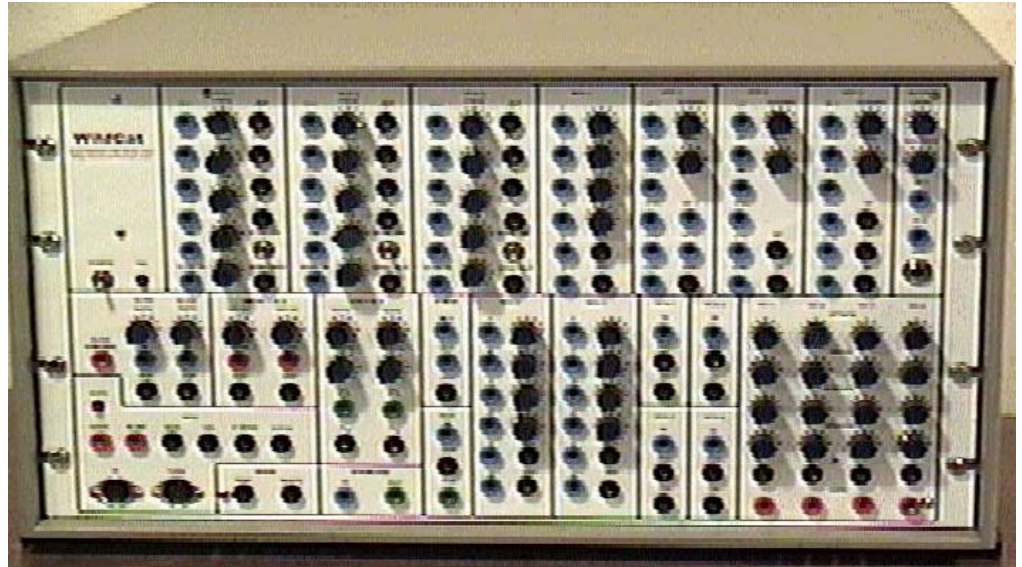
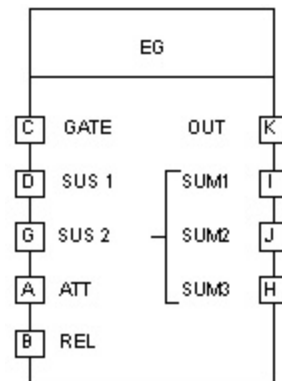


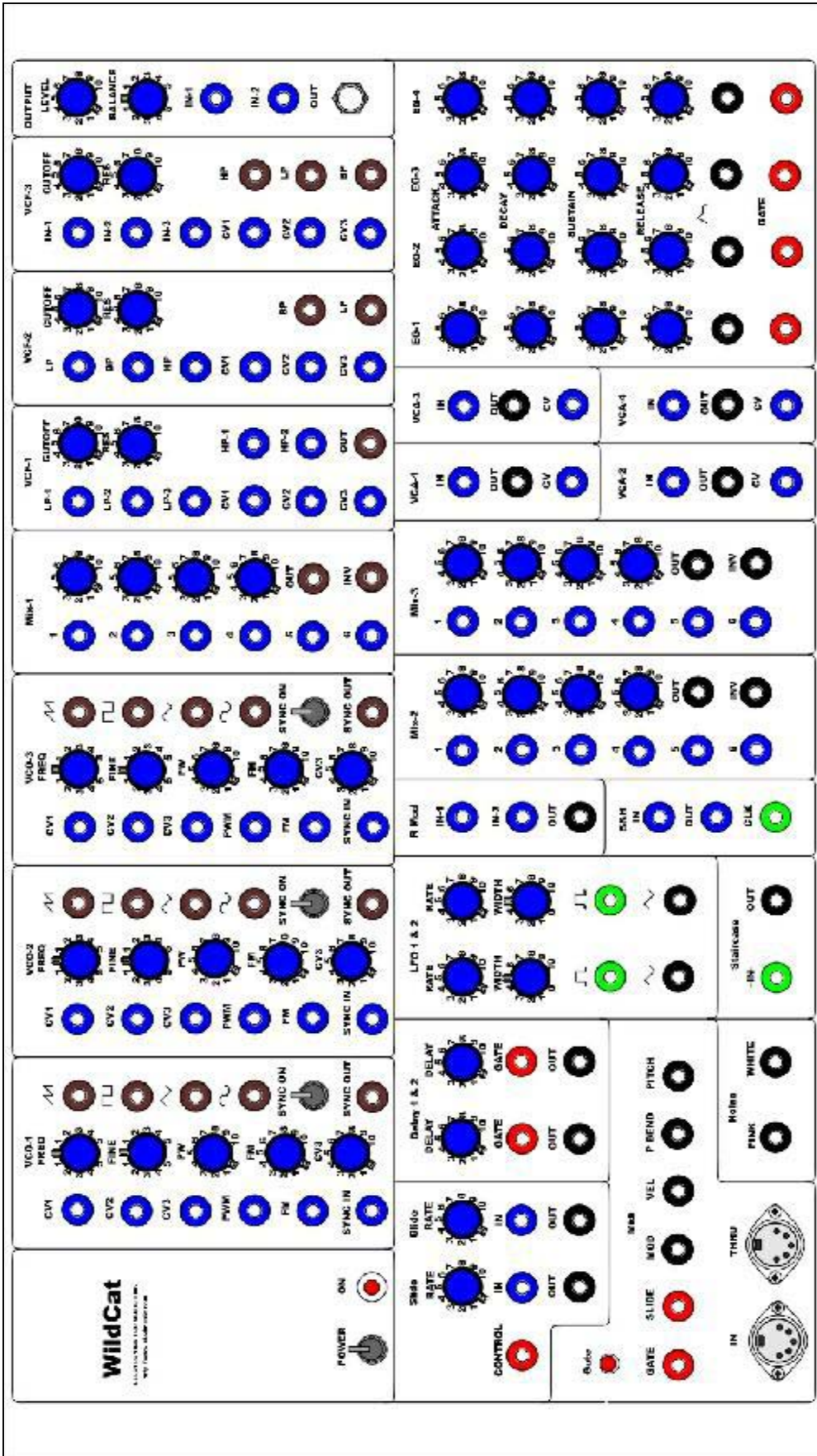
The Wildcat is a modular system designed to be flexible enough to build many types of synthesizers as well as remain unique. The most comprehensive system is naturally the most expensive to build. However the Wildcat board can also be used to construct a much less expensive synthesizer. A full blown Wildcat Modular could cost more than \$1000. The Wildcat Modular-1 was close to \$600. About \$100 went for ribbon cable and header-connectors. If you want to direct-wire and you already have or build your own case you can cut it down to under \$500.



It's all a matter of how much of the board you utilise and what type of hardware you use. Something simple could be constructed for under \$300. People who elect to direct-wire should note that it makes it impossible to remove the board.

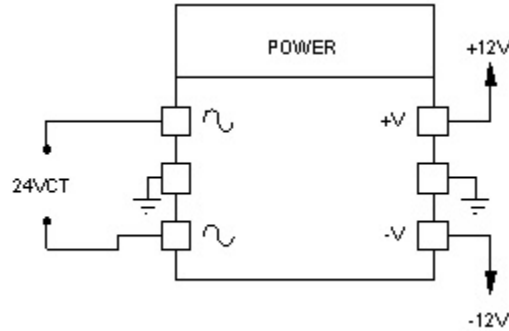
As you read through this document you will see block symbols representing WildCat modules. This system allows WildCat builders to block-diagram their synthesizer. Say you would like plan your synth out before you build it. Now there's no reason to redraw all those schematics to fit your special purpose. Or you want build a web page to show off your synth when it's finished. Usually you could not use EFM schematics or drawings on your site but I would really like to encourage the free use of these diagrams.





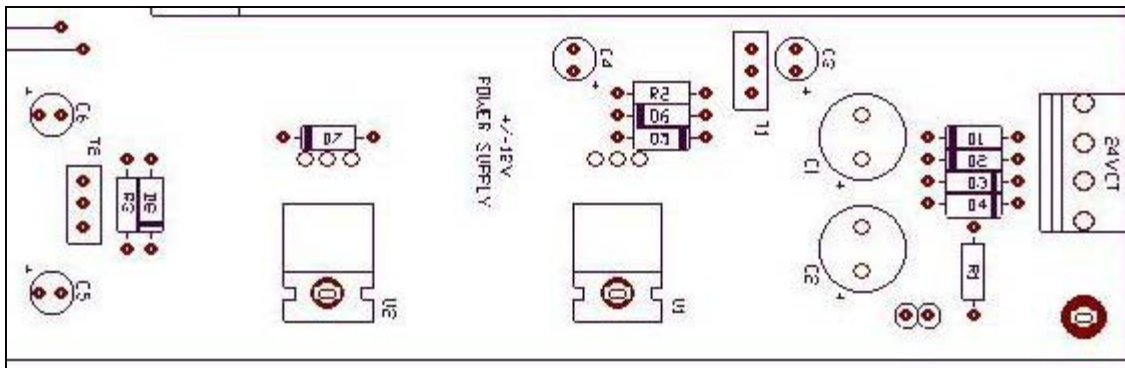
Power Supply

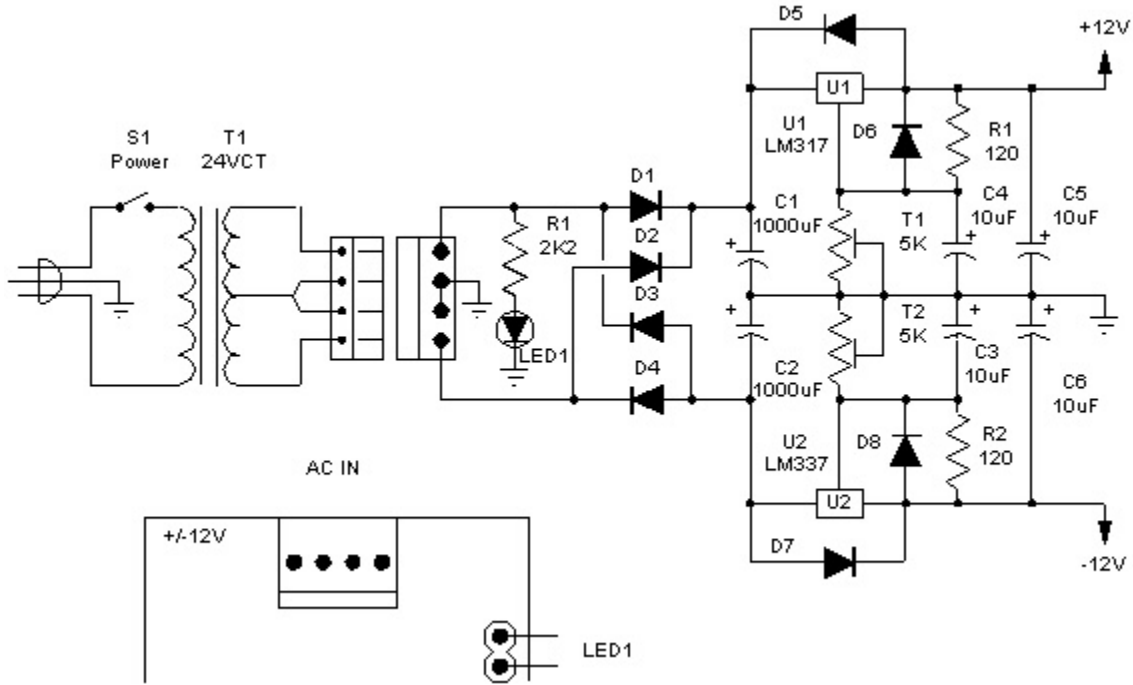
The on-board 2 amp +/- 12 - volt power supply. The power rails run down the center of the board. There are 2 access headers to the right and another to the left. These are for testing purposes during construction and can be used for future expansion.



Description

The WildCat power supply provides plus and minus 12VDC. When S1 is closed line level AC is applied to the 24V center tapped transformer. R1 and LED1 form a power on indicator. D1-4 form a full wave rectifier supplying about +/- 18VDC at filter capacitors C1 and C2. U1 is a variable-output positive voltage-regulator. R2 and T1 form a voltage divider C4 is used as a capacitance multiplier. The voltage at the R2-T1 junction determine the regulators output voltage. D5 and D6 are for short circuit protection. Likewise U2 is a variable-output negative voltage-regulator. R3 and T2 form a voltage divider and C3 is used as a capacitance multiplier. D7 and D8 are for short circuit protection.





Parts

- T1 24VCT Transformer (1)
- S1 SPST Power Switch (1)
- R1 2.2K 1% Resistor (1)
- R2,R3 120 Ohm 1% Resistor (2)
- T1,T2 5K 10T Trimmer (2)
- C1,C2 1000uF 35V Electrolytic Capacitor (2)
- C3,C4,C5,C6 10uF 35V Electrolytic Capacitor (4)
- D1-D8 1N4001 Diode (8)
- U1 LM317 (1)
- U2 LM337 (1)

Setup

- Equipment: Digital Multimeter
- Hook up a power LED.
- TIP: I used a PC-board header connector and soldered an LED to it so that I could remove it after testing.
- There are two 3-terminal power headers on the power supply rails labelled +, -, and GND. Set your meter to DC-Voltage and attach your probes. Turn S1 on and look for DC voltage at the power header. You should see something. If not check for DC voltage at D1 and D4.
- TIP: Use meter probes with removable mini-clips. It's so much easier than trying to hold probes while adjusting trimmers.
- Adjust T1 for +12V and T2 for -12V.

Midi to CV Converter

Analog synthesizers are controlled by compatible control-voltages.

- CV - A control voltage is any voltage used to alter the operating parameters of a module. This can range from -V to +V.
- Gate - Simply on and off.

