CLX-VU

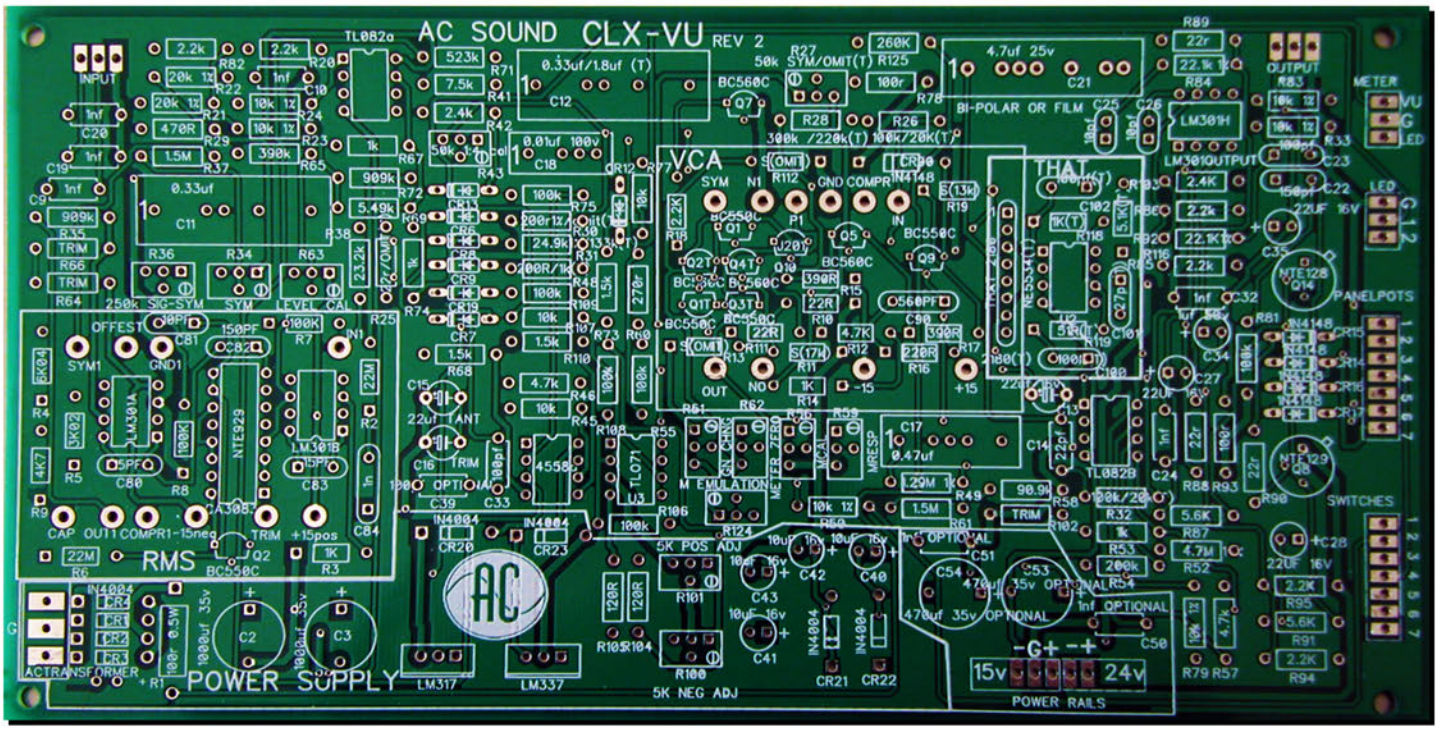
VCA COMPRESSOR

PROJECT MANUAL

CONTENTS

SECTION 1 INTRODUCTION

CLX-VU PCB REV. 2



Congradulations on your purchase of the **AC Sound CLX-VU** Compressor/Limiter! This compressor is based on a classic design from the '70s. Its sonic signiture can be heard on countless records. An engineer favorite for Kick & Snare, and Bass.

