Crestron **C2VEQ-4**
Volume/Equalizer Control Expansion Card
Operations & Installation Guide

CRESTRON

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Contents

Volume/Equalizer Control Expansion Card: C2VEQ-4

Introduction

Features and Functions

The Crestron® C2VEQ-4 Volume/Equalizer Control expansion card is a digitally controlled 4-channel audio processor that provides volume/tone, mixer and equalization capabilities for the Crestron PRO2, PAC2, RACK2, or AV2 (with card cage) 2-Series control systems. The C2VEQ-4 fits in any of the 2-Series control system's 40 Mb/s high-speed communications Y-bus slots.

Each channel of the C2VEQ-4 has independent settings for volume, treble, bass, mute, and mixer controls plus a 12-band parametric equalizer.

Functional Summary

- Four balanced/unbalanced audio I/O channels
- 24-bit 96KHz A/D and D/A converters with dual DSPs provide improved audio quality
- Independent settings for volume, treble, bass, and mute per channel
- 4 x 4 matrix mixer controls set the percentage of each input desired at each output
- Five modes of audio equalization per channel
  - a ten-band graphic equalizer and two-band parametric equalizer
  - a five-band graphic equalizer and seven-band parametric equalizer
  - a speech-optimized five-band graphic equalizer and seven-band parametric equalizer
  - a three-band graphic equalizer and nine-band parametric equalizer
  - a full twelve-band parametric equalizer

Volume, bass, and treble ramp times, scaling, preset levels, and volume muting may be specified on a per-channel basis. All of these aspects are software controllable. Volume, bass, and treble control may be sent to more than one channel via software to support stereo applications.

Input and output connections are completely independent of each other. Therefore, it is possible to have a balanced input paired with an unbalanced output and vice-versa.

The treble and bass controls are independent from volume and are individually controlled for each channel. Each channel includes a muting relay. When the signal driving Mute1 goes high, the muting circuit is activated providing <-100dBV output level from any volume level. Likewise, channels "2," "3,"and "4" drive Mute2, Mute3, and Mute4, respectively. When the muting signal goes low, the muting circuit is deactivated and the volume and tone return to their original preset levels.

NOTE: MuteAll is an override. All channels are muted when this signal is high. When it is low, the channels follow the state of Mute1, Mute2, Mute3, and Mute4.

Each of the four channels has a twelve-filter parametric equalizer that permits you to correct for acoustical distortions in the listening area or in the speakers themselves, and/or to establish preset values that enhance the sound conditions for favorite music or recording media.

The 12 filters are identical in function. Each delivers up to 12dB of boost or cut when using DAT software; from -36dB to +24dB in a SIMPL program. Each filter also has an adjustable bandwidth control (from .02 octaves to 2 octaves), and a center frequency control range from 10 Hz to 20 KHz. Use each filter anywhere in the audio spectrum, not just pre-selected ranges as typically found on graphic equalizers. In addition, you can select from among five filter types (low pass, high pass, EQ filter, bass shelf, and treble shelf) or select no filter.

Each channel is equipped with protective relays that turn ON only after safe conditions are sustained by the electronic circuitry. This feature protects the output from "pops" caused by accidental power-down/power-up conditions to the C2VEQ-4.

C2VEQ-4 Simplified Block Diagram
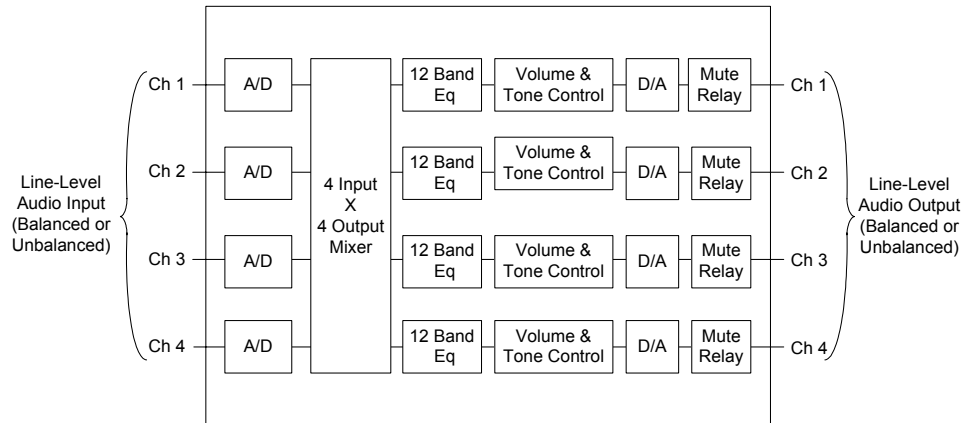
Specifications

The following table provides specifications for the C2VEQ-4.

C2VEQ-4 Specifications

SPECIFICATION	DETAILS	
Power Requirements	8.0 Watts	
Control System Update Files [1, 2]		
2-Series Control System Update File	Version 3.083.CUZ or later	
Input Channels (labeled 1 – 4)	Two 5-pin mini-connectors: two channels plus ground per connector.	
Output Channels (labeled 1 – 4)	Two 5-pin mini-connectors: two channels plus ground per connector.	
Volume (per channel)	-80dB to +20dB, 0.5dB control step [balanced I/O]	
Mute (per channel)	> -100dB	
Tone (per channel)	Bass gain range	±15dB
	Bass step size	0.5dB
	Treble gain range	±15dB
	Treble step size	0.5dB
Frequency response	±0.1dB 20-22kHz ±0.5dB 10Hz-30kHz	
Total harmonic distortion (THD) + Noise	<0.008% @1kHz 20 to 22kHz A-weighted	
S/N ratio	>97dB balanced, >95dB unbalanced, 20 to 22kHz A-weighted	
Crosstalk	> -90dB 20Hz-22kHz	
Common mode rejection	> 90dB 20Hz-22kHz	
Input level (max.)	4Vrms balanced, 2Vrms single-ended	
Input impedance	10K ohms balanced, 5K ohm single ended	
Output level	4Vrms balanced, 2Vrms single-ended	
Output impedance	200 ohms balanced, 100 ohms single-ended	
Environmental temperature	32° to 122°F (0° to 50°C)	
Humidity	10% to 90% RH (non-condensing)	
Dimensions	Height: 0.98 in (2.49 cm)	
	Width: 5.00 in (12.70 cm)	
	Depth: 6.77 in (17.20 cm)	
Weight	3.75 oz (0.105 kg)	

1   Crestron 2-Series control systems include the AV2 with CAGE2, PAC2, PRO2, and RACK2.
2   Filenames for 2-Series control system update files have a CUZ extension and can be obtained from the Downloads | Software Updates section of the Crestron website (www.crestron.com). Refer to note after this footnote.

