20 dBu.
The Sidechain High-Pass Filter allows the user to reduce the low frequency content of the signal being fed into the threshold control.
It offers three different filter frequencies of 50Hz, 100Hz and 200Hz. The filter response is 6dB per octave and the frequency stated is the - 3dB point.
The filter only effects the signal being sent to the threshold detector, it is not in the audio signal path.
The Sidechain Low-Pass Filter allows the user to reduce the high frequency content of the signal being fed into the threshold control.
It offers three different filter frequencies of 5kHz, 1.0kHz and 500Hz. The filter response is 6dB per octave and the frequency stated is the -3dB point.
The filter only effects the signal being sent to the threshold detector, it is not in the audio signal path.

3.2.4 Mode Button

Switches the Enhancer between Primary and EXP/Gate mode.

3.3 Primary Mode

Figure 3.2 EC24 Enhancer Primary Mode

The EC24 Primary mode is a source enhancer specifically suited to vocals and other non-percussive source signals.
To operate in as transparent manner as possible an inverse soft knee has been implemented as shown in figure 3.3. The shape of this knee response allows attenuation to be gradually reduced as the source signal reaches the set threshold. As can be seen from the graph the point at which attenuation starts to be reduced is dependent on the how much attenuation is being applied by the range control. The rate of removal of attenuation starts quickly and then slows as it approaches 0dB of attenuation, resulting in a smooth and transparent opening of the enhancer.

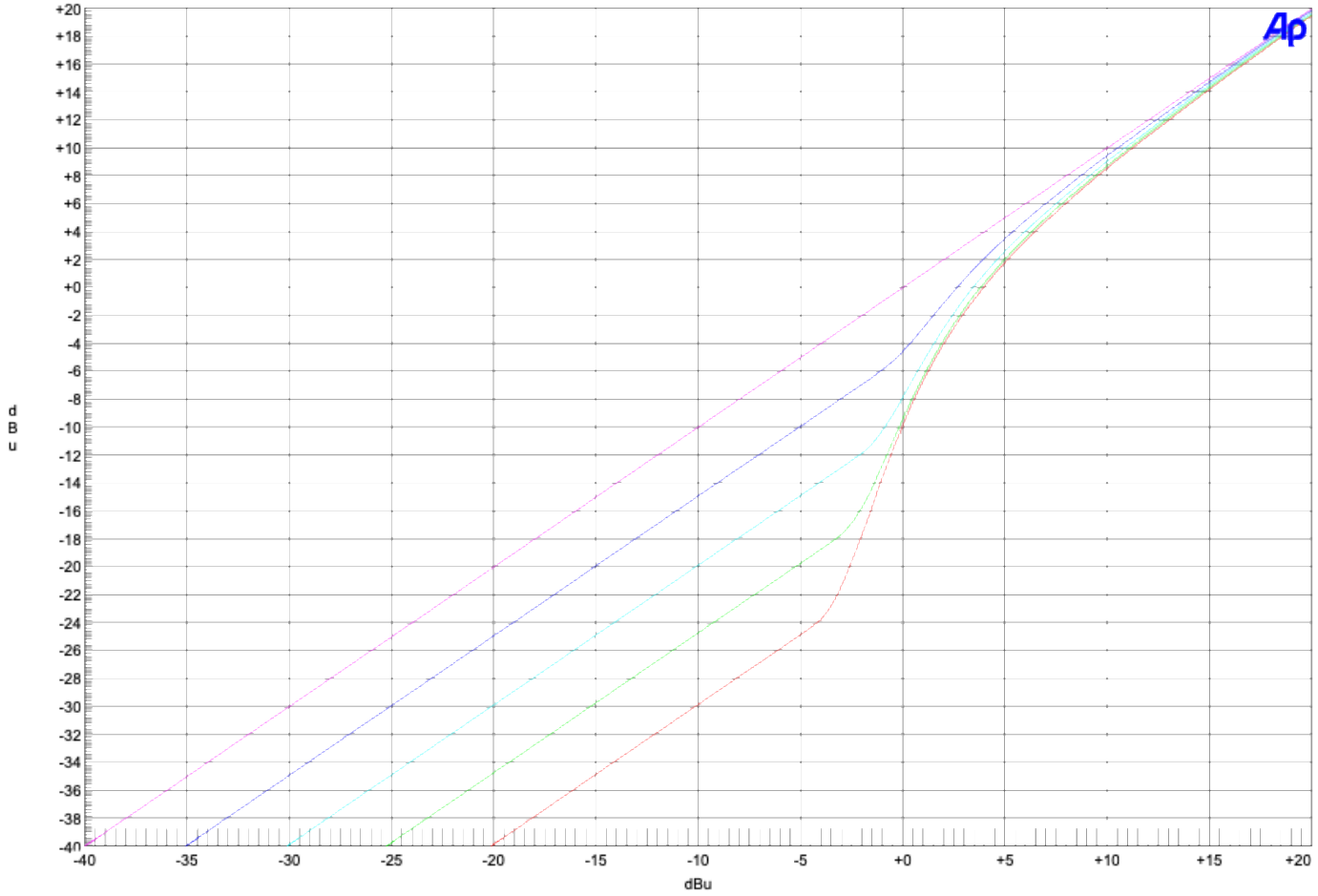


Figure 3.3 Primary Mode Attenuation Curves, Range Values 0dB, 5dB, 10dB, 15dB & 20dB

3.3.1 Attack Control

The attack control adjusts the rate of change of attenuation once the input signal has exceeded the knee of the Primary curve relative to the set Threshold level.
The attack times range from 0.2ms to 100ms and are defined as the time taken for 64% of the attenuation to be removed (1 time constant).
The times are calibrated when the range control is set to its maximum value of 20dB, but will react more quickly to lower levels of attenuation.
The attenuation attack curve is shown below in Figure 3.4

3.3.2 Release Control

The release control has a range of 5ms to 2000ms and is defined as the time taken to apply 64% of the target attenuation and has a logarithmic response curve.
In order to make the Primary response as smooth as possible the attenuation is held for 10ms once the signal has dropped below the set threshold before the attenuation is reapplied.
The attenuation release curve is shown below in Figure 3.4

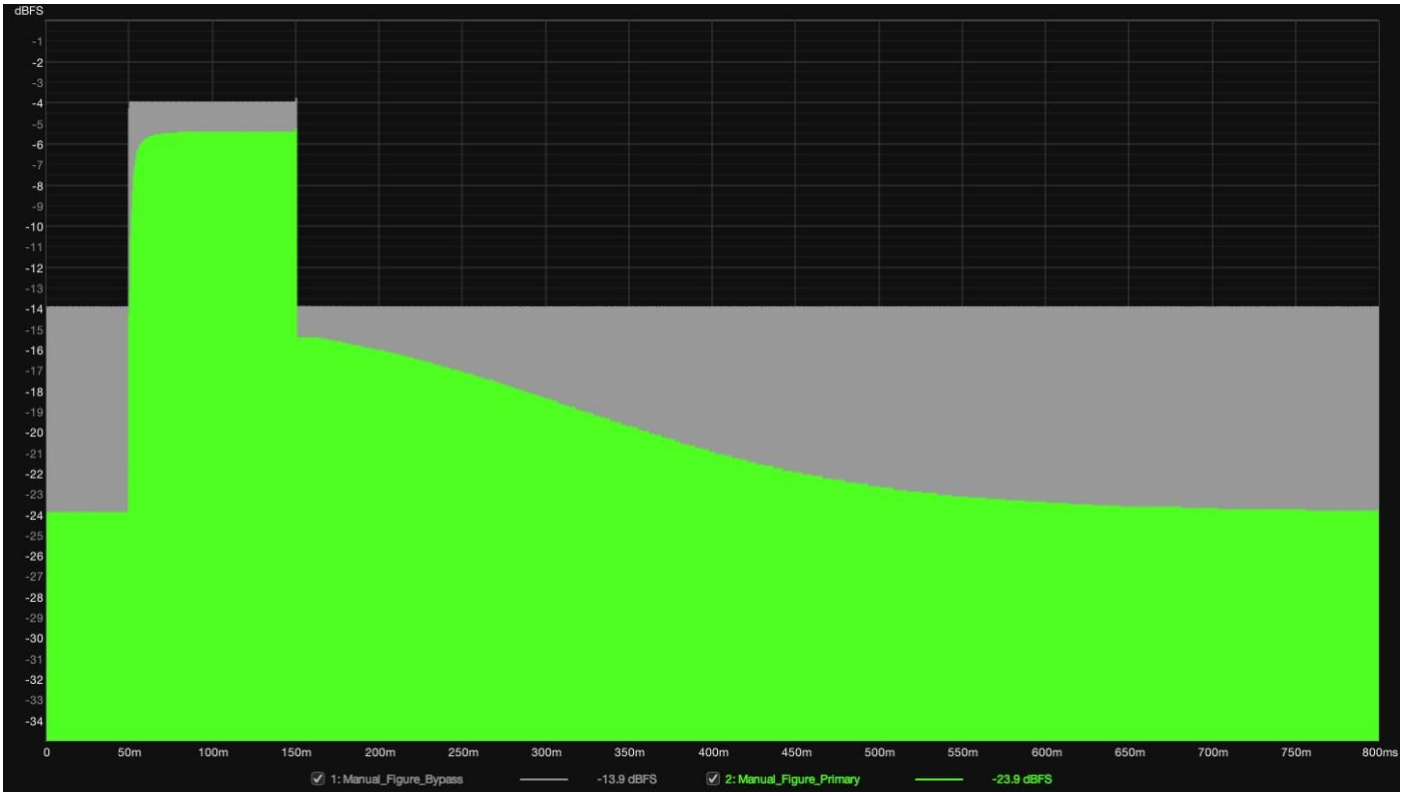


Figure 3.4 Primary Mode Attack, Hold & Release Curves

3.3.3 Range Control

The range control sets the maximum attenuation applied to the source signal, below threshold, and has a range of 0dB to 20dB.

3.4 EXP/Gate Mode

Figure 3.5 EC24 Enhancer EXP/Gate Mode

The EC24 EXP/Gate mode adds parameters for additional control for envelope shaping of the input source. It is intended for use with percussive sources but may also be employed on vocals and other musical sources where a more drastic “effect” is required, such as in sound design or more stylised forms of music. Unlike the Primary mode the EXP/Gate has a hard knee attenuation release characteristic.

3.4.1 Attack Control

The attack times range from 0.2ms to 100ms and are defined as the time taken for 64% of the attenuation to be removed (1 time constant).
The set Attack values are shared between the Primary and the EXP/Gate modes.

3.4.2 Hold Control

The Hold control determines how long the gate is held open for once the input signal has dropped below the threshold level. Once this time has passed the release phase starts. The hold control range is from 5ms to 2000ms.

3.4.3 Release Control

The release control has a range of 5ms to 2000ms and is defined as the time taken to apply 64% of the target attenuation and has a logarithmic response curve.
The release phase of the attenuation curve begins after the input signal has dropped below the set threshold level and the hold time has passed.