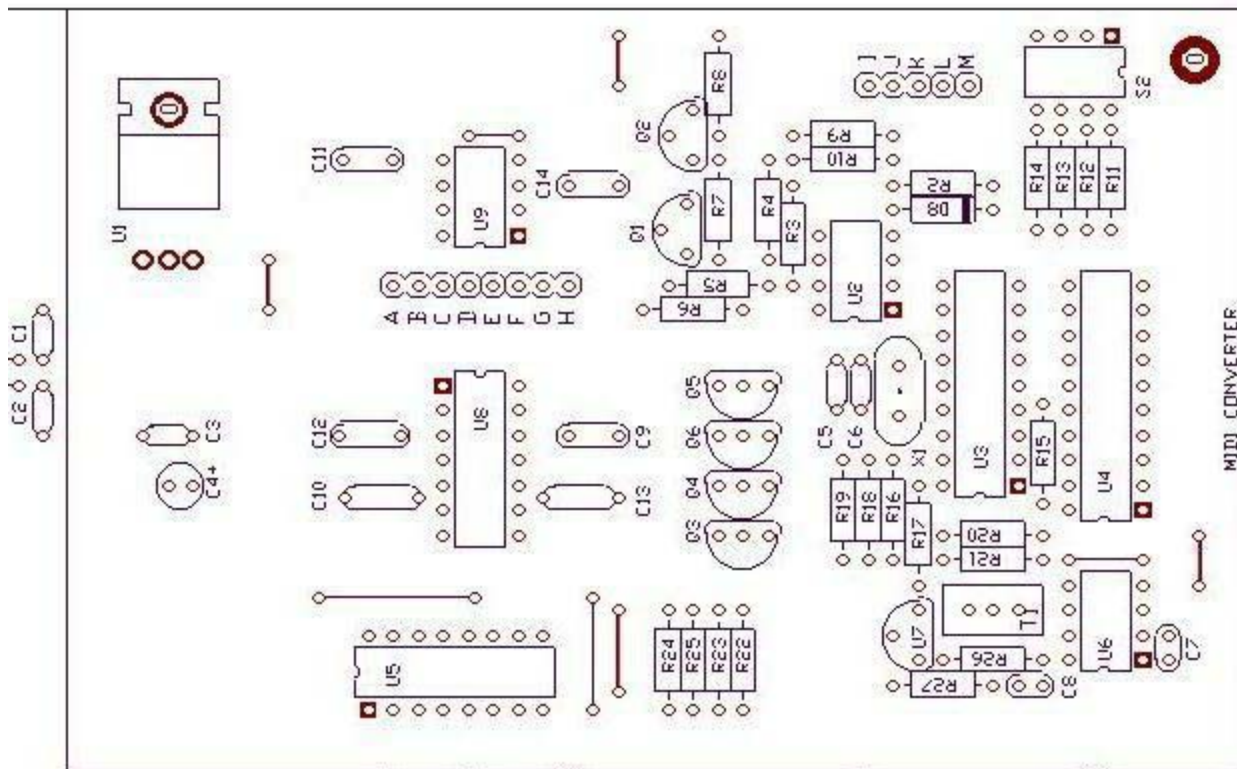
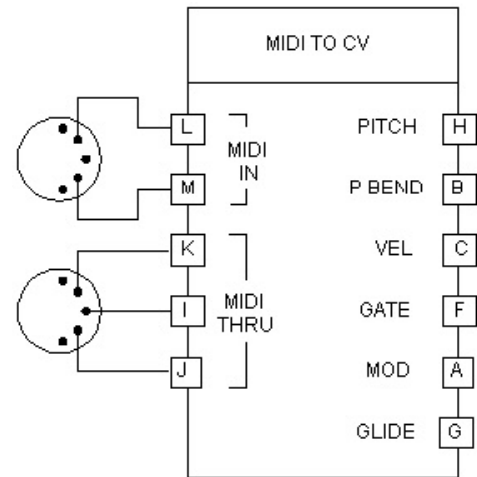
The time was when playing a analog synthesizers involved performing on analog controllers. Every piece had it's own keyboard and there were all sorts of standards. Interfacing was a mess and you could forget about serious sequencing. The Midi to CV converter allows you to retain the flavor and feel of analog control using midi enabled devices.

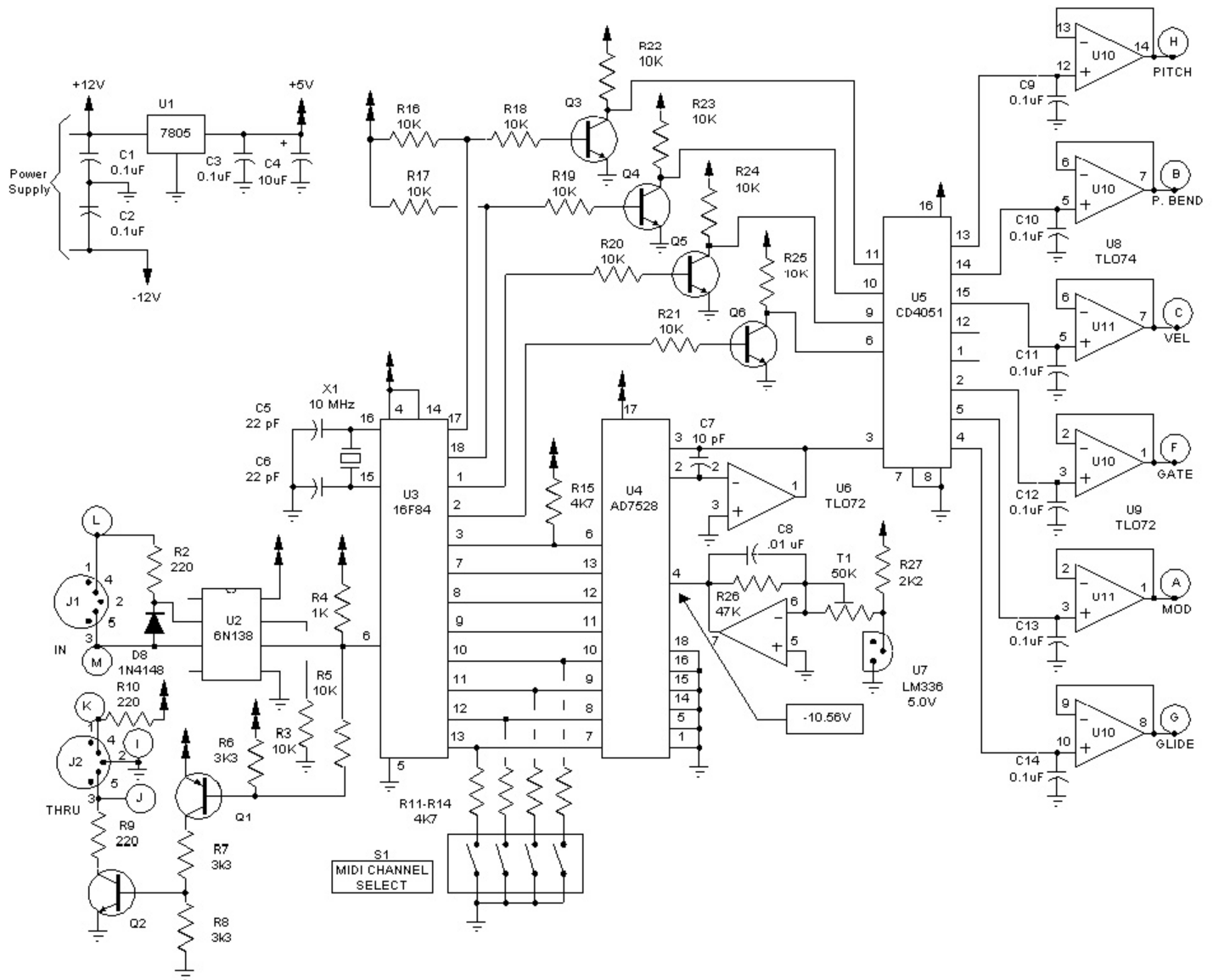
Inputs:

- Midi In

Outputs:

- Midi Thru
- Pitch - Note
- Pitch Bend - PB Wheel
- Velocity - Note Pressure
- Gate - Note On-Off
- Mod - Mod Wheel
- Glide - Whenever more than one key is pressed





Description

The midi to CV converter uses a 7805 regulator for its +5V supply C1,C2 and C3 are bypass capacitors for voltage regulator U1. Midi is transmitted and received on a closed current loop U2 is a optical coupling device that converts the I/O state on the current loop into serial data the PIC microprocessor U3 can understand. The PIC puts the serial data together and uses the instruction to do a couple of things seemingly simultaneously. It seems simultaneous because the PIC is so fast however it does all of this one step at a time. Q1, Q2 form a non-inverting buffer that provides the midi-thru signal. Midi data, depending of the transmitting device can handle a lot of information we don't necessarily need to control an analog synthesizer and that's good because it makes doing the job with a low cost PIC possible. We can get by with fairly minimal set of controls.

- Pitch
- Pitch Bend
- Velocity
- Gate
- Mod
- Glide

The PIC loads the correct number into the DAC digital to analog converter U4 to generate a voltage that corresponds to the midi message received. Then selects which output is active by strobing the demux U5's select pins through the Q3-Q5 inverter-buffers. When one of the outputs goes high the voltage is sampled and held by capacitors C9-C14 until it is refreshed. U8a is the DAC output amp and U8b is the DAC voltage reference amplifier.

NOTE: R1 is part of the power supply and not shown here.

Parts

C1-C2 0.1uF Ceramic Capacitor 2
C4 10uF@16V 1
C5,C6 22pF Ceramic Capacitor 2
C7 10pF Ceramic Capacitor 1
C8 .01uF Poly Capacitor 1
C9-C14 0.1uF Mono Capacitor 6
R2,R9,R10 220 Ohm 1% Resistor 3
R3,R5,R16-R25 10K 1% Resistor 12
R4 1K 1% Resistor 1
R6,R7,R8 3.3K 1% Resistor 3
R11-R14,R15 4.7K 1% Resistor 5
R26 47K 1% Resistor 1
R27 2.2K 1% Resistor 1
T1 50K 10T Trimmer 1
Q1,Q3-Q6 2N3906 5
Q2 2N3904 1
U1 7805 +5V Voltage Reg 1
U2 6N138 1
U3 PIC16F84 1
U4 AD7528 1
U5 CD4051 1
U6 LM358 1
U9 TLO72 2
U7 LM336Z 5.0V 1
U8 TLO74 1
S2 4 Position Dip Switch 1
J1,J2 5 Pin Din Panel Mount Jack 2

Setup

To generate a 1V/Octave scale the DAC needs the correct reference voltage. Adjust Trimmer T1 until the voltage on U4, pin-4 is -10.56V.

Glide

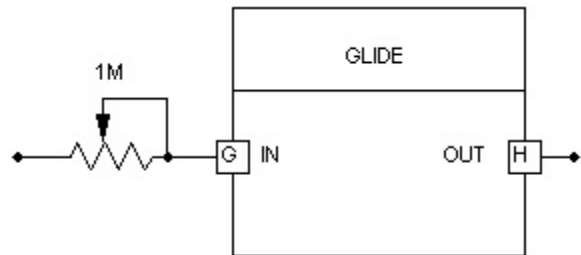
The Glide or Lag module is a variable frequency low-pass filter. As the cutoff frequency is lowered the charge-time increases and sharp changes in voltage are smoothed. Generally used for pitch-lag (portamento) and smoothing the sample & hold output. It's called glide because it smoothes the transition from one note to another. Effectively gliding from one note to the next note played.

Input:

- CV - In

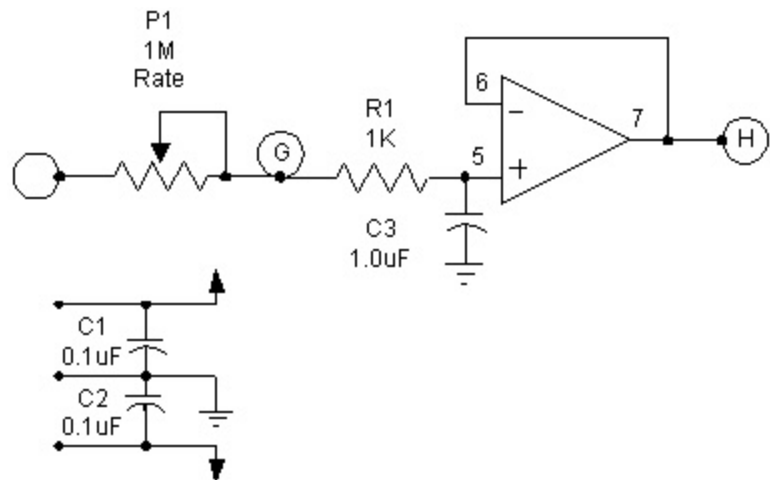
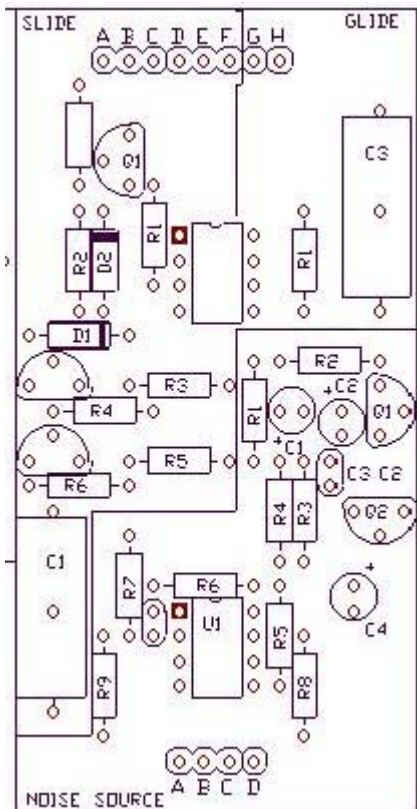
Output:

- CV - Out



Description

Voltage on the input charges C3 . P1 controls the charge rate.



Parts

- C1,C2 0.1uF Ceramic Capacitor
- C3 1.0uF Mono Capacitor
- R1 1K
- U1 1/2 TLO72

Slide

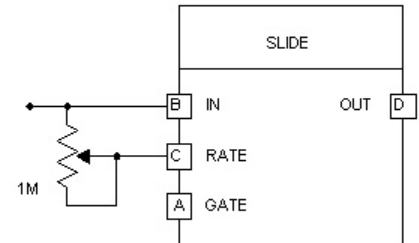
The Slide module is much like the Glide module, performing the same sort of function it is however gated. Meaning that the preset lag time is bypassed unless the control input is held high or a gate voltage is present.