NOTE: Crestron software and any files on the website are for Authorized Crestron dealers and Crestron Authorized Independent Programmers (CAIP) only. New users may be required to register to obtain access to certain areas of the site (including the FTP site).

Physical Description

The C2VEQ-4 is a circuit board fastened to an aluminum faceplate. The card is manufactured to easily fit in an unoccupied Y-bus slot of a Crestron 2-Series control system.

Four mini connectors provide the interface to four channels of balanced/unbalanced audio input (IN 1-4) and four channels of balanced/unbalanced audio output (OUT 1-4). Connect the balanced/unbalanced input (IN) ports to the audio output of any A/V equipment that needs volume, treble, bass, mixer, and/or equalization control; connect the balanced/unbalanced output (OUT) ports to an amplifier. Each channel includes a muting relay.

Refer to the following illustrations for a detailed view.

C2VEQ-4 Faceplate
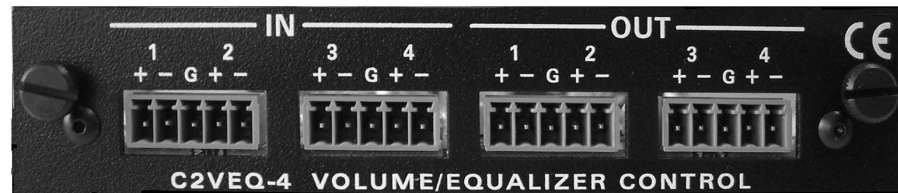
C2VEQ-4: Top, Side & Front Views
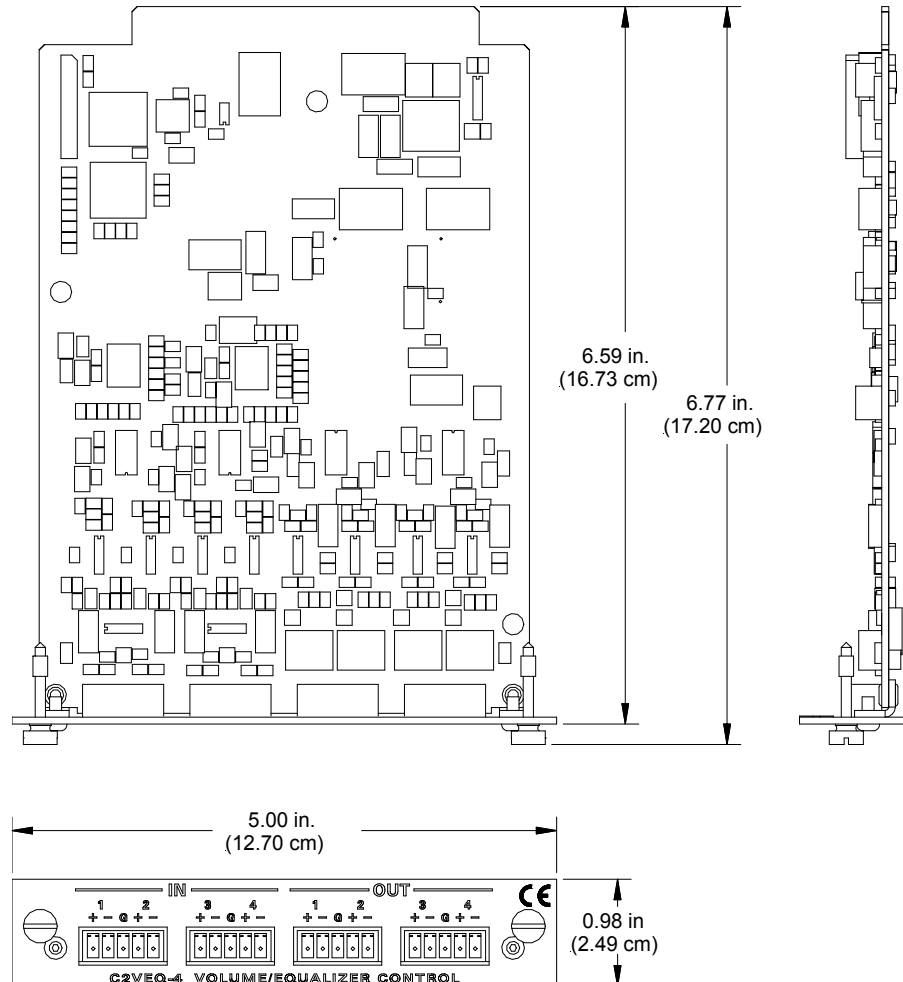
NOTE: These diagrams are for illustration purposes only and do not show the exact location of components on the circuit board.

Industry Compliance

As of the date of manufacture, the C2VEQ-4 has been tested and found to comply with specifications for CE marking and standards per EMC and Radiocommunications Compliance Labelling (N11785).

NOTE: This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Installation and Hookup

The C2VEQ-4 cards are designed for installation into a dedicated expansion slot on a 2-Series control system.

The only tools required for installation are a Phillips screwdriver, a grounding strap, and a grounded workstation.

CAUTION: The C2VEQ-4 and control system contain electro-static discharge (ESD) sensitive devices. Perform the following procedure while wearing a grounding strap that is properly grounded and on a grounded workstation to avoid damaging the C2VEQ-4 and/or the control system.

CAUTION: To prevent stripping of screw heads, threads, or mounting holes, **DO NOT** over tighten screws. Tighten only to the specification listed in the individual step(s).

NOTE: If the C2VEQ-4 is being installed in an AV2, the optional CAGE2 must be installed before continuing below. For instructions on installing the CAGE2 into an AV2 control system, refer to the latest revision of the CAGE2 3-Card Expansion Cage for AV2 Installation Guide (Doc. 5964).

Installation

Follow the instructions below to install the C2VEQ-4 into a 2-Series control system.

1. Disconnect power from the control system.

2. Remove the two screws and blank faceplate from the desired slot in the control system using a Phillips screwdriver.

3. Align the C2VEQ-4 with the card guides in the open slot and slide the expansion card into the slot.

4. Firmly press both ends of the C2VEQ-4 faceplate to seat the expansion card in the control system connector.

5. Hand-tighten the thumbscrews to secure the C2VEQ-4 in position.

6. Reapply power to the control system.

Hookup

Four balanced/unbalanced inputs are provided for audio input, utilizing five-position mini-connectors. Audio inputs may be balanced using (+) and (-) inputs, or unbalanced using (+) input for signal and connecting (-) input to (G) and signal source ground.

Four balanced/unbalanced outputs are provided, also utilizing five-position mini-connectors.

NOTE: An unbalanced input may use a balanced or unbalanced output. Likewise, a balanced input may use a balanced or unbalanced output.

For connection details, refer to the following diagrams.