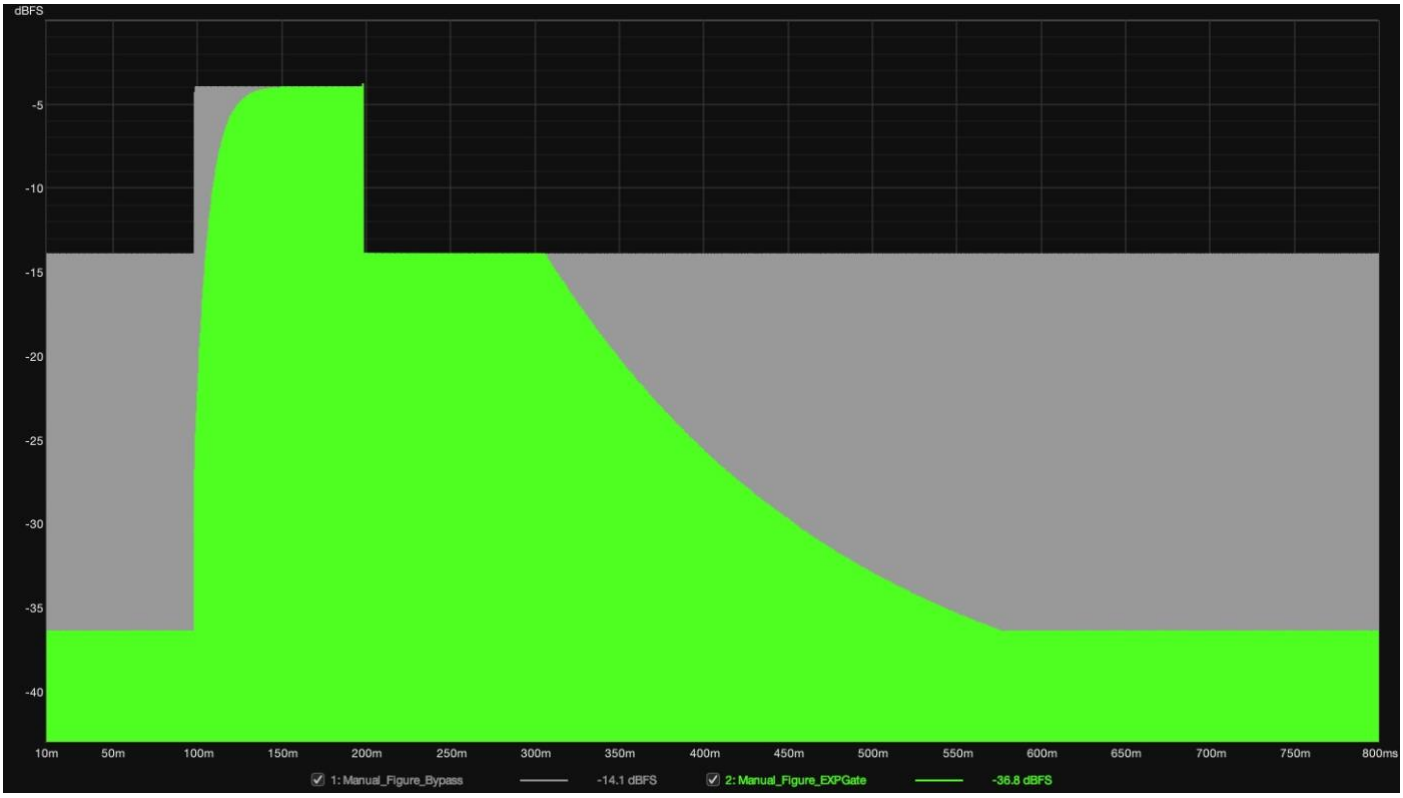


Figure 3.6 EXP/Gate Mode Attack, Hold & Release Curves

3.4.4 Ratio Control

The ratio control determines the rate at which attenuation is reduced in relation to the signal level, as it approaches the set threshold level.

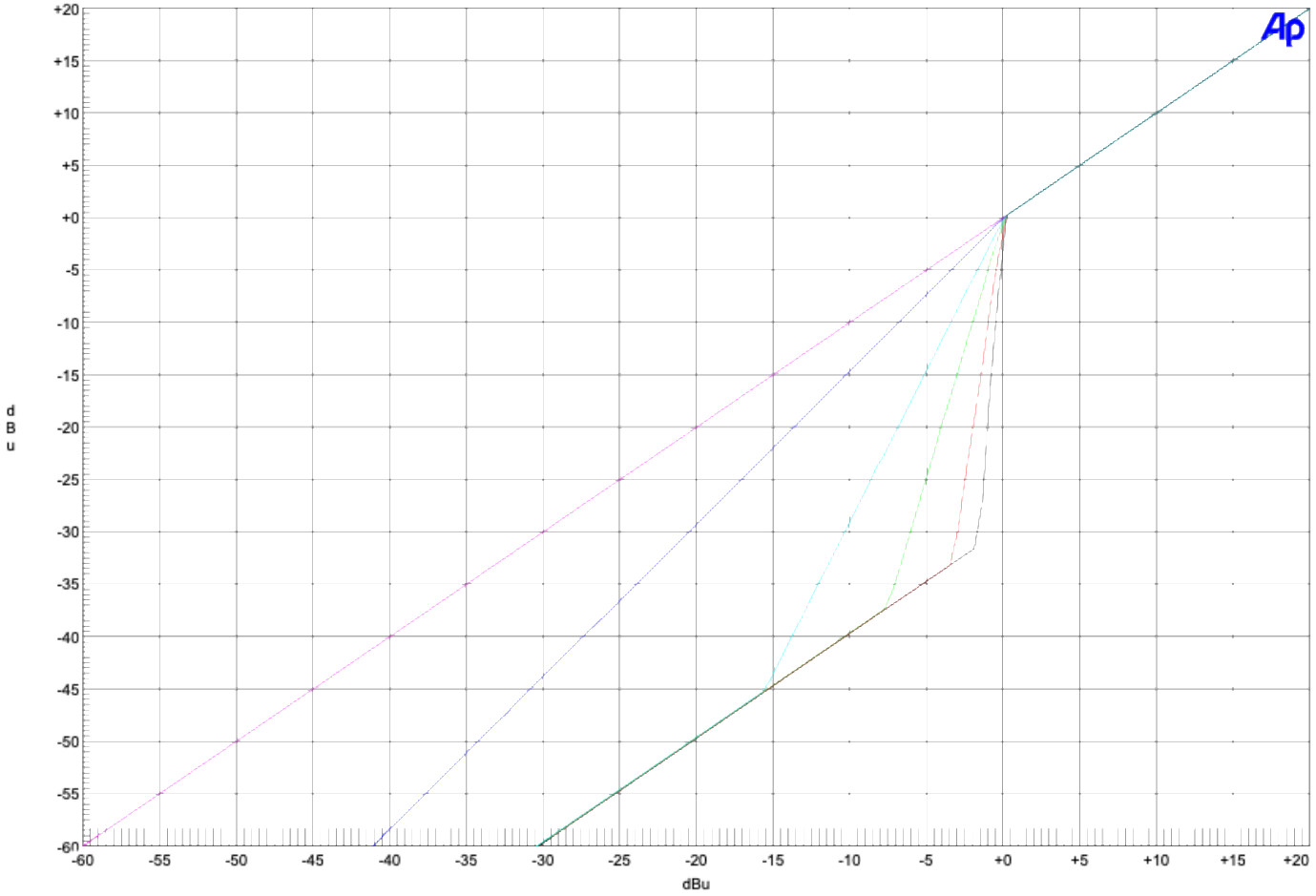


Figure 3.7 EXP/Gate Mode: Ratio Control – Ratio Values: 1, 1.5, 3, 5, 10, 20

3.4.5 Range Control

The range control sets the maximum attenuation of the EXP/Gate and has a range of 0dB to 60dB.

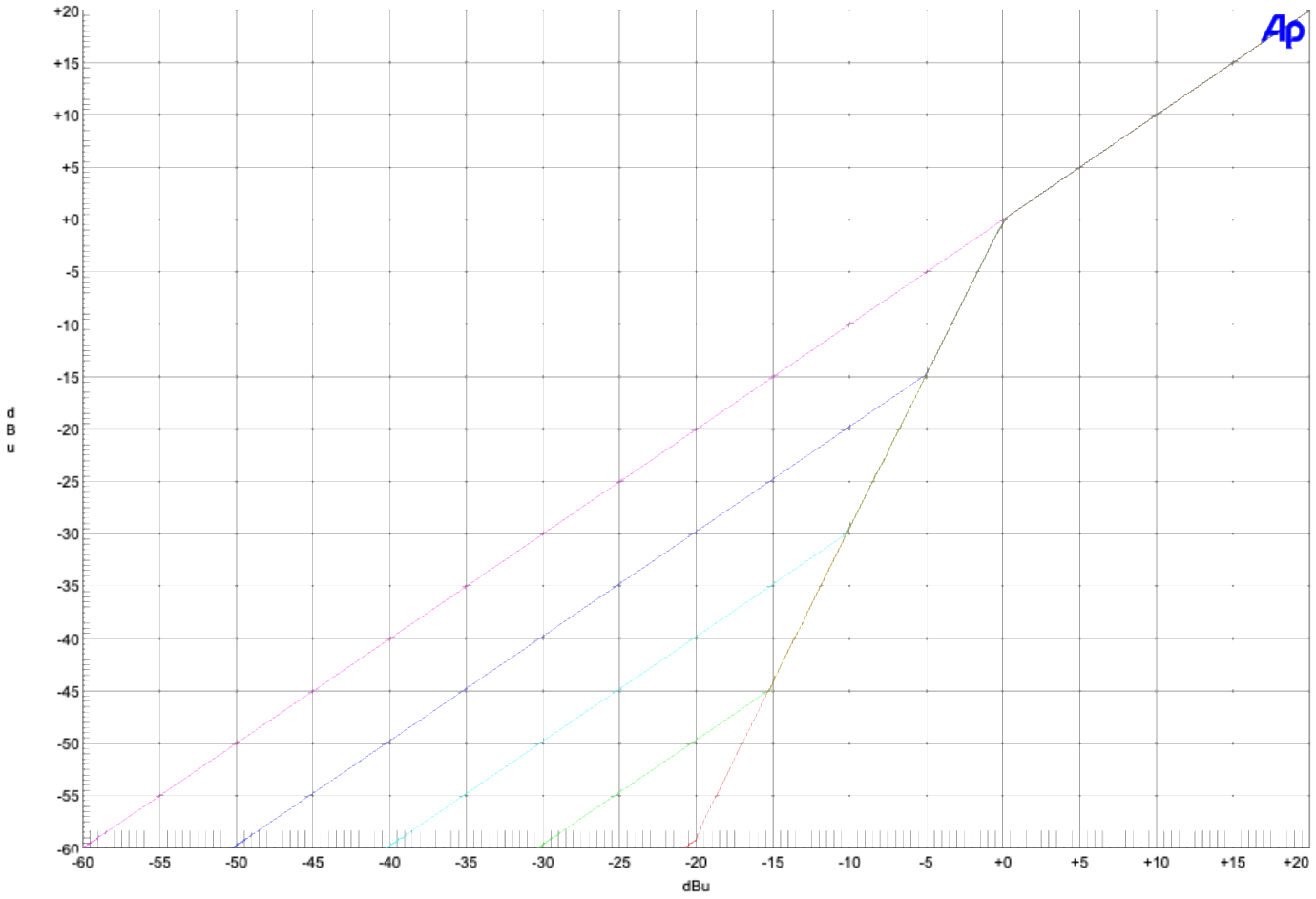


Figure 3.8 EXP/Gate Mode: Range Control – Range Values: 0dB, -10dB, -20dB, -30dB & -40dB

4 C-Comp

Figure 4.1 EC24 C-Comp

4.1 C-Comp Overview

The EC24 C-Comp (Clean Compressor) is designed to be as transparent as possible when reducing the dynamic range of the source signal.
It achieves this by having two separate release curves of opposite exponentials, the release curve transitions midway through the release phase.
The initial release starts slowly then increases in rate to a maximum before transitioning to the opposite exponential curve, slowing the rate of decrease in attenuation as it approaches zero.

4.2 ”IN” Control

This is the process engage control and switches the C-Comp into circuit. When the process is disengaged the audio passes though unaffected. The gain reduction LED ring still displays the attenuation but with colour changed to Grey instead of the C-Comp processes signature colour.
This behaviour is also mirrored on the C-Comp attenuation bar graph in the master section.

4.3 ”EXT SC” Button

When active, switches the input signal routed to the processor’s level detector from the main audio input signal to the EC24s split return input signal.
The input level meter also changes to show the level of the split return input signal.

4.4 Threshold Control

The threshold control (see chapter 2.4 for more detail) sets the level at which the C-Comp will apply attenuation to the input signal.
It has a range of -40to+20dBu.

4.5 SC High-Pass Filter Button

The Sidechain High-Pass Filter allows the user to reduce the low frequency content of the signal being fed into the threshold control.
It offers three different filter frequencies of 50Hz, 100Hz and 200Hz.
The filter responses are 6dB per octave and the frequency stated is the -3dB point.
The filter only affects the signal being sent to the threshold detector, it is not in the audio signal path.
The filter is placed after the EXT SC switch and so the filtering is applied to whichever signal routed to the threshold detector.

4.6 Hold Control

The hold control offers three different settings for the delay between the signal dropping back below the set threshold level and the onset of the release phase of the compressor’s attenuation.

