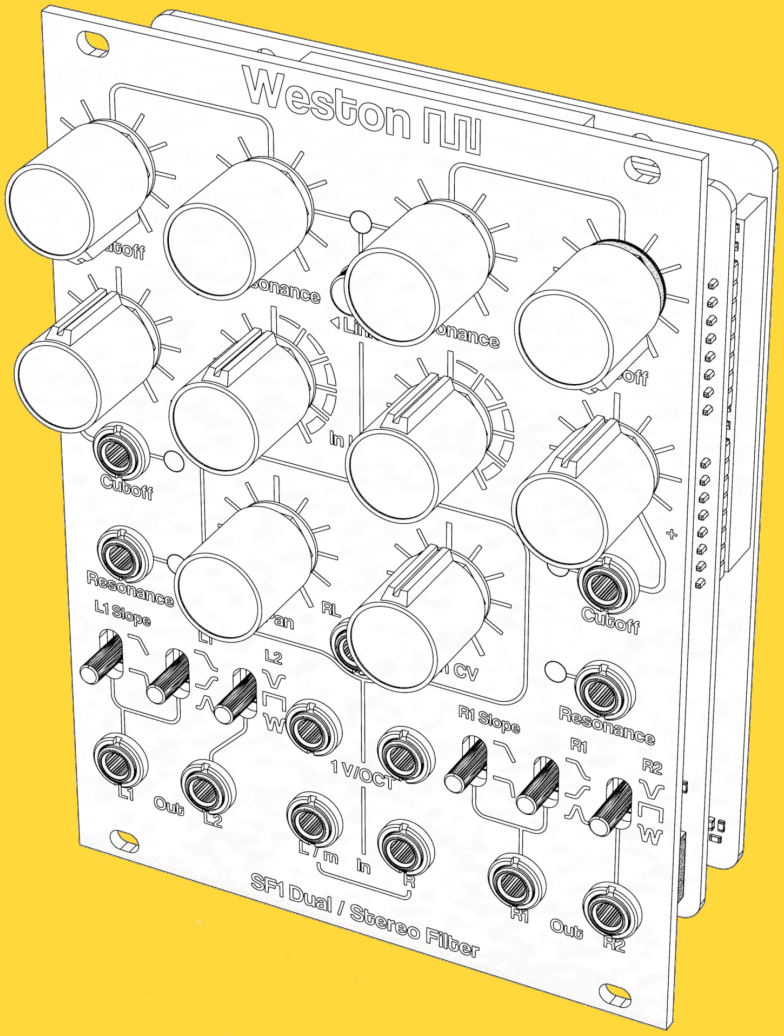
SF1

Stereo / Dual Filter

Eurorack Module

User Manual



Weston Precision Audio

Designed In Portland, Oregon

Revision 01 - September 16, 2022

DESCRIPTION

SF1 is a dual voltage controlled filter (VCF) module designed to be used either as a pair of identical, but separate VCFs, or as a stereo filter, accepting its input as 2 mono (L/R) inputs through standard 3.5mm TS connections.

The core of SF1 is a 4-pole voltage-controlled lowpass filter which uses precise "pole-mixing" to provide a multitude of outputs from each filter. Each filter has TWO outputs which are available concurrently. The first set of outputs (L1/R1) may be selected to output Low Pass, High Pass, or Band Pass responses. At each one of these selections, the cutoff curve may be selected between "2 pole" (12 db/octave) or "4 pole" (24 db/octave).

The second set of outputs (L2/R2) may be selected to output a single pole Notch, 2 pole All-pass, or 4-stage Phaser response.

Finally, each pair of outputs (L1/R1 and L2/R2) feeds into a set of 2 voltage controlled crossfaders which may be used to modulate the amount of panning between the 2 sides of SF1.

SF1's output and linking options make SF1 a highly versatile module. From a stereo VCF, to a dual sine wave V/octave synth voice, all the way to a phase-modulator, the SF1 can do it!

SPECS

Module Size: 18HP
Depth: 25mm (To back PCB), 33mm (To end of power connector)

Audio Outputs:
~1kOhm Output Impedance

Inputs (All inputs >=100kOhm Impedance): Volts/octave 1&2, Resonance 1&2, Frequency cutoff 1&2, Panning CV.