Typical Balanced/Unbalanced Inputs and Outputs
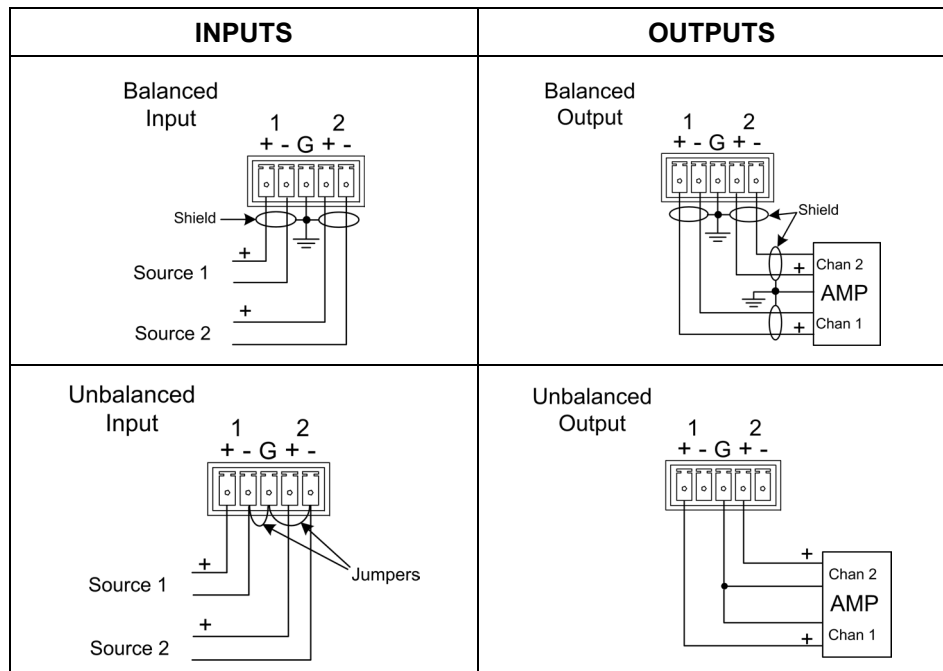
NOTE: Using the unbalanced configuration for the audio output reduces the total audio gain by 6dB.

Programming Software

Setup is easy thanks to Crestron's Windows®-based programming software. The following are recommended software version requirements for the PC:

- SIMPL Windows version 2.04.14 or later with library update file 240. Requires SIMPL+ Cross Compiler version 1.1.

- Crestron Database version 15.8.8 or later. Required by SIMPL Windows.

- Digital Audio Tools version 1.03.00 or later.

The Digital Audio Tools software is the preferred method to adjust equalization. In fact, if you want to use a graphic equalizer, you MUST use Digital Audio Tools, because this is where the default graphic equalizer characteristics are set up. Refer to the following section for more details on using Digital Audio Tools.

Digital Audio Tools

The full parametric equalization controls built into the C2VEQ-4 provide graphic and parametric equalization, programmable using Crestron's Digital Audio Tools software or SIMPL Windows. The Digital Audio Tools (DAT) software is free and available from the download section of the Crestron website (www.crestron.com).

Almost all users will use the Digital Audio Tools and not the SIMPL Windows symbol to adjust equalization because of the program's simplicity, speed, and ease of operation. From the point of view of the symbols for the C2VEQ-4, all equalization is parametric; graphic equalizers are just parametric equalizers with specific default frequencies, Q (bandwidth), and type. If you want to use a graphic equalizer, you MUST use Digital Audio Tools, because this is where the default graphic equalizer characteristics are set up. SIMPL Windows programmers might want to set up sliders from the TrimBand gains to let the user modify slightly what the programmer has stored.

The C2VEQ-4 adjustments in Digital Audio Tools contain five tabs:

- Master Volume – for setting the overall volume in the four channels.

- Mixer – for setting the level of each of the four possible inputs you want to appear at each channel output, plus setting the relative gain of each channel. You can also specify up to five presets of various setting combinations. Using these adjustments properly lets you compensate for analog sources with different input levels to obtain a seamless transition between sources at a given volume level.

- Graphic EQ – for choosing the number of graphic equalizers, and provides access to the graphic equalizer sliders.

- Parametric EQ – for making parametric equalization adjustments and permits setting up to five equalization filter presets per output channel.

- Communications – for setting up communications and adjusting the equalizer in real time.

For additional details, refer to the Digital Audio Tools help file.

Programming with SIMPL Windows

NOTE: The following assumes that the reader has knowledge of SIMPL Windows. If not, refer to the extensive help information provided with the software.

NOTE: The following are acceptable file extensions for programs that include a C2VEQ-4, developed for specific control system types:

  .smw   *projectname*.smw (source file)
  .spz   *projectname*.spz (compiled file for 2-series)
 .usp   *projectname*.usp (source code module for SIMPL+)

NOTE: In the following, the PRO2 control system is used.

SIMPL Windows is Crestron's primary software for programming Crestron control systems. It provides a well-designed graphical environment with a number of workspaces (i.e., windows) in which a programmer can select, configure, program, test, and monitor a Crestron control system. SIMPL Windows offers drag and drop functionality in a familiar Windows® environment.

This section describes a sample SIMPL Windows program that includes a C2VEQ-4.

Configuration Manager is where programmers "build" a Crestron control system by selecting hardware from the *Device Library*. In Configuration Manager, drag the PRO2 from the Control Systems folder of the *Device Library* and drop it in the upper pane of the *System Views*. The PRO2 with its associated ports is displayed in the *System Views* upper pane.

PRO2 System View
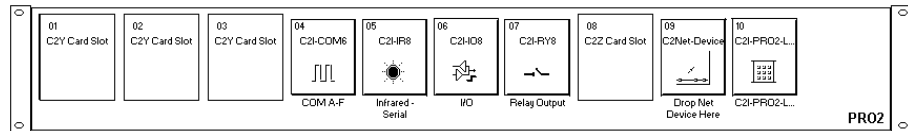
The *System Views* lower pane displays the PRO2 system tree. This tree can be expanded to display and configure the ports.

Expanded PRO2 System Tree
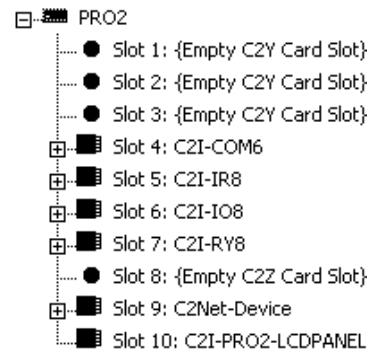
C2Y Card Slot in Configuration Manager

To incorporate a C2VEQ-4 card into the system, drag the C2VEQ-4 from the Plug-in Control Cards | Cards (2-Series Y Bus) folder of the *Device Library* and drop it on

C2Y Card Slot (01) in *System Views*. The PRO2 displays the C2VEQ-4 in slot 01. Click + to expand the tree so you can view the ports of the C2VEQ-4. Refer to following graphic.

