CV SUITE
LINE MIXER

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Operation Manual

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Re
Rack Extension

We would like to dedicate our first Rack Extensions to the inventors of Roland TR-707 and TR-727.

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1. Introduction

Thank you for choosing Quadelectra CVSuite Line Mixer. We hope that you'll enjoy making music using it, and that it will inspire your creativity, on your productions.

The Line Mixer is the brother of Quadelectra's Line Processor device, which can alter many aspects of a single CV signal. We advise you to try that as well.

Used together the Line Mixer and the Line Processor, are a strong plus to your toolbox for your modulation needs.

↘ 1a. What Is The Quadelectra CVSuite Line Mixer

The Quadelectra CVSuite Line Mixer is a 16 in, 5 out CV Signal Mixer. The term "Mixer" as we'll see later on, goes beyond the conventional definition for audio mixers, due to the nature and the use of CV signals as control and modulation signals. Because of that, additional functionality has be introduced to the CVSuite Line Mixer for joining CV signals. Functionality that will extend your creativity, as it can produce complex modulation patterns and envelopes, symmetrical or asymmetrical LFO waveforms plus more.

Line Mixer's 16 inputs are distributed to 4 groups. Therefore each group controls, 4 CV inputs. Polarity can be inverted per Input Signal if desired by the user, then the quartet is mixed. The result of each group mixed signal goes through the "Mixer" section for additional per group gain adjustment, and then group result signals fed to the final stage of processing, which is called "Post Function".

The four groups handling quartets of CV inputs are marked A through D. Input CV sockets are named after the group letter, followed by their sequence number. For example A1 (Group A, Input 1), C2 (Group C, Input 2), B4 (Group B, Input 4) etc.

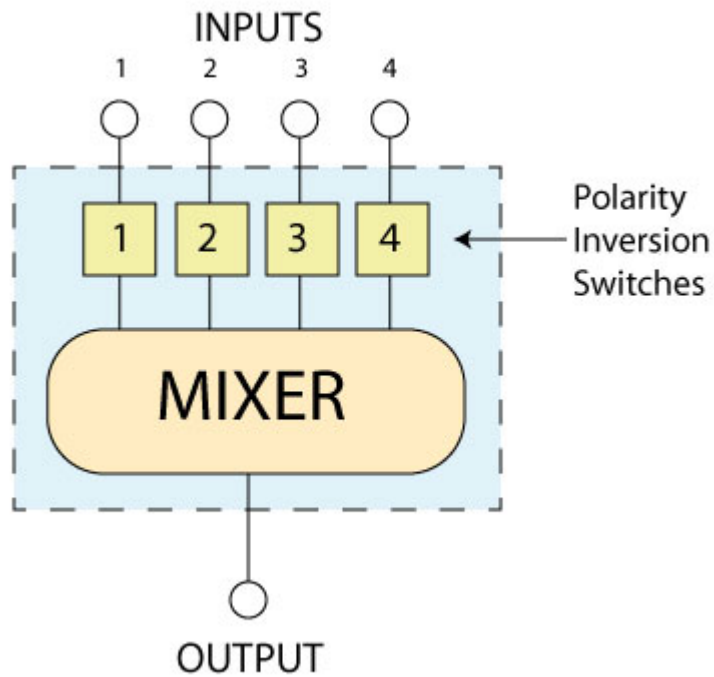**QUADELECTRA**
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INPUTS

Figure 1a-1: The diagram for each of the four groups. The four signals from the input CVs entering a group are subjected to Polarity Inversion if desired by the user, and then mixed by the group's algorithmic mixer.

