Expat Audio VU Driver Board

For gain reduction metering on VCA-based compressors

Introduction

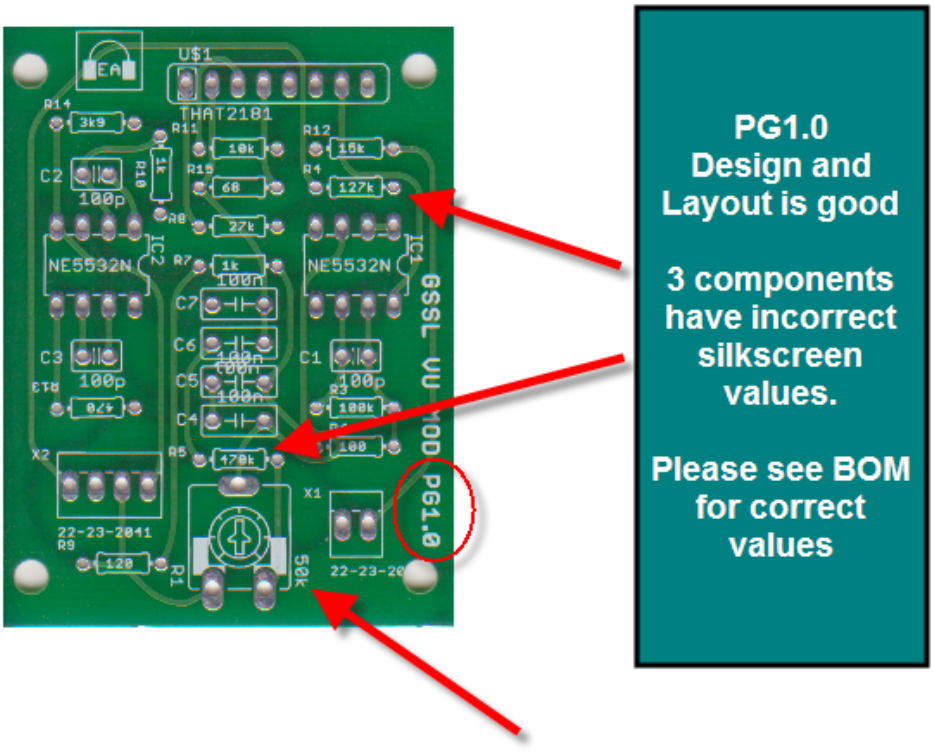
The Expat audio VU-Meter driver board is a simple way to integrate a VU-based gain reduction indicator accurately and flexibly into most VCA-based compressors.
It allows gain reduction to be shown on a Vu Meter that might be used for monitoring the input or output signal. This allows the use of only one meter to be used in the product, that'll monitor inputs, output and gain reduction.

The board works with the GSSL compressor, using the listed components, and from the existing power supply.

In addition, it can easily be adapted to work with other compressors, with only one resistor change expected, to match potentially different db/volt VCA applications. No modification is required to the design or bill of materials of the Expat Audio VU Driver board for use with the GSSL.

Revision Control & Edits

Expat Audio PCB's are typically designed using a X.Y versioning system Please look on your PCB to see the version number. The silkscreen will either read "version X.Y" or PG X.Y