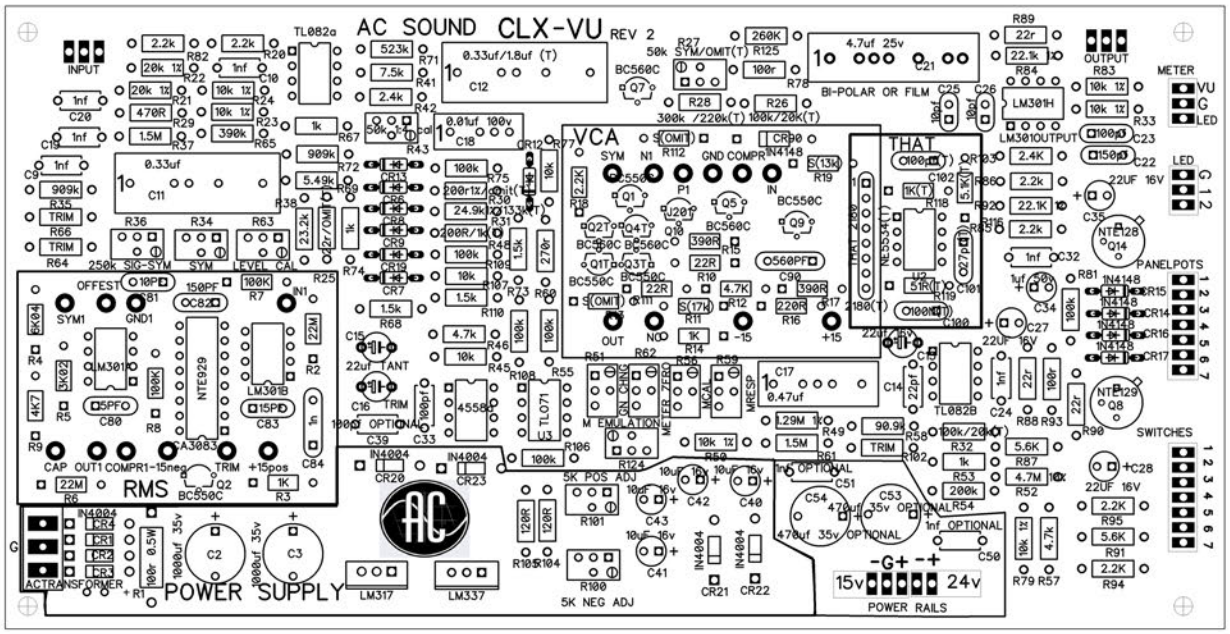
Please use this build manual as a refrence and if you have any questions feel free to email us at:
info@acsoundstudio.com

Disclaimer: Electricity kills! Please use every precaution when working on this project. We can not be responsible for any accidents that may accure while working on this project.