Input:

- CV - In
- Rate - Lag Time
- Gate - On/Off Time

Output:

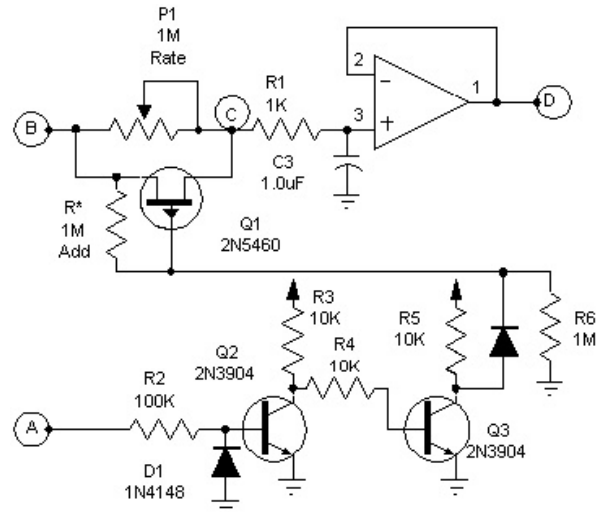
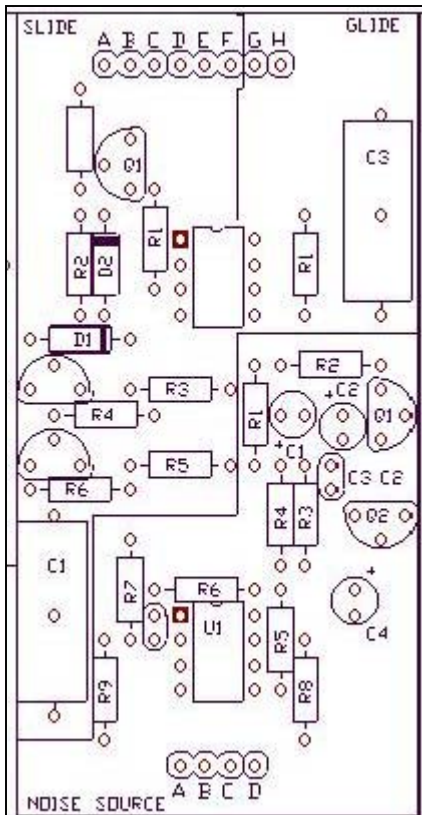
- CV - Out



Description

P1 controls the charge rate of C3. Q1 is a bypass switch for P1. Q2 is an inverter, if the gate is low the collector is high holding Q3 on. If Q3 is on the collector voltage is low and Q1 is on or shorted, closing the circuit across P1. Removing P1 from the signal path.

When a gate voltage turns Q2 on the collector is low. Q3s turns off, the collector goes high turning Q1 off. If Q3 is off or open P1 is inserted into the signal path and controls the charge-rate.



Parts

- C1 1.0uF Mono Capacitor
- R1 1K 1% Metal Film Resistor
- R2 100K 1% Metal Film Resistor
- R3,R4,R5 10K 1% Metal Film Resistor
- R6,* 1M 1% Metal Film Resistor
- P1 1M Potentiometer
- D1,D2 1N4148 Diode
- Q1 2N5460 P-Fet Transistor
- Q2,Q2 2N3904 NPN Transistor
- U1 1/2 TLO72

VCOs 1-3

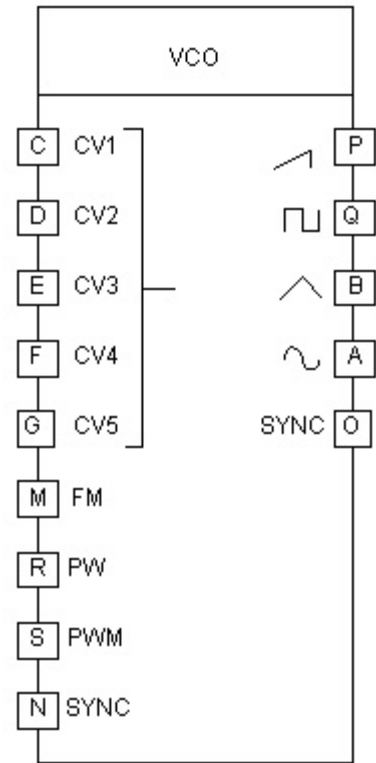
The voltage controlled oscillators are generally used to generate audio range signals but can easily be tuned to produce low frequency voltage for modulation purposes. There are simultaneous saw, pulse, triangle and sine outputs. The FM input is a dedicated audio range input for high frequency modulation. It is used to produce ringing or bell like sounds. The Sync output is not usually used because sync can be obtained from the Saw or Pulse outputs. It produces a very thin pulse that in addition to sync can be used as a trigger other devices or modules.

Inputs:

- CV1 - CV3 - 1 volt per octave CV inputs.
- CV4 - Frequency CV
- CV5 - Fine Tune CV
- FM - Audio Mod
- PW - Pulse Width
- PWM - Pulse Width Mod
- Sync - Sync In Note: Must be connected to -12V when not in use.

Outputs:

- Saw
- Pulse
- Triangle
- Sine
- Sync



Description

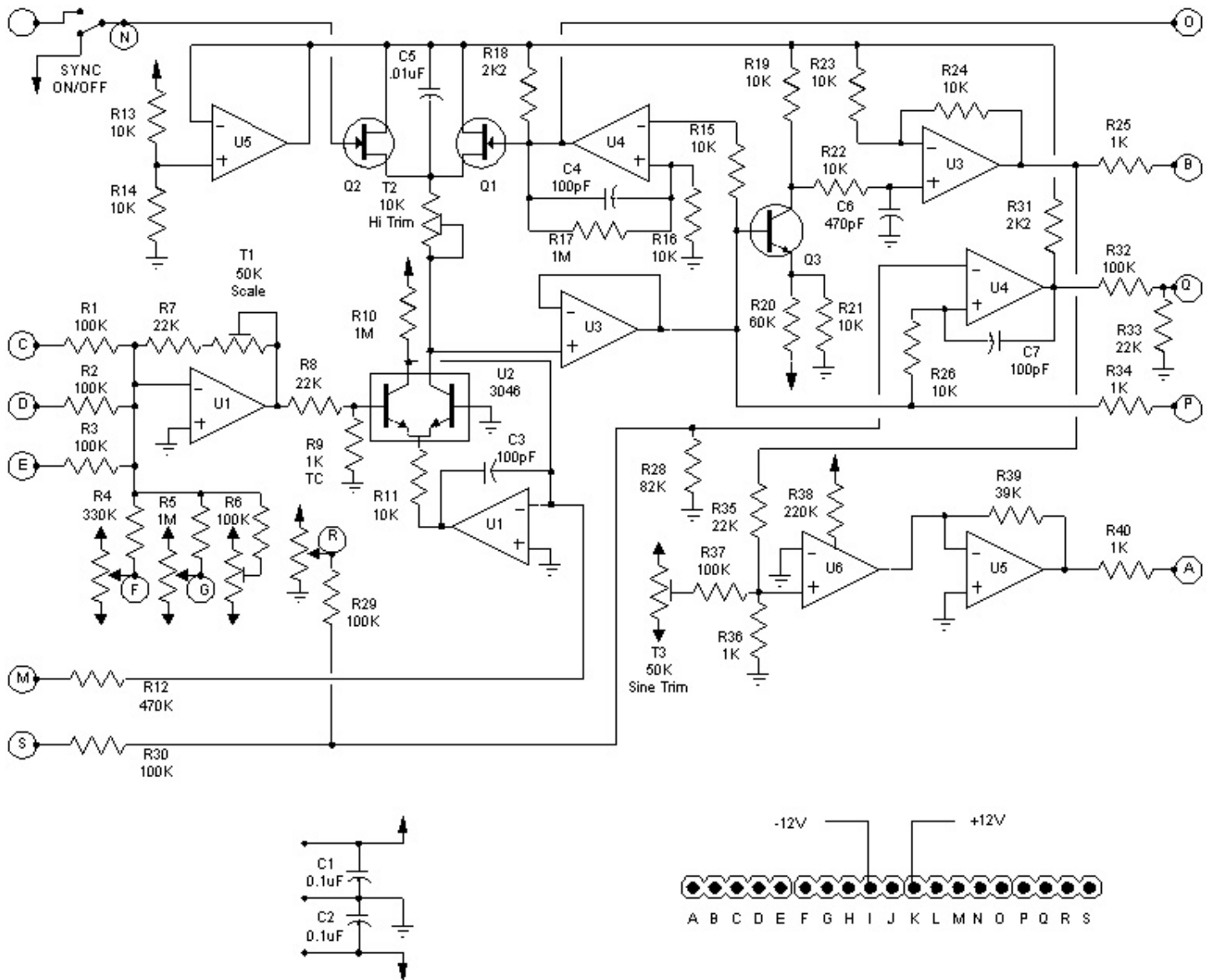
U1 and U2 from a linear voltage to exponential current sink. As current flows from the +V source C5 starts to charge. When the voltage at the output of buffer (U3a) reaches the threshold level of the comparator (U4a) it turns on . This turns Q1 on and shorts C5 resetting it and the cycle begins again. This oscillation forms a sawtooth waveform on the output of buffer (U3a)

An external input on the gate of the synchronisation transistor (Q2) causes the transistor to turn off and on shorting C5 regardless of whether U4a is on. Oscillation occurs in sync with the controlling oscillator.

An FM input causes the oscillator center frequency to change with the signal amplitude or Frequency Modulates the exponential converter.

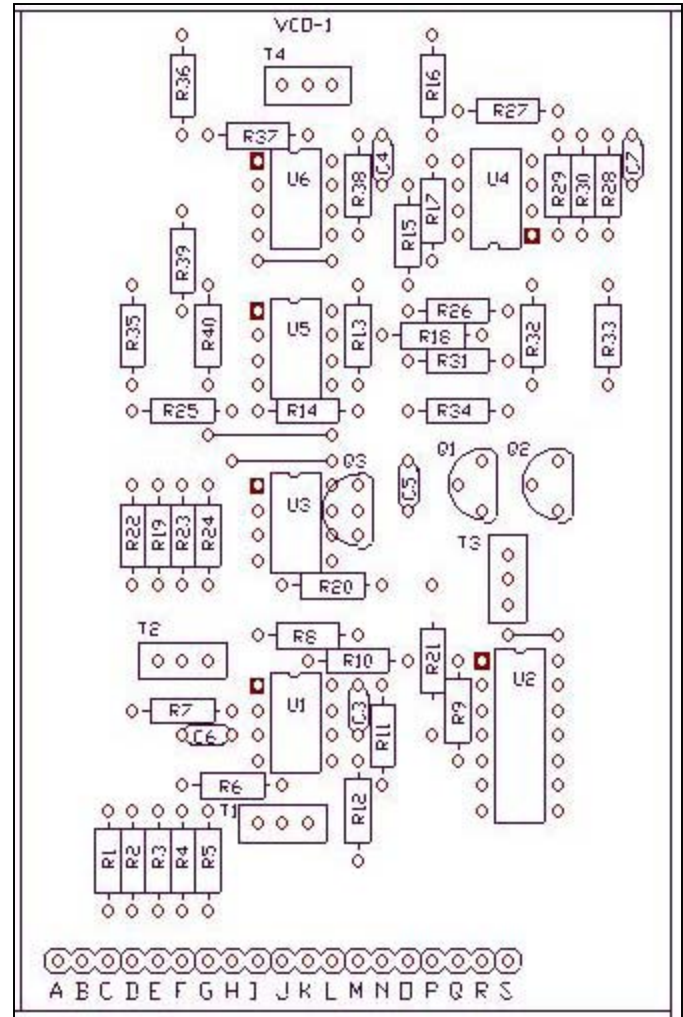
The sawtooth waveform is applied to the base of Q3. Q3 is a phase splitter and U3b combines the signals to form a triangle waveform. The sawtooth waveform is also applied to the non-inverting input of comparator U4b. U4b is biased through R28 so that it turns on as soon as the voltage starts to rise at the output of U3a. The output of U4b is a variable pulse waveform A voltage applied to U4a's inverting input changes the duty cycle altering the pulse width. The Sine output is formed by overdriving the input of Operational Transconductance Amplifier U6.

Note: R27 is not used



Parts

- C1,C2 0.1uF Ceramic Capacitor 2
- C3,C4,C7 100pF Ceramic Capacitor 3
- C5 0.01uF Mono Capacitor 1
- C6 470pF Ceramic Capacitor 1
- R1,R2,R3,R6,R29,
R30,R32,R37 100K 1% Metal Film Resistor 9
- R4 330K 1% Metal Film Resistor 1
- R5,R10,R17 1M 1% Metal Film Resistor 3
- R7,R8,R28,R33,R35 22K 1% Metal Film Resistor 5
- R9 1K Tempco 1
- R11,R13,R14,R15,R16,
R19,R21,R22,R23,
R24,R26 10K 1% Metal Film Resistor 11
- R12 470K 1% Metal Film Resistor 1
- R18,R31 2.2K 1% Metal Film Resistor 2
- R20 60K 1% Metal Film Resistor 1
- R25,R34,R36,R40 1K 1% Metal Film Resistor 4
- R28 82K 1% Metal Film Resistor 1
- R38 220K 1% Metal Film Resistor 1
- R39 39K 1% Metal Film Resistor 1
- T1,T2,T4 50K 10T Trimmer 3
- T2 10K 10T Trimmer 1
- P1,2,3,4,5 50K Potentiometer 5
- Q1,Q2 J112 N-Fet Transistor 2
- Q3 2N3904 NPN Transistor 1
- U1,U3,U5 TLO72 Dual Opamp 3
- U2 LM3046 Transistor Array 1
- U4 LM393 Dual Comparator 1



Setup

- If Q2 is installed make sure Pad-N is connected to -V.
- Turn all trimmers to their center positions.
- Attach a 50K Pulse-Width pot to pad R. Set the PW pot to 50%
- Attach header pin-P to a monitor amp with a level control and turn it way down.
- Hook up your midi keyboard to the midi in on the midi converter.
- Attach a jumper from the midi converters pitch output to header pin-C
- Turn the unit on and check for +V (U1 Pin-8) and -V (U1 Pin-4)
- Adjust T6 until the output is somewhere around 440Hz
- **TIP:** If you have a mute controller you can use a guitar tuning fork.
- Play low octave apart D notes and adjust T1 until they are in tune.
- Play high octave apart D notes and adjust T2 until they are in tune.
- **TIP:** You may have to go back and forth between T1 and T2 a few times to get it right.
- When the oscillator is in tune with itself re-adjust T6 for 440Hz
- Check the output pins B- Tri Q- Pulse P- Ramp A-Sine for signals.
- **Tip:** If you don't have a scope use your monitor amp.
- Adjust T3 for the best looking/sounding sine.

Mixer/Inverters 1-3

There are three 6-input mixers that can be used for audio, CV or a combination of both. There are normal and inverted outputs.