Assembling the board

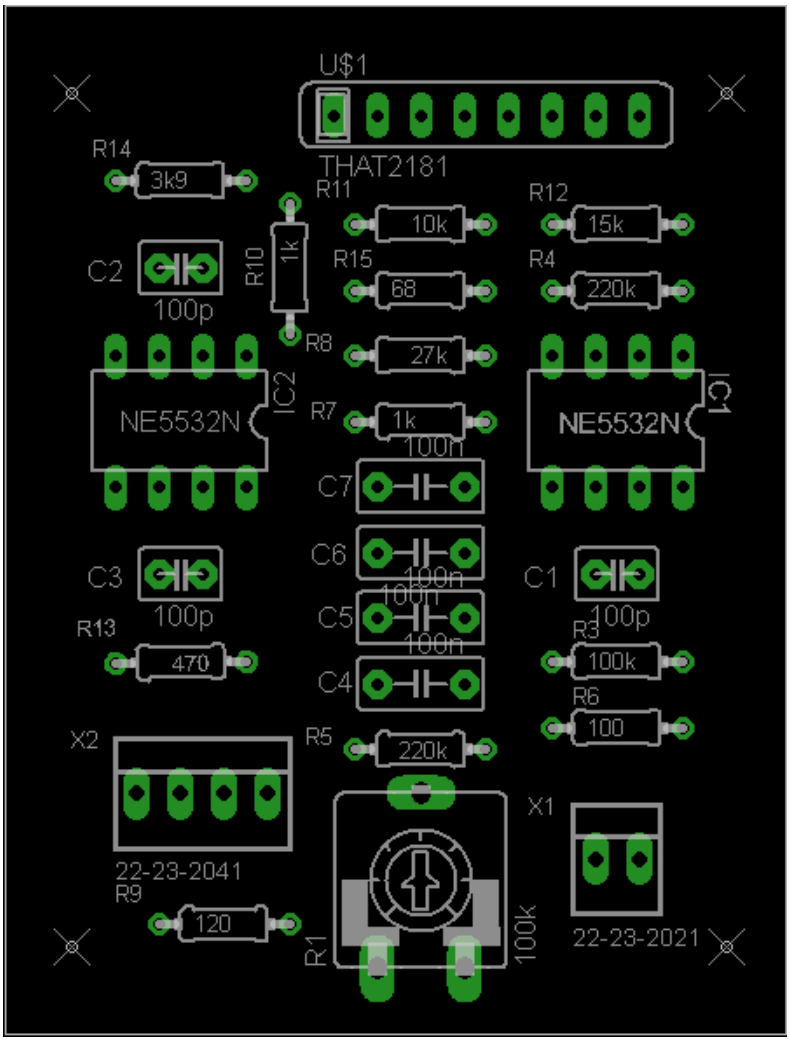
Assemble the board by soldering the components according to the board layout shown here.

Bear in mind that R2 is not mounted on the board, but instead is connected off-board, in series with the VU meter.

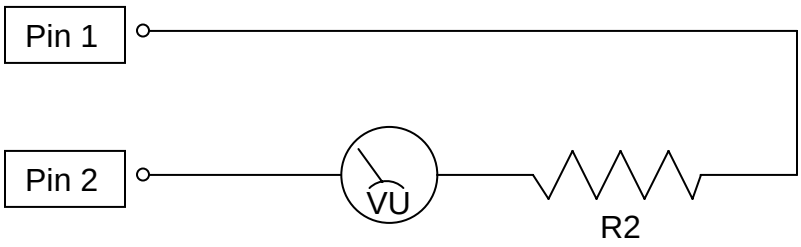
The semiconductors may be socketed if preferred, as can the VCA; however this is not essential.

In addition, the headers to make the off-board connections may also be direct-soldered… for the confident builder.

Once the board has been assembled and visually checked to make sure that the joints look good, and that there are no accidental solder bridges etc, it's time to start making the connections.



There are two connectors, X1 and X2. X1 is very simple to connect; it only has two pins, connect one pin to one end of the VU meter/R2 combination, and the other pin to the other end, as shown:



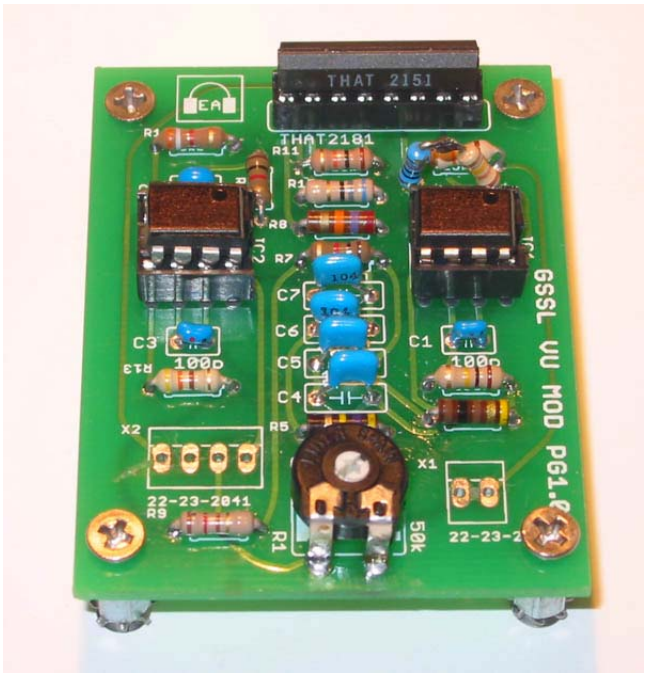
Bear in mind that a true VU meter pays no attention to polarity, so it can be connected either way around with no difference. Also, it doesn't matter whether the resistor goes before or after the VU meter. –Basically, so long as they're connected together in series as shown, everything should work correctly.