4.7 Knee Control

The knee control offers 3 different options for the width of the transition window between the signal being below the set threshold and above the set threshold. When the Knee is set to hard compression starts at point the input signal reaches the set threshold point.
When set to medium, the onset of compression starts at 2.5dB below the threshold point and extends 2.5dB above the threshold softening the knee of the input v output response.
When set to soft the onset of compression starts at 5dB below the set threshold point and extends 5dB beyond the threshold point.

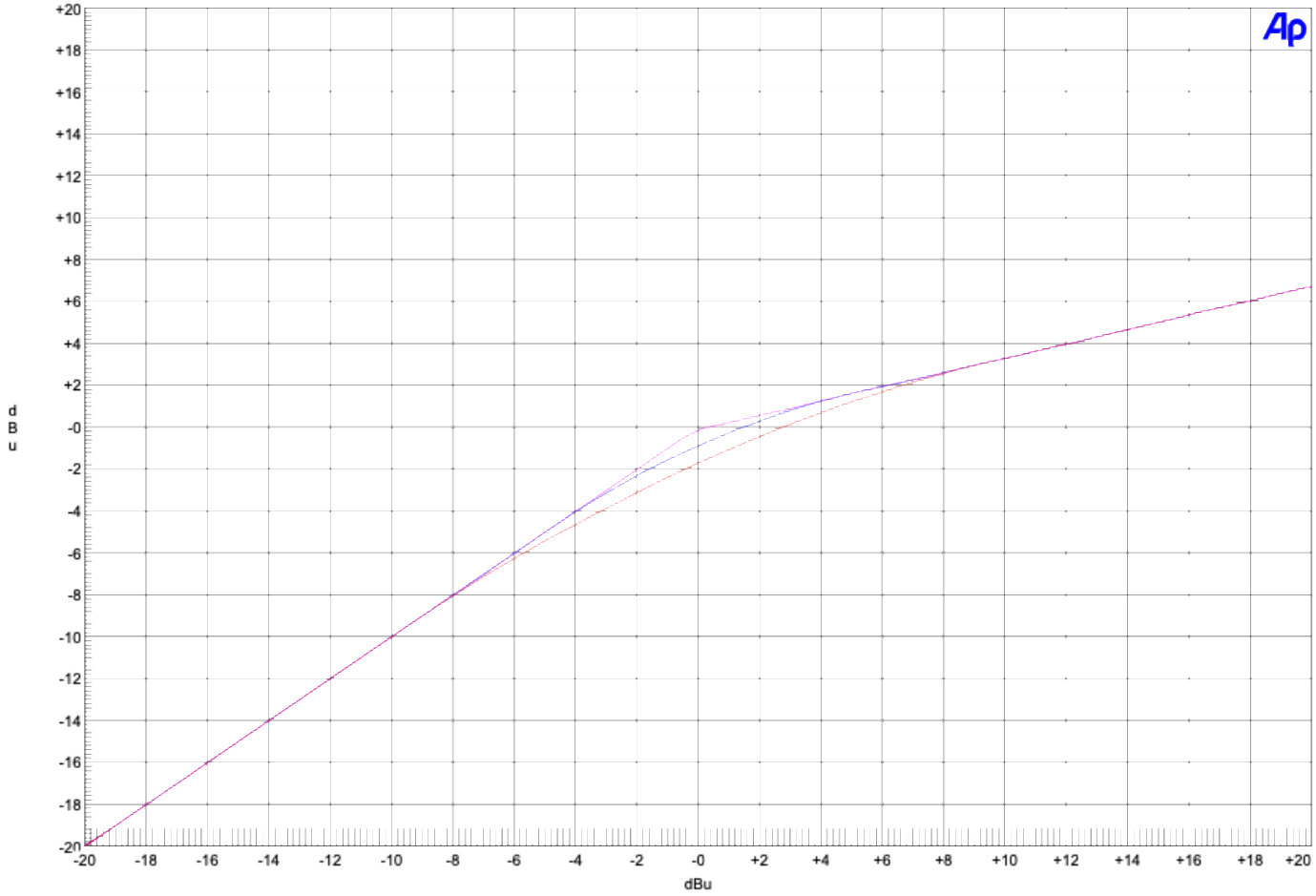


Figure 4.2 C-Comp Knee Control – Hard, Medium, Soft

4.8 Ratio Control

The Ratio control sets the rate at which gain reduction occurs once it has reached the set threshold value. The control range goes from 1.0 to 1 (no compression) to 20 to 1. The scale of the control is skewed to allow finer adjustment at lower ratio settings.

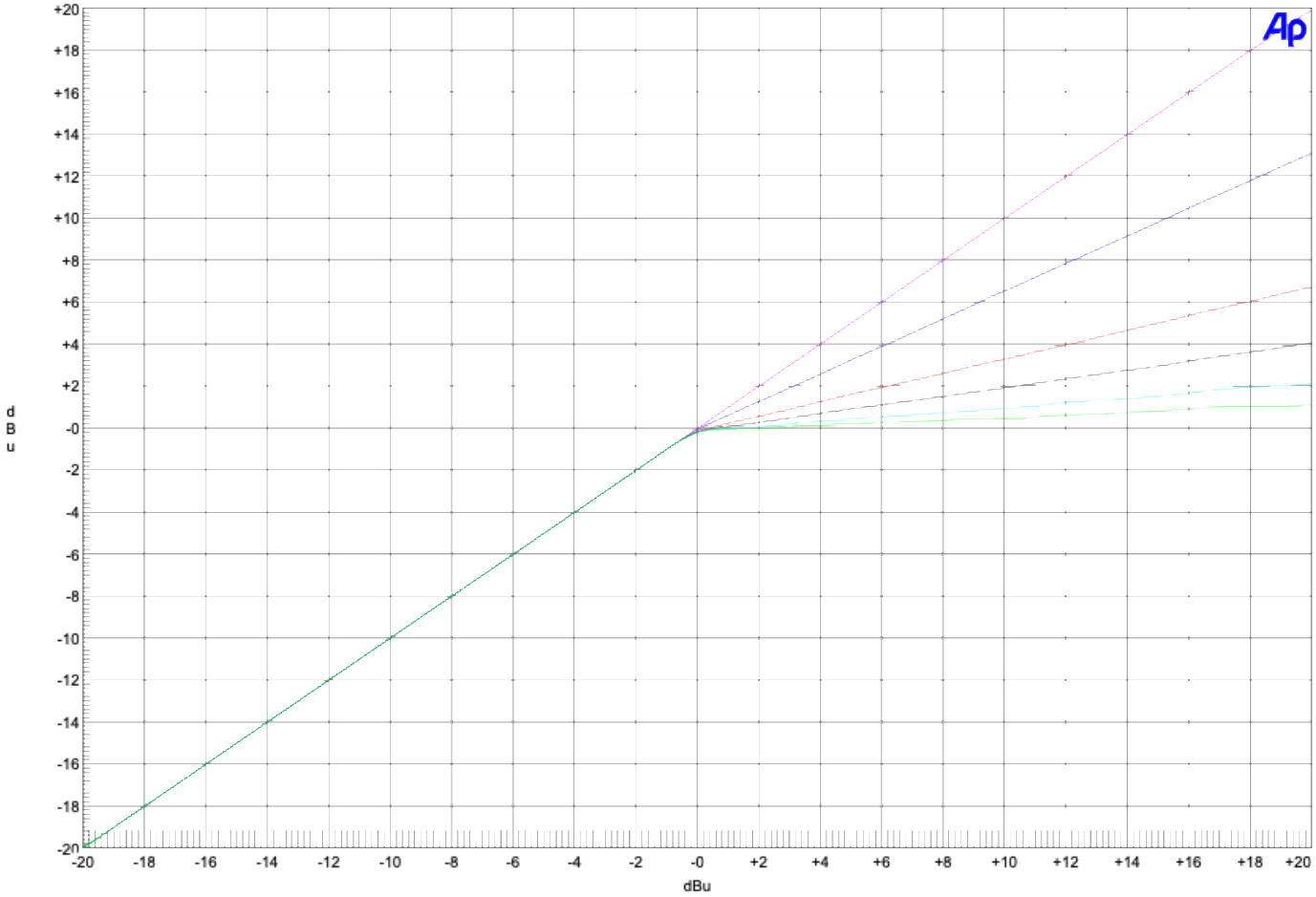


Figure 4.3 C-Comp Ratio Control – 1:1, 1.5:1, 3:1, 5:1, 10:1, 15:1 & 20:1

4.9 Attack Control

The attack times range from 0.5ms to 50ms and are defined as the time taken for 64% of the final attenuation to be applied (1 time constant), once the input signal has exceeded the set threshold level.

4.10 Release Control

The release control has a range of 5ms to 2000ms and is defined as the time taken to release 64% of the attenuation from the point in time that the input signal passed back below the threshold level, plus the time selected by the hold control.
As mentioned earlier the release curve transitions from one exponential curve to another midway through the release, resulting in transparent compression effects.

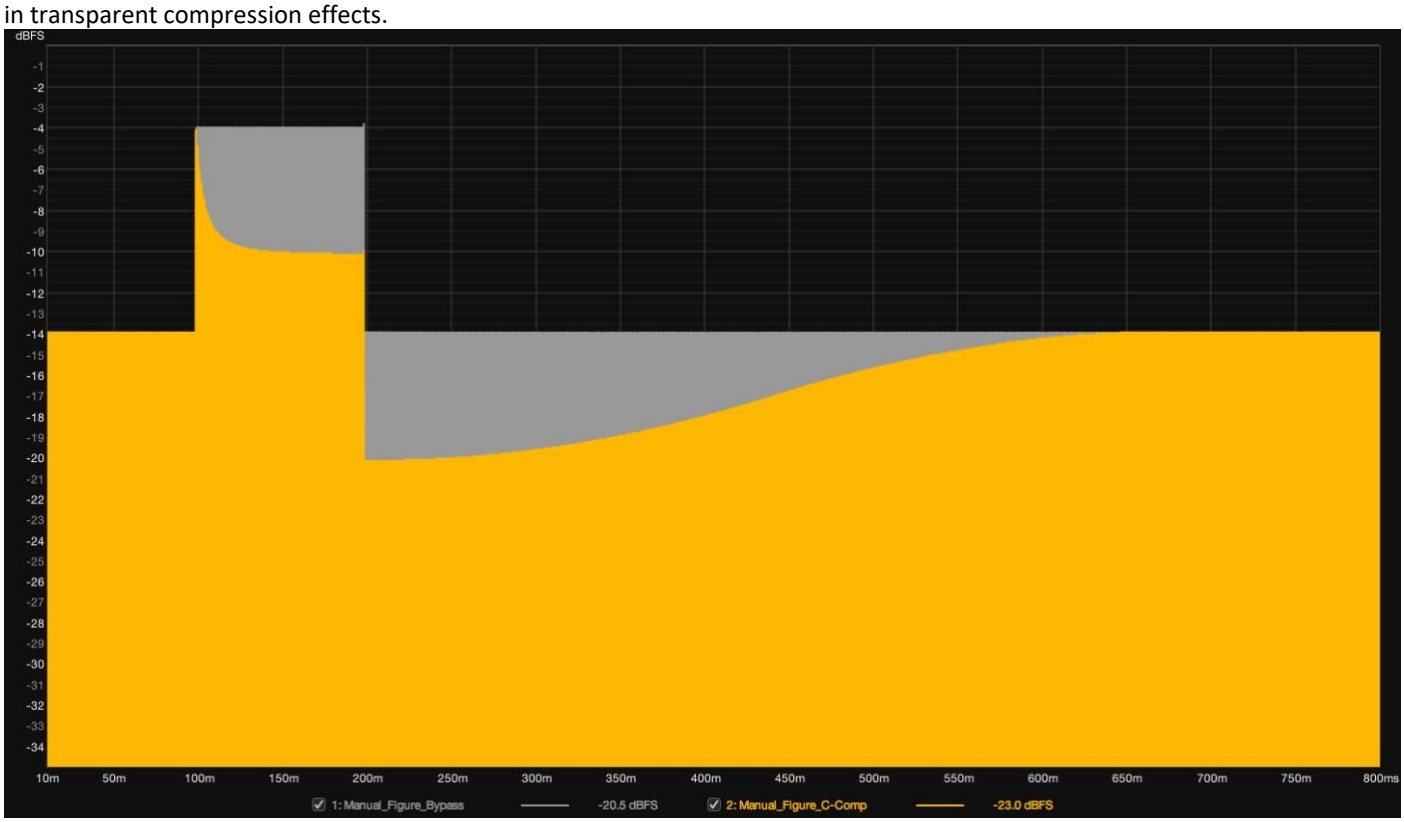


Figure 4.4 C-Comp Attack and Release Curves

4.11 Gain Control

The gain control provides makeup gain to compensate for the signal level lost during compression. The control has a gain range of 0 to +20dBu.