The "Post Function" section is in fact a 5th group that accepts the results of Groups A through D, instead of CV inputs, and performs the final mix to their signals.
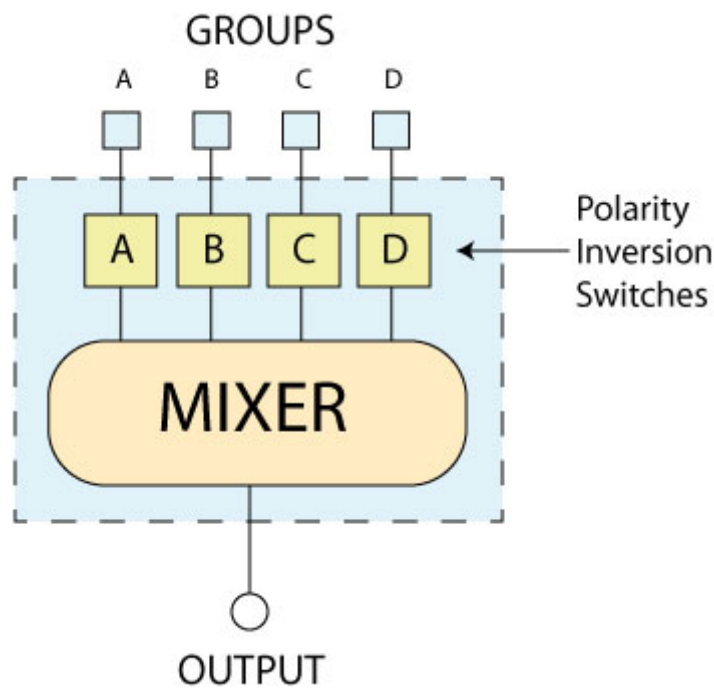
GROUPS

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Figure 1a-2: The Post Function Section, is identical to the Group ones, except that the incoming signals are the resulting outputs from the four groups.

Because, of this design unit can also parallel process the signals from the Groups, and output them separately to dedicated per group CV out sockets on the back panel. More information on these outputs can be found on "Chapter 3: The Back Panel".

Internally, no clipping is applied to the signals. Any resulting signals from the Groups or the "Post Function" are clipped just before they "leave" the device through their CV outs. This means that although group CV out sockets always deliver a clipped signal, the "Mixer Section" and the "Post Function" will process any signals, unclipped.
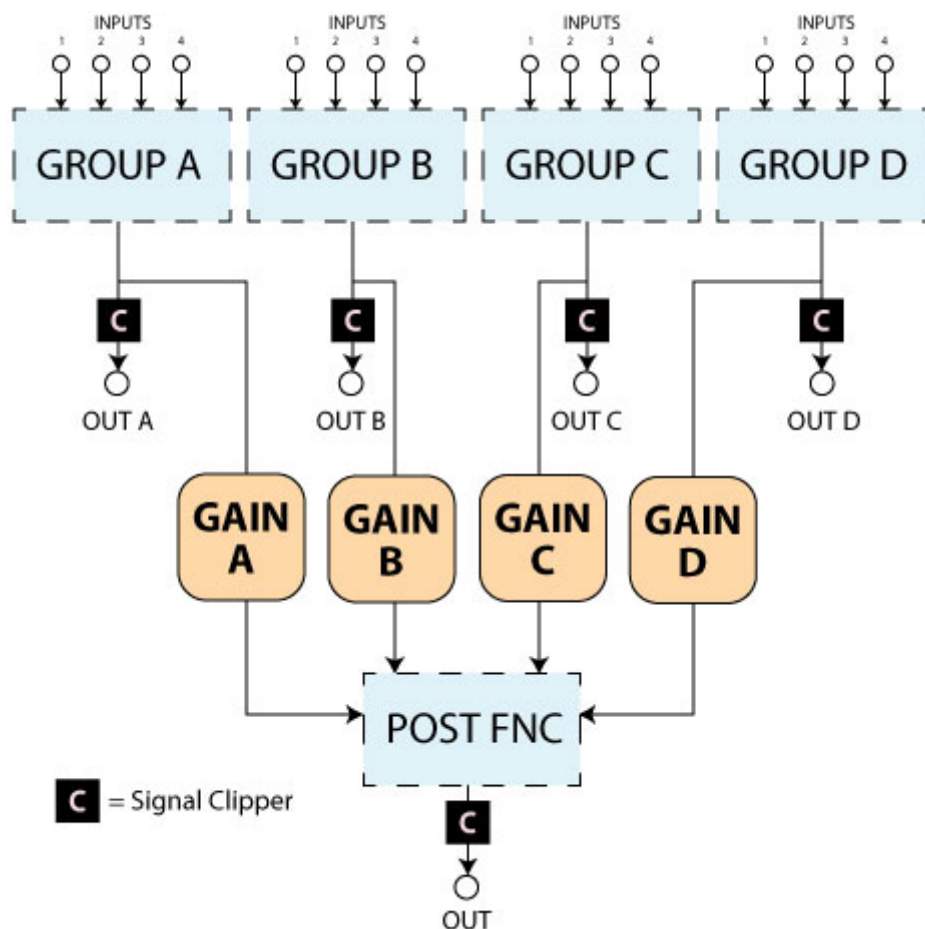