Expanded Slot 1:C2COM-3
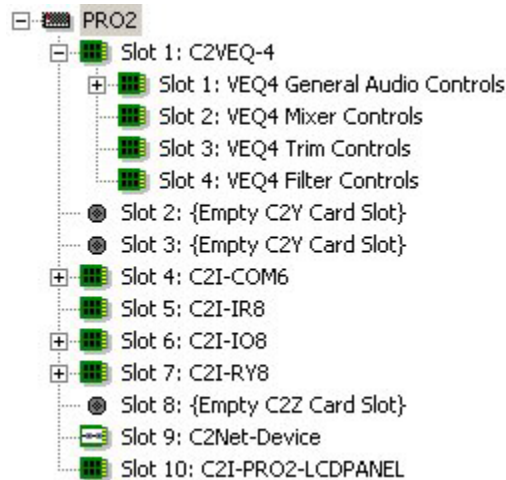
C2VEQ-4 Symbols in Programming Manager

Programming Manager is where programmers "program" a Crestron control system by assigning signals to symbols. Due to the extensive functionality of the C2VEQ-4, a single symbol in SIMPL Windows would be too complex. Instead, the C2VEQ-4 is broken up into slots. In Program Manager, expand the C2VEQ-4 to view the individual slots, and then drag the desired symbol to *Detail View*. The slots and corresponding symbols are described beginning on page 10.

NOTE: At power on, volume is set to zero; bass and treble are flat; and the mixers are set to route 100% of each input only to the corresponding output. Changes to the volume, bass, treble, and mixer settings are provided by the SIMPL program. EQ trim and filter control presets are stored in the card itself, and can be activated using "recall" functions. EQ, trim and mixer presets, if any, are stored and can be activated using recall functions

Example Program

NOTE: Before attempting to program the equalization controls in SIMPL Windows, please study the example program. There are some subtleties that must be carefully handled. For example, if you intend to directly set one of the <**TrimBandOut**> signals in your program, and the <**TrimBandOut_FB**> signal can be set to a different value by some other method (using DAT software or recalling presets), <u>do not</u> connect the <**TrimBandOut_FB**> signal back to the <**TrimBandOut**>. Oscillations might result between the directly driven value and the different feedback value. Instead, use an Analog Increment with Optional Feedback symbol. (Refer to "New Symbols" on page 18 for more details.) Connect the directly driven value and the <**TrimBandOut_FB**> signal to individual inputs. Connect its output to the <**TrimBandOut**> input of the C2VEQ-4. The same logic applies to any value that can be changed in two places. Refer to the example program.

An example program for the C2VEQ-4 is available from the Crestron FTP site (ftp://ftp.crestron.com/Examples). Search for C2VEQ-4.Basic Example.zip.

General Audio Controls – Slot 1, SubSlot 1

Refer to the table that follows the symbol for a list of inputs and their functional descriptions.

General Audio Controls Symbol
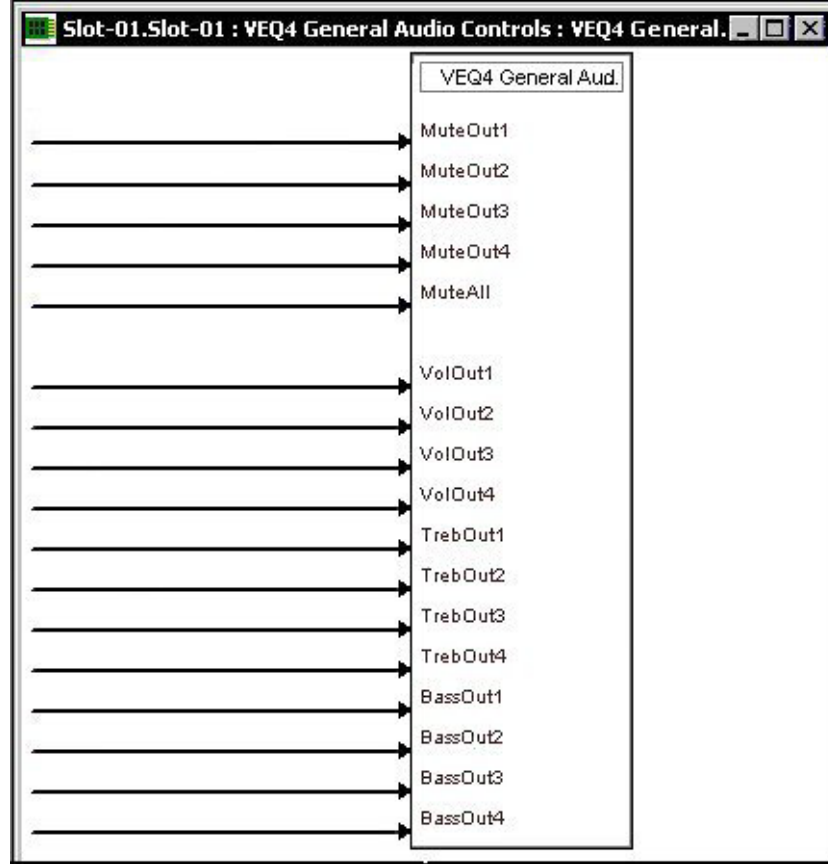
The C2VEQ-4 symbol is defined by the assigned inputs. The diagram above shows the C2VEQ-4 symbol in SIMPL Windows.

C2VEQ-4 General Audio Controls Symbol Input Descriptions

Signal Type	Name	Value	Definition
Digital	MuteOut (1 through 4) plus MuteAll	1/0	High = Mute On Low = Mute Off
Analog	VolOut (1 through 4)	0 to 100% -80dB to +20dB	0% = Volume set to lowest 100% = Volume set to highest
	TrebOut (1 through 4)	0 to 100% ± 15dB	50%=Flat Treble 0%= -15dB 100%= +15dB
	BassOut (1 through 4)	0 to 100% ± 15dB	50%=Flat Bass 0%= -15dB 100%= +15dB

Mixer Controls – Slot 1, SubSlot 2

The 4x4 matrix mixer controls provide the equivalent of a small-scale mixing board. These controls use a logarithmic scale (0dB to –80dB) with 0dB corresponding to 0 attenuation; anything –80dB and below will mute the signal. (Refer to the signal description table on the next page.) You can direct any input or combination of inputs to any output, via analog variables in the SIMPL program. You can specify the percentage (0 to 100%) of each linear analog input you want to appear at each output.

