DIPOLE CHEAT-SHEET

OVERVIEW:

Two individual dual peak multi-mode VCFs with dedicated controls for Cutoff, Resonance and Spread (sets secondary peak cutoff frequency offset). A standard 12db/Oct output with selectable HP/BP/LP Called 'POLE' and a Dual Peak output with selectable HP/BP/LP called 'DIPOLE', per channel.
The DIPOLE outputs are the result of any combination of filter topology, selected via the HP/BP/LP switch, above the Outputs. Additionally, the two filters may be routed in serial or parallel, providing steeper filter slopes (By doubling up LP for instance) and more interesting combinations of filter topologies at varying or stacked Cutoff frequencies.

A fifth output called DIPOLE AB combines all 4 filters into a single mono output with a little extra functionality. While You can always get all four filter outputs in stereo, DIPOLE AB is the sum of the two POLE outputs as well as the two DIPOLE outputs, routed in serial or parallel.
The equivalent in stereo would be to sum channel A's POLE and DIPOLE outputs on the LEFT and channel B's POLE And DIPOLE outputs on the right.
With this in mind, you can also use any combo of POLE/DIPOLE as your LEFT/RIGHT stereo output and also have two Stereo outputs simultaneously.

Voltage controlled Resonance is available on all channels and is capable of self oscillation far beyond the audio band In any mode of operation. Each channel's RES potentiometer controls both filter peaks simultaneously.

Additionally, each channel features a DRIVE control. In light use, DRIVE can alter spectra and boost lower level signals. When used heavily, drive will boost a signal into soft clipping and produce additional overdrive into hard clipping for loud Signals and when resonance is set high. Set to the lowest position, the signal will pass without gain.
DRIVE is especially useful when filtering a Sine or Triangle wave - which typically produces little result. By 'squaring up' the input signal, DRIVE produces additional harmonics which can be passed or filtered. DRIVE will alter the character of the filter and resonance response, and varies with input waveform types.

LEDs

The two RGB LEDs indicate cutoff and resonance states. RED and GREEN show the status of the present cutoff Frequency, RED indicates the voltage sum is above zero volts, GREEN indicates below zero volts. BLUE indicates Depth of resonance.

DC-COUPLED INPUTS:

Audio:

Input A is normalized into Input B. This allows processing a stereo signal (output A/B) from a mono input signal and for using the Dipole AB quad peak (mono) output from a single input.

If for some reason, you do not want the signal going into input A to also go into B, you can patch a dummy cable or null signal into input B.

DC-COUPLED INPUTS (continued)

Control Voltage as Input:

Control voltages may also be processed via the Stereo Dipoles filters. Essentially allowing use as a complex Slew Processor. Minimum Cutoff using the controls alone is 0.3Hz or 3.33 minutes. This range can be broadened with Negative CVs applied to the FM inputs.

Control voltages:

Each channel has dedicated CV inputs - we will focus on channel A for simplicity.

FM-A, controls both FREQ and SPREAD Cutoff frequency. The knob-less attenuator is bipolar, so center is off, Left is Max Inverted Level, Right is Max Normal (Positive) Level.

RES-A, controls both POLE and DIPOLE resonance level. RCV LVL knob-less attenuator is unipolar.

SPRD-A, controls the secondary cutoff frequency separately from the main FM CV inputs. An attenuator is not provided to allow accurate use as a 1V/OCT tracking input for the secondary filter.