Power input:
+12V & -12V via standard 10 pin Eurorack connector. Protected against reverse polarity internally and with shrouded connector.

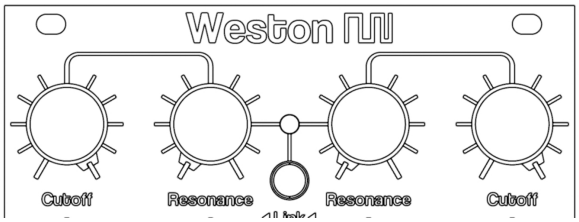
Power consumption (+12V / -12V):
Typ: 120mA / 120mA
Max: 135mA / 135mA

MAXIMUM LIMITS

Supply Voltage: +13.5V / -13.5V

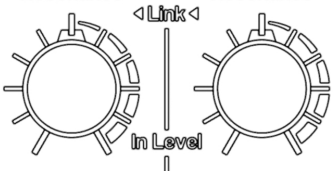
All inputs: Up to power supply levels.

MAIN CONTROLS

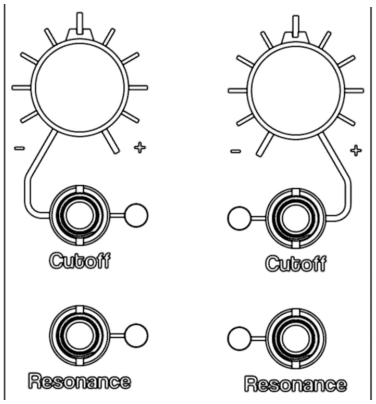


Cutoff:
These pots controls the "cutoff frequencies" of the left and right filter cores.

Resonance:
These pots control the amount of resonance or Q-value of the left and right filter cores. Using one of the low-pass modes on L1 or R1 outputs and putting the corresponding resonance pot to full CW will result in self-oscillation and the filter will act as a sine wave oscillator.



Audio In Level:
Each filter's audio input's amount is controlled by these pots. There is a detent at the center ("high noon") of each pot which corresponds to exactly unity (gain of 1) of the audio input signal. Turning the pot past center results in progressively more overdrive.

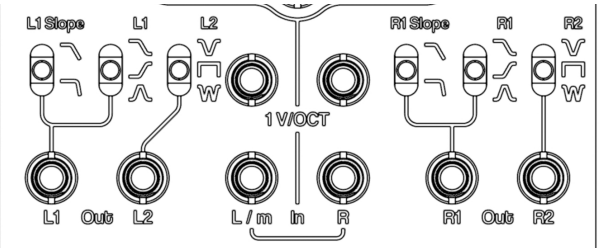


Cutoff CV Input:
Signals input to these jacks will control the cutoff frequency of each filter. The control pots are "attenuverters", meaning that the center (which also has a detent) is 0. Turning the pot CW means positive voltages add to the cutoff frequency, and negative voltages subtract to the cutoff frequency. Turning the pot CCW reverses this, e.g., a positive-going envelope would tend to "close off" a low pass filter when turning CCW.

Resonance CV:
Signals input to these jacks will control the amount of resonance of each filter. These inputs to not have an attenuator so they work "full strength".

V/Oct:
These inputs are simply another frequency CV which is calibrated to 1 Volt/octave. Use these to control pitch when self-oscillating.

OUTPUTS

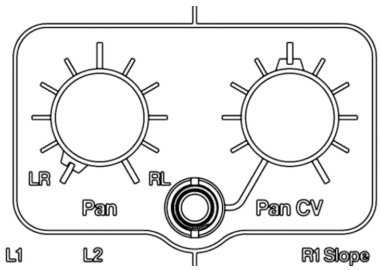


Each filter has 2 outputs that are available at the same time. The "1" outputs (L1 & R1) have 2 switches which control their output type. The "2" outputs (L2 & R2) have 1 switch which controls their output type. The selections available are summarized in the table below:

SF1 Output Modes

L1 or R1 Slope	L1 or R1 Type	L1 or R1 Output Result
Up	Up	12 dB/oct. Low Pass
Up	Middle	12 dB/oct. High Pass
Up	Down	12 dB/oct. Bandpass
Down	Up	24 dB/oct. Low Pass
Down	Middle	24 dB/oct. High Pass
Down	Down	24 dB/oct. Bandpass
	L2 or R2 Type	**L2 or R2 Output Result**
	Up	6 dB/oct. Notch
	Middle	12 dB/oct. All-Pass
	Down	24 dB/oct. Phaser (2 "combs")

Finally, each pair of outputs is routed through the voltage-controlled panner/ crossfader:



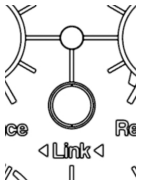
When the "Pan" pot is full counter-clockwise, the "L/m" audio input is routed to the L1 and L2 outputs, and the "R" to R1/R2. When the "Pan" pot is full clockwise, the "L/m" audio input is routed to the R1 and R2 outputs, and the "R" to L1/L2. When the "Pan" pot is in the center, each output will receive 50% of the "L/m" input signal and 50% of the "R" input signal.

A signal applied to the "Pan CV" jack will serve to control the panning in the same manner as the "Pan" pot and is attenuated by the "Pan CV" pot.

So, if the "Pan" pot is in the dead-center, a positive-going voltage applied to "Pan CV" will do the equivalent of turning the "Pan" pot clockwise, and a negative-going voltage will do the equivalent of turning the "pan" pot counter-clockwise. Thus, the position of a sound within the L/R audio space can easily be modulated via a control signal.

Bode plots of the nominal output responses from all 9 settings of SF1 are included in the appendix at the end of this document.

LINK BUTTON



The “Link” button provides a convenient way to use the SF1 with a stereo audio signal present as a dual mono pair to the L and R inputs.

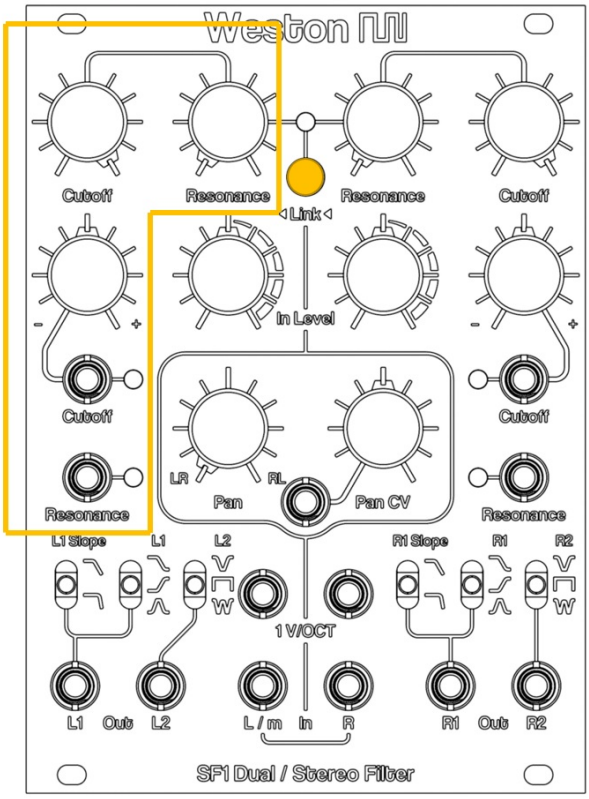
When the “Link” button is engaged and the orange LED above it is lit, the LEFT side...

- Frequency pot
- Resonance pot
- Frequency CV input / attenuverter
- Resonance CV

...will control BOTH filters.

The illustration on this page shows the link function more graphically.

When “Link” is depressed and LED is lit, the highlighted controls/inputs work for BOTH filters in parallel.



MAINTANENCE

SF1 will not require any particular maintenance, but there are 2 sets of trimmers which are adjustable during service.

Along the top edge of the unit are the Volts per octave trimmers for each filter, which work like a V/oct trimmer on any oscillator.

Along the bottom edge of the unit are 2 trimmers which are used to calibrate the audio input stages so that they are exactly unity when the audio input pots are centered. These are adjusted upon assembly and would normally not need to be adjusted.

CONCLUSIONS

As with any piece of modular synth equipment, it is best to just play with it by itself and with other modules. Find what you like and most importunely, have fun making music!! There is no wrong answer!