Inputs:

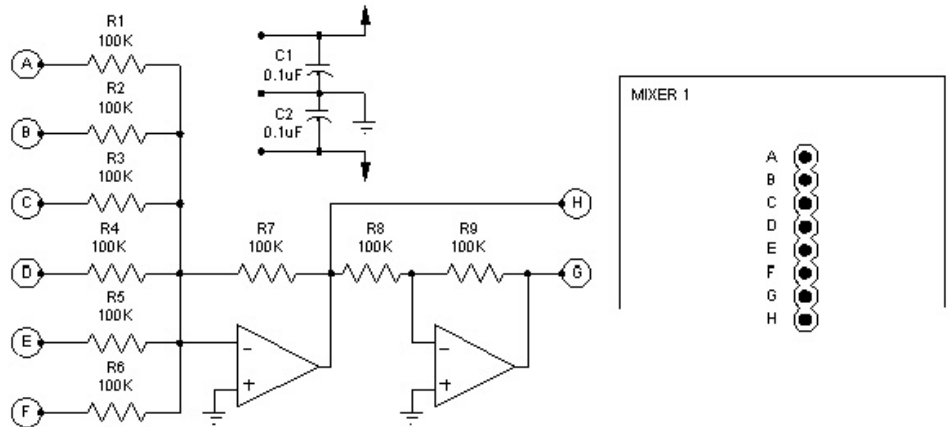
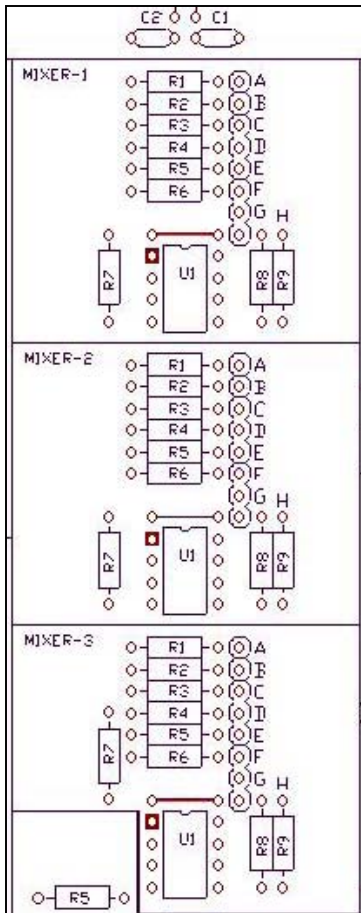
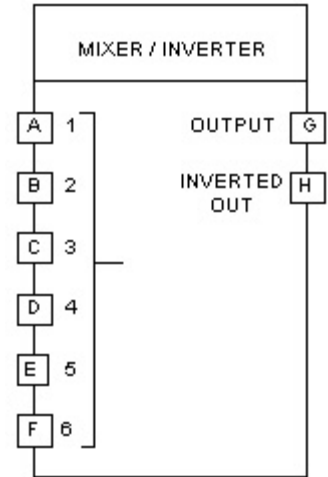
- 1-6 - Audio and/or CV inputs

Outputs:

- Normal
- Inverted

Description

When signals are present on the inputs U1a adds them together and outputs the inverted sum of all inputs. U1b is a simple inverting signal.



Parts

- R1-R9 100K 1% Metal Film Resistor 9
- U1 TLO72 Dual Opamp 1

VCF-1

VCF-1 is a 4-pole Moog type transistor ladder with low-pass and high-pass inputs. Notch can be obtained by splitting the input between both high and low inputs. This filter features voltage controlled resonance and several dedicated mixers.

Inputs:

- HP In 1-2
- LP In 1-3
- Frequency CV 1-3
- Cutoff parameter
- Resonance parameter
- Resonance CV

Outputs:

- Audio Out

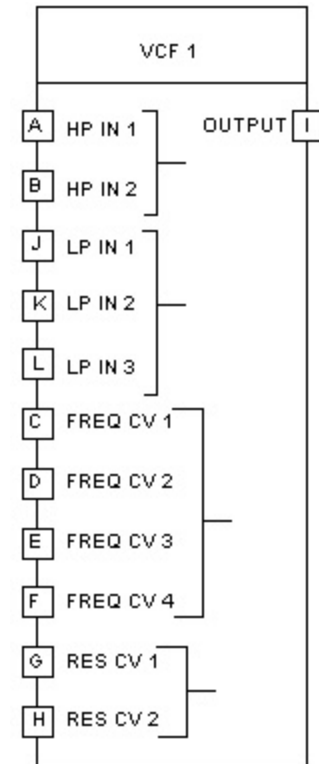
Description

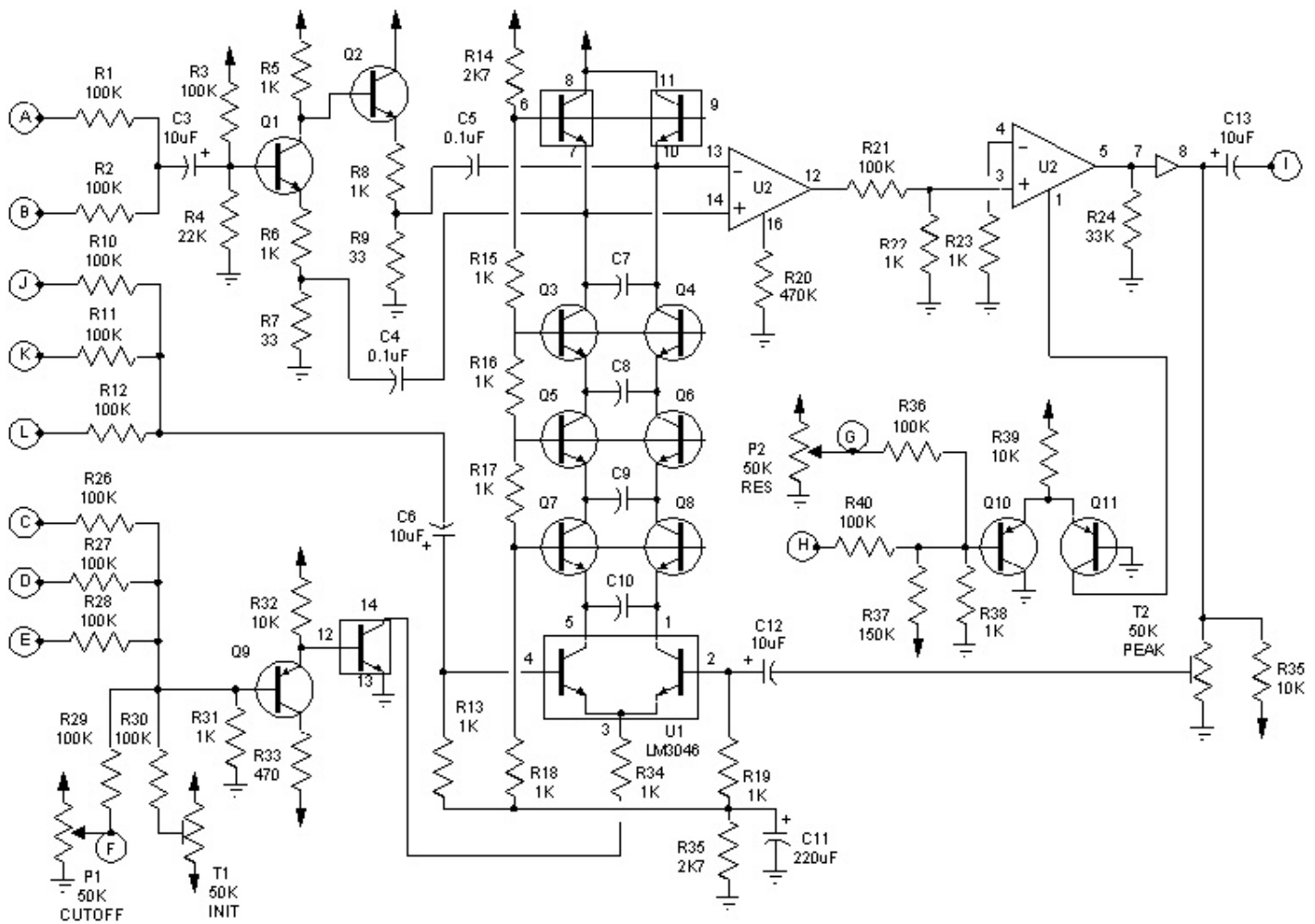
due to temperature variations. The voltage applied to the base of the exponential-transistor causes a exponential collector current sink that's applied to the transistor ladder through R34. The ladder transistors are biased at increasingly positive potentials by the voltage divider string R14-18 and R35. The bottom pair of transistors split the current supplied to R34 into equal parts when there is no audio on the base of the U1 (3,4,5) transistor. When audio is present both left and right sides of the ladder are modulated inversely. As current flow increases the collector impedance of the ladder transistors is decreased providing a higher cutoff frequency by

form current to voltage converters that provide a voltage that's the log of the ladder current to reverse the non-linear effect audio signals cause on current within the ladder.

This inverse modulation on the ladder causes a push-pull voltage to develop at the top of the ladder. A high pass input is provided by phase-splitting transistors Q1-Q2 connected to the top of the ladder. These voltages are applied to differencing and level shifting amplifier U2a and then to resonance vca U2b. The gain of U2b is set by bias current supplied by constant current source Q10 and Q11. The ratio of currents through these two transistors is a rough exponential function of the voltage difference between the bases. Current supplied from Q2 is reasonably constant and repeatable. The resonance signal must be dynamically

are different.



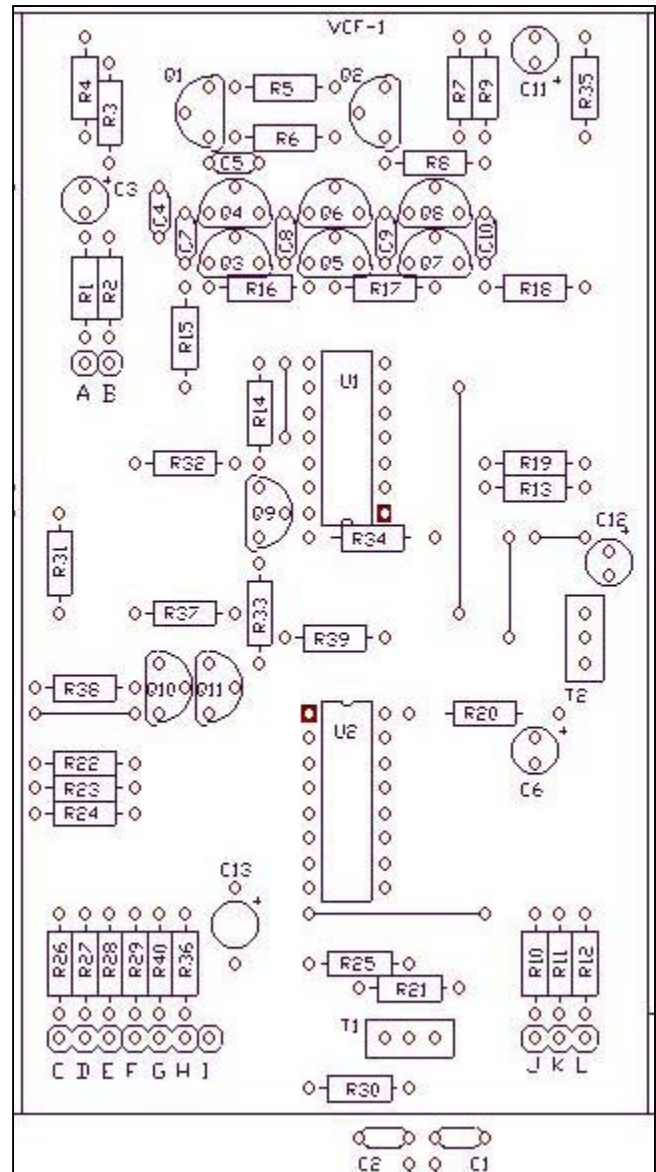


Parts

- C1,C2 0.1uF Ceramic Capacitor 2
- C3,C4 470pF Mono Capacitor 2
- R1,R2,R3,R6,R7,R8,
- R11,R13,R16,R18 10K 1% Metal Film Resistor 10
- R4,R5,R9,R10, 220 Ohm 1% Metal Film Resistor
- R12 47 Ohm 1% Metal Film Resistor 1
- R14,R15,R24,R25 1K 1% Metal Film Resistor 4
- R17 4.7K 1% Metal Film Resistor 1
- R19,R20,R21,R22 100K 1% Metal Film Resistor 5
- R23 47K 1% Metal Film Resistor 1
- T1 50K 10T Trimmer 1
- P1,P2 50K Potentiometer 2
- D1-D6 1N4148 Diode 6
- Q1,Q2 2N3906 PNP Transistor 2
- U1 LM13600 Dual OTA 1
- U2 TLO71 Opamp 1

Setup

- Attach a jumper from VCO1s ramp output to pad-J
- Attach a Res Pot to pad-G and turn it to the minimum position.
- Adjust all trimmers to mid position.
- Hook your monitor amp to pad-l
- Turn the unit on and check for +/-V
- Adjust T1 until the sound is about half muffled then turn the Res-Pot to 80%
- Adjust T2 until the filter just starts to oscillate.
- Turn the Res-Pot to minimum
- Adjust T1 until the sound is almost completely muffled



VCF-2

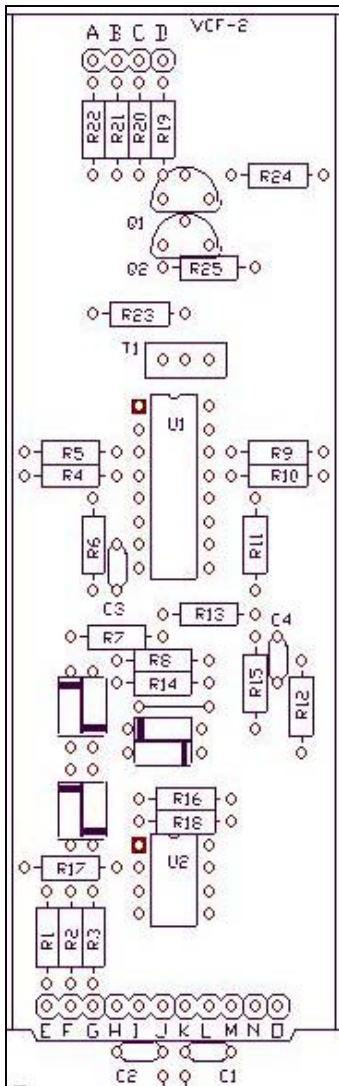
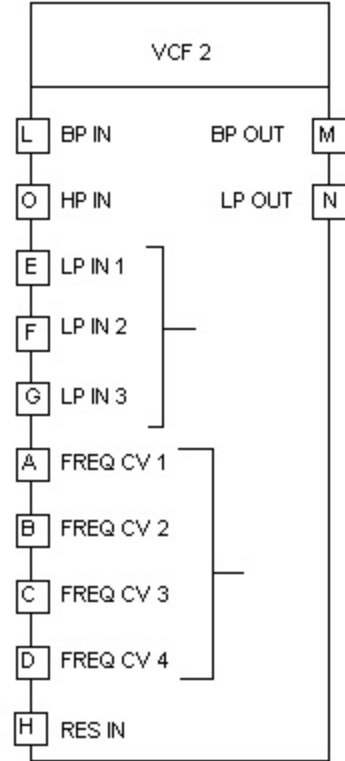
VCF-2 is a Sallen & Key 2-pole low-pass, band-pass and high-pass filter based on the Korg MS-20 filter.