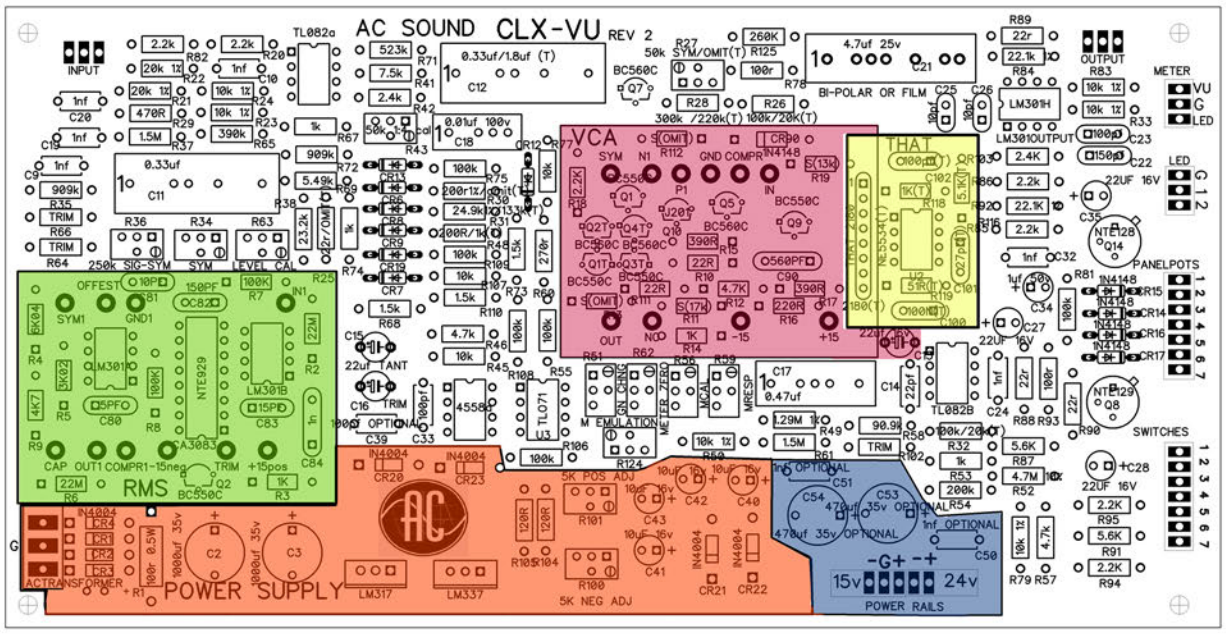
SECTION 1

SPECIFICATIONS

THE CLX-VU REVISION 2 CIRCUIT BOARD



CLX-VU PCB SECTIONS



OPTIONAL POWER

POWER SUPPLY