...IDEAS?!...

- Send two different oscillator waveforms to the audio inputs, center the pan pot, and send an audio rate signal to pan CV for cool AM (amplitude modulation) effects. At fast rates you will get a fun tremolo effect.
- Use both filters as oscillators (self-oscillation) and tune them to a musical interval (third, fifth, octave, etc..) and control both with the 1 V/oct inputs for a sine-wave synth voice.
- You can route both VCFs in series by patching L1 out to R audio and use L2 out to get 8 pole LP, HP, or BP filter. Or patch L2 out to R audio in and use R2 out to get a 2 pole notch, an all-pass filter with 720 degrees of phase displacement, or a phaser with 4 “combs”!

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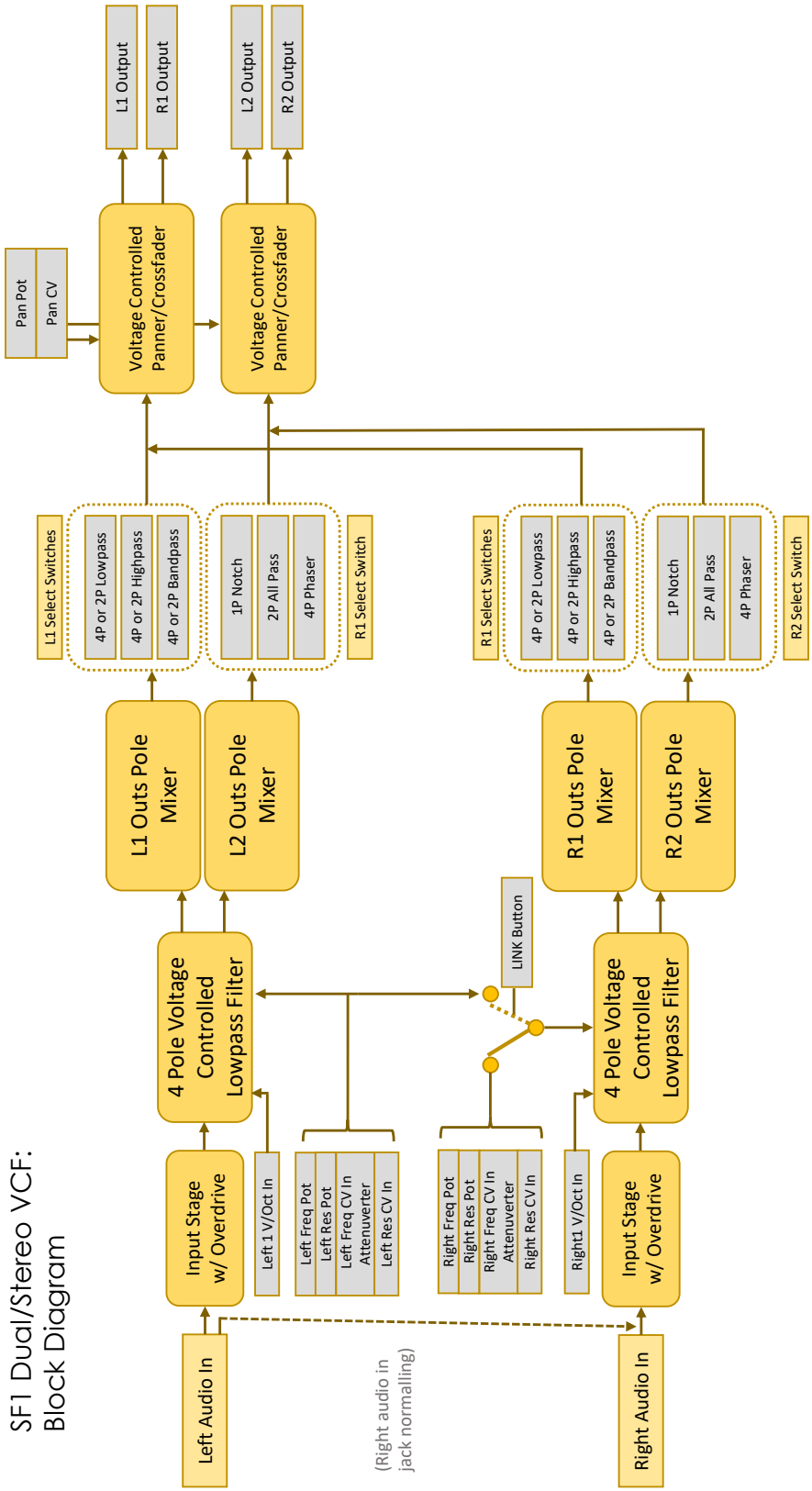
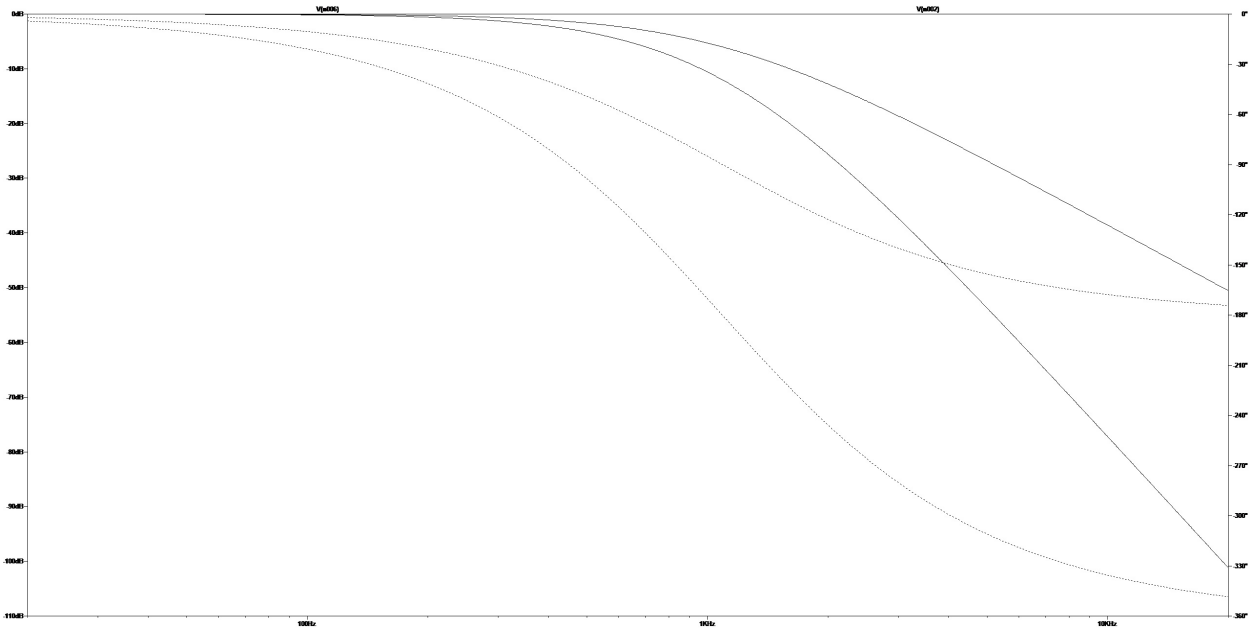
APPENDIX: BLOCK DIAGRAM