Figure 1a-3: The complete CVSuite Line Mixer Diagram.

↘ 1b. CV Signals

Just in case you haven't read Reason's manual (we recommend doing so) on CV signals, here's a quick roundup:

As you already know Reason CV signals are used (becides sequencing) to control device parameters. These signals are in fact floating point numbers varying either from 0.0 to 1.0 or -1.0 to 1.0.

Signals ranging from 0.0 to 1.0 are called Unipolar Signals (i.e. they contain positive values only), while signals ranging from -1.0 to 1.0 are called Bipolar.

A unipolar signal is f.e. the CV output of an envelope as it will change a parameter from its value and above or below but never both ways, above AND below that value, whereas a bipolar signal is usually the CV output from an LFO which will affect its target parameter both above and below a central value.

CV Signals operate on the constant value of a parameter and change it, by producing values above (if their value is a positive number) or below (if the value is a negative number) that value. The trimmer knob situated in some cases below input CV sockets defines the range of values above and below the constant value, and thus the strength of the effect of the input CV signal.

Quadelectra CVSuite Line Mixer accepts CV signals as input, and mixes them in a set of different ways.

↘ 1c. How To Read This Manual

We explain the various processing methods of the Line Mixer using graphs depicting the logical diagrams or the results of a mixing process on a set of reference waveforms. The reference waveforms are two sinusoid varying in period and amplitude.

For your convenience, and comparison reasons, these original source waves are shown in dashed lines.

All graphs have a image caption below with a short caption describing the effect results in brief. For example:
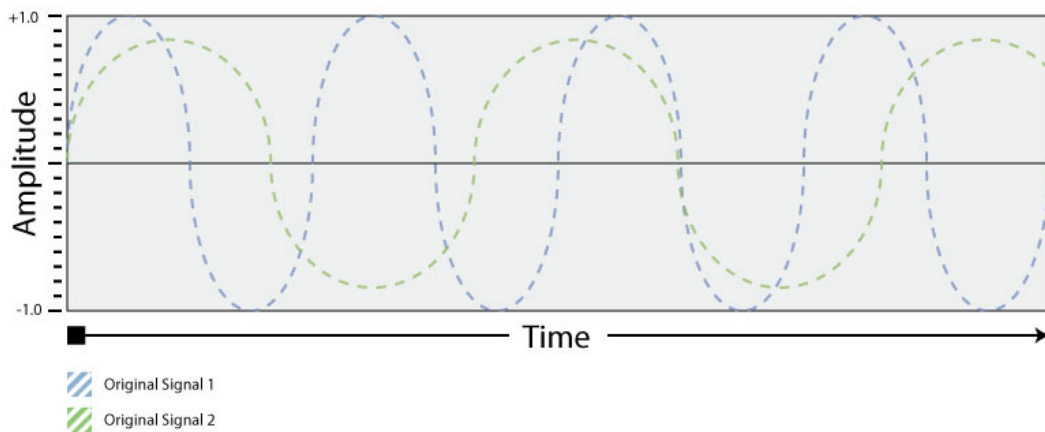
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Figure 1c-1: The two reference signals are shown in dashed lines.

In the Second Chapter we'll check out the front panel and see how you can mix your CV signals using the Line Mixer.

In Chapter Three, we take a look at the back panel and the available connections.