Inputs:

- BP In - Band-Pass Input
- HP In - Hi-Pass Input
- LP In 1-3 - Low-Pass Input Mixer
- Freq-CV 1-3 - Frequency CV Mixer
- Freq CV 4 - Cutoff Parameter
- Res In - Resonance Parameter

Outputs:

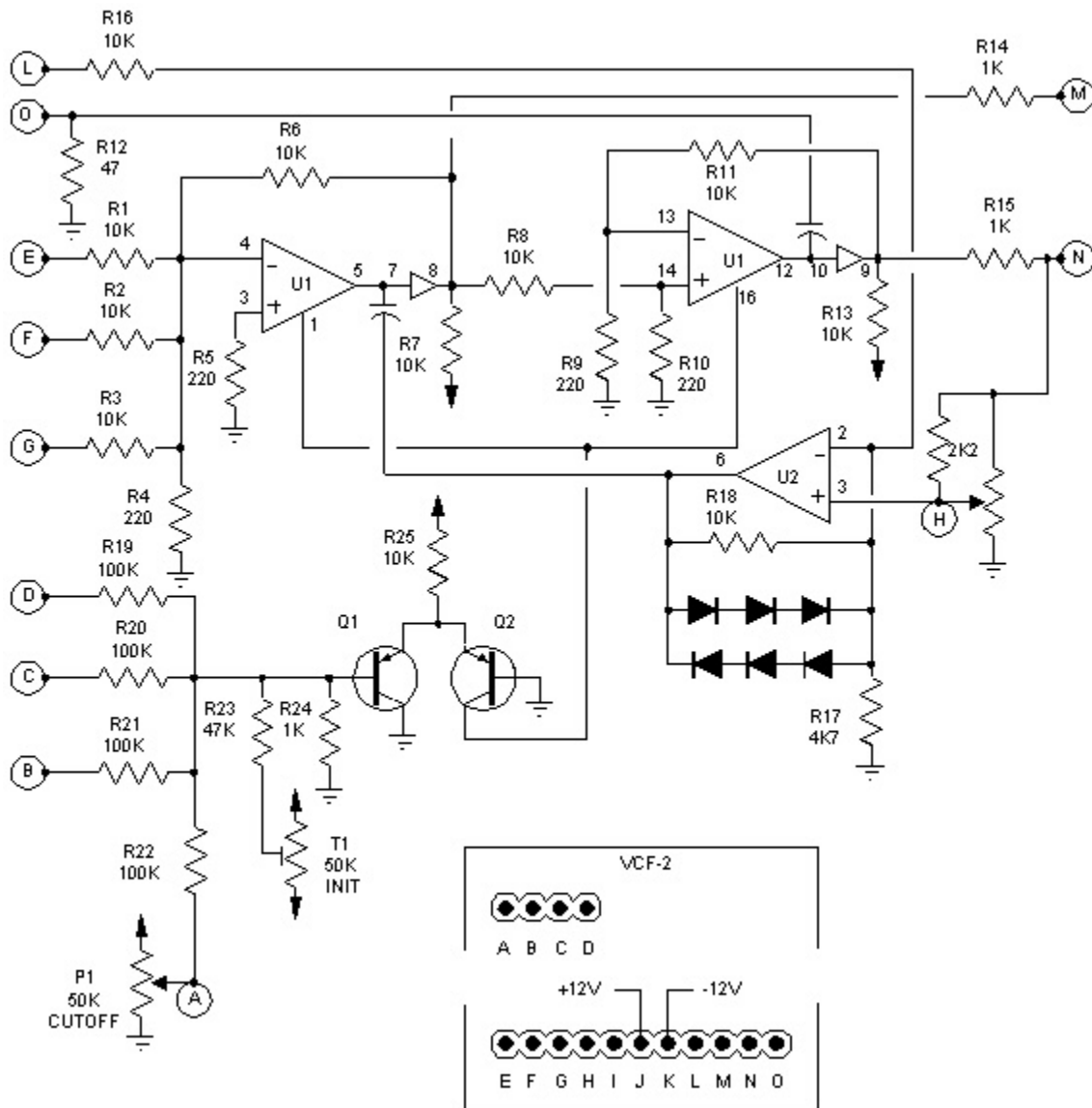
- BP Out- Band-Pass Output
- LP Out - Low-Pass Output



Description

U1a and U1b are inverting and non-inverting integrators connected in series. The gain of these amplifiers determine the center frequency of the filter. The gain is set by bias current supplied by constant current source Q1 and Q2. The ratio of currents through these two transistors is a rough exponential function of

reasonably constant and repeatable. U2 provides amplified feedback that's injected into C3. A high pass input is available on C4 and there is a band-pass input on the feedback amplifier.



Parts

- C1,C2 0.1uF Ceramic Capacitor 2
- C3,C4 470pF Mono Capacitor 2
- R1,R2,R3,R6,R7,R8,
- R11,R13,R16,R18 10K 1% Metal Film Resistor 10
- R4,R5,R9,R10, 220 Ohm 1% Metal Film Resistor
- R12 47 Ohm 1% Metal Film Resistor 1
- R14,R15,R24,R25 1K 1% Metal Film Resistor 4
- R17 4.7K 1% Metal Film Resistor 1
- R19,R20,R21,R22 100K 1% Metal Film Resistor 5
- R23 47K 1% Metal Film Resistor 1
- T1 50K 10T Trimmer 1
- P1,P2 50K Potentiometer 2
- D1-D6 1N4148 Diode 6
- Q1,Q2 2N3906 PNP Transistor 2
- U1 LM13600 Dual OTA 1
- U2 TLO71 Opamp 1

VCF-3

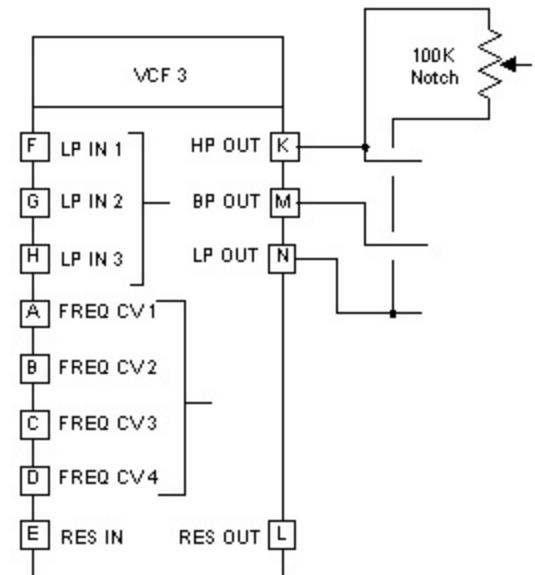
VCF-3 is a 2-pole State Variable filter based on the Oberheim SEM with simultaneous High-Pass, Band-Pass, Low-Pass and Notch outputs.

Inputs:

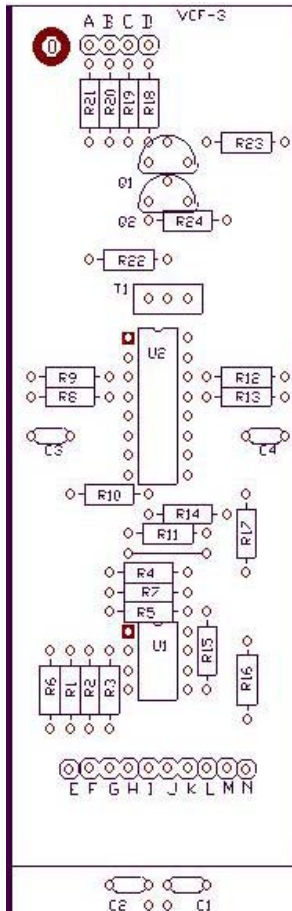
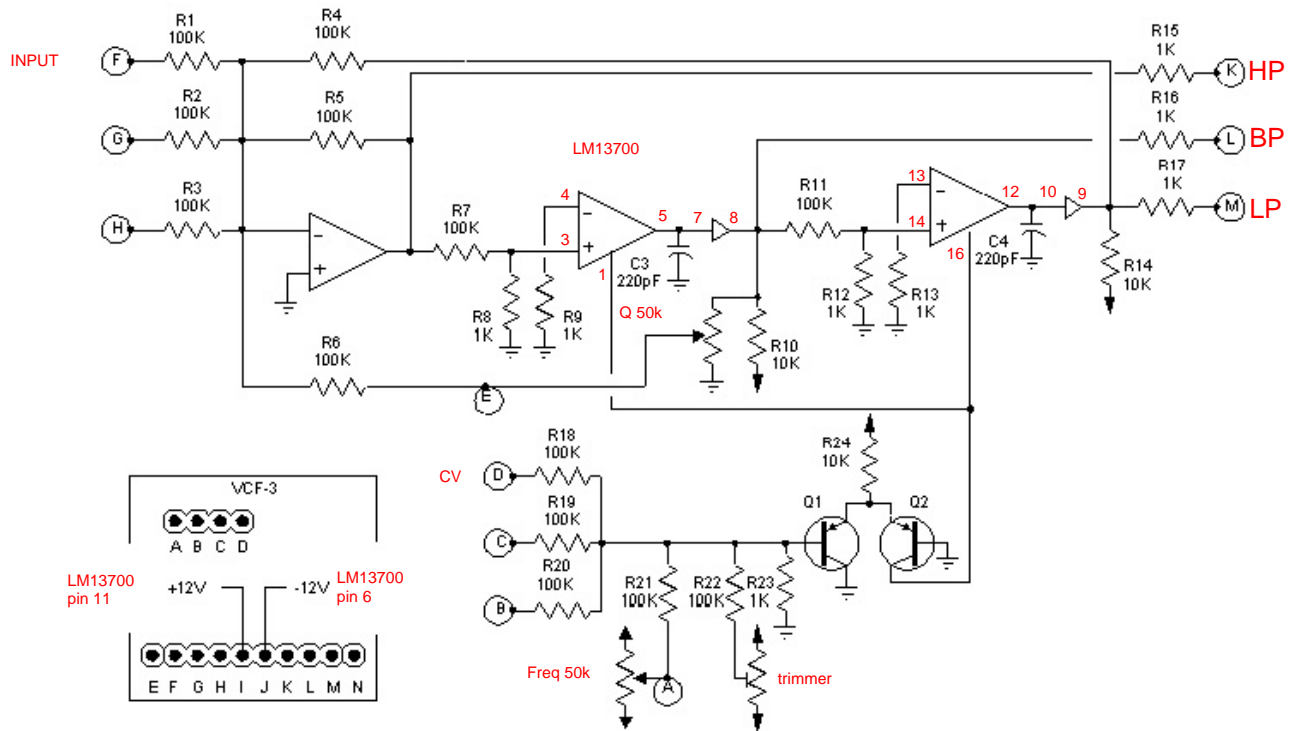
LP In 1-3 - Low Pass Input Mixer
Freq CV1 - Cutoff Parameter
Freq CV1 - CV4 - Frequency CV Input Mixer
Res In - Resonance Parameter Return

Outputs:

HP Out - High - Pass Output
BP Out - Band- Pass Output
LP Out - Low - Pass Output
Res Out - Resonance Parameter Send

**Description**

U2a and U2b are identical integrators connected in series. The gain of these amplifiers determine the center frequency of the filter. The gain is set by bias current supplied by constant current source Q1 and Q2. The ratio of currents through these two transistors is a rough exponential function of the voltage difference between the bases. Current supplied from Q2 is reasonably constant and repeatable. High, band and low-pass outputs are all available at the same time. Notch out is available by mixing the high and low-pass outputs.



Parts

- C1,C2 0.1uF Ceramic Capacitor 2
- C3,C4 220pF Ceramic Capacitor 2
- R1,R2,R3,R4,R5,R6,R7, R11,R18,R19,R20,R21, R22 100K 1% Metal Film Resistor 13
- R8,R9,R12,R13,R15, R16,R17,R23 1K 1% Metal Film Resistor 8
- R10,R14,R24 10K 1% Metal Film Resistor 3
- T1 50K 10T Trimmer 1
- P1,P2 50K Potentiometer 2
- Q1,Q2 2N3906 PNP Transistor 2
- U1 TLO71 Opamp 1
- U2 LM13600 Dual OTA 1

VCA 1-4

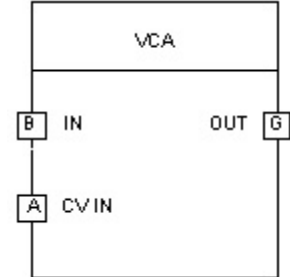
There are 4 Voltage Controlled Amplifiers that can be used as audio or CV amplifiers.