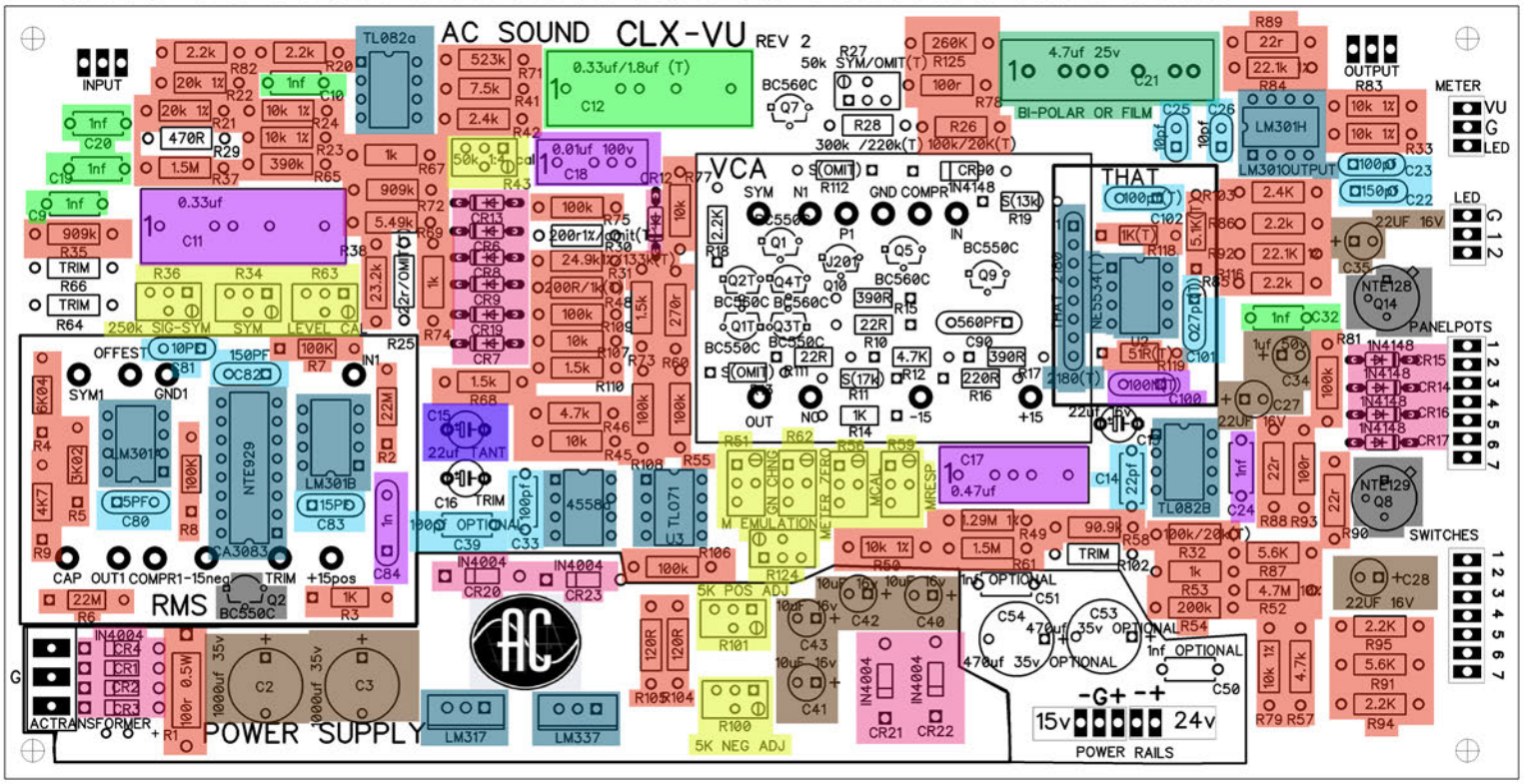
RMS UNIT

DISCRETE 200 VCA

THAT 2180 VCA

PCB COLOR DISIGNATION

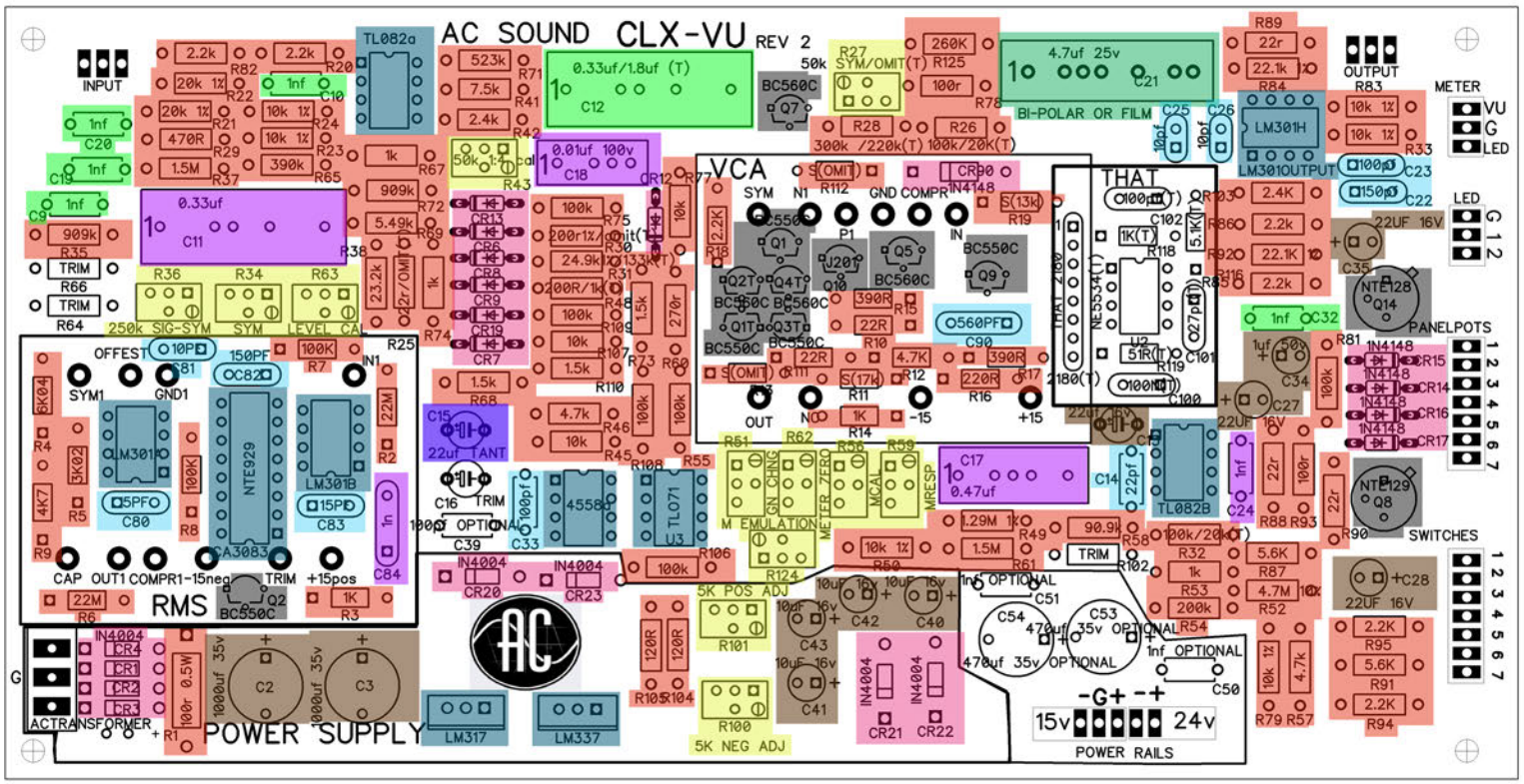
CLX-VU PART DESIGNATIONS FOR THAT 2180 BUILD