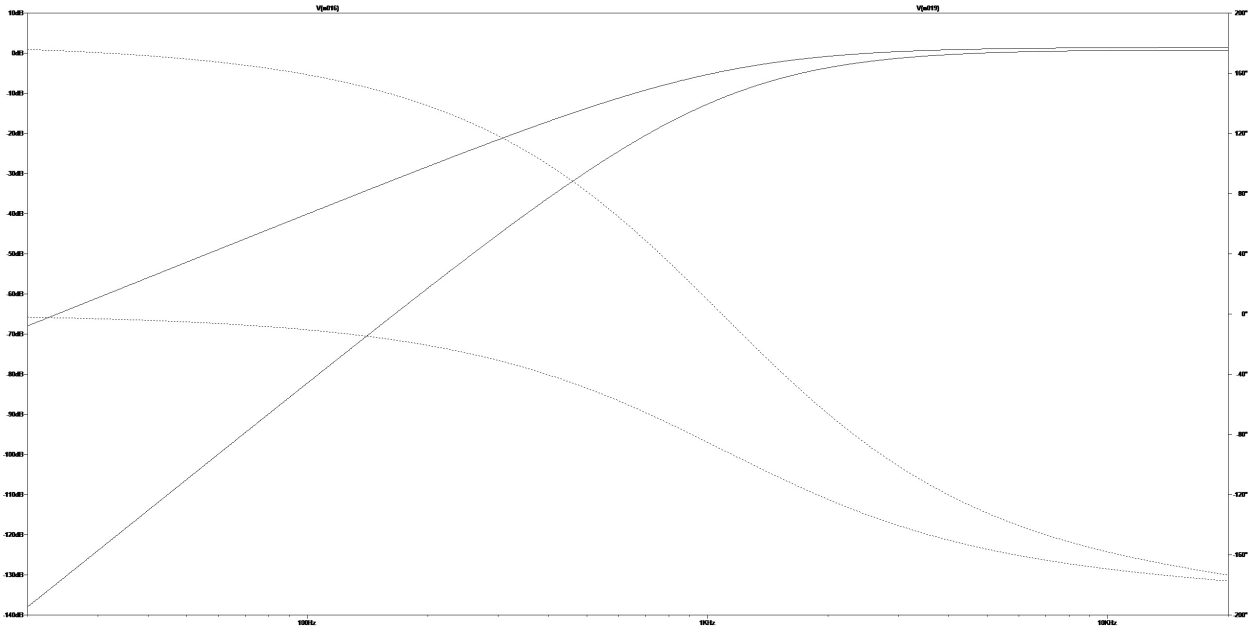
APPENDIX: L1/R1 OUTPUT

NOMINAL RESPONSES

Low pass (2 pole and 4 pole):



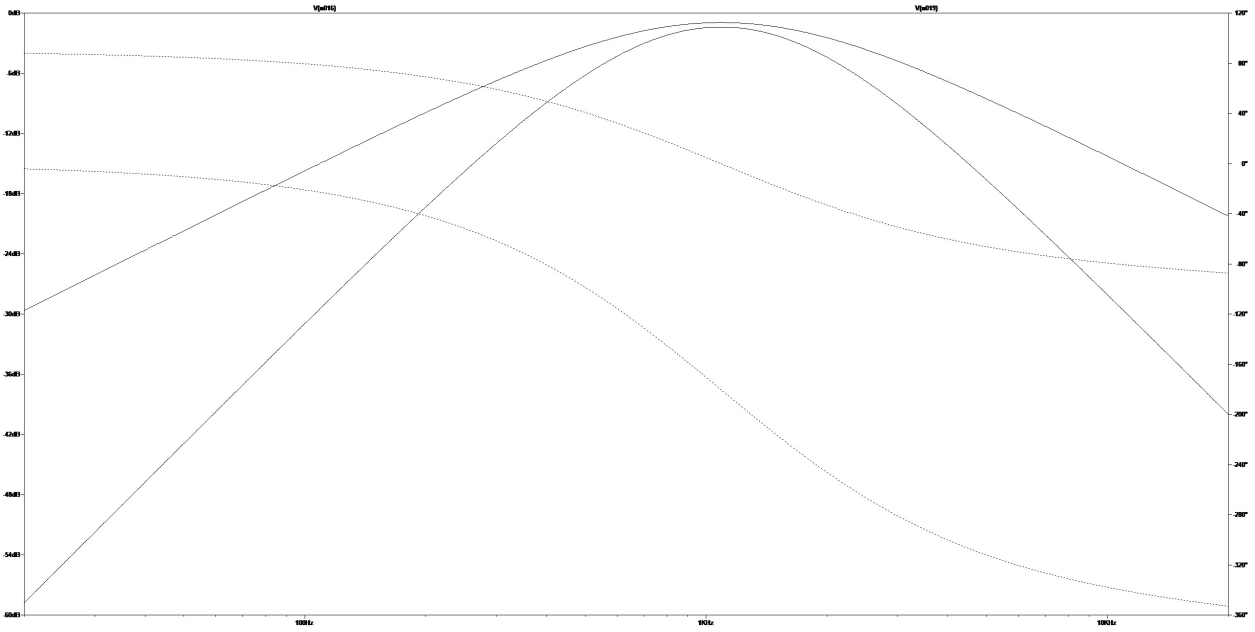
High pass (2 pole and 4 pole):