The other connector (X2) has four connection pins;

Pin	Function
1	Input
2	+15V (positive)
3	0Volts
4	-15V (negative)

Pin 4 (negative 15V DC) is the pin closest to the trim pot (R1), and pin 1 (the input) is closest to the boards edge.

Connect four wires to these four pins, and mark them according to the above table. **CHECK AND DOUBLE-CHECK** to make sure that you have them the right way around; this is the ONLY thing that can mess you up, so take the time now!



Here is a picture of the assembled board. Among other things, it shows how the four 100nF capacitors are all grouped together, while the three 100pF capacitors are nearer to the two 5532 IC's. The VCA in this instance is a 2150 series (though it could also be a 2180 series).

Connecting to the GSSL main board

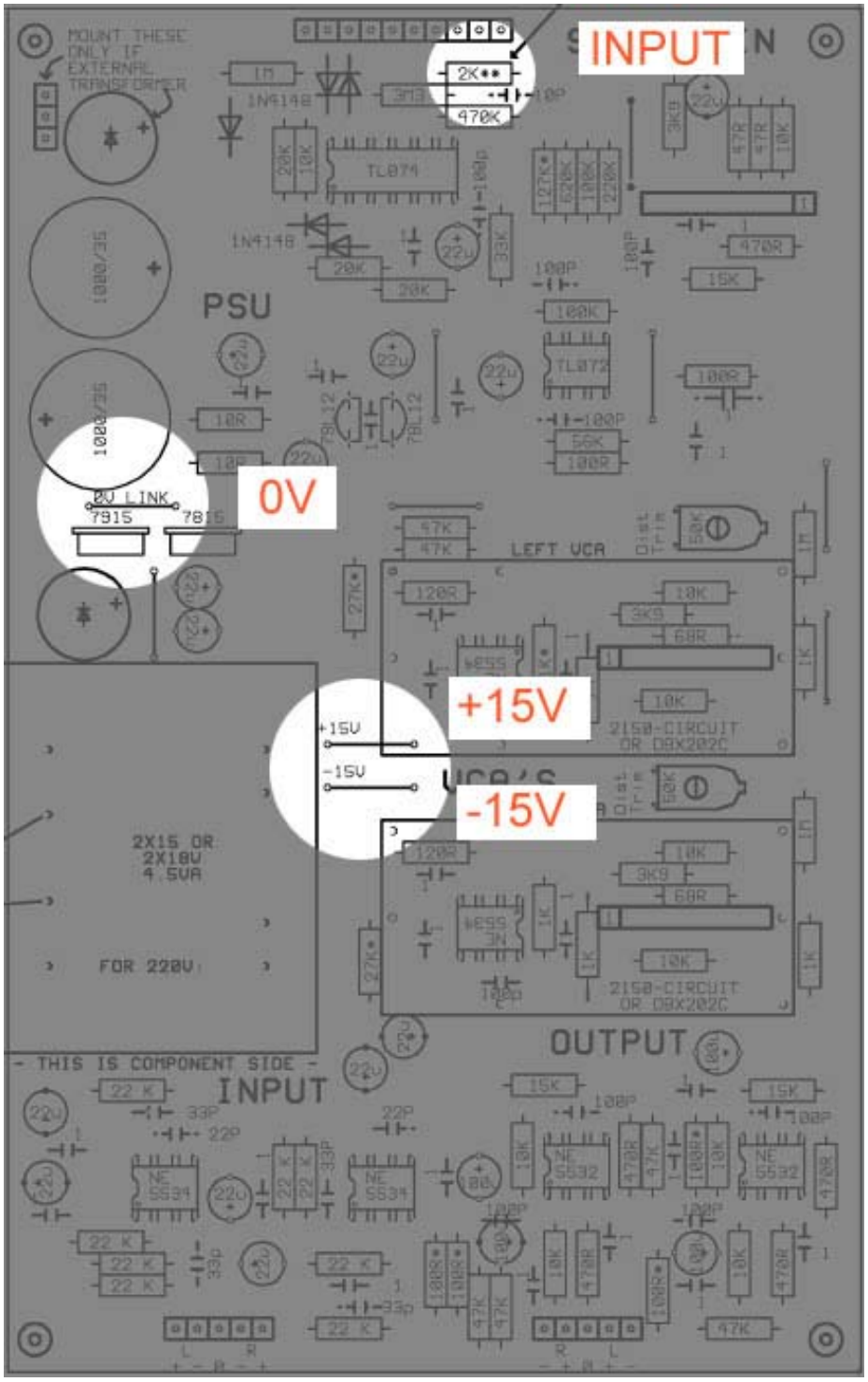
The four wires which connect to connector X2 should be labeled +15V, 0V, -15V and input.