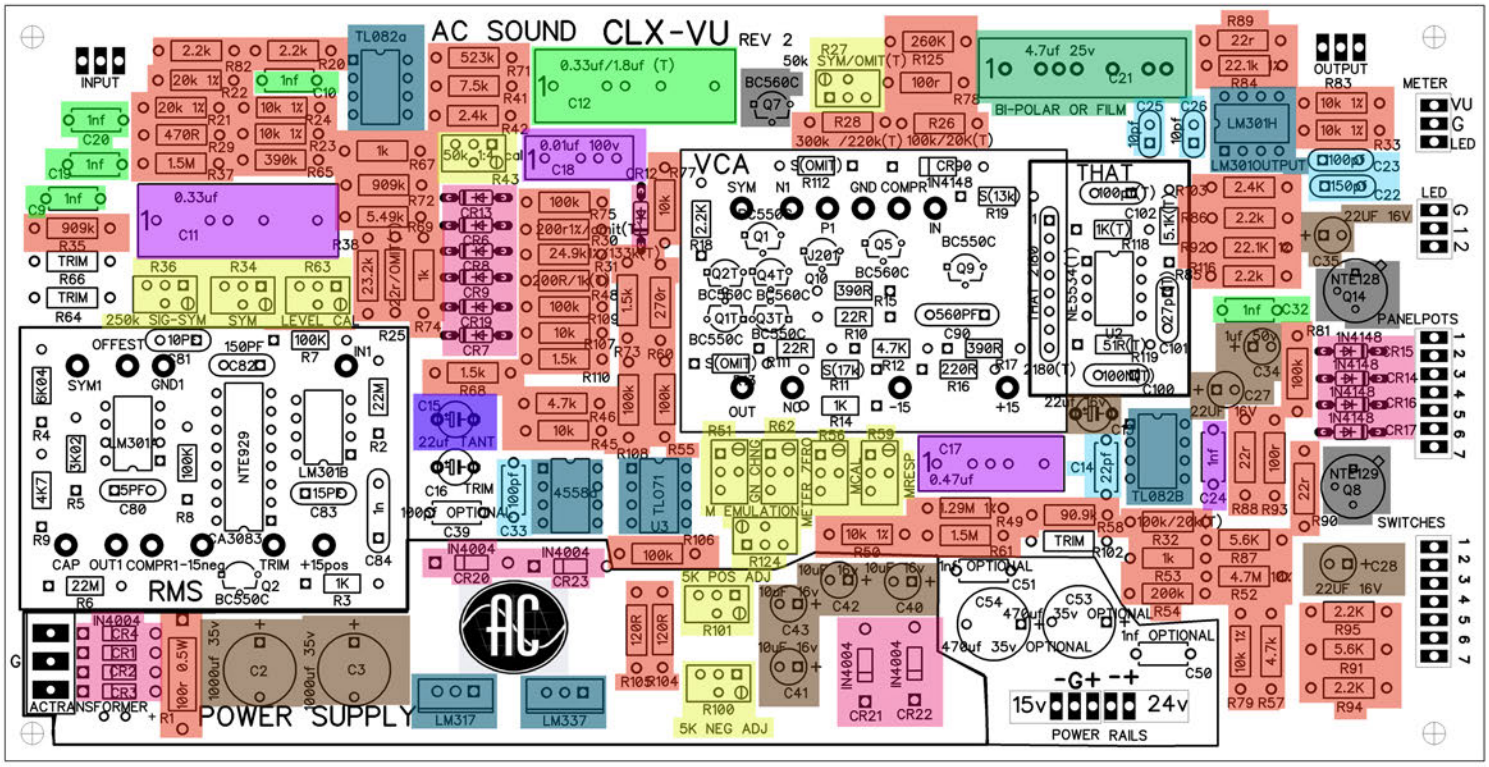
RESISTORS
TRIMMERS
INTEGRATED CHIPS
FILM/BI-POLAR CAPACITOR
DIODES
POLYPROPELENE CAPACITORS
ELECTROLYTIC CAPACITORS
TANTALUM CAPACITOR
POLYESTER CAPACITOR
CERAMIC COG/NPO CAPS
TRANSISTORS

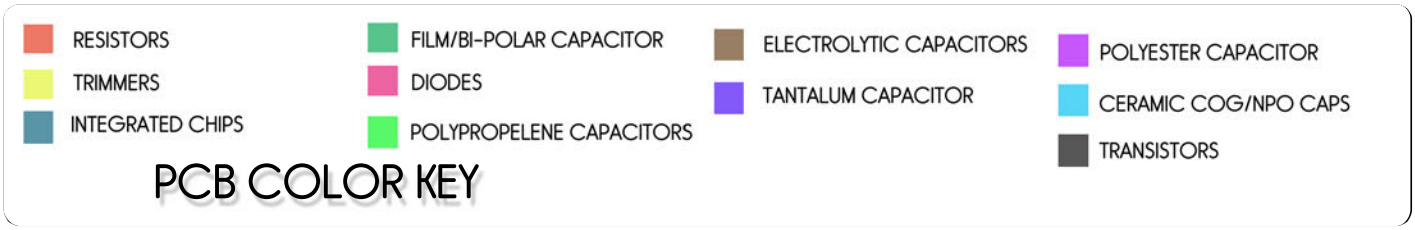
PCB COLOR KEY

CLX-VU PART DESIGNATIONS FOR 200 SERIES VCA BUILD



CLX-VU PART DESIGNATION FOR MAIN BOARD





These pictures show you the variation in parts you will need to the various builds.