APPENDIX: L1/R1 OUTPUT

NOMINAL RESPONSES

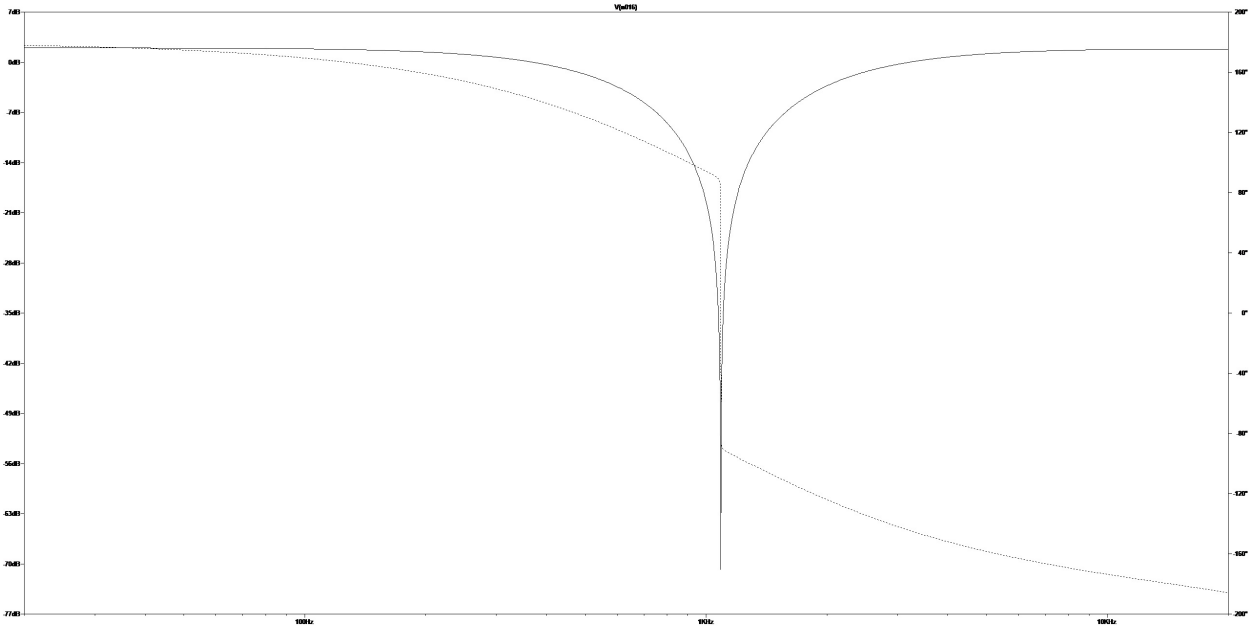
Band pass (2 pole and 4 pole):