Finally at the end of the manual you can find a Specifications Chart and MIDI control map to help you set up an external controller.

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2. The Front Panel

The CVSuite Line Mixer's Front Panel, is divided in 6 different sections. The first four sections are called groups, and they process signals in parallel.

The "Mixer" and "Post Function" sections operate on the results of the four groups.

Figure 2-1: The Quadelectra CVSuite Line Mixer Front Panel.

Let's take a closer look:

- **Group A, B, C and D**: The first 4 sections are identical and operate in the same manner. They are called Groups (A, B, C and D). As mentioned, each group is capable of mixing up to 4 signals, according to a selected algorithm out of a total of nine.

  Different algorithms provide different processing and thus different results. CV Inputs that are not connected, do not "participate" in the mix / they are not calculated.

  The Signal Polarity for each of the 4 inputs of a group can be inverted if desired using a set of four buttons numbered respectively.

- **Mixer**: The mixer section allows you to change the gain of the output signals for each group before they are fed to the final stage of processing (Post Function). You can de-amplify a signal setting its gain to a value lower than 100% or amplify it up to 200%.

- **Post Function**: "Post Function" section works just like a Group, except that the incoming four signals, participating in the final mix, are the output results of each group. This section produces the final output of the CVS Line Mixer.

↘ 2a. Group A-D Sections

Each of the first four sections called "Group A" through "Group D" provide similar functionality. Four input CV signals are handled per group. You can switch each signal's polarity from normal to inverted and select the type of mixing, that they will be subjected to.

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2ai. "INV" Switches 1-4 (Polarity Inversion Switches)

You have the ability to invert each signal's polarity by switching on the corresponding "INV" button, labeled after the group input it controls.

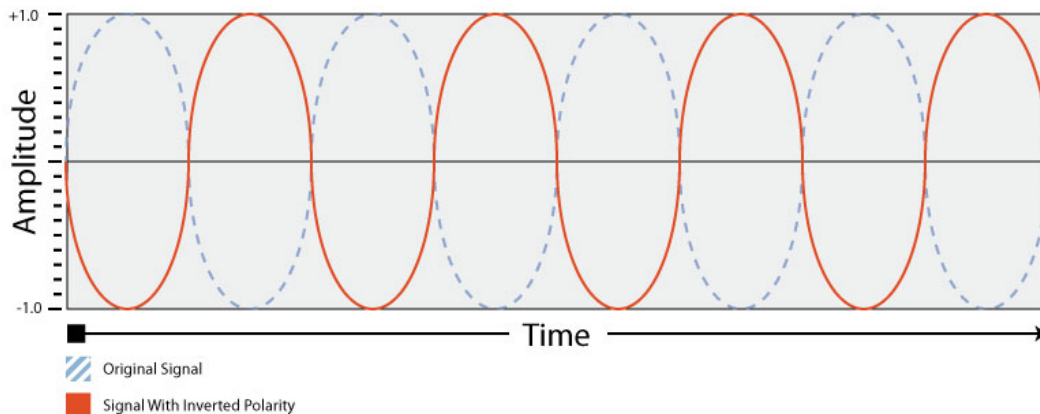These buttons are located at the bottommost of each group.

Figure 2ai-1: Original Reference Signal 1 when it's corresponding "INV" switch is set to on.

Polarity Inversion is a very helpful feature when mixing signals, as we'll see a bit further.

2aii. Group Mixer Function

The group mixer function controls are located above the polarity switches. They consist of a LED display and a button with a "down" arrow head. Clicking on the display will open a popup window with all the available mixing functions (algorithms), while clicking on the button will select the next in the popup list algorithm, and ultimately cycle through them all.

In contrast to an audio mixer, and because of the fact that CV signals have different logic than audio -that of a control signal- the mixing process can be done in different ways and give you the most desirable result.

A CVS Line Mixer group can mix the four signals it controls, in 9 different ways. The various algorithms output results either from calculation (First 3 Algorithms), logical selection (Middle 4 Algorithms), or CV controlled selection (Last 2 Algorithms).