On the surface of the GSSL board, you should have two links labeled +15V and -15V near the VCAs; these are highlighted on the image to the right.

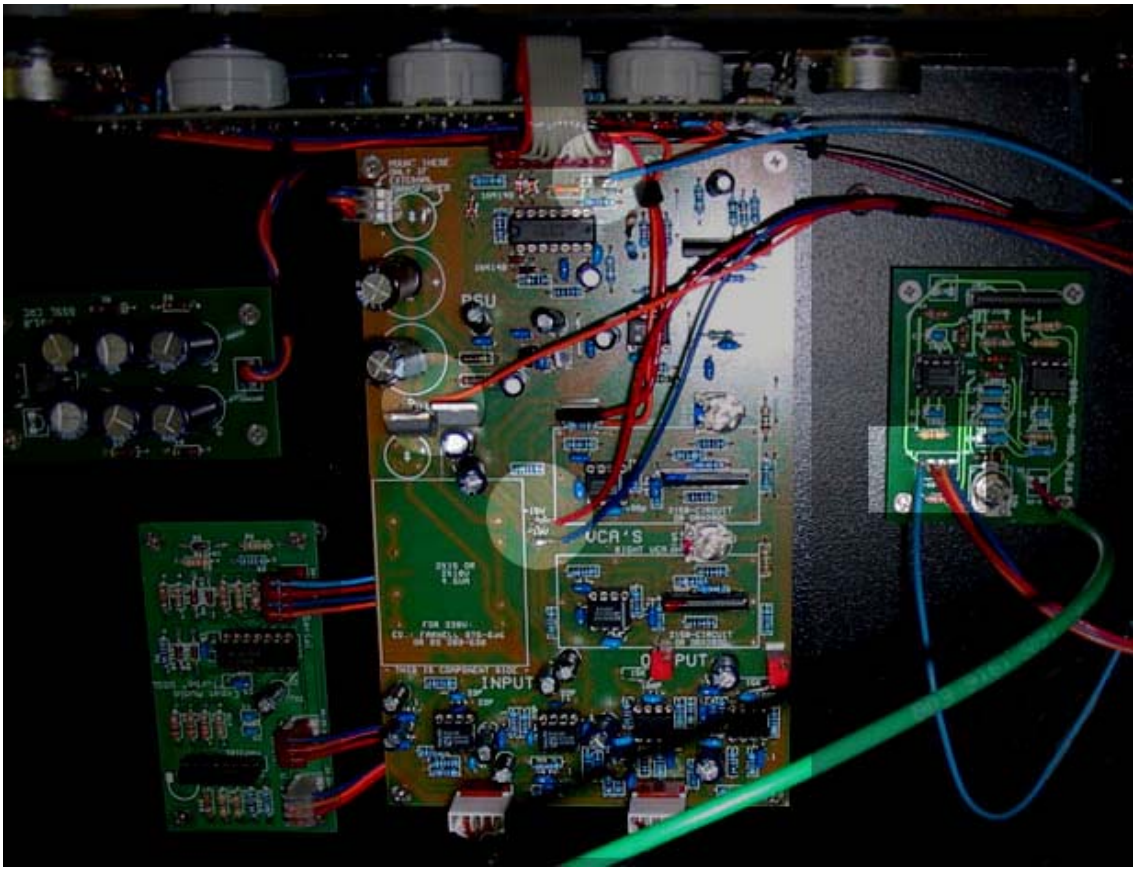
Solder the +15V and -15V wires to the appropriate links, making sure that there are no stray wire strands and that the connection is secure.