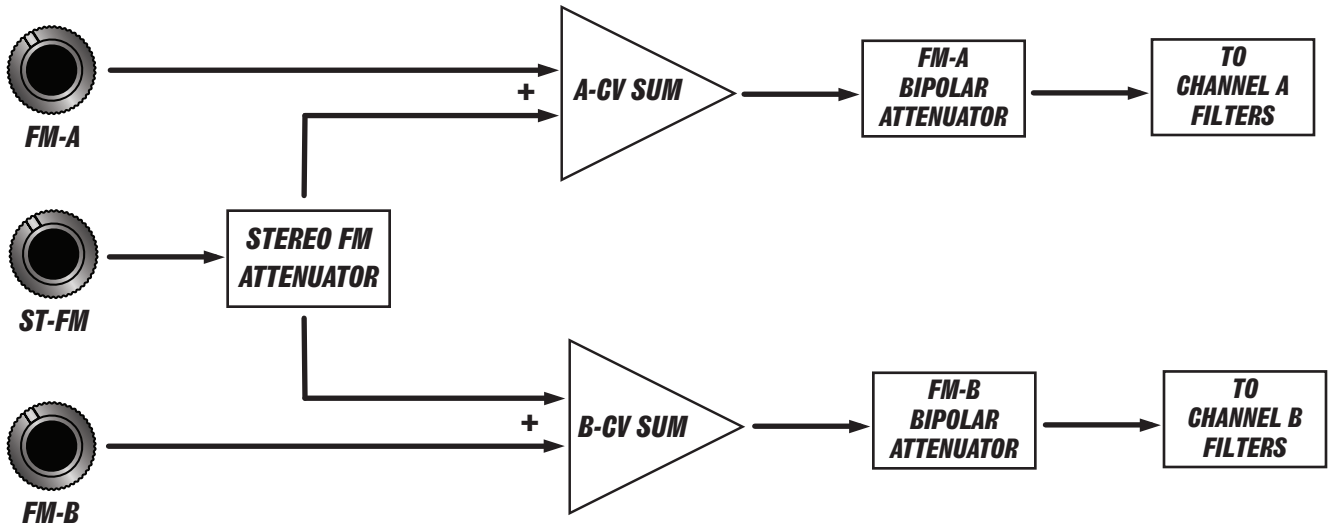
V/OCT-A, controls pitch tracking for the respective filter channel's Pole and Dipole filters.

Stereo Control Voltage inputs:

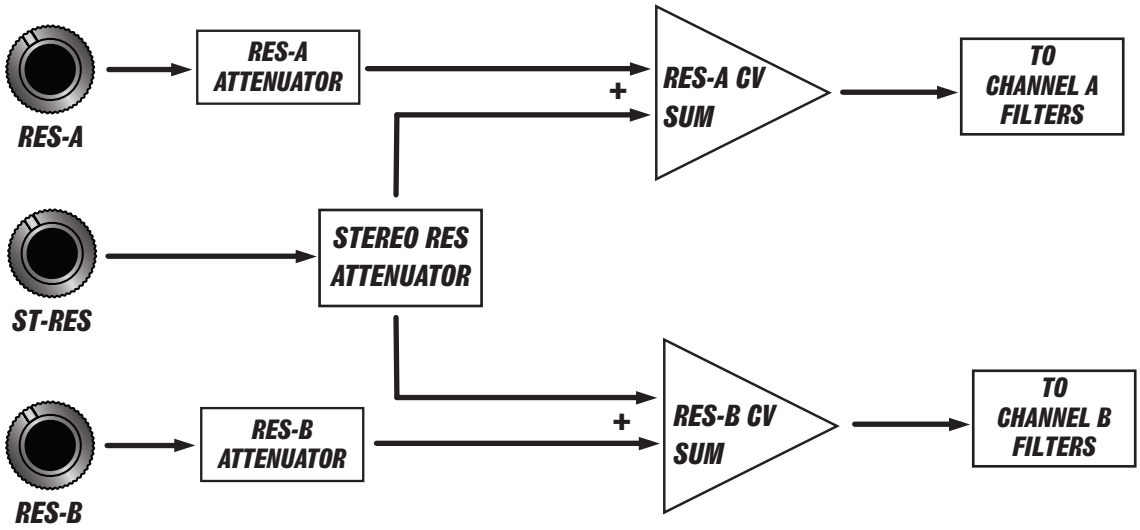
V/OCT - controls the pitch tracking on all four filters, simultaneously. Sums with V/OCT input on each channel.