4.12 Mix Control

The mix control mixes the attenuated output signal of the C-Comp with the C-Comps input signal. The control has a range of 0 to 100% and has been designed to replicate the effect of parallel compression techniques used on mixing consoles.

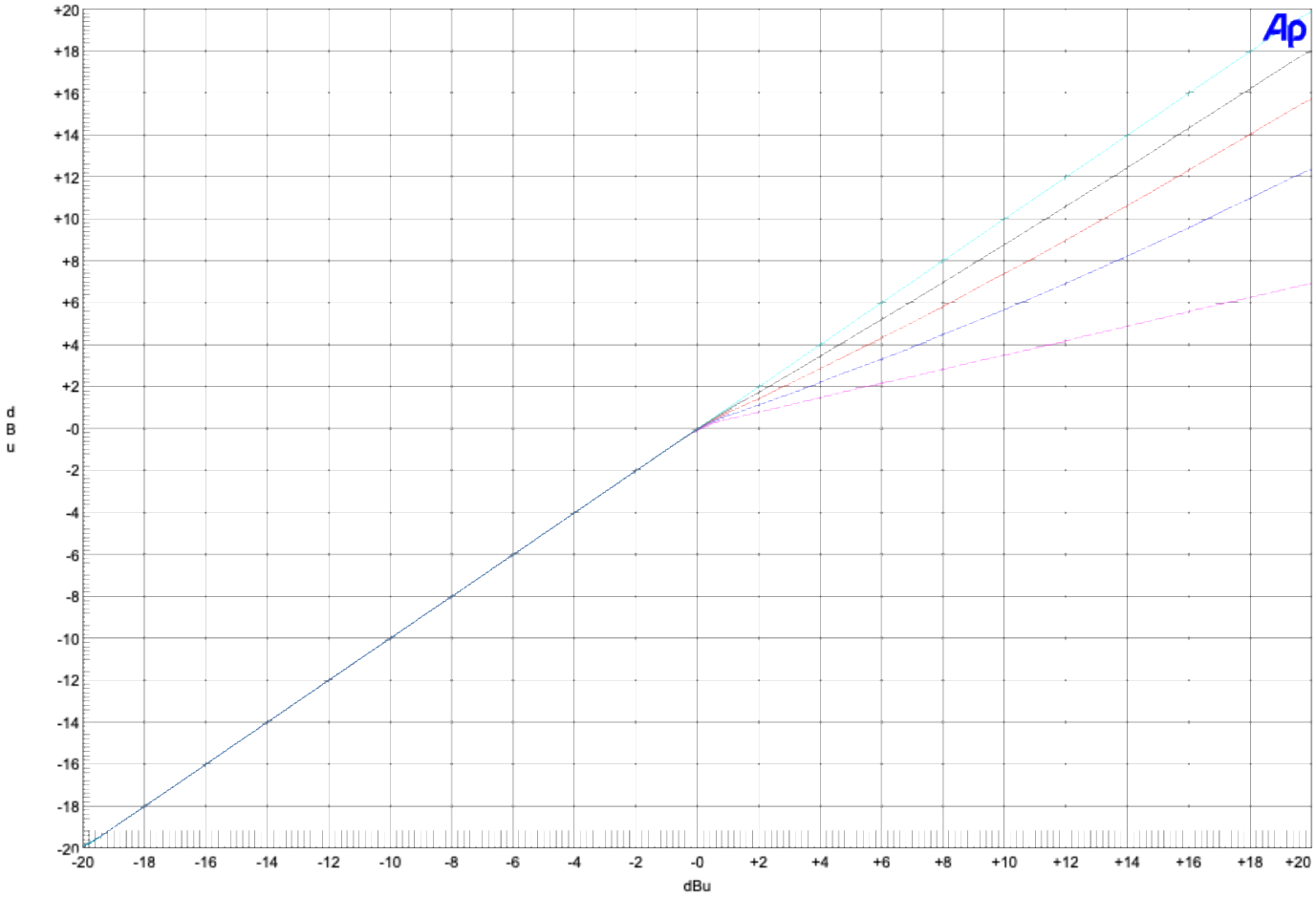


Figure 4.5 C-Comp Mix Control – 0%, 25%, 50%, 75% & 100% (Ratio = 3:1)

5 F-Comp

Figure 5.1 EC24 F-Comp (Diode Mode Selected)

5.1 F-Comp Overview

The F-Comp is inspired by the character of different topographies of classic compressors. By combining key characteristics of the knee, ratio and attack and release times of these classic topographies the F-Comp is able to provide 3 different modes of compression.
As with the different modes in the Enhancer, some controls are common to the F-Comp, while some controls only appear for certain compressor modes.

5.2 ”IN” Control

This is the process engage control and switches the F-Comp into circuit. When the process is disengaged the audio passes though unaffected. The gain reduction LED ring still displays the attenuation but with colour changed to Grey instead of the F-Comp processes signature colour.
This behaviour is also mirrored on the F-Comp attenuation bar graph in the master section.

5.3 ”EXT SC” Button

When active, switches the input signal routed to the processor’s level detector from the main audio input signal to the EC24s split return input signal.
The input level meter also changes to show the level of the split return input signal.

5.4 Threshold Control

The threshold control sets the level at which the F-Comp will apply attenuation to the input signal (see chapter 2.4 for more detail)
It has a range of -40 to +20dBu.

5.5 SC High-Pass Filter Button

The Sidechain High Pass Filter allows the user to reduce the low frequency content of the signal being fed into the threshold control.
It offers three different filter frequencies of 50Hz, 100Hz and 200Hz.
Repeatedly pressing the SC High-Pass button steps through the frequencies from top to bottom, with a 4th press switching the high pass filter out of circuit again. The filter response is 6dB per octave and the frequency stated is the -3dB point.
The filter only effects the signal being sent to the threshold detector, it is not in the audio signal path.
The filter is placed after the EXT SC switch and so the filtering is applied to either signal routed to the threshold detector.

5.6 Mode Button

The Mode Button switches the F-Comp processor between its 3 different compressor modes. These are Opto, Diode, and Mu. Pressing the button scrolls through the three modes and also make mode dependent controls appear and dis- appear as required.

5.7 Gain Control

The gain control provides makeup gain to compensate for the signal level lost during compression. The control has a gain range of 0 to +20dBu.

5.8 Mix Control

The mix control mixes the attenuated output signal of the F-Comp with the F-Comps input signal. The control has a range of 0 to 100% and has been designed to replicate the effect of parallel compression techniques used on mixing consoles.
For a graph of the mix relationships please refer to figure 4.5 in the C-Comp Section 4.12.

5.9 Opto Mode

Figure 5.2 EC24 F-Comp Opto Mode

The F-Comp Opto Mode is inspired by the characteristics of a number of Langstrath Audio's favourite vintage optical gain cell compressors. It features a sharp knee with a fixed ratio that decreases slightly for signals well above the set threshold level. The attack and release times are also fixed with a medium attack and a slow exponential release.
The F-Comp Opto mode is very much a simple 2 control compressor (Threshold and Gain) designed to be very quick to setup and deliver great sounding results when used on vocal sources and acoustic guitars. Transfer function and Attack release characteristics are shown below.