In the following list of algorithm definitions variables i1, i2, i3 and i4 represent the four inputs of a group respectively.

The nine algorithms are:

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- **Add**: Outputs the sum of all signals. (i1 + i2 + i3 + i4).

> **NOTE** *Note that you can also use the "Add" procedure to subtract signals too, by inverting their polarity.*

- **Multiply**: Outputs the result of the multiplication from all signals together (i1 x i2 x i3 x i4).

- **Average**: Outputs the average value from all signals. This is identical to "Add" function except that the result is divided by the number of connected signals, so the resulting value is always inside the normalized CV range (-1.0 to +1.0).

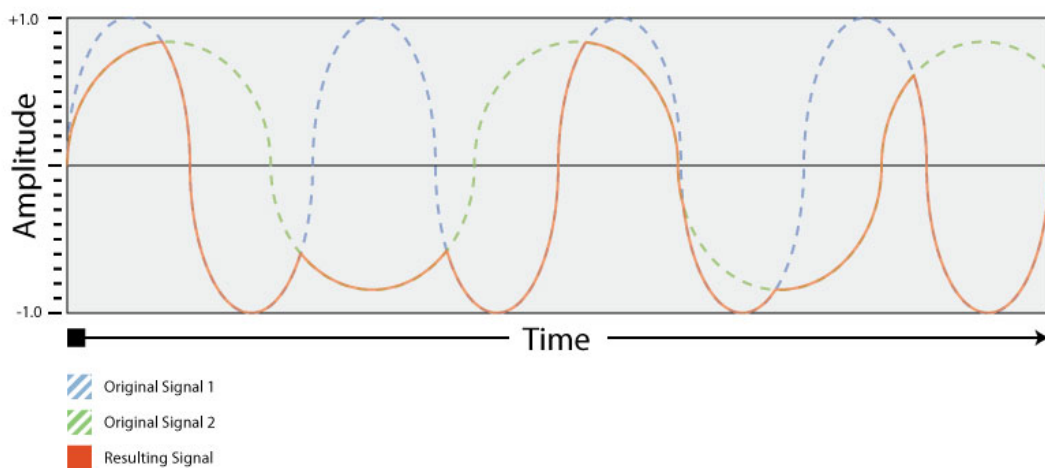- **Min**: Outputs the value of the minimum input signal.

Figure 2aii-1: The two reference signals and the resulting minimum selection.

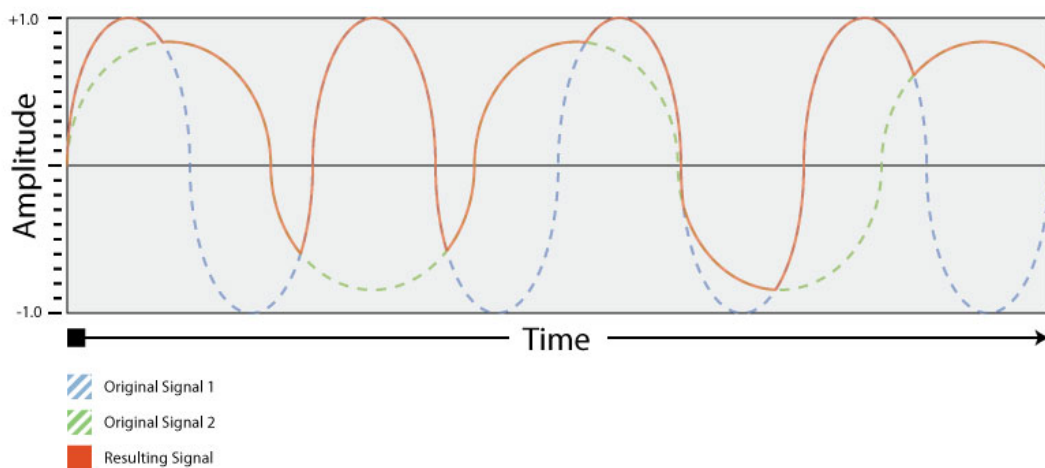- **Max**: Outputs the value of the maximum input signal.