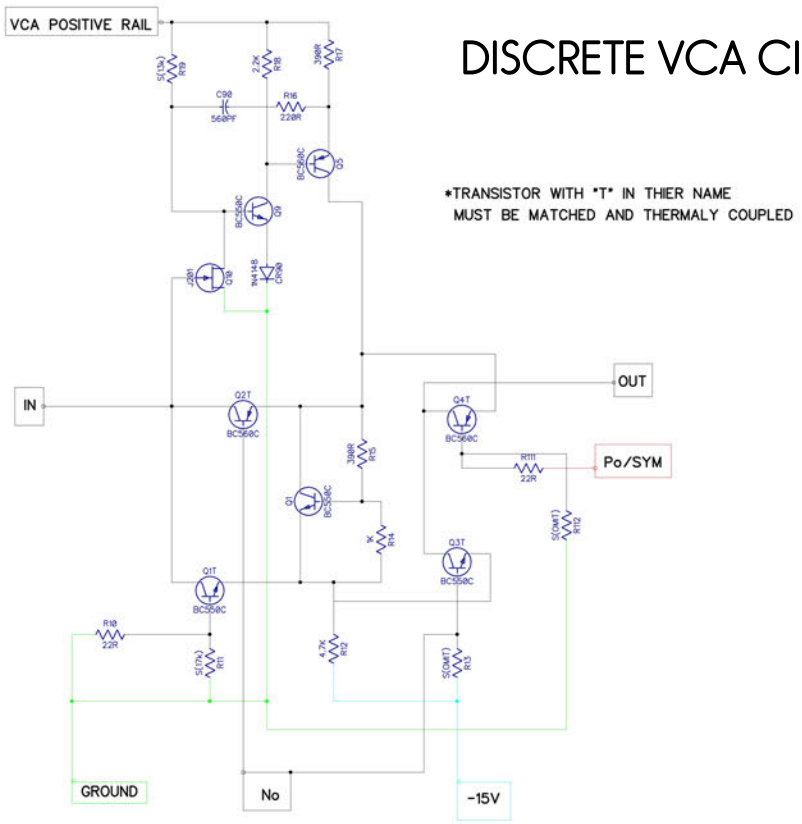
This build manual focuses on the THAT 2180 chip build.

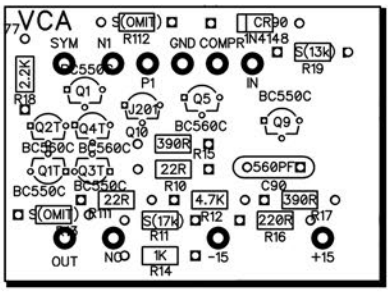
SECTION 1

SCHEMATICS

SCHEMATICS

DISCRETE VCA CIRCUIT



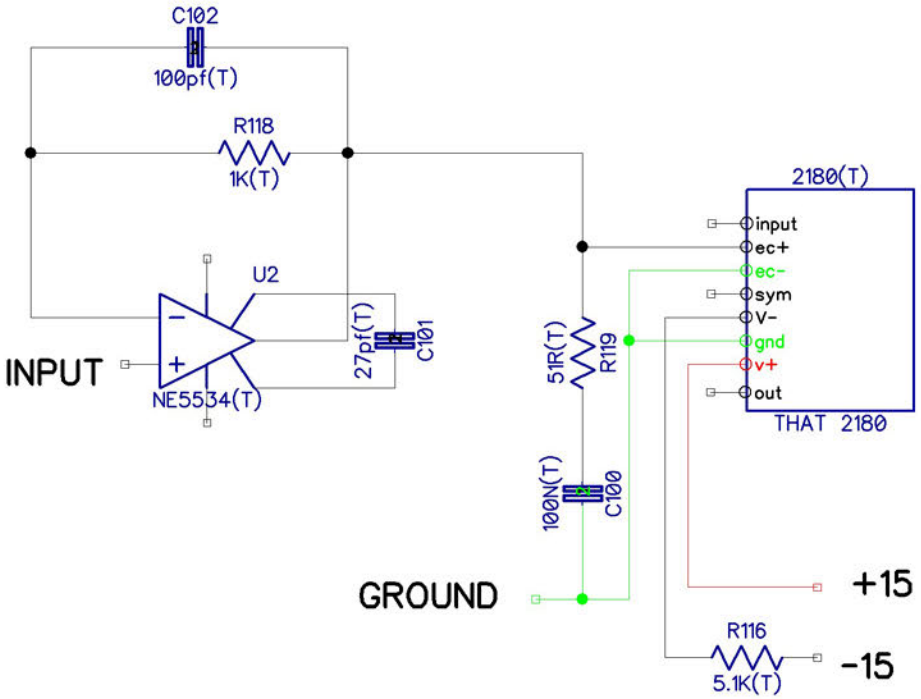


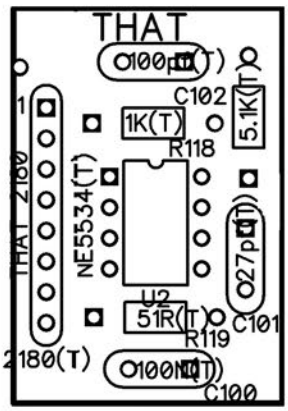
THE DISCRETE VCA IN THE CLX-VU CONSISTS OF 8 TRANSISTORS. THEY MUST BE MATCHED AND THEN THERMALY COUPLED SO THEY TRACK TOGETHER AS TEMPERATURE FLUXUATES. THE EXTERNAL TRANSISTOR BC560C MUST BE SELECTED ATER THE 200 SERIES VCA IS INSTALLED/BUILT. HOW TO EXACTLY SELECT THESE TRANSISTORS AND OPTIMIZE THE DISCRETE VCA IS OUT OF THE SCOPE OF THIS MANUAL.

