

M105 VCA

FUNCTION DESCRIPTION



The M105 module is a voltage controlled amplifier whose circuit is based around the Analog Devices SSM2164 quad precision VCA's. It gives an overall unity gain when the front potentiometer 'Fixed Control Voltage' or FCV is at maximum. The same occurs when 5vdc is present at CV1 input with its potentiometer to maximum. CV2 input behaves the same as CV1 with its pot to max. position. A maximum attenuation of -100db is applied when all the CV controls and the fixed control front pot are at zero volt... NO SOUND. Max amplification is +20db if CV's exceed 5vdc. 2 signal inputs are provided with two separate signal outputs. The M105 can accommodate signal amplitudes of 20vpp.

The 'Mode Control' switch gives choice for two different amplification responses:

Linear or **Exponential**.

In the linear mode, the gain will 'track' linearly with any incoming CV (including the FCV pot).

IN the exponential mode, the gain will have an exponential response (not linear) for any incoming CV's.

The M105 module is used where a variable gain is desired for gating or modulating AC or DC voltages sources. Articulation of a signal, tone or sound, utilizing oscillators, controllers, envelope generators, and the VCA is the basic traditional patch through which the signal path comes and goes after being modulated when necessary. In addition Low frequency oscillators can be used at CV1, CV2 to modulate the signal present at M105 signal inputs. Tremolo effect, echo effect can be create upon an audio signal. Audio frequencies modulating on CV1 or CV2 can create sidebands for 'metallic' sound effect purposes.

The printed circuit board

The PCB has been designed to fit behind a 1U Moog style front panel. It is a double side board 2.6" X 5.5" and is mounted using 4-40 1.5" hexa standoffs to keep accessibles the onboard trimmer. All the parts are through hole types. Power is connected by use of a 6 pins 0.156" Molex type connector. The PCB has 4 mounting holes, one on each corner.

The circuit description

The M105 VCA schematic is based around the Analog Devices SSM2164 IC. Since The SSM2164 contains four independent voltage controlled amplifiers (VCAs) in a single package and the fact it is not quite expensive, the idea to build the VCA around it was easy. But looking deeper in the chip I found that the four separate inner control voltages were all of exponential types. At start I wanted to have both Linear and Expo responses available, So I needed to find a design which would provide both types. Fortunately browsing on the web for 'clues' I found some..

July 25, 2002 issue of EDN presented Mike Irwin's Design Idea of his simple yet elegant technique for linearizing the SSM2164 VCA.

A clever use of a quarter of the 2164 (U1A) in feedback with some opamps (U2A,B) and other selected parts to drive another quarter of the 2164 (U1B) will give me what I was looking for. A VCA that has switchable Linear or Expo voltage controls on the fly. In fact only U1B is used as a VCA. Using Mike's "servo" technique, positive input voltages invert and offset exponentially against the Voltage Reference (-5vdc) connected to the input of his Master Cell (U1A). The resulting output voltage controls the other SSM2164 gain cell (U1B) with 2 possible responses:

- linear dB/V proportionality (U2B out)
- Standard native Expo (U2A out)

Switchable through front panel rocker switch Control Mode.

Since only half of the SSM2164 was used in this design I could have used the other half and make a Dual VCA ... Hmmm, that wasn't what I was aiming at. So I only used half the 2164 for my design. My decision.

U3A,B are used as summing opamps for all the CV voltages including CV1, CV2 and the fixed gain front potentiometer. All these CV responses Will behave according to what response is selected (Lin/Expo).

U4A is used as a summing opamp for signal inputs. It also serves as a buffer for the 30k load input of U1B. Any 10vpp signals can be served.

Two separate signal output paths are provided. A separate +5vdc regulator voltage is used for the front panel Fixed CV.

Adjustments and trimmings:

- Connect supply to 6 pins Molex connector.
- Place Mode Control switch to LIN position.
- Adjust front Fixed CV knob to position 10 (max).
- Adjust CV1 pot to 0 (min) with no voltage at CV2 input.
- Connect oscilloscope to one of the signal outputs.

Adjustments and trimmings (continued) :

- Feed one of the signal input with 1khz 10vpp sinewave.
- Make sure the output signal level (osc.) shows the same as the input.
- Move the Fixed CV pot.. the output signal should move accordingly.
Move back the Fixed CV pot to max position.
- Now place the Mode switch to EXP position.
- The output signal is gone.. this is normal.. trim P1 until you get the same level you had at LIN position before (10vpp).
- Flip the switch back and forth on each positions and keep adjusting P1 until both positions show the same max signal level.

The M105 is now ready to be used.

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ArcEnSon

ELECTRONIC SPECIFICATIONS

POWER CONNECTOR

PIN ASSIGNMENTS

1	-15V
2	A GND
3	A GND
4	+15V
5	D GND
6	+5V

Panel Size: Single width 2.125" w x 8.75" h.

Control voltage inputs: 2 summed

Control voltage impedance: 100k +/-5%

Signal inputs: 2 summed

Signal inputs impedance: 100k +/-5%

Fixed CV pot range: -100db....+3db

CV1 pot range: 0v = -100db.... +5v = +3db

Mode switch: LIN / EXP responses

Each signal output impedances: 1k +/-5%

Power:

+15V @ 26mA,

-15V @ 24mA,

+5V @ 0mA.