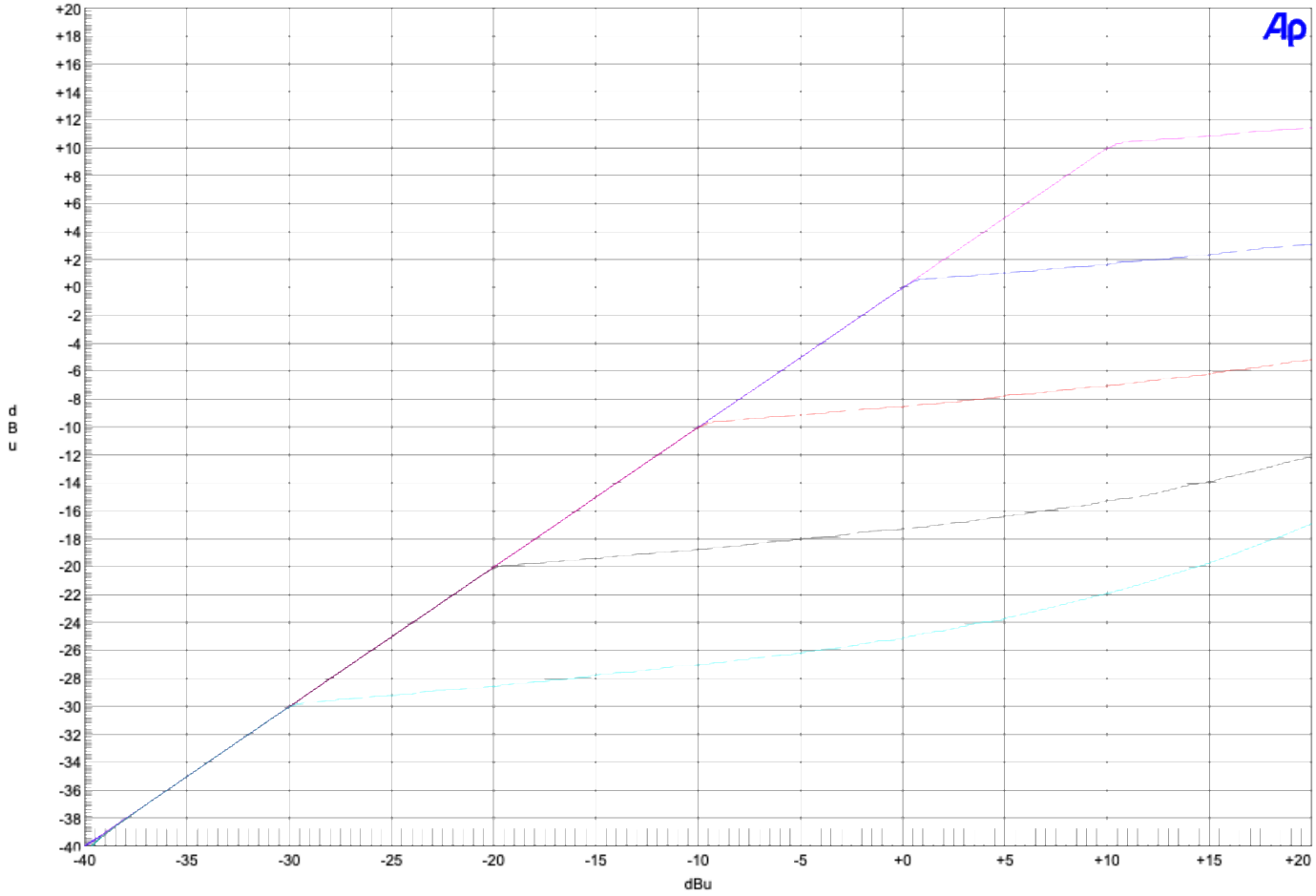


Figure 5.3 Opto Mode Threshold Control – 10dBu, 0dBu, -10dBu, -20dBu & -30dBu

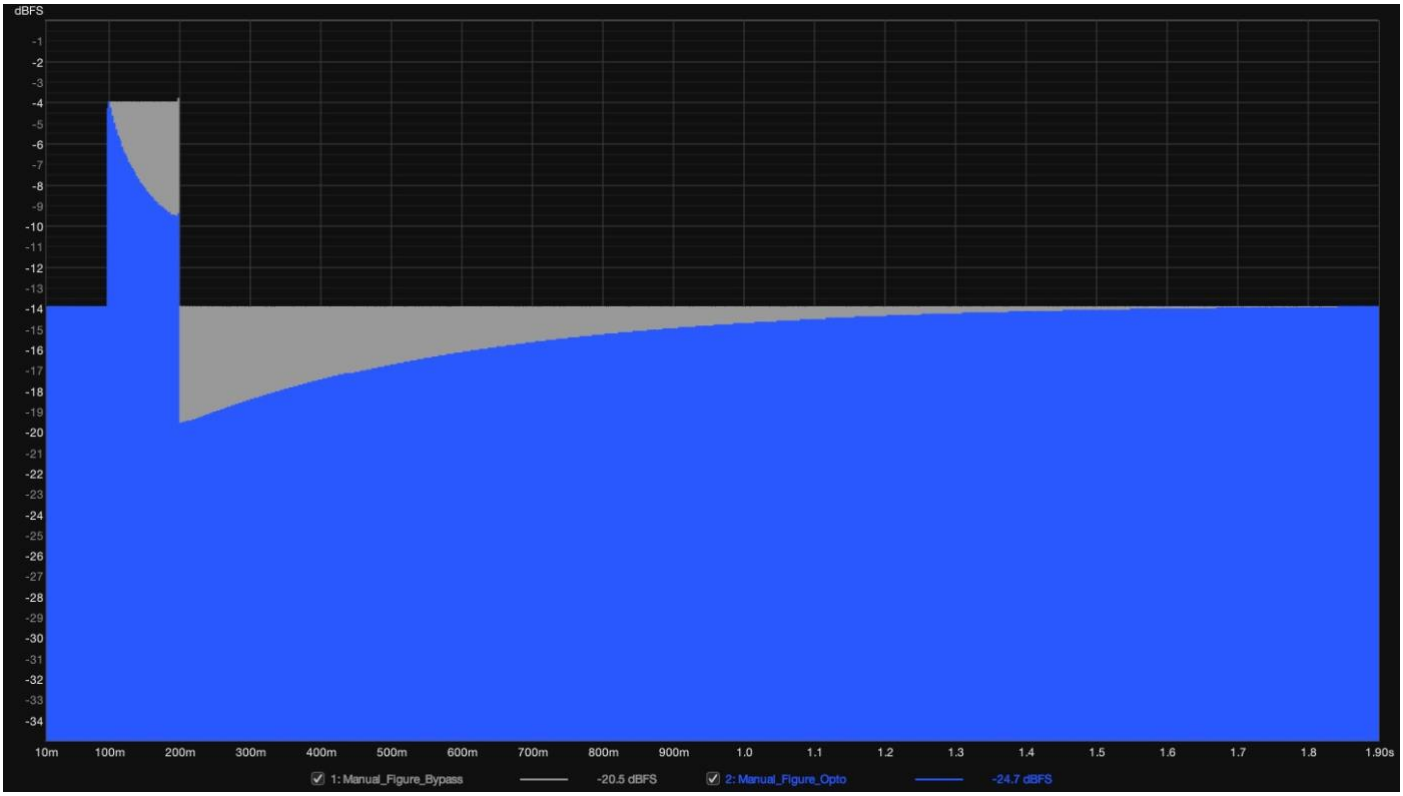


Figure 5.4 Opto Mode Attack and Release Curves

5.10 Diode Mode

Figure 5.5 EC24 F-Comp DiodeMode

The F-Comp Diode mode takes its inspiration from the common characteristics of several classic transformer coupled diode bridge compressors.
It has a fixed exponential shaped attack time coupled with a linear shaped release curve that is excellent for accentuating the natural decay in drums and bass stringed instruments.

5.10.1 Ratio Control

Sets the rate at which gain reduction occurs once it has reached the set threshold value.
The control range is from 1.0 to 1 (no compression) to 20 to 1. The scale of the control is skewed to allow finer adjustment at lower ratio settings

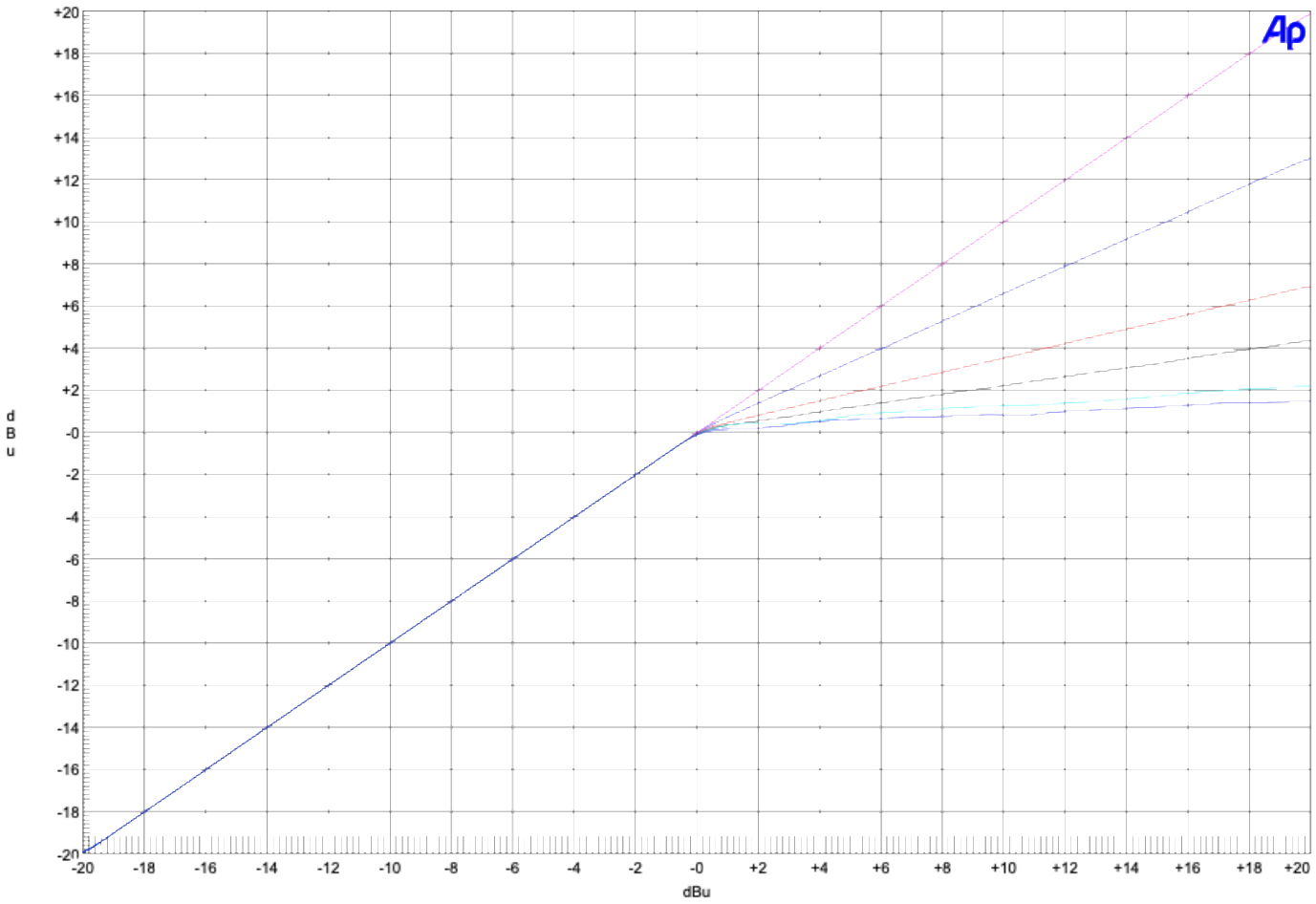


Figure 5.6 F-Comp Diode Mode Ratio Control – 1:1, 1.5:1, 3:1, 5:1, 10:1, 15:1 & 20:1

5.10.2 Release Control

Release Control The release control has a range of 5ms to 2000ms and is defined as the time taken to release 64% of the attenuation from the point in time that the input signal passed back below the threshold level.
The Diode mode release curve has a linear dB/Time characteristic

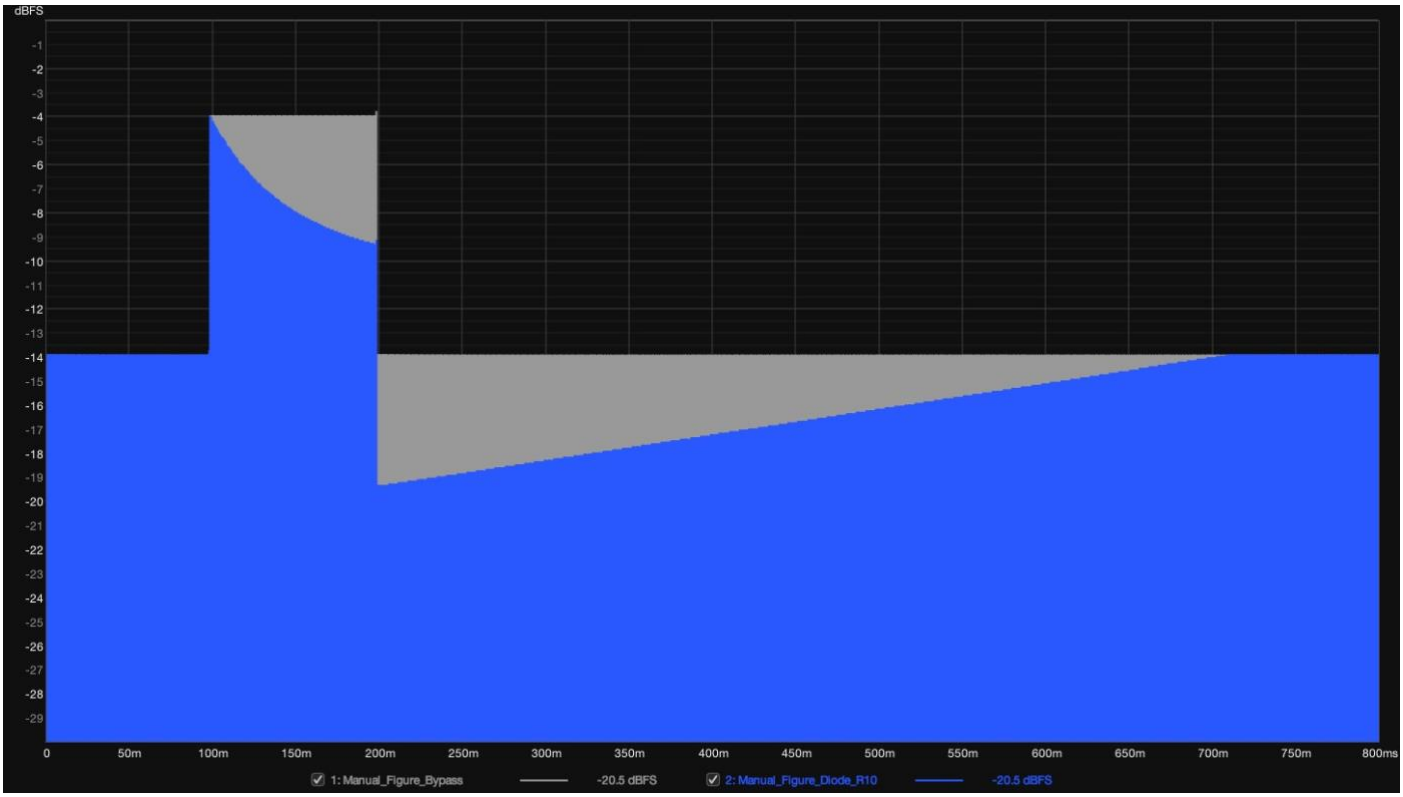


Figure 5.7 F-Comp Diode Mode Attack and Release Curves

5.11 Mu Mode

Figure 5.8 EC24 F-Comp Mu Mode

The F-Comp Mu mode is inspired by the program dependent nature of the classic vari-mu designs.
This mode features a very wide knee around the threshold control point which means the ratio of compression increases gradually from below the threshold point, this leads to a very pleasing compression effect when applied across program material with a wide range of frequency content.

5.11.1 Time Constant Control

This control changes the attack and release times of the F-Comp simultaneously to combine the timing characteristics into one control.
It should be noted that unlike some of the famous classic valve vari-mu compressors the time constant remains linear across its range, so that setting a time constant of 1 results in the shortest attack and release times available. While a time constant setting of 5 will result in the longest attack and release times.
Both the attack and release curves of the Mu mode are exponential dB/time curves on the minimum settings. The decision to link the two controls together was made after extensive listening tests to a wide range of source material.