BOM

THAT 2180 VCA CIRCUIT

SCHEMATICS





THE 2180 THAT CHIP IS A HIGH PERFORMANCE MONOLITHIC VCA CHIP. ITS SPECIFICATIONS OUTPREFORM EVERY SPECIFICATION OF ITS ANCESTOR THE DISCRETE 200 SERIES VCA. THIS CHIPS REQUIRES A LOW IMPEDENCE BUFFERED OPAMP TO WORK CORRECTLY, AS SHOWN IN THE SCHEMATIC. THE CHIPS INPUTS AND OUTPUTS ARE CONNECTED JUST LIKE THE ORIGINAL VCA BUT IS DESIGNED TO WORK AT A LOWER IMPENDENCE SO THE RESISTORS AROUND THE CHIP ARE SCALED FROM THE ORIGINAL 133K TO 20K. THE LOWER IMPEDENCE CHANGES THE LOW BASS EXTENTION ROLL OFF ON CAPACITOR C12, AND MUST BE COMPINSATED BY INCREASING C12'S VALUE FROM 0.33uF TO 1.8uF.

BOM

AC SOUND CLX-VU THAT VCA

RefDe	Value	Type	Quantity
2180(T)	THAT 2180	2180	1
U2	NE5534(T)	NE5534	1
C101	27pf(T)	5.5 cOg	1
C102	100pf(T)	5.5 cOg	1
C100	100N(T)	5.5 POLY	1
R119	51R(T)	1/4 WATT	1
R118	1K(T)	1/4 WATT	1
R116	5.1K(T)	1/4 WATT	1