C2VEQ-4 Mixer Controls Symbol
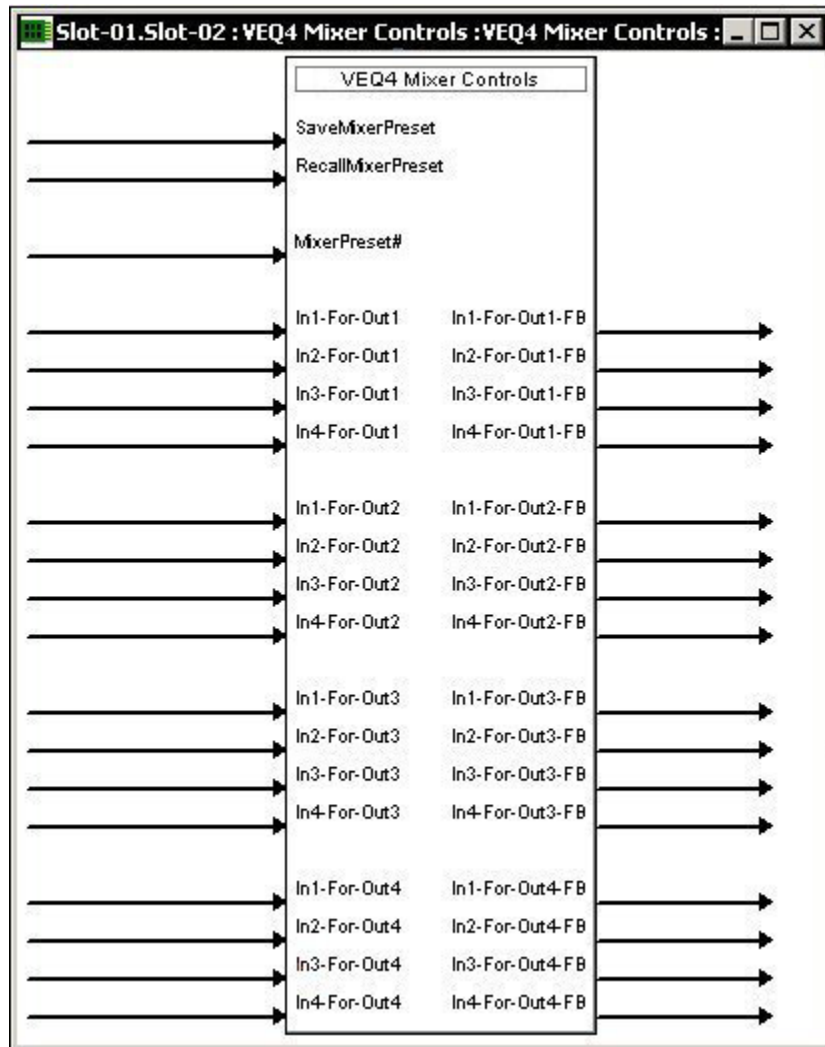
Digital Mixer Inputs and Outputs

SIGNAL TYPE	NAME	VALUE	DEFINITION
Digital Inputs	SaveMixerPreset	1/0	Saves current mixer values on mixer channels 1-4 into the given MixerPreset#, on the rising edge of the signal.
	RecallMixerPreset	1/0	Recalls the current mixer values on mixer channels 1-4 from the given MixerPreset# on the rising edge of the signal.
Analog Inputs	MixerPreset#	1 to 5	Five user-definable mixer presets, each includes all MixerBands.
	In1-For-Out1 through In4-For-Out1; In1-For-Out2 through In4-For-Out2; In1-For-Out3 through In4-For-Out3; In1-For-Out4 through In4-For-Out4	0 to –800d or lower	(0dB to –80dB) For these controls of audio outputs 1, 2, 3, and 4, each analog increment of 1 = 0.1dB.
Analog Outputs	In1-For-Out1-FB through In4-For-Out1-FB; In1-For-Out2-FB through In4-For-Out2-FB; In1-For-Out3-FB through In4-For-Out3-FB; In1-For-Out4-FB through In4-For-Out4-FB	0 to –800d or lower	Feedback immediately tracks input. At –800d or lower, input will be muted. If a preset value is recalled, the feedback value can be different from the input.

Trim Controls – Slot 1, SubSlot 3

TrimBand

TrimBand refers to a modification of the gain of the forty graphic filters.

There are ten trim presets. A trim preset is a set of all forty TrimBands. (The TrimBands are not labeled with actual frequency values since they can be changed in the Digital Audio Tools or by setting the full parametric filters in the symbol.) Trim presets can be used to modify the soundfield for different kinds of music where you might want to emphasize the bass, or bring out a treble frequency.

Programming in SIMPL Windows

Signal Descriptions

Each channel has a set of ten TrimBand inputs. The TrimBand inputs only adjust the gains of the gain-adjustable filters; thus <**TrimBand1-1**> corresponds to channel 1, filter 1; <**TrimBand1-2**> corresponds to channel 1, filter #2; <**TrimBand2-1**> corresponds to channel 2, filter 1, and so forth. The gains are adjustable within a range of -10dB to +10dB. All TrimBand values propagate immediately to the outputs. TrimBand values are added to the gain values of the filters. If Gain = 10dB and Trim = -3dB, the result is 7dB.

Valid values for TrimBand range from -100 (-10dB) to +100 (+10dB). 2-Series symbols such as the Analog Scaler with I/O Limits and Analog Ramp (Bounds Limited) can handle range and sign mapping.

A TrimBand value of 0 (0dB) means that the signal will pass unaffected. Values above and below 0 boost or reduce the gain in increments of .1dB. That is, changing the analog value by one signifies a change in boost or attenuation of 0.1 decibel.

The C2VEQ-4 provides ten trim presets, where a trim preset is a set of all forty TrimBand values.

On the rising edge of <**SaveTrimPreset**>, the forty TrimBand values will be stored in the preset specified by <**TrimPreset#**>. Valid values for <**TrimPreset#**> range from 1 to 10.
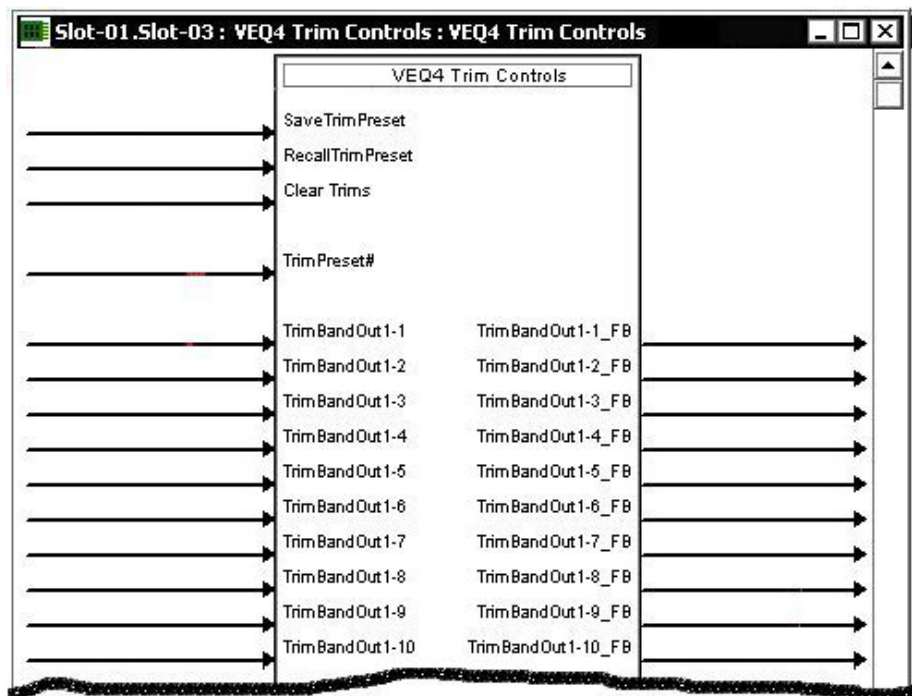
On the rising edge of <**RecallTrimPreset**> the values stored in the indicated <**TrimPrese**t#> will be recalled and propagated to the outputs. Here the <**TrimBand#-#_FB**> outputs may have different values than the TrimBand inputs (the only time these values will differ).