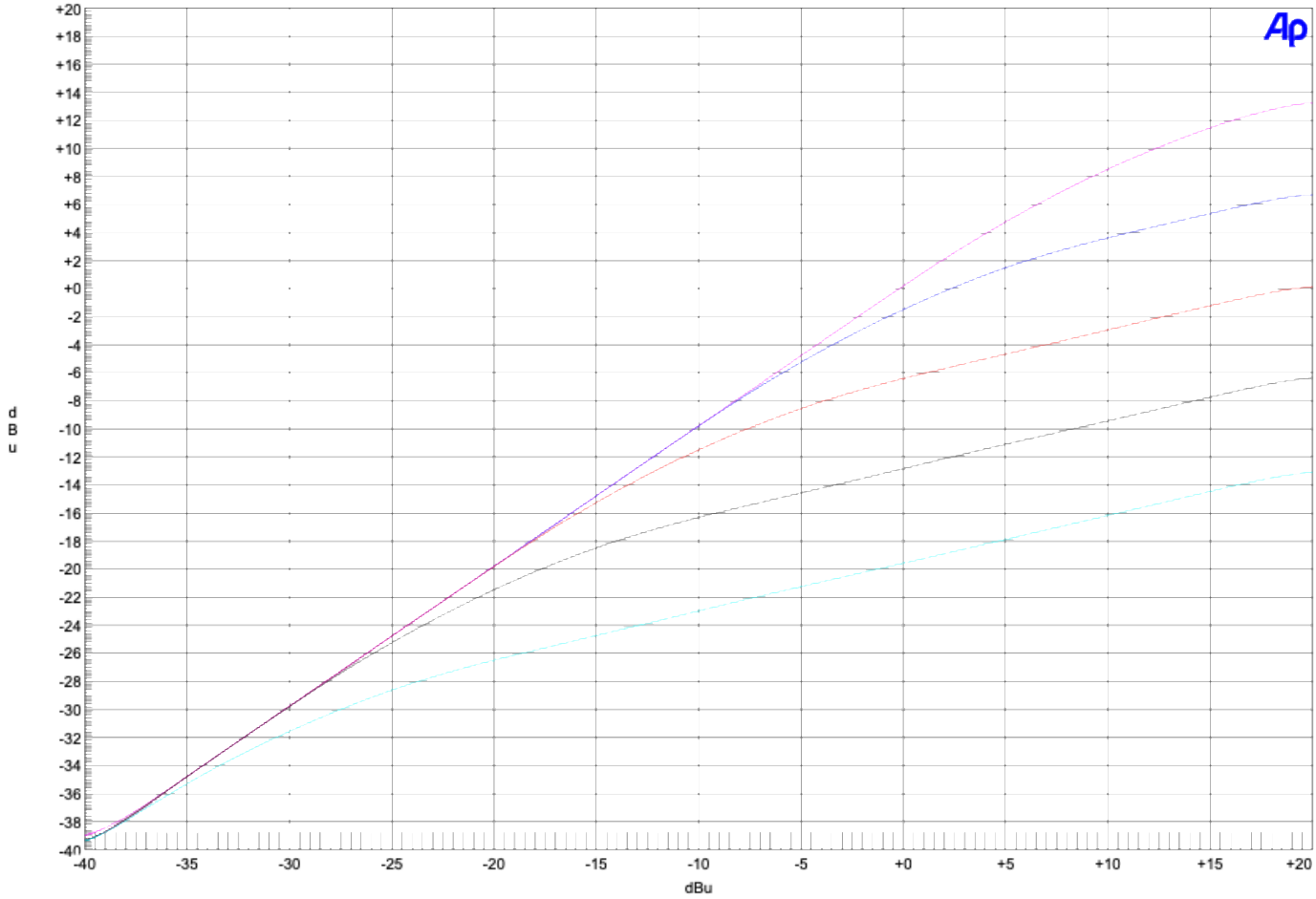


Figure 5.9 F-Comp Mu Mode Transfer Function, Threshold – 0dB, -5dB, -10dB, -15dB, -20dB

6 Limiter

Figure 6.1 EC24 Limiter

6.1 Limiter Overview

The EC24 limiter uses a much faster version of the C-Comp's attack and unique opposite exponential transition release shape, with a ratio of 1 to infinity.
It is very much designed to be used in combination with the other compression stages to remove unexpected transients from the source material.
However, it can be equally useful when deployed as a stand alone limiter. Due to the fast attack times, best audio results are usually achieved with a combination of fast attack times and slower releases.
However, thanks to the presence of the mix control, the limiter can be used to create drastic "smashed" effects, which can be dialled back to taste.

6.2 "IN" Control

This is the process engage control and switches the Limiter into circuit. When the process is disengaged the audio passes though unaffected. The gain reduction LED ring still displays the attenuation but with colour changed to Grey instead of the Limiter processes signature colour. This behaviour is also mirrored on the Limiter attenuation bar graph in the master section.

6.3 ”EXT SC” Button

When active, switches the input signal routed to the processor’s level detector from the main audio input signal to the EC24s split return input signal.
The input level meter also changes to show the level of the split return input signal.

6.4 Threshold Control

The threshold control (see chapter 2.4 for more detail) sets the level at which the Limiter will apply attenuation to the input signal.
It has range of -40 to +20 dBu.

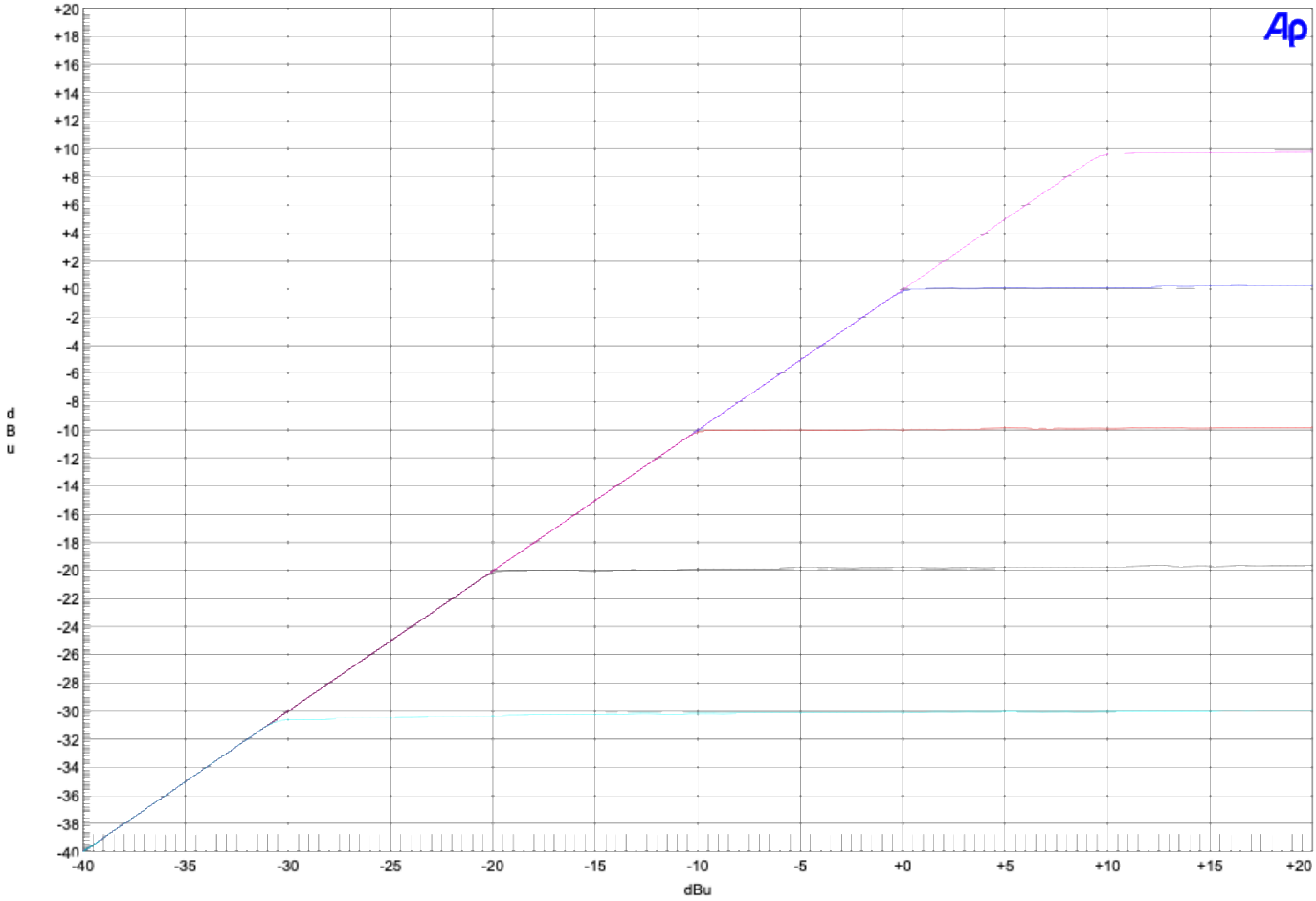


Figure 6.2 Limiter Transfer Function, Threshold – +10dB, 0dB, -10dB, -20dB

6.5 SC High-Pass Filter Button

The Sidechain High Pass Filter allows the user to reduce the low frequency content of the signal being fed into the threshold control.
It offers three different filter frequencies of 50Hz, 100Hz and 200Hz.
The filter responses are 6dB per octave and the frequency stated is the -3dB point.
The filter only effects the signal being sent to the threshold detector, it is not in the audio signal path.
The filter is placed after the EXT SC switch and so the filtering is applied to whichever signal routed to the threshold detector.

6.6 Attack Control

The attack times range from 0. 01ms to 20ms and are defined as the time taken for 64% of the final attenuation to be applied (1 time constant), once the input signal has exceeded the set threshold level.

6.7 Release Control

The release control has a range of 1ms to 500ms and is defined as the time taken to release 64% of the attenuation from the point in time that the input signal passed back below the threshold level, plus the time selected by the hold control. As mentioned earlier, the release curve transitions from one exponential curve to another midway through the release, resulting in transparent compression effects. Please see figure below.

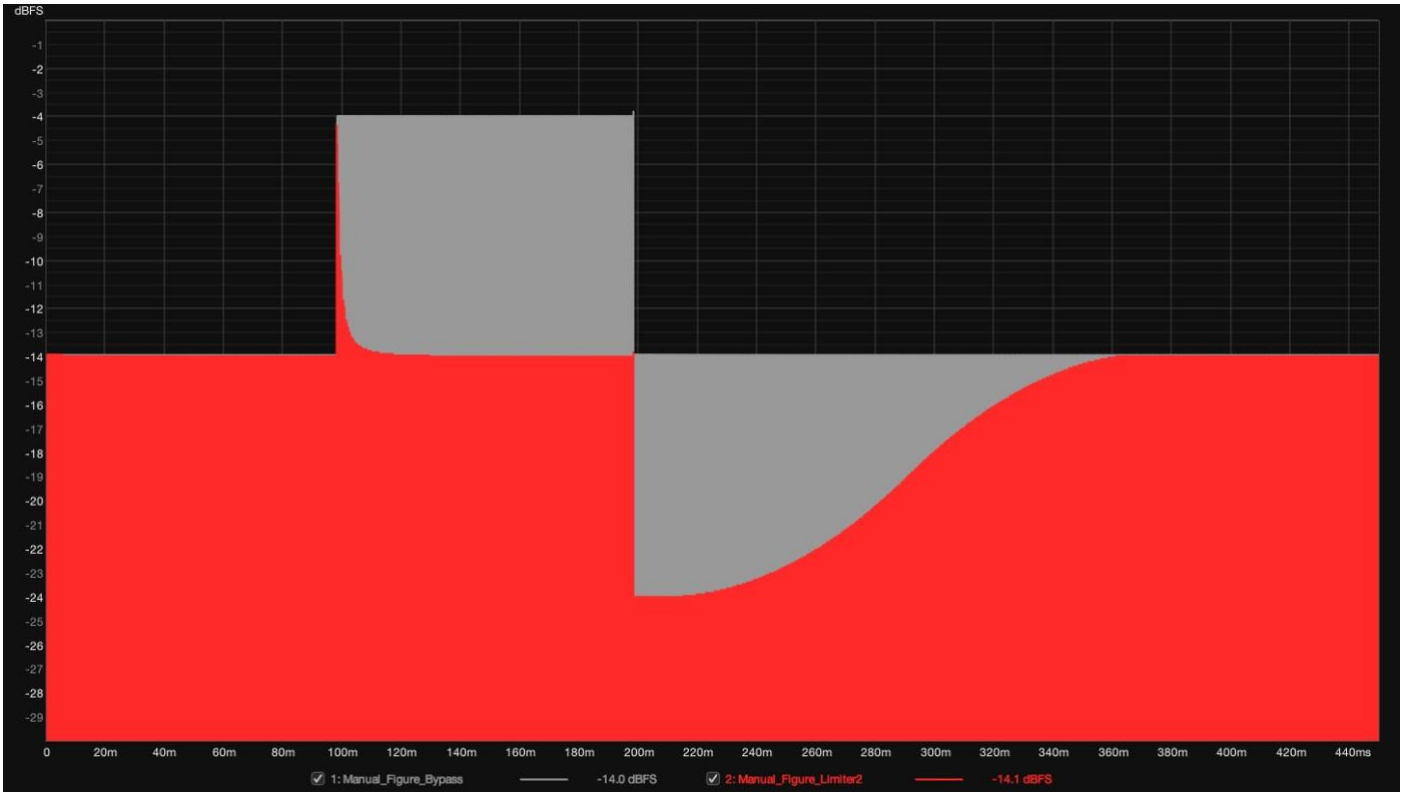


Figure 6.3 Limiter Attack Release Curves

6.8 Gain Control

The gain control provides makeup gain to compensate for the signal level lost during compression.
The control has a gain range of 0 to +20dBu.