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Figure 2aii-2: The two reference signals and the resulting maximum selection

- **Narrow Sel. (Narrow Selection)**: Selects and outputs the closest input value to the zero crossing. This is not to be confused with "Min", although using Unipolar signals the results are identical. Narrow Selection in a bipolar signal can select either a positive or a negative value depending on which is closer to zero.
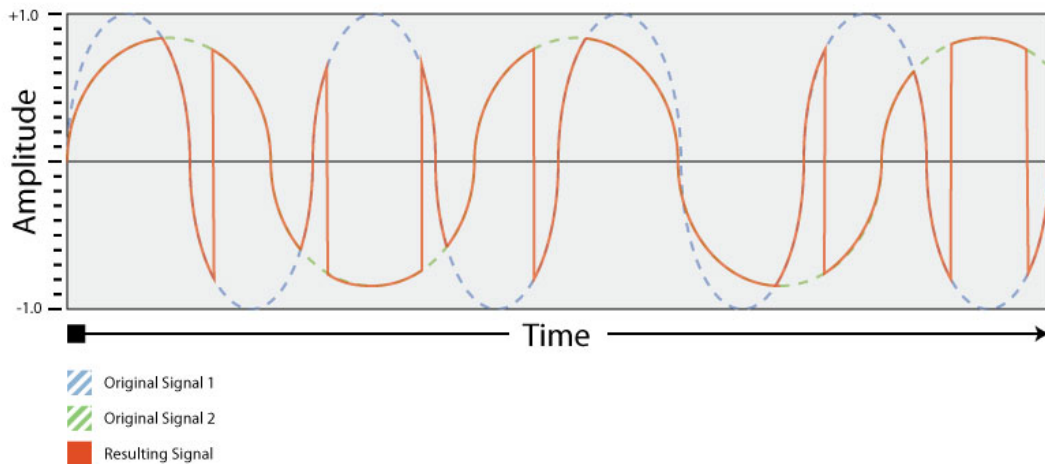

Figure 2aii-3: The reference signals and the resulting Narrow Selection. Notice that only the values from both signals, that closest to zero crossing are kept.

- **Wide Sel. (Wide Selection)**: The opposite of "Narrow Selection". The "Wide Selection" returns the value most far from zero crossing. Again this should not be confused with the "Max" function, even if in Unipolar signals the result is identical.
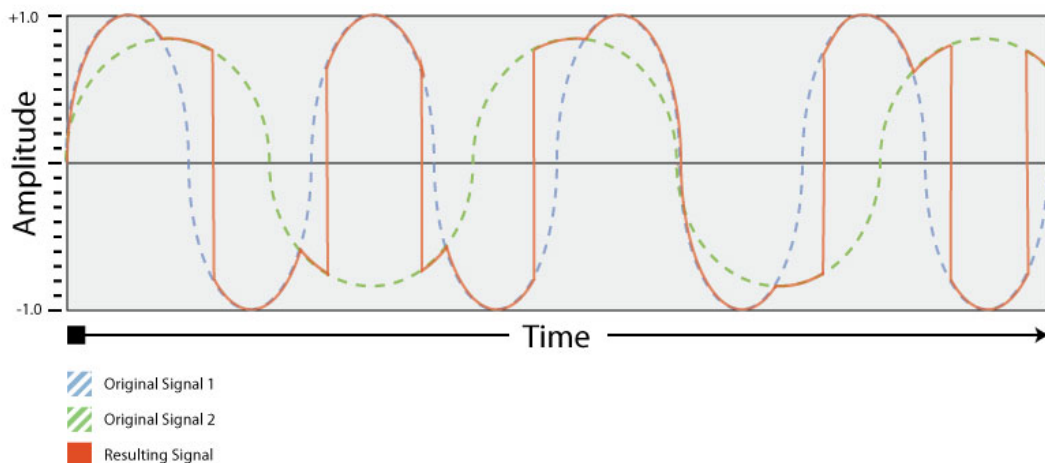

Figurer 2aii-4: The reference signals with the resulting Wide Selection. Here the most distant from zero-crossing values have been selected.