If <**RecallTrimPreset**> goes high and <**TrimPreset#**> is set to an invalid value (out of the 1 to 10 range) all trim settings will be cleared, and all signals will pass with whatever gain setting was in effect. This is the same as recalling a trim preset in which every TrimBand value is set to 0.

A rising edge of <**ClearTrims**> will also set all TrimBand values to 0.

The Trim Controls symbol is illustrated below and on the next page; the tables following the illustrations provide join details.

Trim Controls Symbol
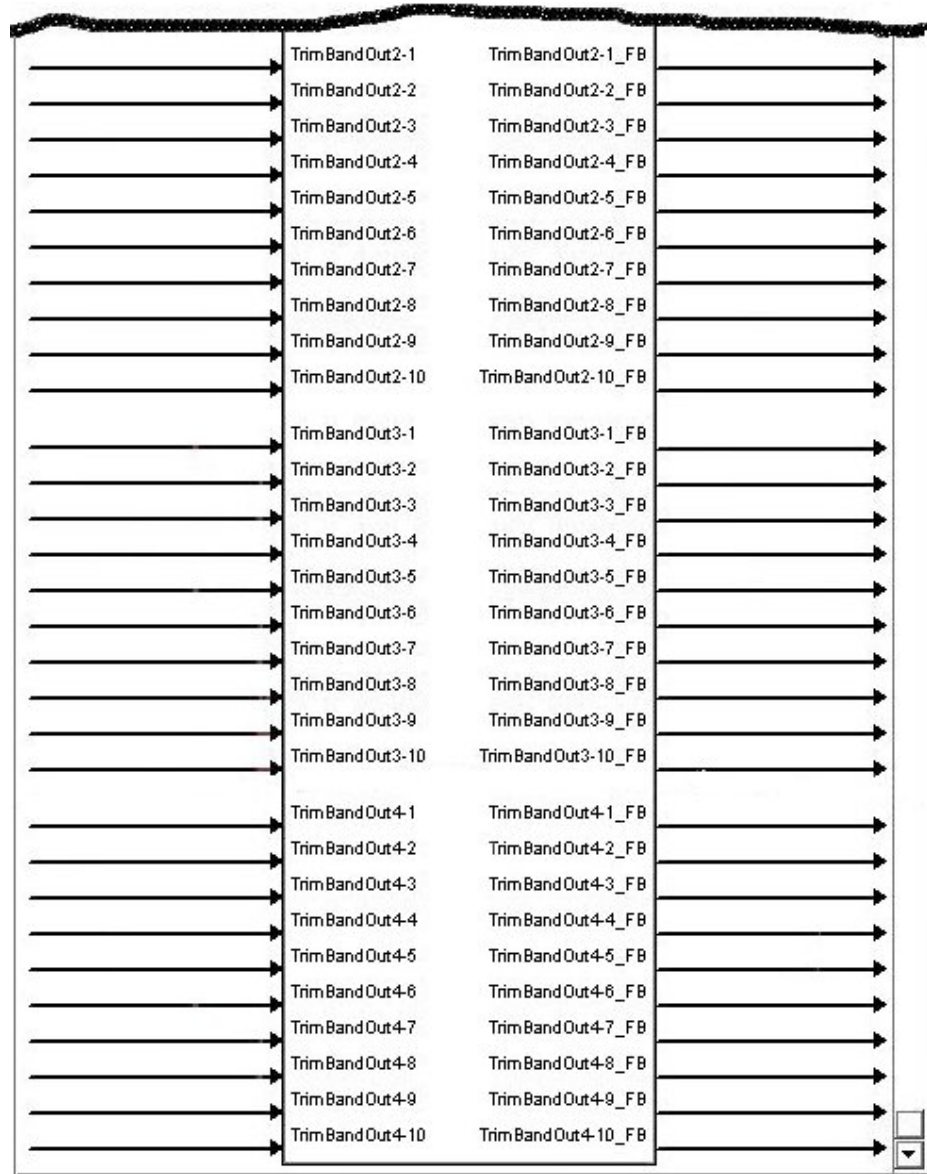
Trim Controls Symbol Input Signals – Digital

NAME	VALUE	DEFINITION
SaveTrimPreset	1/0	Saves current trim values on the given TrimPreset#, on the rising edge of the signal. TrimPreset# range is 1 – 10.
RecallTrimPreset	1/0	Recalls the current trim values on TrimBand 1-10 from the given TrimPreset# on the rising edge of the signal.
Clear Trims	1/0	Clears all of the trim values (sets to 0dB) on the rising edge of this signal.

Trim Controls Symbol Input/Output Signals – Analog

NAME	VALUE	DEFINITION
TrimPreset#	1 to 10	10 user-definable trim presets, each includes all TrimBands.
TrimBandOut1-1 through 1-10, 2-1 through 2-10, 3-1 through 3-10, 4-1 through 4-10 (40 total)	-100 to 100	-10dB to +10dB Each analog increment of 1 = 0.1dB.
TrimBandOut1-1 through 1-10_FB, 2-1 through 2-10_FB, 3-1 through 3-10_FB, 4-1 through 4-10_FB (40 total)	-100 to 100	-10dB to +10dB Each analog increment of 1 = 0.1dB.

Filter Controls – Slot 1, SubSlot 4

In addition to the 10 trim presets, the C2VEQ-4 provides five filter presets, where a preset is a set of 48 filters. A filter consists of the type, center frequency, gain, and the ratio of the center frequency to the filter bandwidth (also called Q) for each channel.

The C2VEQ-4 provides twelve filters for each channel, with five modes of audio equalization (settable using Digital Audio Tools):

- A ten-band graphic equalizer and a two-band parametric equalizer. In this mode, the first ten filters in all channels are used to set up the default frequencies (31.5Hz, 63Hz, 125Hz, 250Hz, 500Hz, 1KHz, 2KHz, 4KHz, 8KHz, and 16KHz) for graphic equalization, leaving filters 11 and 12 available for parametric equalization.