Then solder the 0V wire to the 0V link which is just behind the voltage regulators, with the same care.

Finally the 'input' connection must be soldered to the 'double-asterisk' resistor near to the 10-way edge connector.



If you're adding the VU meter driver to an existing GSSL and retaining the existing metering in addition, be sure to solder to the RIGHT end of the resistor as shown; -the end which has an arrow pointing to it in the accompanying illustration. –If you're building your GSSL from scratch, or if the VU meter is to be the only metering for the GSSL, this resistor may be omitted, and replaced with a wire link, which means that you may carefully solder to the link just as you did with the other three wires (see photograph).



Before powering on for the first time, it would be wise to check that the power rail wire polarity is correct; so just to be extra-sure, measure the resistance between pin 4 of one of the 5532's on the main board, and pin 4 of one of the 5532's on the VU driver board… there should be essentially no resistance (in other words a direct connection) and likewise between pin 8 of the 5532s on the VU board should be directly connected to pin 8 pf the main board 5532s. Double check that neither DC voltage rail is short-circuited to 0V or the input wire, and triple-check the orientation of the VCA (pin 1 should be closest to R14/R10) and it's time to power-on.

At power-on, the needle of the VU meter should rise above its rest position. The trim-pot should allow you to adjust the needle to point to 0VU, and should have just enough range of motion to allow the needle to go off-scale if adjusted far enough. –If you're trying to use the board on a unit with voltages significantly less than ±15V, the needle range may be reduced, and the value of R5 may be reduced to increase the trim-pot's range of adjustment if necessary.

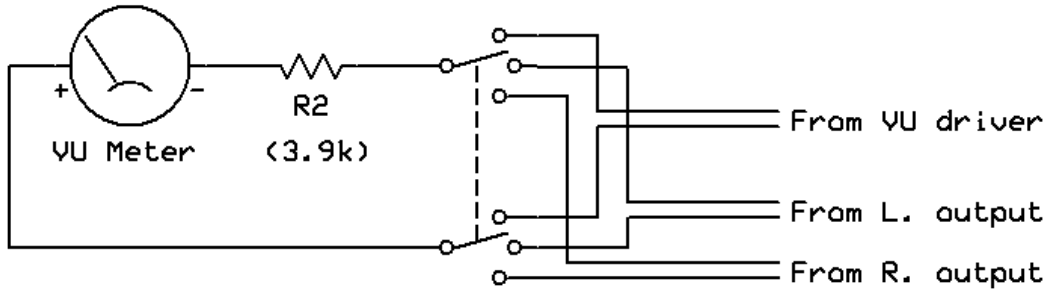
Once you've adjusted the needle to point to Zero VU with no gain reduction taking place, you should be able to check the VU meter's tracking of the actual gain reduction taking place, by sending a steady tone through the compressor, and adjusting the THRESHOLD control so that some gain reduction takes place. –For a GSSL, the meter should track perfectly. For any other application, you may find that the gain reduction tracking may require some adjustment to match that compressor's dB/Volt characteristic. This is achieved by adjusting the value of R4, until the VU meter's observed gain reduction display matches the change in signal level. Once it matches for a particular reduction amount (-3dB for example) it should match perfectly across the entire needle sweep.

