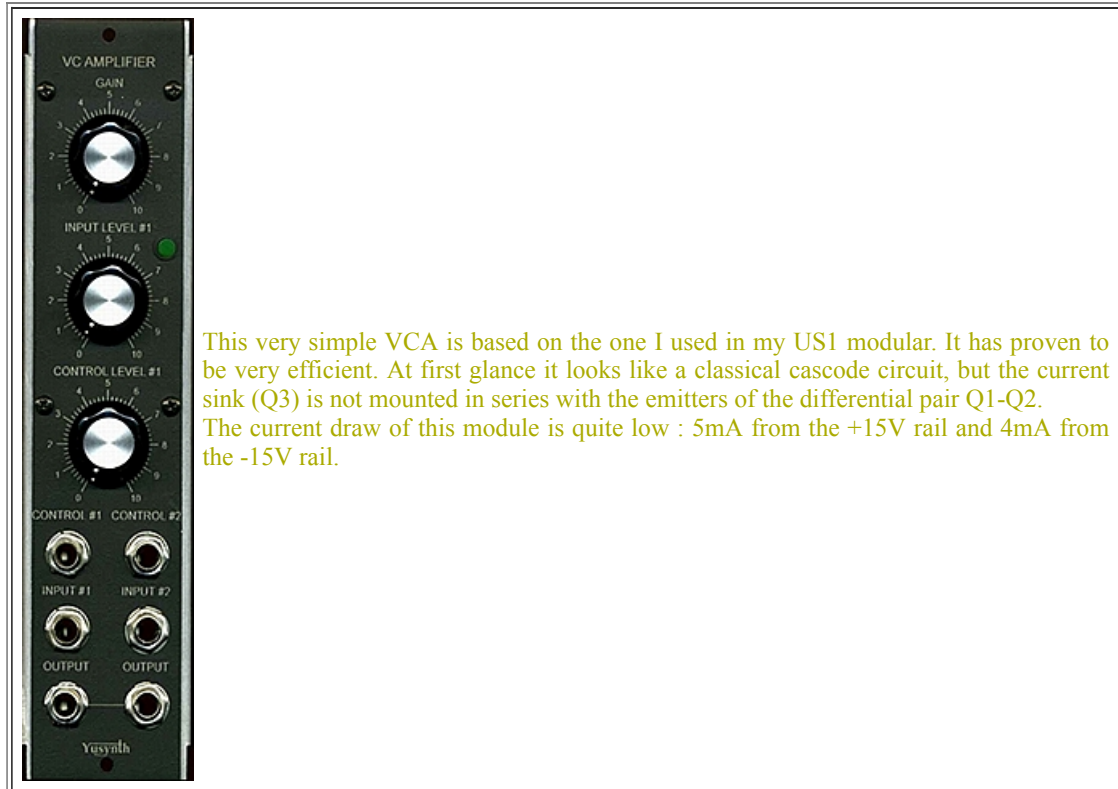
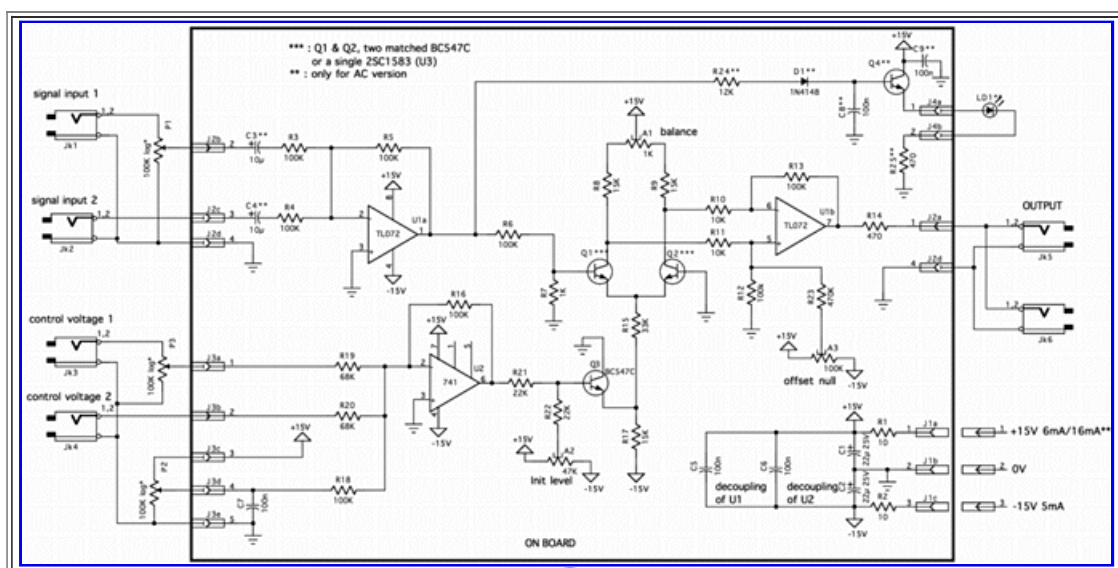


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Description



Schematics



The schematic is rather simple.

U1a (1/2 TL072) sums up and inverts the two inputs. Q1 and Q2 are connected as a differential stage, it is a good practice to have these two transistors matched or to use a dual transistor such as a 2SC1583.