- A five-band graphic equalizer and a seven-band parametric equalizer. In this mode, the first five filters in all channels are used to set up the default frequencies (63Hz, 250Hz, 1KHz, and 4KHz, 10KHz) for graphic equalization, leaving filters 6 through 12 available for parametric equalization.

- A speech optimized version of the five-band graphic and seven-band parametric equalizer arrangement utilizing default frequencies (160Hz, 600Hz, 1KHz, and 2.5KHz, 5KHz).

- A three-band graphic equalizer and a nine-band parametric equalizer. Here the first three filters in all channels are for the default frequencies (250Hz, 1KHz, and 4KHz), leaving filters 4 through 12 available for parametric equalization in case you want to notch out a 60 Hz hum or other resonant frequency.

- A full twelve-band parametric equalizer. You may use the equalizer as a full twelve-band parametric equalizer, however it is recommended that you first become fully familiar with equalization techniques.

The <**FilterType**> inputs set the type of filter or equalization. Valid values are as follows:

> 0 = Off (No parametric equalization).
>
> 1 = EQ (Permits precise amplitude adjustment of a selectable range of frequencies, or removes an unwanted frequency from a signal). The bandwidth range can vary from a small slice of the spectrum to a 3.5-octave area. Typically, EQ filters allow fine adjustment to compensate for room acoustics, noise, and speaker limitations.
>
> 2 = High Pass (Filters out all audio below the <**FilterFreq**> levels). A high-pass filter circuit passes all signals that have a frequency higher than the specified frequency, while attenuating all frequencies lower than its specified frequency.
>
> 3 = Low Pass (Filters out all audio above <**FilterFreq**> levels). A low-pass filter passes all frequencies below the specified frequency, while attenuating all frequencies above this specified frequency.
>
> 4 = Treble Shelf (Uniformly boosts or attenuates all frequencies above the <**FilterFreq**> levels, without affecting the frequencies below. The amount 7of modification is given by <**FilterGain**>). A Treble Shelf filter boosts or attenuates all frequencies above the specified frequency in a uniform manner while not affecting the low frequencies below the specified frequency. For example: Because bass frequencies have longer wavelengths, small speakers may sound distorted when trying to reproduce these frequencies. The Treble Shelf filter can increase the proportion of treble to bass, enabling the smaller speakers to produce a clearer sound.
>
> 5 = Bass Shelf (Uniformly boosts or attenuates all frequencies below the <**FilterFreq**> levels without affecting the frequencies above. The amount of modification is given by <**FilterGain**>). A Bass Shelf filter uniformly boosts or attenuates frequencies below the specified frequency while not affecting high frequencies above the specified frequency. For example: To increase the gain of bass frequencies applied to a subwoofer, you can set the bass shelf filter to uniformly increase the amplitude of all bass frequencies. The Bass Shelf filter can also be used to uniformly decrease the bass frequencies to eliminate a booming bass sound.

NOTE: Various combinations of these filters may be used to equalize the soundfield in order to produce a flat response, and reproduce the sound as the recording engineer originally intended.

The <**FilterFreq**> input selects the center frequency. Valid values range from 5 (5Hz) to 24000 (24kHz).

The <**FilterGain**> inputs boost or attenuate the center frequency, or with shelving filters, all frequencies above or below the center frequency. Valid values range from -360 (-36dB) to +240 (+24dB).

A <**FilterGain**> setting of 0 (0dB) means that the signal will pass unaffected. Values above and below 0 will boost or attenuate the frequency in increments of 0.1dB. That is, changing the filter gain value by 1 signifies a boost or attenuation of 0.1 decibels.

The <**FilterQ**> input sets the width of the band of frequencies around the center frequency, expressed in octaves. Valid values range from 0.02 to 3.5 octaves.

Smaller Q values represent a narrow band of boost or attenuation, while larger values represent a wide band of boost or attenuation.
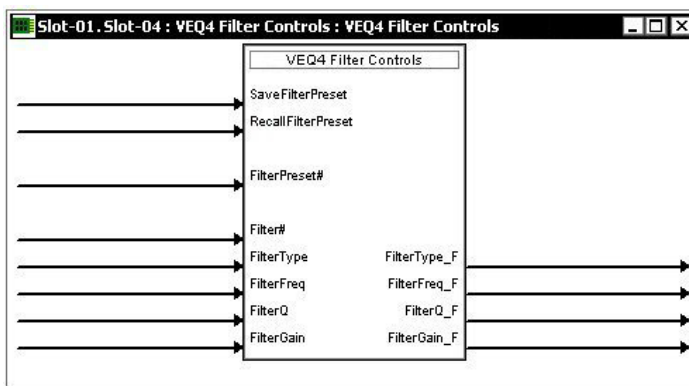
On the rising edge of <**SaveFilterPreset**>, the current filter values for all 48 filters will be stored in the preset specified by <**FilterPreset#**> Valid values for <**FilterPreset#**> range from 1 to 5.

A rising edge of <**RecallFilterPreset**> will recall the type, gain, frequency and Q of the specified <**FilterPreset#**> for all 48 filters.

The outputs <**FilterType_F**> through <**FilterGain_F**> report the current filter settings.

The Filter Controls symbol is illustrated below. Refer to the tables that follow the symbol for join details.

Filter Controls Symbol

Filter Controls Input Signals – Digital

NAME	VALUE	DEFINITION
SaveFilterPreset	1/0	Saves the current filter values into the given FilterPreset# on the rising edge of the signal.
RecallFilterPreset	1/0	Recalls the filter values from the given FilterPreset# on the rising edge of this signal.

Filter Controls Input Signals – Analog

NAME	VALUE	DEFINITION
FilterPreset#	1 to 5	5 user-definable filter presets, each of which includes 48 filters
Filter#	1 to 48	Select filter (1-12 CH1; 13-24 CH2; 25-36 CH3; 37-48 CH4)
FilterType	0 to 5	0=off, 1=EQ, 2=High Pass, 3=Low Pass, 4=Treble Shelf, 5=Bass Shelf
FilterFreq	5 to 24000	5 Hz to 24 kHz Each analog increment of 1 = 1 Hz
FilterQ	20 to 3500	0.02 to 3.5 octaves Each analog increment of 1 = 0.001 octaves
FilterGain	-360 to 240	-36dB to +24dB Each analog increment of 1 = 0.1dB

Filter Controls Symbol Output Signals – Analog

NAME	VALUE	DEFINITION
FilterType_FB	0 to 5	0=off, 1=EQ, 2=High Pass, 3=Low Pass, 4=Treble Shelf, 5=Bass Shelf
FilterFreq_FB	5 to 24000	5 Hz to 24 kHz, each analog increment of 1 = 1 Hz
FilterQ_FB	20 to 3500	0.02-3.5 octaves, each analog increment of 1 = 0.001 octaves
FilterGain_FB	-360 to 240	-36dB to +24dB, each analog increment of 1 = 0.1dB

New Symbols

The following new symbols have been created to facilitate programming for audio devices:

- Analog Ramp (bounds limited) - Many of the values that the C2VEQ-4 permits are limited to a specific range, such as a gain restriction of -36dB to +24dB. The parameters for this symbol would be a lower limit of -360d, and an upper limit of 240d. These values are multiplied by 10, as the C2VEQ-4 expects the gain in units of 0.1dB.