A note on the value of R2 (nominally 3900Ω): -This is a typical value (normally quoted as being between 3600Ω and 3900Ω, or 3.6kΩ-3.9kΩ) and should work perfectly well for most true VU meter applications. –If however your selected meter states a different series resistance, then use that value in place of 3900Ω (3.9kΩ).

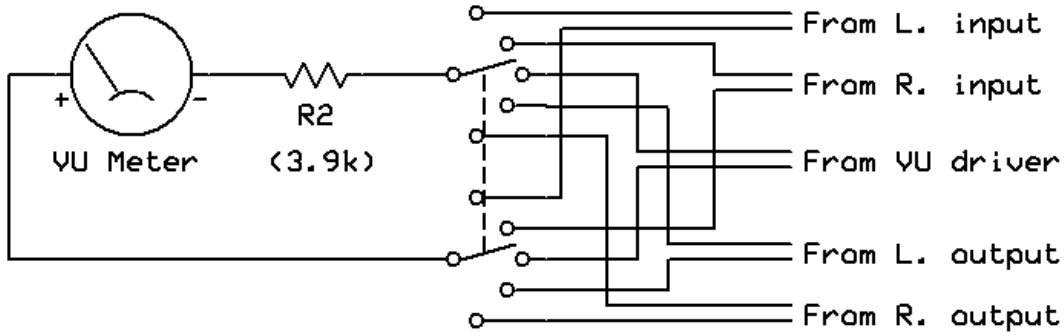
Using the same meter for GR, Input and Output monitoring

Finally, since you now have a VU meter as the gain reduction indicator, you may also want to make further use of the meter to check output (and/or input) levels. Following are a few examples of wiring a rotary switch to switch the meter function between gain reduction (G.R.) and signal level.

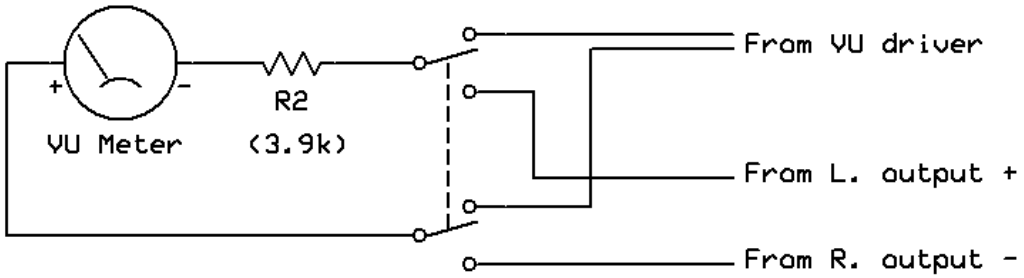
Using a 2-pole 3-way switch, the meter can be switched between GR, output-left and output-right like so:



Using a 2-pole 5-way switch, the meter can be switched between input-left, input-right, GR, output-left and output-right like so:



And, -because the GSSL uses differentially-balanced outputs Using a 2-pole 2-way switch, the meter can also cunningly be switched between GR and a sum of both outputs like so:



Bill of Materials

Resistors		Capacitors	
R1	100kΩ horiz. Trim pot.	C1	100p
R2	3900Ω (mounted off-board)	C2	100p
R3	100k	C3	100p
R4	220K	C4	100n
R5	220K (for GSSL)	C5	100n
R6	100Ω	C6	100n
R7	1kΩ	C7	100n
R8	27k		
R9	120Ω	Semiconductors	
R10	1k	IC1	NE5532
R11	10k	IC2	NE5532
R12	15k	U$1	THAT 21xx VCA
R13	470Ω		
R14	3k9	Misc.	
R15	68Ω*	X1	2-pin component header
*May be omitted if a pre-trimmed VCA is used		X2	4-pin component header

All resistors may be ¼-Watt, carbon film, metal film or similar. The capacitors should be non-polarized, 25V or higher rating, ceramic or any film composition is acceptable. The 5532s can be any suffix (5532N, 5532AN etc) through-hole (as opposed to surface-mount) and the VCA may be from the THAT 2150, 2151, 2180 or 2181 series. If using a pre-trimmed VCA, then R15 may be omitted, but this is not essential, and the board will work well even with the resistor fitted.