- **Balance 2:2**: The Balance 2:2 uses the multiplication result of inputs i3 and i4 to select a value between the range of i1 and i2.

  A multiplication result (i3 x i4) of -1.0 will return the value of i1, while a multiplication result of 1.0 will return the value of i2.

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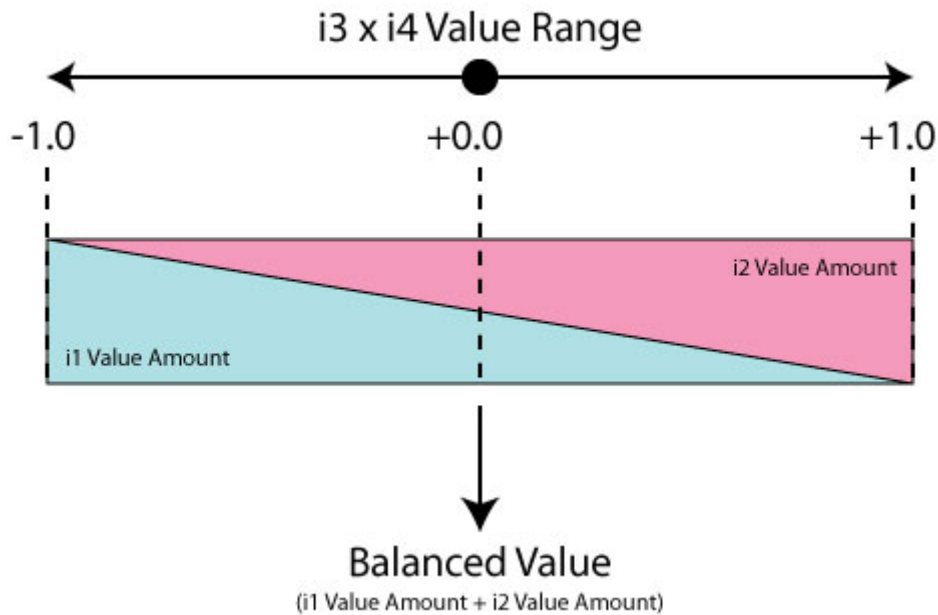Results in between will return a number between the two. The balance functions, in fact, work like a cross fader.

Figure 2aii-5: The Balance 2:2 schematic. The result of this algorithm is a balanced value of inputs i1 and i2, by the multiplication result of i3 and i4

When no signal is connected to either i3 or i4, the value range used is that of the remainder input. If neither i3 and i4 are connected the Balance algorithm produces no change.

- **Balance 3:1**: Similar to "Balance 2:2" except that the input signal i4 is used to control the balance between i1, i2 and i3.

  In this scenario a value on i4 of -1.0 selects the value from i1, while a value 0.0 selects i2 and value 1.0 selects i3. Ranges in between select a number between the range i1-i2 if negative, and i2-i3 if positive, like a 3 position x-fader.
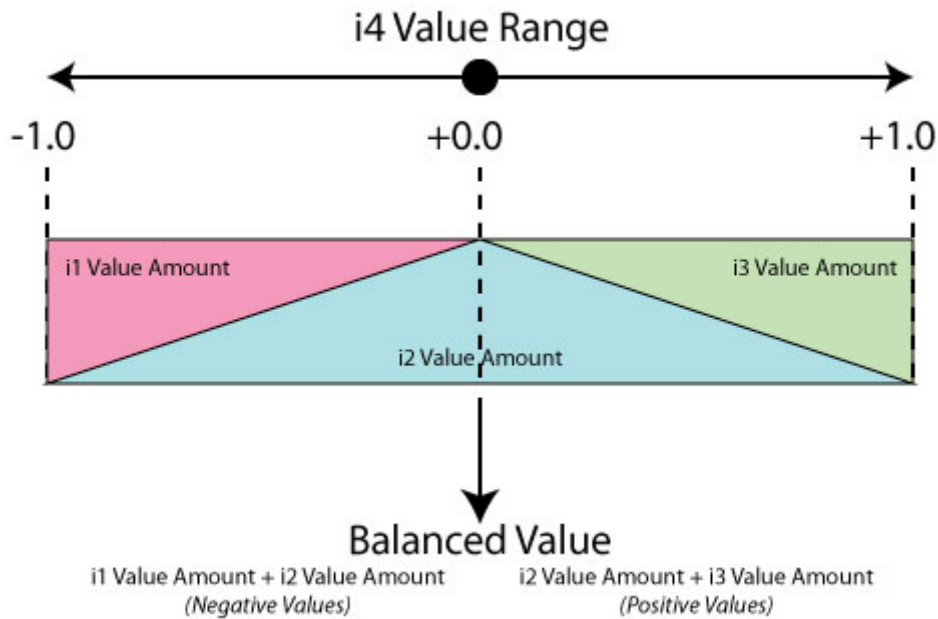
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Figure 2aii-6: The Balance 3:1 schematic. The result here is a balanced value using the analogy from i4, between either i1 and i2 (negative values) or i2 and i3 (positive values).