- Analog Scaler with I/O Limits - Useful for scaling an analog that goes from one value to another, to a different range (linearly). The "format" is 0d (input is treated as an unsigned value).

- Log/Antilog with Limits - For example, applying an Analog Ramp (0d to 65535d) yields a logarithmically varying output between the lower and the upper limits that are specified. In the C2VEQ-4, for example, the lower limit is 5d and the upper limit is 24000d. (5Hz and 24KHz).

- Analog Increment - Allows you to go from one value to another, in specified increments. Also permits a "speed up" of the ramping by specifying a hold time at which the analog starts to increment at a given rate. If, for example, you wanted to ramp the gain in steps of 0.5dB, and have it repeat every 0.1s after holding the button for 1s, you can use one of these symbols with the following parameters: HoldTime = 1s, RepeatTime = 0.1s, Increment = 5d (in units of 0.1dB), LowerLimit = -360d, UpperLimit = 240d, MuteLevel = -360d.

- Analog Scaler with Overflow Handling - Scales the range of values for its analog input signal to the range defined by the scale factor and minimum value parameters. The symbol differs from the Analog Scaler symbol in that it applies the offset before considering any overflow condition.

- Analog Scaler without Zero Pass - Operates identically to the Analog Scaler symbol, except that it has no "zero pass" feature. That is, when the input is at 0%, the output remains equal to the minimum value and does not mute.

- Analog Increment with Optional Feedback - This symbol generates an analog value that changes by an incremental amount with each rising edge of an **up** or **down** command. The output value is bounded by **LowerLimit** and **UpperLimit** values. That is, if a rising edge of **up** will cause the output to exceed the upper limit value, the output will hold at the upper limit value. Similarly, when the output reaches the lower limit value, it will hold at the lower limit value. At startup, the output is set to **MuteLevel**.

Refer to the SIMPL Windows Help file for additional details.

Problem Solving

Troubleshooting

The table below provides corrective action for possible trouble situations. If further assistance is required, please contact a Crestron customer service representative.

C2VEQ-4 Troubleshooting

TROUBLE	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
C2VEQ-4 does not function.	Circuit card is not properly seated in slot.	Verify C2VEQ-4 is properly inserted into control system slot per procedures in this guide.
	Cables from C2VEQ-4 to audio equipment are incorrectly connected.	Verify wiring.
	Control system firmware does not support the C2VEQ4.	Upgrade the control system firmware to CUZ 3.083 or greater.
Hum on audio.	Grounding problem.	Connect or remove control system chassis ground.
No audio on one or more channels.	Mute enabled in error.	Disable mute.

Further Inquiries

If after reviewing this Operations and Installation Guide, you cannot locate specific information or have questions, please take advantage of Crestron's award winning customer service team by calling:

- In the US and Canada, call Crestron's corporate headquarters at 1-888-CRESTRON [1-888-273-7876].

- In Europe, call Crestron International at +32-15-50-99-50.

- In Asia, call Crestron Asia at +852-2341-2016.

- In Latin America, call Crestron Latin America at +5255-5093-2160.

- In Australia and New Zealand, call Crestron Pacific at +613-9480-2999.

Future Updates

As Crestron improves functions, adds new features, and extends the capabilities of the C2VEQ-4, additional information may be made available as manual updates. These updates are solely electronic and serve as intermediary supplements prior to the release of a complete technical documentation revision.

Check the Crestron website (www.crestron.com) periodically for manual update availability and its subjective value. Updates are available from the Download | Product Manuals section and are identified as an "Addendum" in the Download column.

Return and Warranty Policies

Merchandise Returns / Repair Service

1. No merchandise may be returned for credit, exchange, or service without prior authorization from CRESTRON. To obtain warranty service for CRESTRON products, contact the factory and request an RMA (Return Merchandise Authorization) number. Enclose a note specifying the nature of the problem, name and phone number of contact person, RMA number, and return address.

2. Products may be returned for credit, exchange, or service with a CRESTRON Return Merchandise Authorization (RMA) number. Authorized returns must be shipped freight prepaid to CRESTRON, Cresskill, N.J., or its authorized subsidiaries, with RMA number clearly marked on the outside of all cartons. Shipments arriving freight collect or without an RMA number shall be subject to refusal. CRESTRON reserves the right in its sole and absolute discretion to charge a 15% restocking fee, plus shipping costs, on any products returned with an RMA.

3. Return freight charges following repair of items under warranty shall be paid by CRESTRON, shipping by standard ground carrier. In the event repairs are found to be non-warranty, return freight costs shall be paid by the purchaser.

CRESTRON Limited Warranty

CRESTRON ELECTRONICS, Inc. warrants its products to be free from manufacturing defects in materials and workmanship under normal use for a period of three (3) years from the date of purchase from CRESTRON, with the following exceptions: disk drives and any other moving or rotating mechanical parts, pan/tilt heads and power supplies are covered for a period of one (1) year; touchscreen display and overlay components are covered for 90 days; batteries and incandescent lamps are not covered.

This warranty extends to products purchased directly from CRESTRON or an authorized CRESTRON dealer. Purchasers should inquire of the dealer regarding the nature and extent of the dealer's warranty, if any.

CRESTRON shall not be liable to honor the terms of this warranty if the product has been used in any application other than that for which it was intended, or if it has been subjected to misuse, accidental damage, modification, or improper installation procedures. Furthermore, this warranty does not cover any product that has had the serial number altered, defaced, or removed.

This warranty shall be the sole and exclusive remedy to the original purchaser. In no event shall CRESTRON be liable for incidental or consequential damages of any kind (property or economic damages inclusive) arising from the sale or use of this equipment. CRESTRON is not liable for any claim made by a third party or made by the purchaser for a third party.

CRESTRON shall, at its option, repair or replace any product found defective, without charge for parts or labor. Repaired or replaced equipment and parts supplied under this warranty shall be covered only by the unexpired portion of the warranty.

Except as expressly set forth in this warranty, CRESTRON makes no other warranties, expressed or implied, nor authorizes any other party to offer any warranty, including any implied warranties of merchantability or fitness for a particular purpose. Any implied warranties that may be imposed by law are limited to the terms of this limited warranty. This warranty statement supercedes all previous warranties.

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