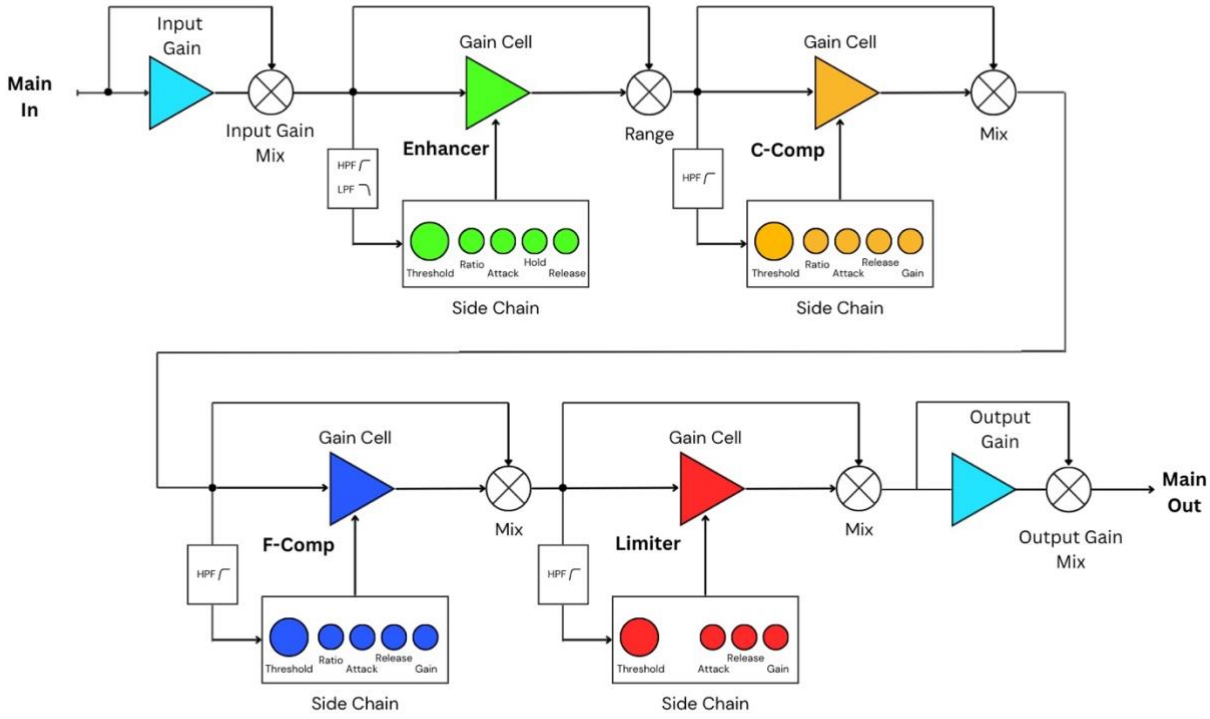
6.9 Mix Control

The mix control mixes the attenuated output signal of the Limiter with the Limiter input signal. The control has a range of 0 to 100% and has been designed to replicate the effect of parallel compression techniques used on mixing consoles.

7 Audio Signal Path

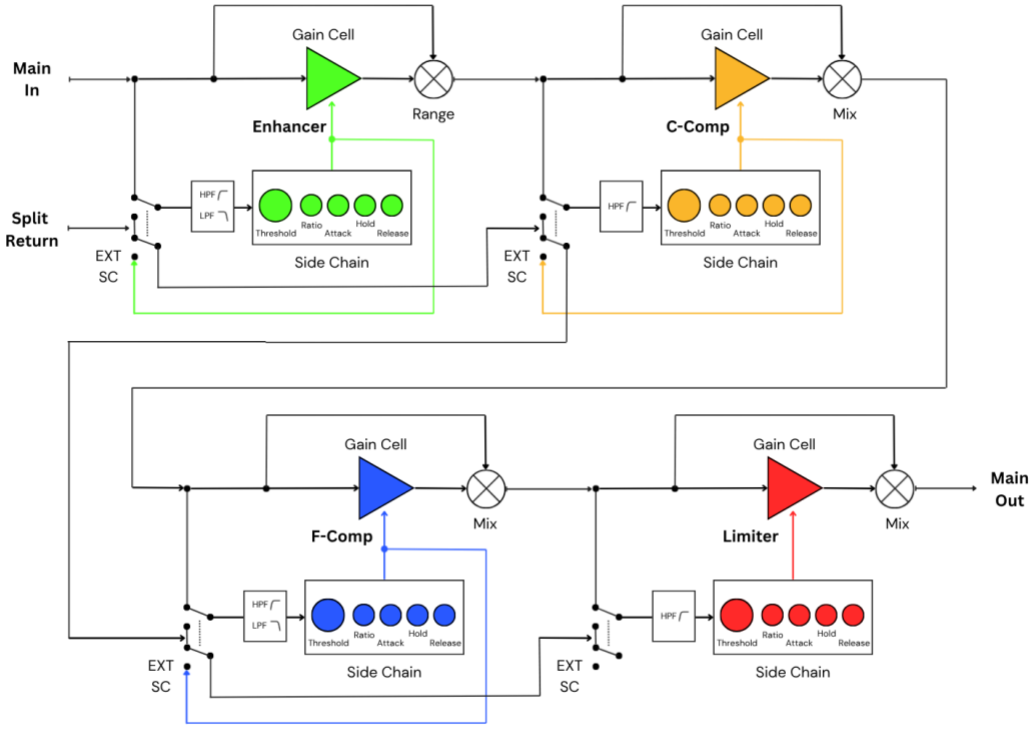
7.1 Basic Audio Signal Path

A conceptual block diagram of the EC24 is shown below.
The easiest way to understand the Mix master control is as a master controller for the mix control for each section. Each process has a mix control as does the Input gain and output gain sections.



7.2 Sidechain Mode

The SEPIA platform provides an additional insert or “split point” input and output for each single module slot.
The default configuration of the EC24 is to use the split return point as an input for an external sidechain.
In this mode of operation any process can be switched to react to an external sidechain signal rather than the input signal itself.
Furthermore, any if 1 or more processes are switched to react to the external sidechain signal they will react as if the process sidechains follow one another.
This offers powerful functionality but can also be quite a complicated concept to get ones head around.
A conceptual block diagram of the routing of sidechain and external sidechain signals is shown below.
Please note the Master Input Gain and Master Output Gain blocks have been omitted for clarity.

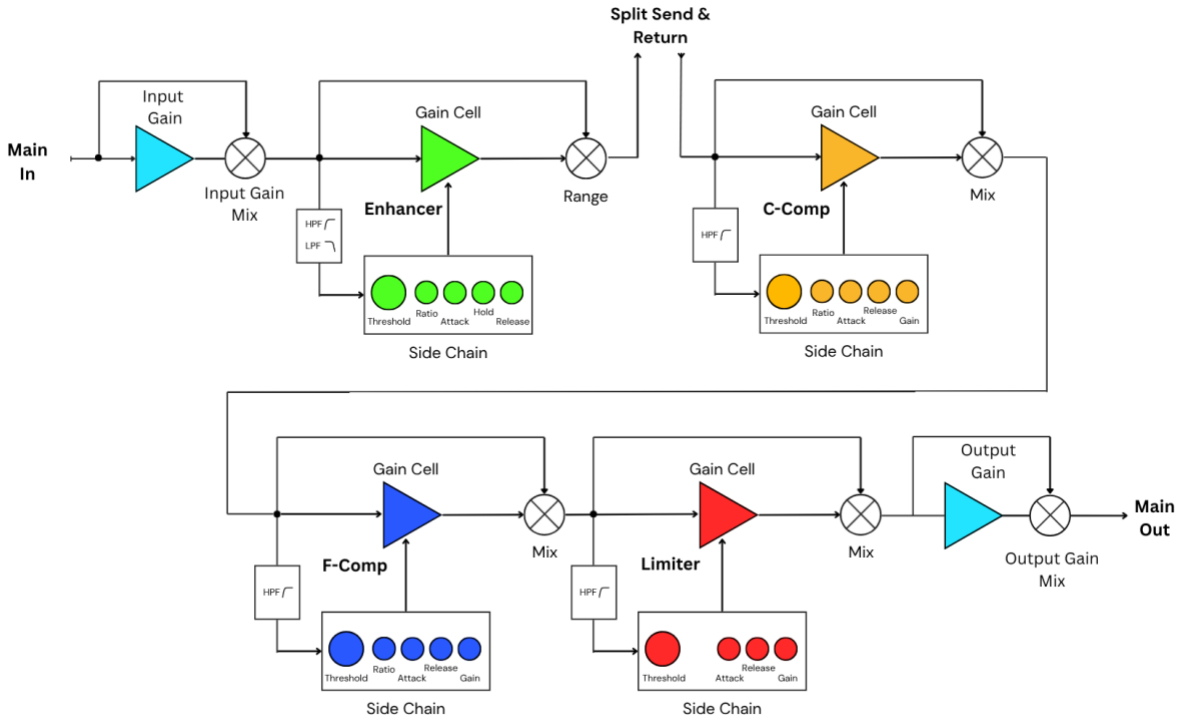


The EXT SC (External Sidechain) button in the master section provides a quick way to restore process sidechains to their normal configurations either to A/B different configurations or to temporarily disable the external sidechain in the event of a problem with the external sidechain signal routing.