Inputs:

- In - Input
- CV In - Control Voltage

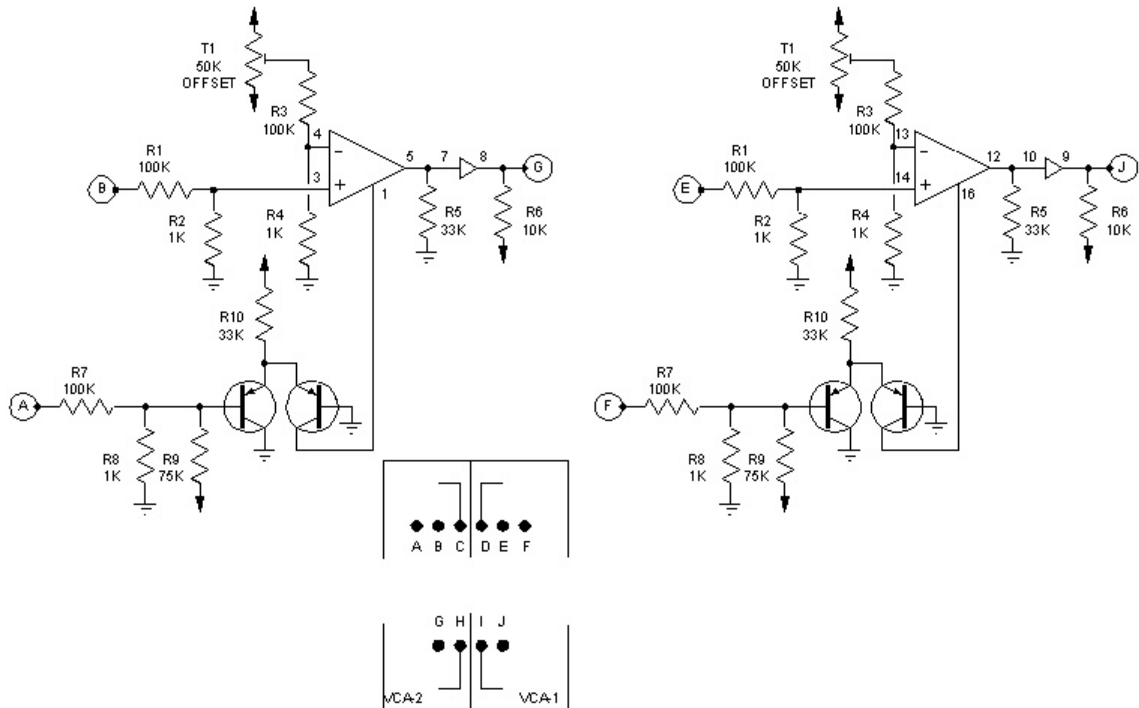
Output:

- Out - Output



Description

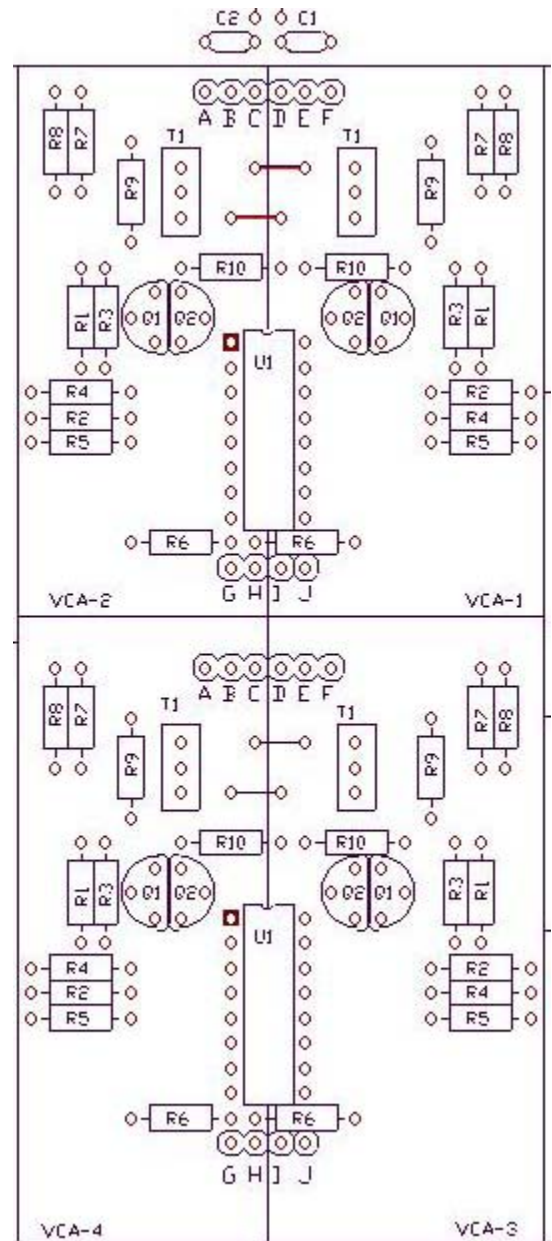
The VCAs are simply non inverting OTAs that have voltage offset compensation. The gain is set by bias current supplied by constant current source Q1 and Q2. The ratio of currents through these two transistors is a rough exponential function of the voltage difference between the bases. Current supplied from Q2 is reasonably constant and repeatable.



Parts

Includes Parts For All Four VCAs

- R1,R7,R3 100K 1% Metal Film Resistor 8
- R2,R4,R8 1K 1% Metal Film Resistor 12
- R5,R10 33K 1% Metal Film Resistor 4
- R6 10K 1% Metal Film Resistor 8
- R9 75K 1% Metal Film Resistor 4
- T1 50K 10T Trimmer 4
- Q1,Q2 2N3906 8
- U1 1/2 LM13600 2



Cross Mix / Inverter

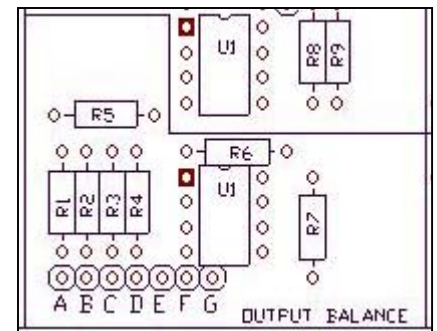
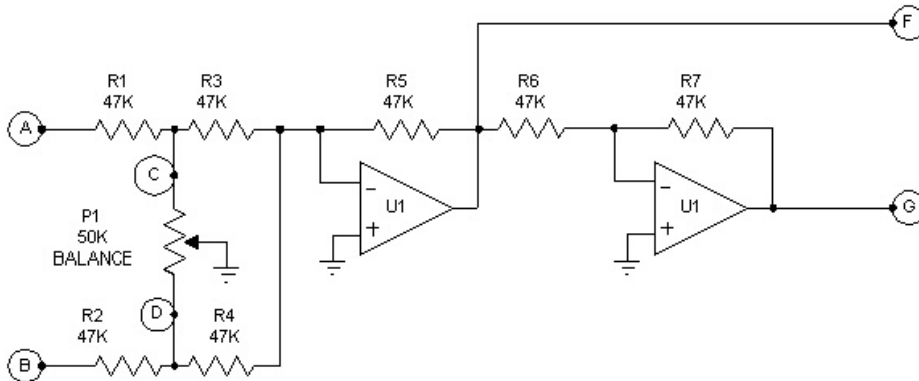
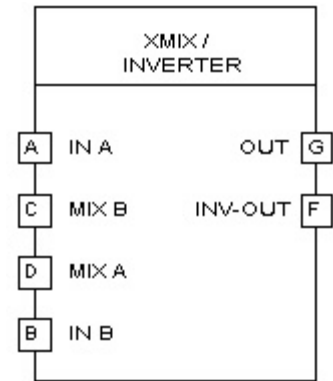
Xmix module with normal and inverted outputs. As one input level is increased the other is lowered, also functions as an inverter.

Inputs:

- In A - Input A
- In B - Input B
- Mix B - If pin is low Signal-A is muted and B is full-on
- Mix A - If pin is low Signal-B is muted and A is full-on

Outputs:

- Out - Output
- Inv-Out - Inverting Output



Parts

- R1-R7 47K 1% Metal Film Resistor 7
- P1 50K 1
- U1 TLO72 1

EG 1-4

There are four Envelope Generators. That can be configured as Attack/Decay w/Gate-Release, Attack/Decay/Sustain/Release, Ramp or Attack/Decay-Release/Sustain where the release can be switched in and out.

Inputs:

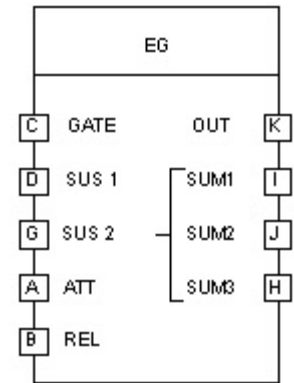
- Gate - Gate Input
- Sum 1 - Voltage Sum Mixer 1
- Sum 2 - Voltage Sum Mixer 2
- Sum 3 - Voltage Sum Mixer 3

Parameters:

- SUS 1 - Sustain 1
- SUS 2 - Sustain 2
- ATT - Attack
- REL - Release

Outputs:

- Out - Output



Description

Q1 and Q2 form a non-inverting level shifter.

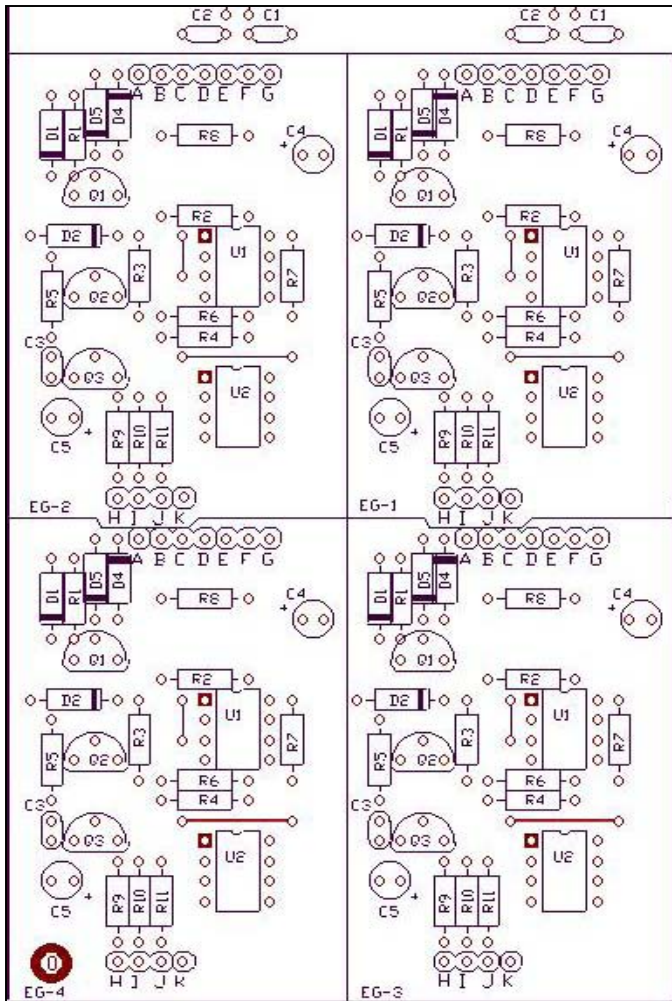
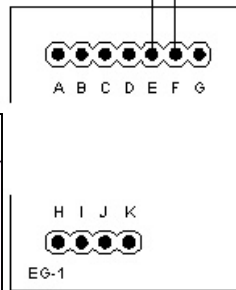
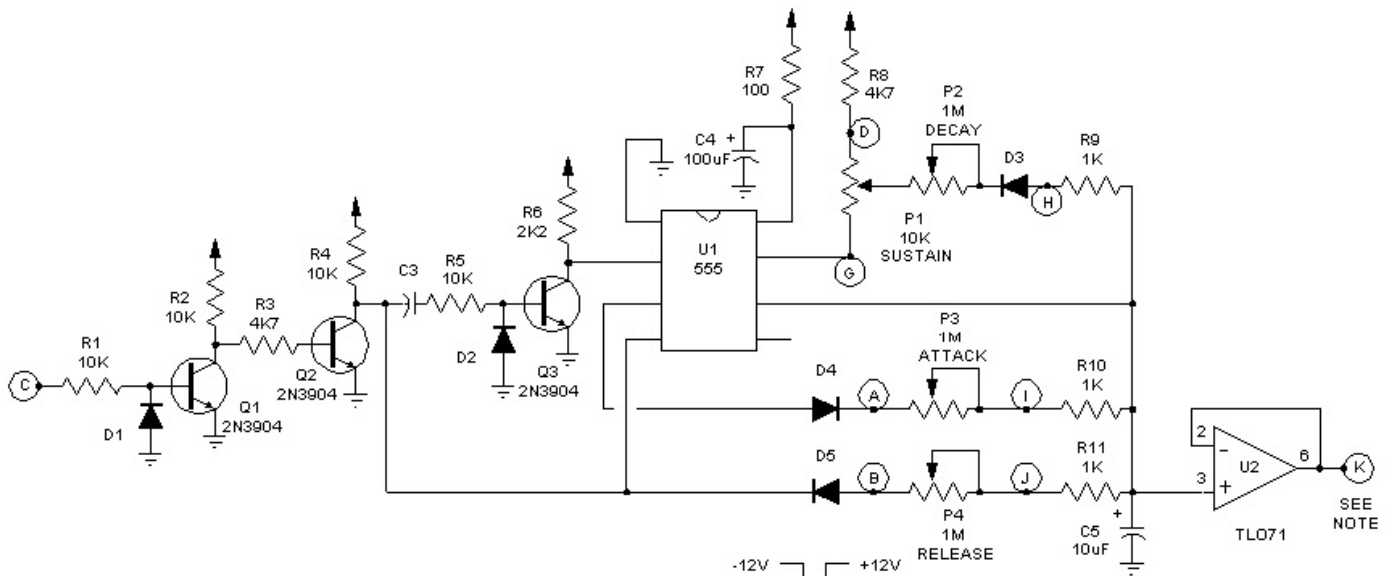
Start: (Gate On) When there is a gate on the base of Q1 the collector is low and Q2 turns off. R4 pulls the collector high and C3 quickly charges and discharges through R5 and D2 causing Q3 to send a low going pulse on the trigger input (pin-2) of the 555. R4 also pulls the 555s reset pin high and removes the discharge path for release diode D5.

Attack: When the 555 is triggered the output (pin-3) goes high and starts to charge C5 through the attack diode D4 and P3. P3 sets the charge rate.

Decay: When the 555s threshold (pin-6) is reached the 555s output goes low. R4 is still holding D5 high so C5 starts to discharge through R9, D3, P2 and P1 through the 555s discharge transistor. P2 sets the decay rate.

Sustain: C5 will continue to discharge until it reaches the voltage level set by the voltage divider formed by the 555s internal discharge transistor and P1. P1 sets the sustain level

Release: (Gate Off) When the gate is removed the collector of Q2 goes low. If this happens before the threshold is reached, the 555s reset (pin-4) is pulled low and the 555 is reset. C5 starts to discharge through R11, P4, D5 and Q2 to ground. P4 sets the discharge rate.