The following CV inputs are routed to all VCF channels as follows:

ST-FM is summed with FM-A/B CV, if applied. A unipolar master attenuator controls the Level of ST-FM going into both filter channels.
Please note that FM LVL, bipolar attenuator controls the combined sum of ST-FM and channel specific FM CV inputs. See below for a visual;



ST-RES is summed with RES-A/B CV, if applied. A unipolar master attenuator controls the Level of ST-RES going into both filter channels.
Please note that RCV LVL is summed with channel specific RES CV inputs, post attenuators.
See below for a visual;



STEREO CONTROLS (cont):

STEREO FREQ controls all four multi-mode filters simultaneously. The range of this control is twice as wide as the individual FREQ and SPREAD controls to allow for full coverage of the entire audio bandwidth, even when FREQ and SPREAD are set far apart and/or to the range maximums, the range is approximately +/- 10 octaves. Due to the restraints of the 2164 VCAs, the total usable range is approximately 17 octaves, at a max cutoff frequency of 50kHz. The lowest cutoff frequency of the controls is approximately 0.3Hz. Therefore the STEREO DIPOLE is completely unrestrictive in the upper band when passing audio and can even filter and add resonance to control voltages.

STEREO RES also controls all four multi-mode filters simultaneously. Unlike the specific RES-A/B controls, which output unipolar voltages, STEREO RES is a Bipolar Control. This allows the user to increase or eliminate the overall Resonance despite the current resonance setting for each channel. Therefore, the default location for STEREO RES control is roughly center position.

PATCH EXAMPLES

The following simple patch examples are provided to get you familiarized with the basic functionality of the STEREO DIPOLE

Variable Width Bandpass

Set POLE output to HP and DIPOLE output to LP. SERIAL routing.
With SPREAD set to center position or above, you now have a variable width BP filter.
Control the HP set point and overall frequency with the respective channel FREQ control.
Control bandwidth with SPREAD (at or above center position.)

Variable Width Notch

Same as above, but change Dipole routing to PARALLEL.

The above patches may also be achieved by setting POLE to LP and DIPOLE to HP and adjusting SPREAD appropriately to achieve the desired effect. Try different combinations of filter type and routing for other obscure filtering.

24dB/Octave filter (4-POLE MMF)

Set both POLE and DIPOLE to the same filter type. Set SPREAD to center potion to match the cutoff frequency of the Main Pole Filter.
Select SERIAL routing. Control the 4-POLE response with FREQ.

Now try offsetting SPREAD to achieve a Pre/Post Delayed dual peak response. Setting SPREAD above or below center will achieve different results.

Multi Output Sine wave VCO/LFO

Turn RES all the way up on all channels. Adjust FREQ and SPREAD on any or all channels to adjust the Main and Secondary peak's pitch.
SIMULTANEOUS SINE WAVE OUTPUTS:

POLE-A - Single Tone
DIPOLE-A - Dual Tone (can route in serial or parallel for alternate tones) (DIPOLE Filter type also affects tone while in SERIAL MODE)

POLE-B - Single Tone
DIPOLE-B - Dual Tone (can route in serial or parallel for alternate tones) (DIPOLE Filter type also affects tone while in SERIAL MODE)

DIPOLE AB - QUAD Tone

Voice Patch - VCO - VCF

Try a combo of the above patches by using one channel as a VCO and patching the output into the other channel's input. Add some DRIVE on the channel you are using as a filter.

Multi-Mode Frequency Gate

Patch a signal input one or both inputs, SET FREQ and/or STEREO FREQ to completely filter the signal into silence. Patch an Envelope into the FM input(s). Adjust Level/Depth with Frequency and FM-CV attenuators. Works best with LP and BP without the use of a VCA.

Ping/Pluck

Patch a fast Trigger or Envelope Function into Input A or both A and B. Adjust FREQ and SPREAD (if DIPOLE output is used) to adjust the single or multi-tone sound desired. Adjust RES to alter the decay of the Ping/Pluck.

Alternately, using a fast or pulse-width adjustable GATE will fire a pluck on the rising and falling edge of the Gate Signal. When timed correctly, a wood-block type sound can be achieved. Bipolar Square signals will fire a pluck on both the positive and negative rising/falling edges as well.

DIPOLE-AB will output a QUAD Toned Pluck. Filter Type in SERIAL configuration offers alternate tones for all DIPOLE outputs.

STEREO Effects

All filtering patches can be extended to STEREO operation. Any of the paired outputs will provide varying stereo effects, including quad panning when all four POLE/DIPOLE outputs are used in a frequency panning application. The multitude of filter topologies and routing options greatly broadens the variety of stereo effects. You are encouraged to experiment. To begin, try using STEREO FM input and setting A/B to opposite CV response using the FM polarizing attenuators.