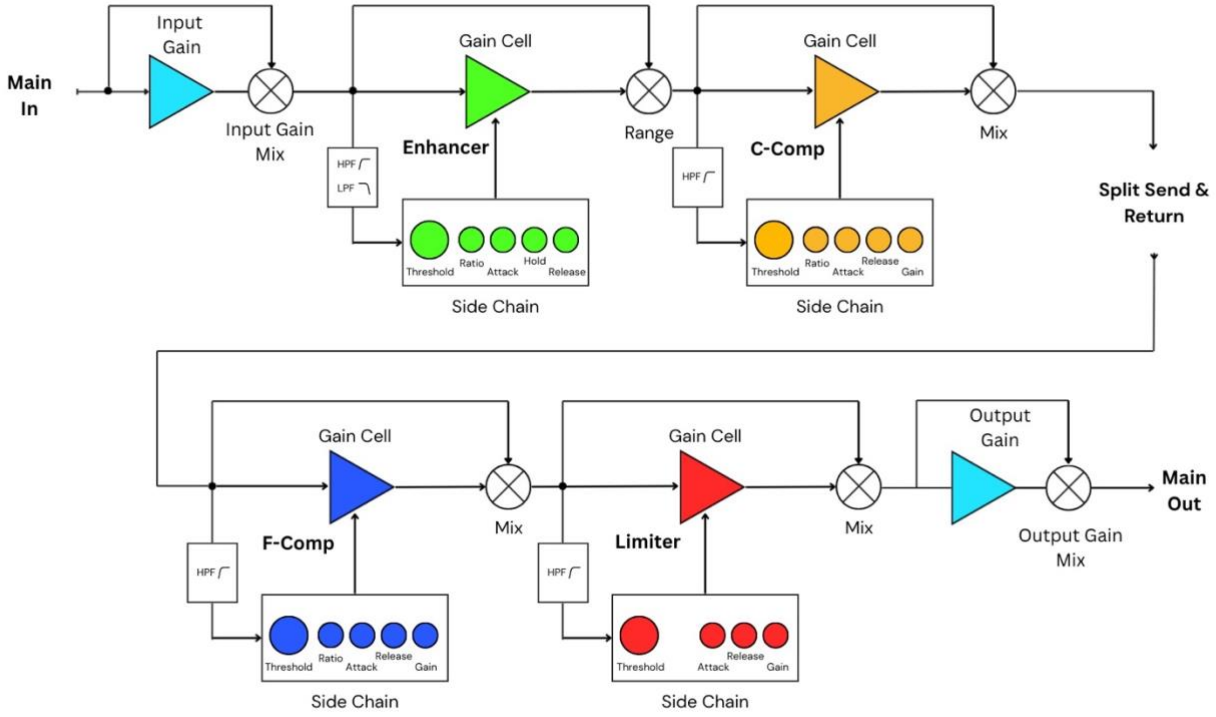
7.3 Split Mode

When an EC24 is “Split” in the SEPIA control software, the EC24 utilises the module slot “split point” to offer an insert send and return that can have its send and return point moved between 3 different points in the process chain.
This functionality allows the user to create complex analogue chains such as routing the input signal through the EC24s Enhancer and C-Comp sections before routing through a third party EQ and then returning to the EC24 for further processing with the F-Comp and Limiter section.

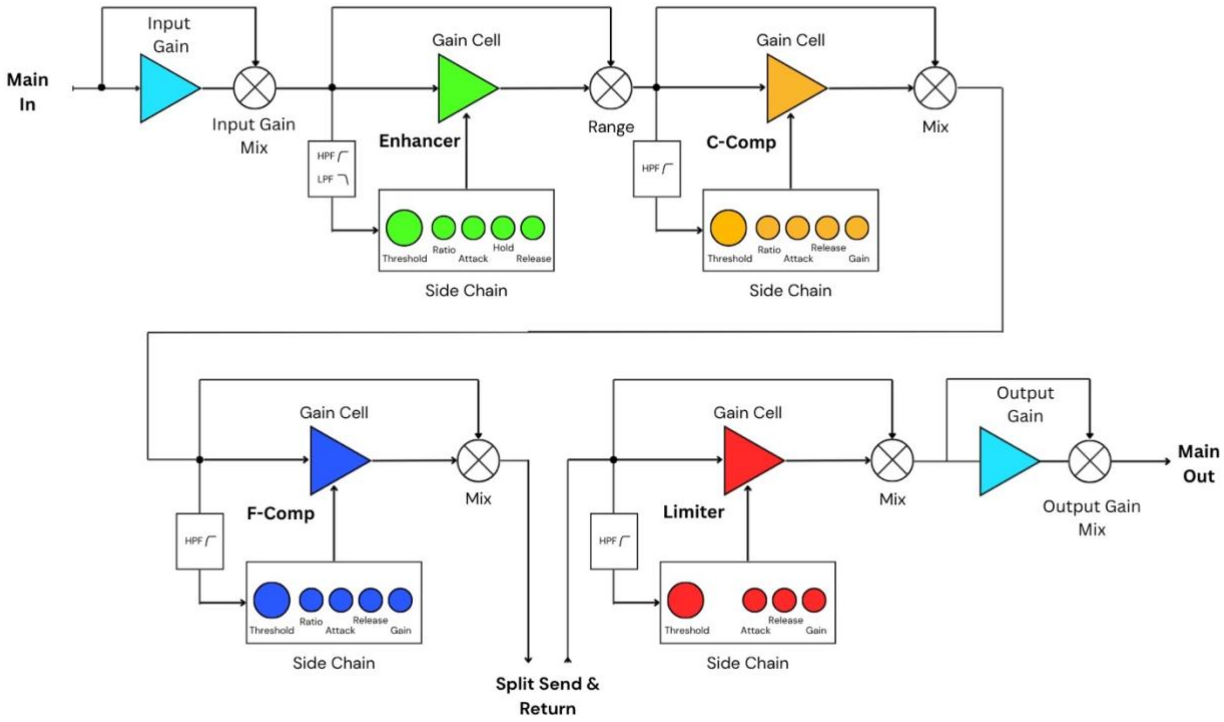
7.3.1 Split Point – Post Enhancer Pre C-Comp



7.3.2 Split Point – Post C-Comp, Pre F-Comp

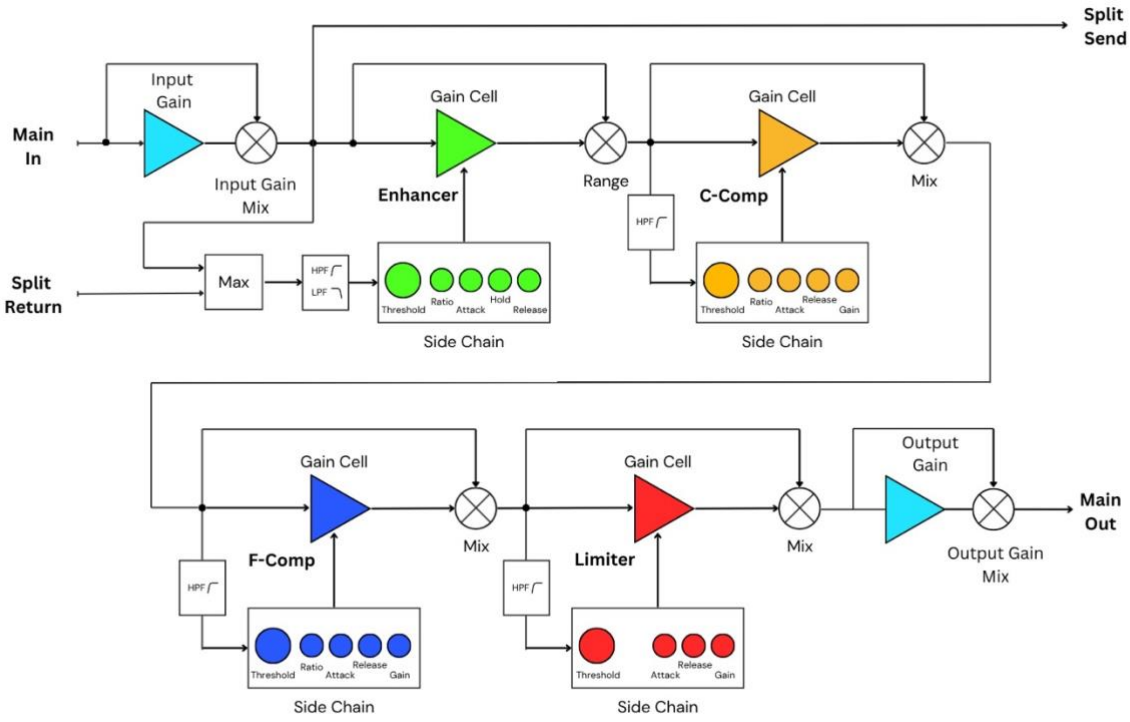


7.3.3 Split Point – Post F-Comp, pre Limiter



7.4 Gang

When a pair of EC24s are ganged together in the SEPIA host software, the gang enable button in the master window allows the input signal of EC24 A to be sent to the insert return point of EC24 B.
EC24 B sends its input signal in the same way and allows each EC24 to compare the A and B signals and react to whichever has the maximum amplitude in order to achieve dual (stereo) operation.



8 Technical Specifications

8.1 Input Section

Input Impedance (Electronically Balanced)	12Kohm
Max Input Level	+20dBu
CMRR	90dB @ 50Hz

8.2 Output Section

Frequency Response (-3dB)	3.5Hz to 120kHz
Max Output Level	+20dBu
Distortion (Dynamics Bypassed)	<0.004% @ 0dBu 20Hz – 20kHz

8.3 Enhancer Parameters

8.3.1 Primary Mode

Threshold	-40 to +20	dBu
Sidechain High Pass Filter Frequencies	50, 100, 200	Hz
Sidechain Low Pass Filter Frequencies	500, 1000, 5000	Hz
Attack	0.2 to 100	ms
Release	5.0 to 2000	ms
Range	0 to -20	dB

8.3.2 EXP/Gate Mode

Threshold	-40 to +20	dBu
Sidechain High Pass Filter Frequencies	50, 100, 200	Hz
Sidechain Low Pass Filter Frequencies	500, 1000, 5000	Hz
Attack	0.2 to 100	ms
Release	5.0 to 2000	ms
Ratio	1.0 to 20	
Hold	5.0 to 2000	ms
Range	0 to -20	dB

8.4 C-Comp

Threshold	-40 to +20	dBu
Sidechain High Pass Filter Frequencies	50, 100, 200	Hz
Hold (Fast, Medium, Slow)	2.5, 5, 10	ms
Knee (Hard, Medium, Soft)	0, 7.5, 15	dB
Attack	0.5 to 50	ms
Release	5.0 to 2000	ms
Ratio	1:1 to 1:20	
Gain	0 to 20	dB
Mix	0 to 100	%

8.5 F-Comp

8.5.1 Opto Mode

Threshold	-40 to +20	dBu
Sidechain High Pass Filter Frequencies	50, 100, 200	Hz
Attack (Fixed)	10	ms
Release (Fixed)	1500	ms
Gain	0 to 20	dB
Mix	0 to 100	%

8.5.2 Diode Mode

Threshold	-40 to +20	dBu
Sidechain High Pass Filter Frequencies	50, 100, 200	Hz
Attack (Fixed)	4	ms
Release	5.0 to 2000	ms
Ratio	1:1 to 1:20	
Gain	0 to 20	dB
Mix	0 to 100	%

8.5.3 Mu Mode

Threshold	-40 to +20	dBu
Sidechain High Pass Filter Frequencies	50, 100, 200	Hz
Attack (Time Constant Control)	4 to 30	ms
Release (Time Constant Control)	100 to 2000	ms
Gain	0 to 20	dB
Mix	0 to 100	%

8.6 Limiter

Threshold	-40 to +20	dBu
Sidechain High Pass Filter Frequencies	50, 100, 200	Hz
Attack	0.01 to 20	ms
Release	1.0 to 500	ms
Gain	0 to 20	dB
Mix	0 to 100	%

8.7 Master Section

Input Gain	-20 to +20	dB
Output Gain	-20 to +20	dB
Mix	0 to 100	%

8.8 Physical Specification

Weight	285	g
Length	126.0	mm
Height	40.2	mm
Width	65.0	mm

9 Legal Information

9.1 Warranty

This product is warranted by Langstrath Audio Limited against defects in materials and workmanship for two (2) years from the date of purchase. Warranty service must be obtained through the local distributor or authorized retailer with proof of purchase. This warranty does not cover misuse, normal wear, or units purchased from unauthorized dealers or resellers. Your rights may vary by country or state.

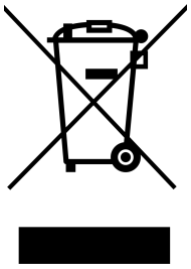
9.2 CE & UKCA Declaration of Conformity

Langstrath Audio Limited declares under its sole responsibility that this product complies with the requirements of the following legislation:

European Union legislation
Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended by Commission Delegated Directive (EU) 2015/863.

United Kingdom legislation
The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (UK RoHS), as amended.

9.3 WEEE/Note on Disposal



In compliance with the European Directive 2002/96/EC (WEEE – Waste Electrical and Electronic Equipment), this product must be recycled at the end of its service life. Do not dispose of it with household waste. Please take the product to designated collection points for proper recycling of electronic equipment. If suitable recycling facilities are not available, please contact the manufacturer to arrange return of the product. Where appropriate, a prepaid return shipment may be provided at the manufacturer's discretion.

Langstrath Audio Limited WEEE Registration: WEE/MM2191AA

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