Parts

- C3 .01uF Ceramic Capacitor 1
- C4 100uF Electrolytic Capacitor 1
- C5 10uF Electrolytic Capacitor 1
- R1,R2,R4,R5 10K 1% Metal Film Resistor 4
- R3,R8 4.7K 1% Metal Film Resistor 2
- R6 2.2K 1% Metal Film Resistor 1
- R7 100 Ohm 1% Metal Film Resistor 1
- R9,R10,R11 1K 1% Metal Film Resistor 3
- P1 10K Potentiometer 1
- P2,P3,P4 1M Potentiometer 4
- D1-D5 1N4148 Diode 5
- Q1-Q3 2N3904 3
- U1 LM555 1
- U2 TLO71 1

Noise Generator

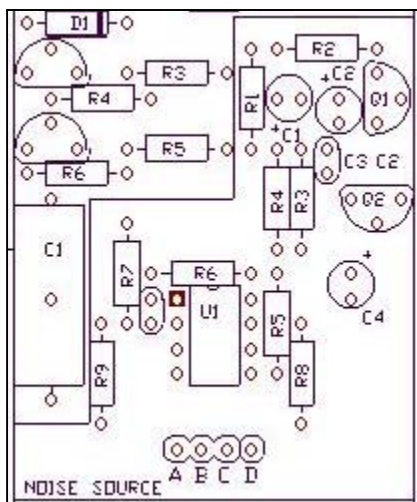
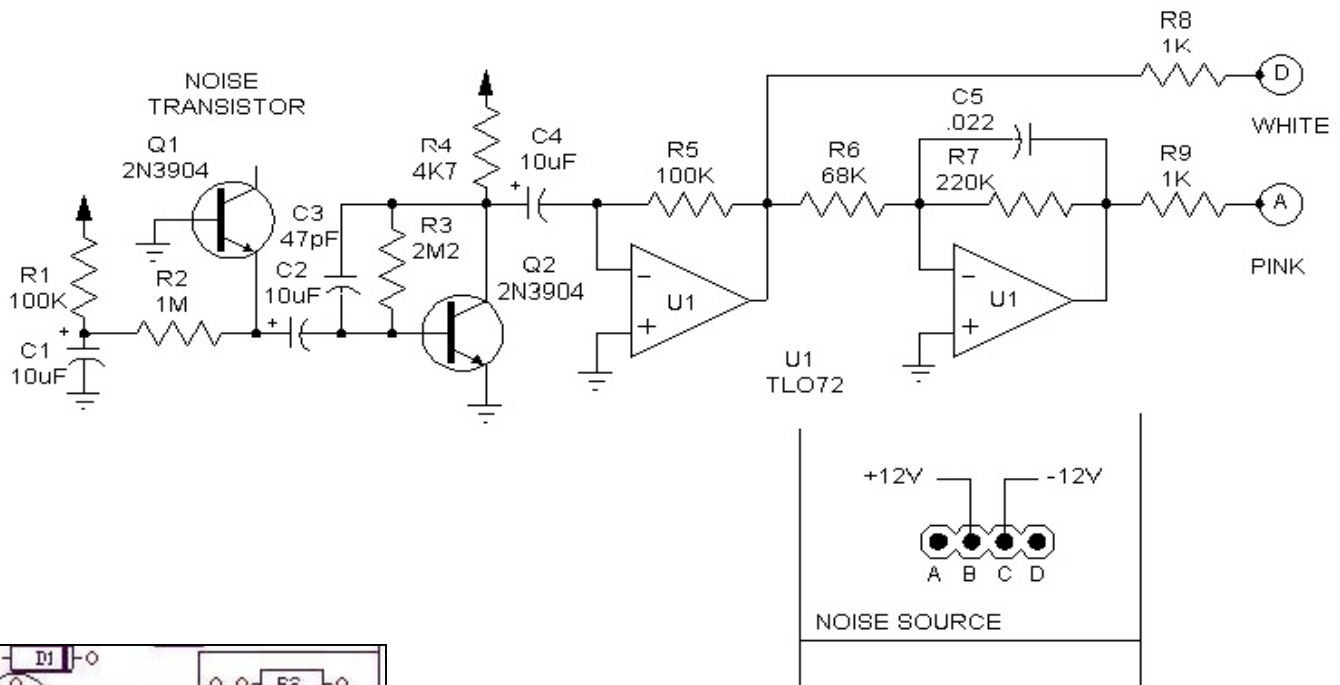
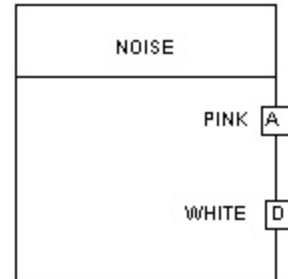
The Noise Source - Generates pink and white noise.

Outputs:

- Pink Noise
- White Noise

Description

Q1 is the noise transistor. It's output is amplified by Q2 and U1a to generate white noise. U1b is a low pass filter that smooths the white noise to output pink noise.



Parts

- C1,C2,C4 10uF Electrolytic Capacitor 3
- C3 47pF Ceramic Capacitor 1
- C5 .002uF Ceramic Capacitor 1
- R1,R5 100K 1% Metal Film Resistor 2
- R2 1M 1% Metal Film Resistor 1
- R3 2.2M 1% Metal Film Resistor 1
- R4 4.7K 1% Metal Film Resistor 1
- R6 68K 1% Metal Film Resistor 1
- R7 220K 1% Metal Film Resistor 1
- R8,R9 1K 1% Metal Film Resistor 2
- Q1,Q2 2N3904 2
- U1 TOL72 11

Sample And Hold

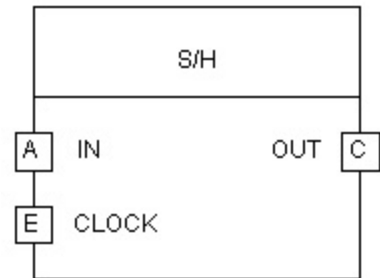
The Sample and Hold Module is used to generate random voltages. It will hold the input CV value for a short time.

Inputs:

- In - CV Input
- Clock - Pulse Input

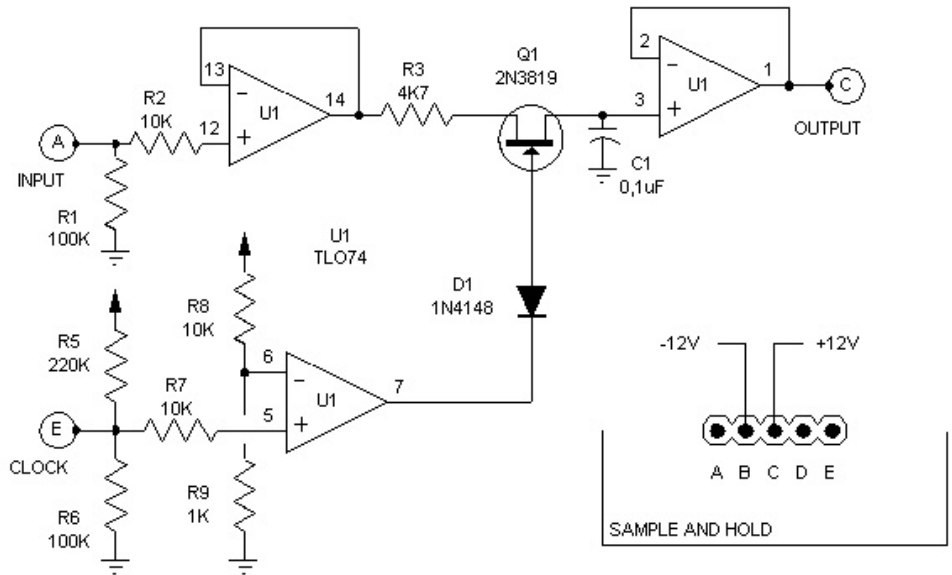
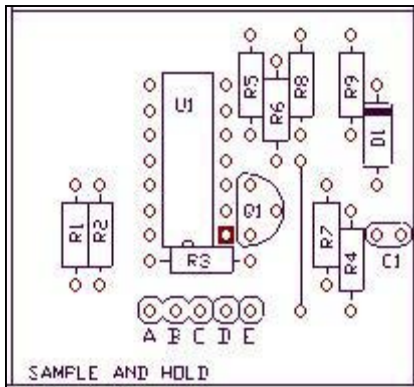
Output:

- Out - Output



Description

U1 (5, 6, 7) is a comparator set to turn on at about 1V. When U1 pin-5 is high it's output (pin-7) goes high and turns on Q1 through D1. If there is a signal on U1 pin-12 it is buffered by U1 (12, 13, 14) and stored by C1 until U1 pin-5 is low. The voltage is then held by C1 until the next time Q1 is turned on. The voltage stored in C1 is buffered by the U1 (1, 2, 3) opamp before the output.



Parts

- C1 0.1uF Ceramic Capacitor 1
- R1,R6 100K 1% Metal Film Resistor 2
- R3,R7,R8 10K 1% Metal Film Resistor 3
- R3 4.7K 1% Metal Film Resistor 1
- R5 220K 1% Metal Film Resistor 1
- R9 1K 1% Metal Film Resistor 1
- D1 1N4148 1
- Q1 2N3819 N-Fet 1
- U1 TLO74 1

Delay Modules 1 & 2

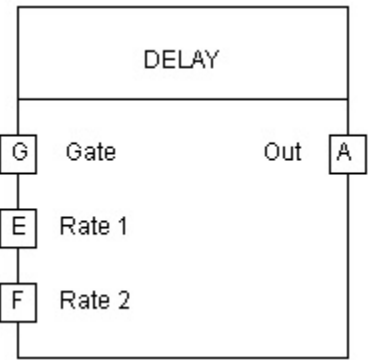
The Delay Modules output remains high and can be used as a lifting point until the input is triggered. The output then goes low and starts to slowly return to +V. The rise time is based on the rate parameter.

Inputs:

- Gate - Gate Control
- Rate 1 - Delay Parameter 1
- Rate 2 - Delay Parameter 2

Output:

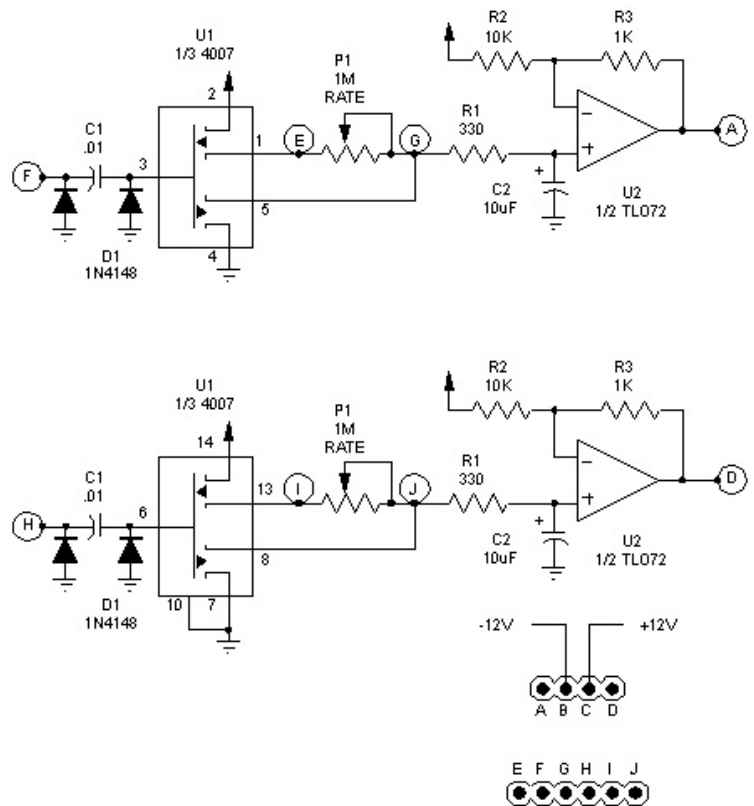
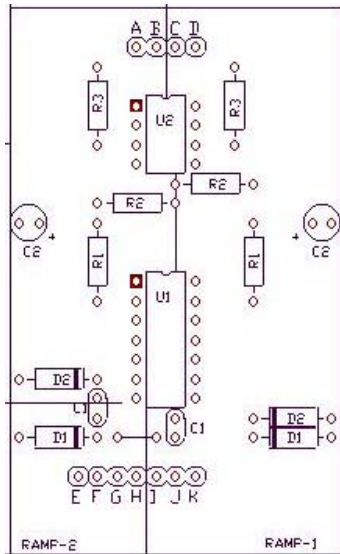
- Out - Output



Description

When the input on C1 is high C1 sends a high going pulse to the 4007

C2. The output pin then goes high and recharges C2 through P1. P1 set the charge rate.



Parts

- C1 .01uF Ceramic Capacitor 2
- C2 10uF Electrolytic Capacitor 2
- R1 330 Ohm 1% Metal Film Resistor 2
- R2 10K 1% Metal Film Resistor 2
- R3 1K 1% Metal Film Resistor 2
- D1,D2 1N4148 Diode 4
- U1 1/3 CD4007 1
- U2 1/2 TLO72 1
- P1 1M Potentiometer 2

Staircase Generator

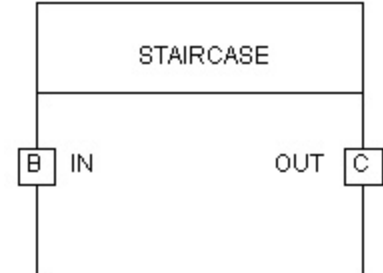
Converts a string of input pulses into a evenly spaced staircase.