When i1, i2 CV inputs are connected, along with either i3 or i4, the balance will perform in the same manner as described on Balance 2:2.

NOTE	*You can invert the cross-fade inputs from the balance algorithms, even on the fly, just by inverting the polarity of one of the inputs contributing to the balance value range (i3 or i4 for Balance 2:2 and i4 for Balance 3:1).*

⭷ 2c. The Mixer

The CVS Line Mixer unit is equipped with 4 gain knobs to help you balance the results of each mixing group. Gain knobs are named "Gain A" through "Gain D" according to the group they relate.

- **Gain A, B, C, D:** Use one of these Gain Knobs to amplify or de-amplify the corresponding Group's signal. Values lower than 100% will de-amplify the signal, while values higher than 100% will amplify it.

  The gain amount of the knob and the value from Gain CV Modifier are added up, allowing the total gain of a signal to reach up to 400%.

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↘ 2d. Post Function

"Post Function" section looks and works just like a Group, except that the incoming four manipulated signals, are the resulting ones from each group plus any gaining applied from the mixer. This section produces the final output from the CVS Line Mixer.

See Section 2a (Groups A, B, C, D) for more info on the "Post Function" functionality.

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3. The Back Panel

The Back Panel of the device, from left to right, has 16 CV inputs divided in 4 groups, 4 CV Gain Modifier Inputs and finally 4 group sub-outputs and a master output.

Figure 3-1: The CVSuite Line Mixer Back Panel.

↘ 3a. Input / Output Connections

The Quadelectra CVSuite Line Mixer has a total of 16 CV inputs, divided in to 4 groups of four inputs each. These are located at the left of the device.

A set of five outputs is situated on the right side of the device.

Outputs named A through D, export the signal from Groups A through D respectively. The rightmost output CV exports the final signal after the Groups' Post Function.

↘ 3b. Modifiers

The unit provides a set of CV Modifier Inputs for controlling the gain of each group. The Gain CV Inputs are located between the Group Inputs and the Outputs, and they are marked A through D.

I. Appendix I: Specifications

↘ Ia. Technical Specifications.

Device Type:	Reason Rack Extension Helper Device. 16in 5out CV Signal Mixer.
Front Panel:	20 x Inverse Switches (Groups A-D, Inputs 1-4 per Group) + (Post Function, Groups A-D).
	5 Algorithmic Mixers with LED display & Selection Button, with 9 Mix Algorithms (Add, Multiply, Average, Min, Max, Narrow Sel., Wide Sel., Balance 2:2, Balance 3:1).
	4 x Gain Knobs (Groups A-D)
Number Of Inputs:	16 x CV Inputs
	4 x CV Modifier Inputs (Gain A - D) + Trim Knobs
Number Of Outputs:	4 x CV Outputs (Group A - D)
	1 x CV Output (Master)

↘ Ib. MIDI Control Chart

MIDI CC #	Parameter
80	Mixer - Gain A
81	Mixer - Gain B
82	Mixer - Gain C
83	Mixer - Gain D

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II. Contact Info

Please feel free to contact us using the following methods:

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