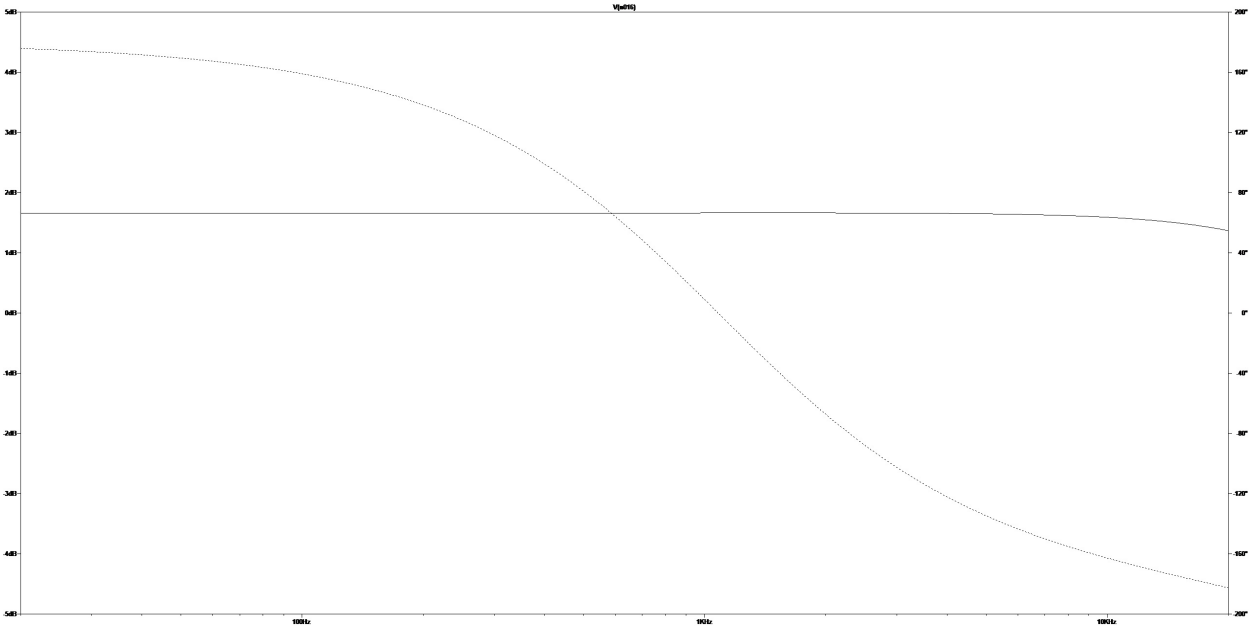
APPENDIX: L2/R2 OUTPUT

NOMINAL RESPONSES

1 Pole Notch:



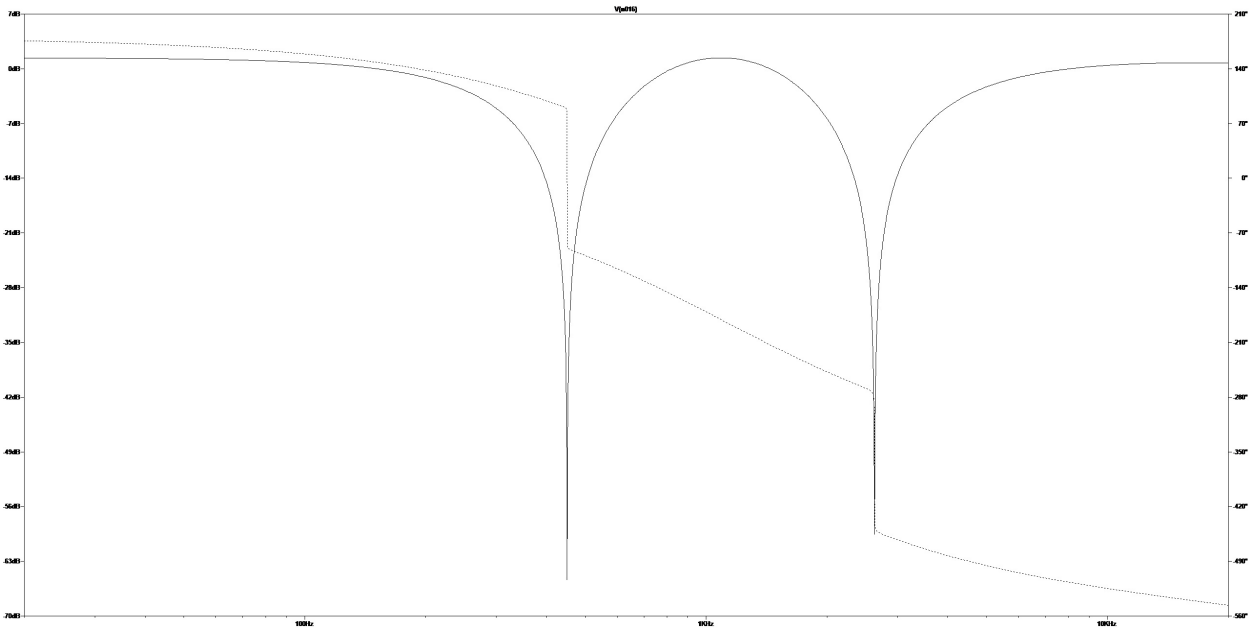
2 Pole All-Pass:



APPENDIX: L2/R2 OUTPUT

NOMINAL RESPONSES

4 Pole Phaser:



REVISION HISTORY

01: Initial release.