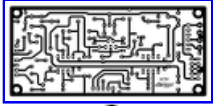
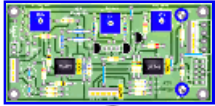
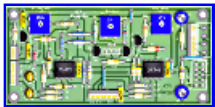
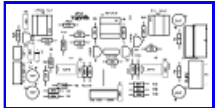


U1b (1/2 TL072) is used as a differential unit gain "amplifier". Voltage control of the circuit is based

around U2 and Q3. U2 inverts the positive voltage control, this may seem weird but is justified by the way Q3 is connected. The collector of Q3 is grounded and its emitter is connected to -15V through R19, therefore the base of Q3 must be driven by a negative bias. Q3 is current generator that forces the current through R17 which acts as a current sink for Q1 & Q2.

Two versions of this circuit can be built :

- an AC version, in such a case C3 & C4 are required, P1, P2 and P3 must be log pots;
- a DC version, C3 & C4 must be omitted (use straps), P1, P2 and P3 must be lin pots

Printed circuit boards and component layout

<p>PCB design</p> 	<p>Component layout</p> <p>DC-version</p>  <p>AC-version</p>  	<p>Download the schematic as a PDF file </p> <p>Download the PCB as a PDF file </p> <p>WARNING ! The document is formatted to be printed directly on a mylar for photo-etching or a "press & peel" paper. Make sure that when the printed face of mylar is in contact with the copper side of the PCB, the lettering can be read normally.</p>
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Components and building details

reference	value	quantity
U1	TL072	1
U2	LM741/TL071	1
U3*	2SC1583	1*
Q1*,Q2*,Q3,Q4**	BC547C	4*
D1**	1N4148	1**
R1,R2	10	2
R14,R25	470 5%	2
R7	1k 5%	1
R10,R11	10k 1%	2
R24	12k 1%	1
R8,R9	15k 1%	2
R17	15k 5%	1
R21,R22	22k 5%	2
R15	33k 5%	1
R19,R20	68k 5%	2
R12,R13	100k 1%	2
R3,R4,R5,R6,R19	100k 5%	5
R23	470k 5%	1
C5,C6,C7,C8,C9	100n	5

Setting and trimming

Trimming is quite easy if you use matched NPNs for Q1 and Q2, and 1% tolerance resistors for R6 to R11. You will need a dual trace scope, a DVM and a sinewave generator. Using 10 turn trimmers is a little bit more expensive than using 1 turn but makes it easier to adjust with high accuracy.

1. Set A1, A2 & A3 to mid-range.
2. Connect the sinewave generator (freq. 1KHz, 4.0Vpp) to input 1, P1 turned fully clockwise (maximum signal).
3. Connect the sinewave generator to the first input of your scope.
4. Turn P2 fully clockwise (maximum gain).
5. Connect the output to the second input of the scope.
6. Adjust the trimmer A1 in order to have a perfectly symmetrical sine wave at the output (the best way is to superimpose the trace of the sinewave at input and the one at the output). You may have also to play slightly with A2 as well to reduce gain if you have saturation on both the positive and negative crests of the output sinewave.
7. Next, turn P2 (GAIN) fully counter-clockwise (no CV). Adjust A2 in order to completely mute the output signal.

When used, A3 must be adjusted as follows : after completion of the previous settings, turn P1, P2 and P3 fully counter-clockwise (no signal, no CV) adjust A3 in order to have an output level (pin 7 -U1b) as close as possible to 0V. If necessary, repeat the settings from 2 to 7.


If you find that a unit gain for maximum control voltage is not enough for you may increase the values of R10 and R11 (e.g. setting R10 & R11 to 47K will double the output gain).

Linearity versus overdrive

With the component values that are used, the VCA is perfectly linear for input signals that do not exceed 10Vpp. Above this level the VCA gets progressively overdriven and starts distorting. I choose not to troubleshoot this since overdriving a VCA can add some byte to its sound ! On some signals (saw, square) there may be some high frequency resonance on very steep edges, this may be eliminated by soldering a small 7pF to 10pF ceramic capacitor in parallel with R11.

References

Actually I have no references for this circuit ! I lost it about 25 years ago...

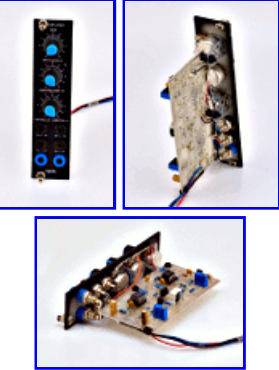
Here is an interesting page dedicated to Gilbert cells and balanced modulator schematics. It deserves being checked 

The DIY builders' gallery

Here are the photographs of the yusynth ARP modules built by other synth geeks around the world.

Thank you guys for sending me these nice photos.

			
<i>Name</i> : Patrick <i>Pseudo</i> : Baronrouge <i>Modular project</i> : JHC live lab <i>Location</i> Toulon, France <i>Web site</i> : http://myspace.com/patjhc	<i>Name</i> : <i>Pseudo</i> : Sebo <i>Modular project</i> : <i>Location</i> : Argentina <i>Website</i> : http://www.cosaquitosenglobo.com.ar	<i>Name</i> : Zarko <i>Modular project</i> : <i>Location</i> : Gardanne, France <i>Website</i> :	

		
<p>Name : Peter Hostermann Modular project : Location : Germany Website : http://www.peter-hostermann.de</p>		

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