Input:

- In - Clock In

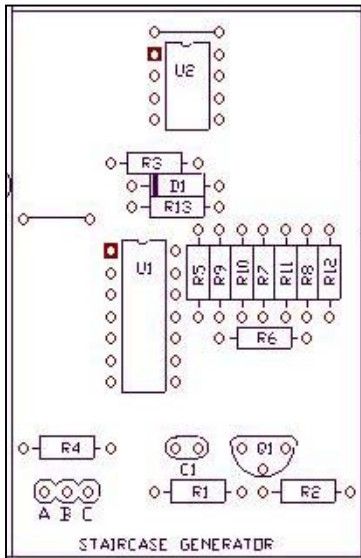
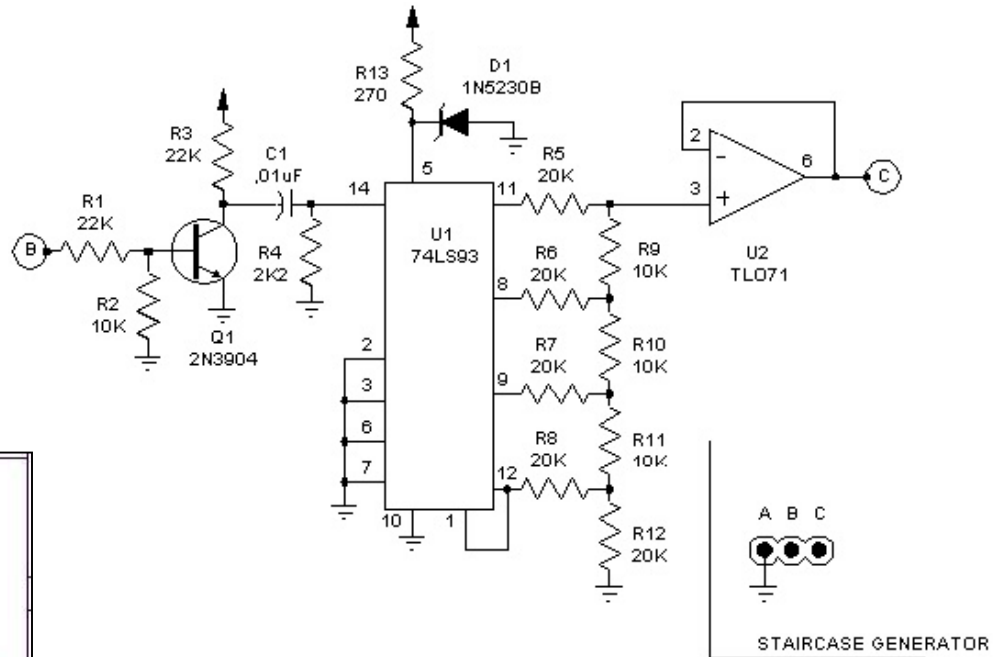
Output:

- Out - Staircase Output



Description

Q1 and R3 form an inverted buffer. C1 and R4 form a pulse converter making sure that any high going pulse on the base of Q1 is a very narrow low going pulse on the four bit binary counters (U1 pin-14) input. U1s outputs are connected to a 4-bit ADC formed by R5-R12



Parts

- C1 .01uF Polystyrene Capacitor 1
- R1,R3 22K 1% Metal Film Resistor 2
- R2,R9,R10,R11,R12 10K 1% Metal Film Resistor 6
- R4 2.2K1% Metal Film Resistor 1
- R5,R6,R7,R8,R12 20K 1% Metal Film Resistor 4
- Q1 2N3904 1
- U1 74LS93 1
- U2 TLO71 1

Ring Modulator

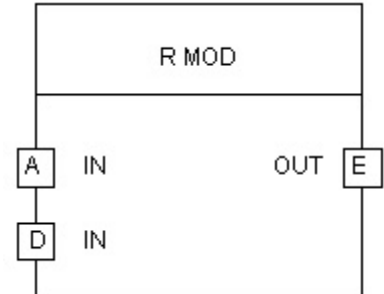
The Ring Modulator is a true balanced modulator. It will output the sum and difference frequencies of the two input signals.

Input:

- IN 1 - Input 1
- IN 2 - Input 2

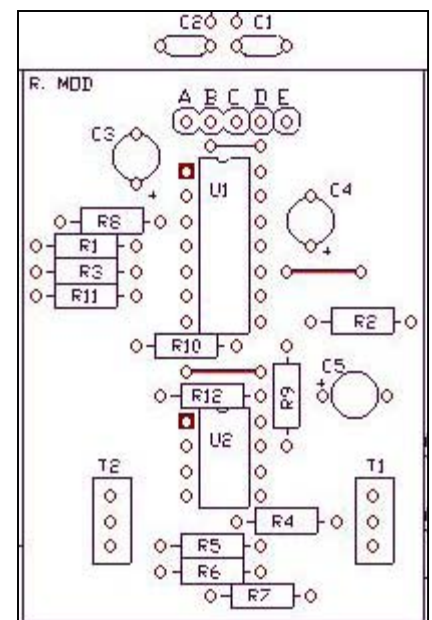
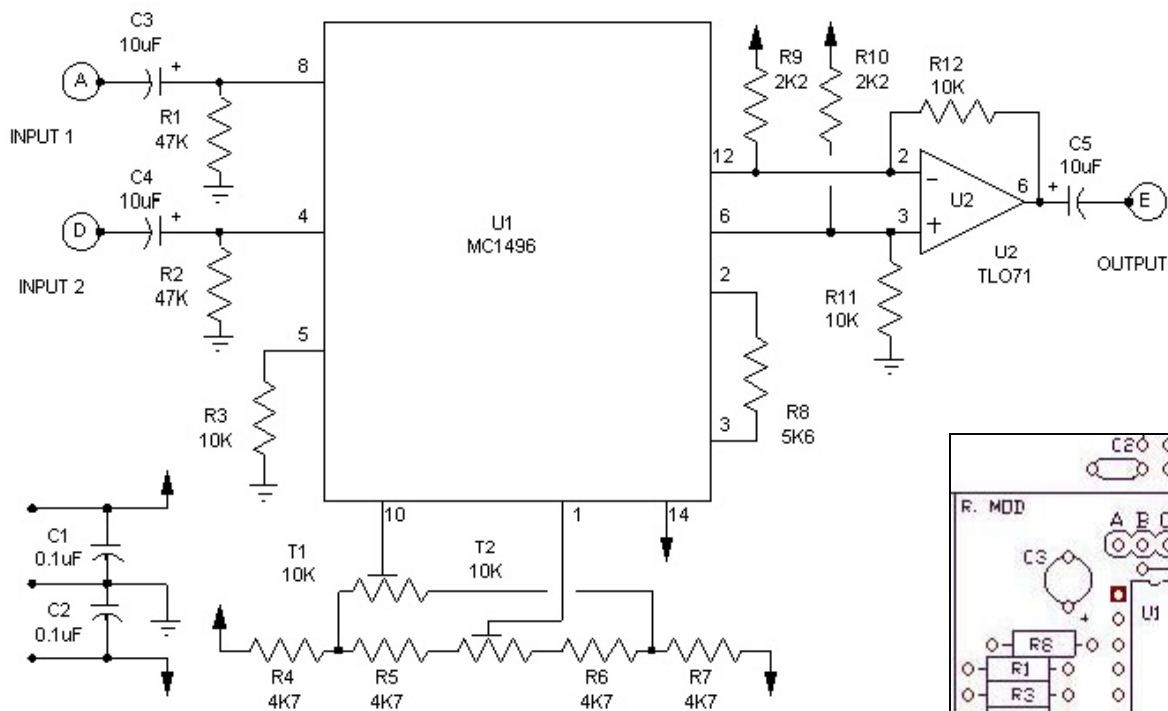
Output:

- Out - Output



Description

The ring modulator uses a special balanced modulator IC (U1) that accepts two ac signals and in conjunction with an output summing amplifier(U2), supplies an output that is the sum and difference frequencies of the two original signals.



Parts

- C1,C2 0.1uF Ceramic Capacitor 2
- C3,C4,C5 10uF Electrolytic Capacitor 4
- R1,R2 47K 1% Metal Film Resistor 2
- R3,R11,R12 10K 1% Metal Film Resistor 3
- R4,R5,R6,R7 4.7K 1% Metal Film Resistor 4
- R8 5.6K 1% Metal Film Resistor 1
- R9,R10 2.2K 1% Metal Film Resistor 2
- T1,T2 10K 10T Trimmer 2
- U1 MC1496 1
- U2 TLO72 1

LFO Modules 1 & 2

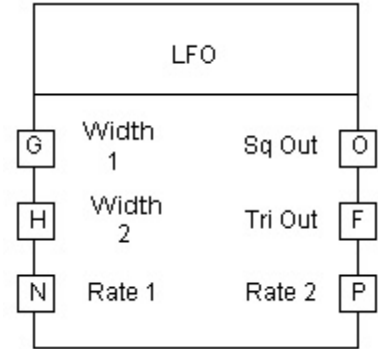
There are two Low Frequency Oscillators. Each with variable Pulse-Width.

Input:

- Width 1 - Width Parameter 1
- Width 2 - Width Parameter 2
- Rate 1 - Rate Parameter 1
- Rate 2 - Rate Parameter 2

Output:

- Sq Out - Variable Width Pulse Output
- Tri Out - Variable Width Triangle Output



Description

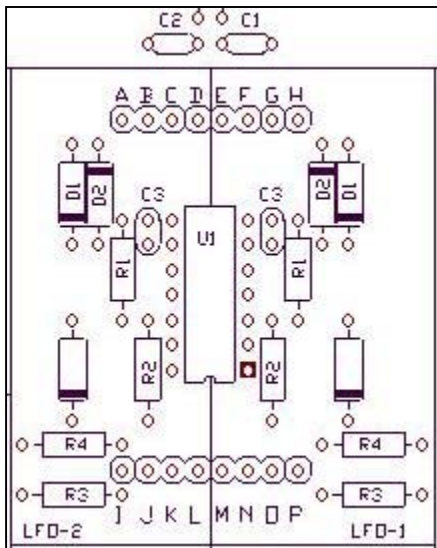
through R1. This positive voltage is amplified by U1b and coupled to it's input through feedback resistor R2. The feedback causes the output of U1b to go maximum positive almost instantaneously. This voltage is applied to the inverting input of U1a through a series of resistance and non-linear devices (diodes). U1a is an integrator charging C3 with a linear negative going ramp voltage. This output is applied to back to the non-inverting input

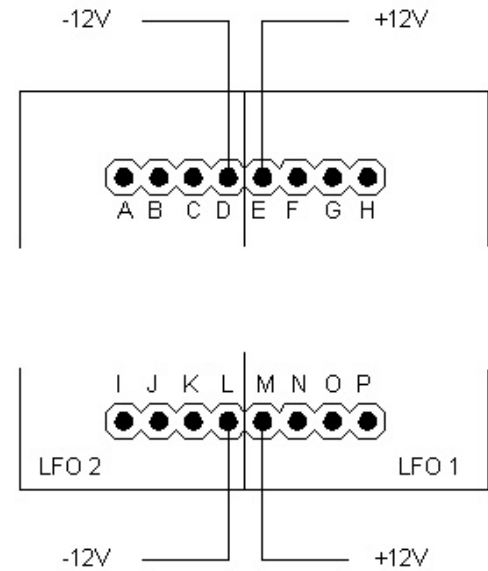
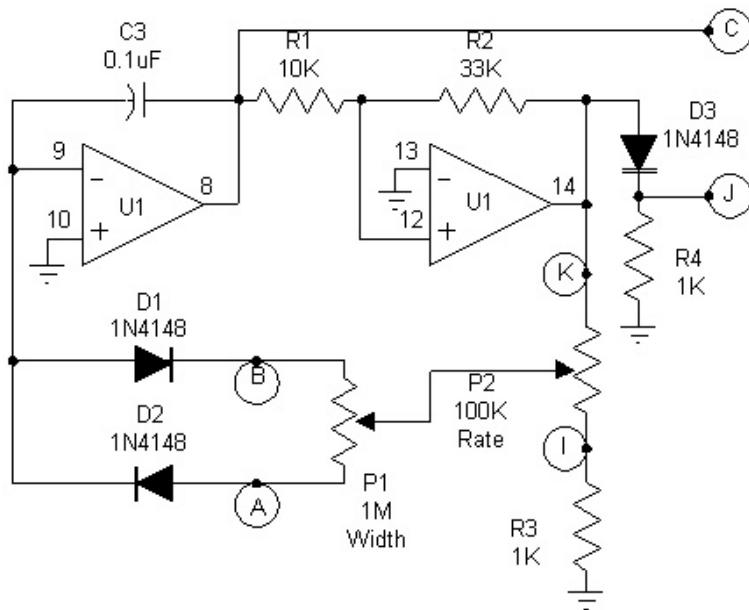
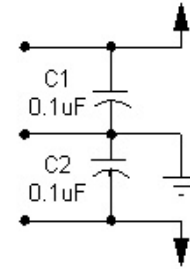
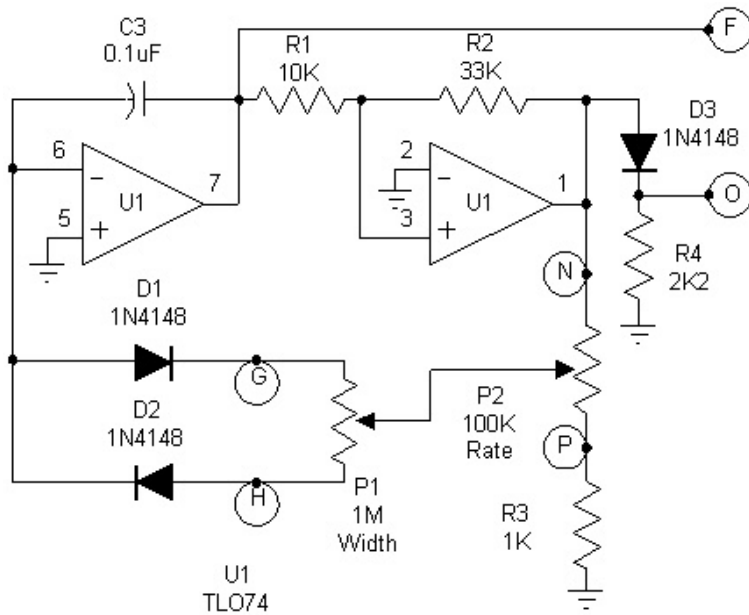
This negative voltage is amplified by U1b and coupled to it's input through

inverting input of U1a through a series or resistance and non-linear devices (diodes). U1a is an integrator charging C3 with a linear positive going ramp voltage. This output is applied to back to the non-inverting input of U1b through R1. When the positive going signal is high enough to overcome the

complete oscillation cycle is completed.

The output of U1b is normally square and the output of U1a is a triangle unless non-linear devices are placed in the signal path. As the more of the signal is passed through non-linear devices the output waveforms get more narrow. The result is that the outputs are variable from positive pulse to square to negative pulse on the U1b output and negative ramp to triangle to positive ramp on the U1a output. D3 and R4 pad the output to match the





Parts

Includes Parts For Both LFOs

- C1,C2,C3 0.1uF Ceramic Capacitor 4
- R1 10K 1% Metal Film Resistor 2
- R2 33K 1% Metal Film Resistor 2
- R3 1K 1% Metal Film Resistor 2
- R4 2.2K 1% Metal Film Resistor 2
- D1,D2,D3 1N4148 Diode 6
- U1 1/2 TLO74 Quad Opamp 1
- P1 1M Potentiometer 2
- P2 100K Potentiometer 2