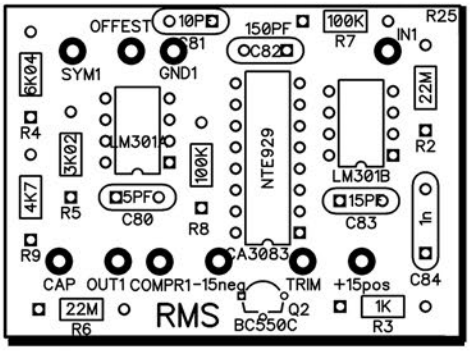
BOM

RMS

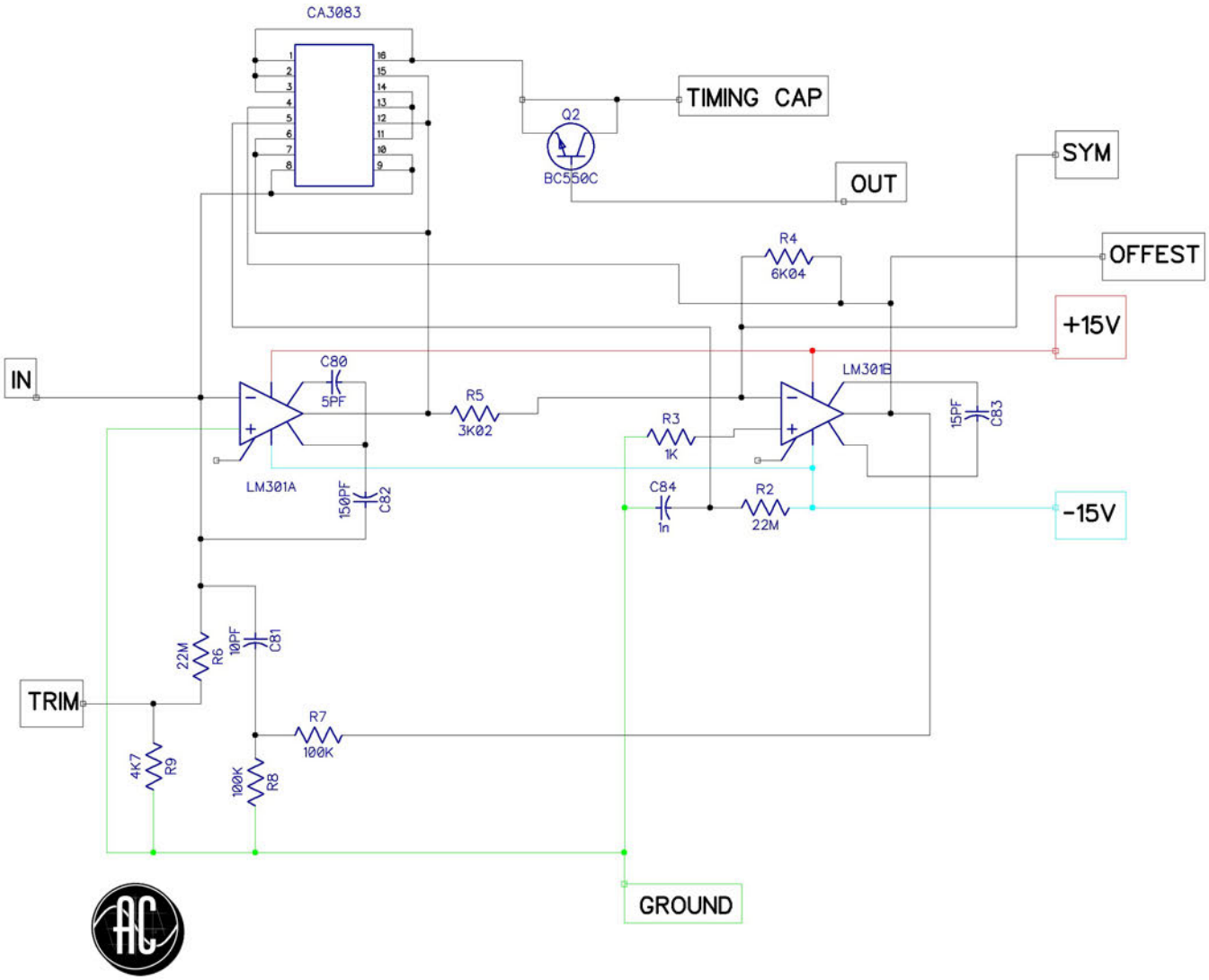
AC SOUND CLX-VU RMS

RefDes	Value	Type	Quantity
CHIPS			
CA3083		NTE929	1
LM301A		LM301	1
LM301B		LM301	1
TRANSISTOR			
Q2	BC550C	BC550C	1
CAPACITORS			
C80	5PF	c0g/npo	1
C81	10PF	c0g/npo	1
C83	15PF	c0g/npo	1
C82	150PF	c0g/npo	1
C84	1n	POLY	1
RESISTORS			
R3	1K	1/4 WATT	1
R5	3K02	1/4 WATT	1
R9	4K7	1/4 WATT	1
R4	6K04	1/4 WATT	1
R7, R8	100K	1/4 WATT	2
R2, R6	22M	1/4 WATT	2

RMS UNIT PCB

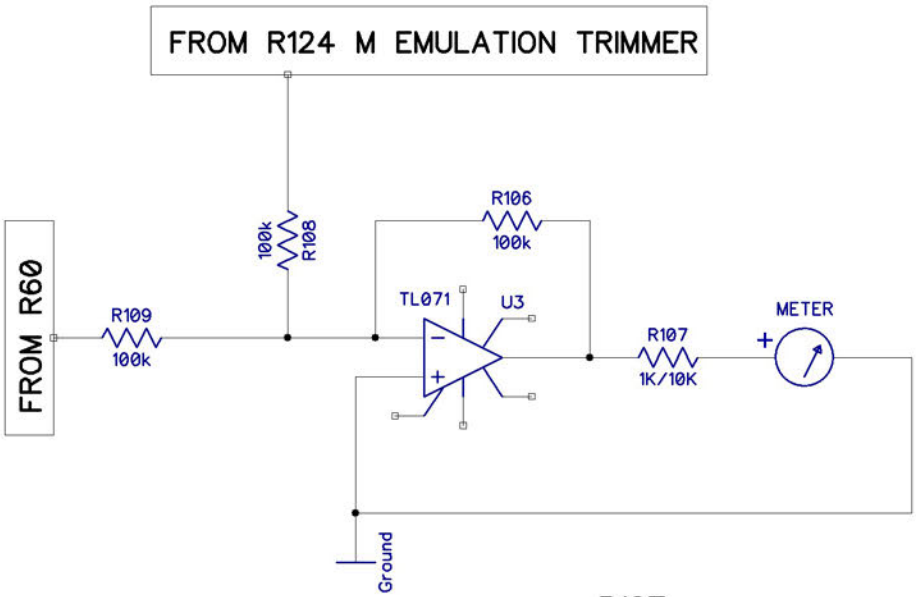


RMS UNIT SCHEMATIC



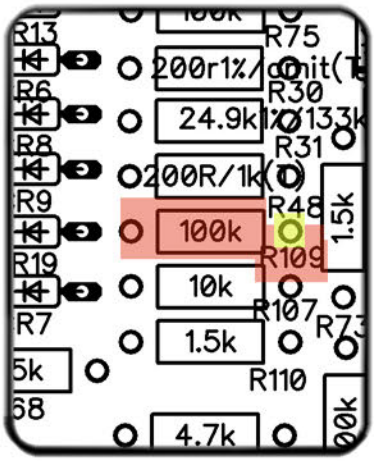
METER EMULATION CIRCUIT

SCHEMATICS



R107

1K	1 mA METER
10K	0.1 mA METER



SIDE TO LEAVE OPEN FOR CALIBRATION

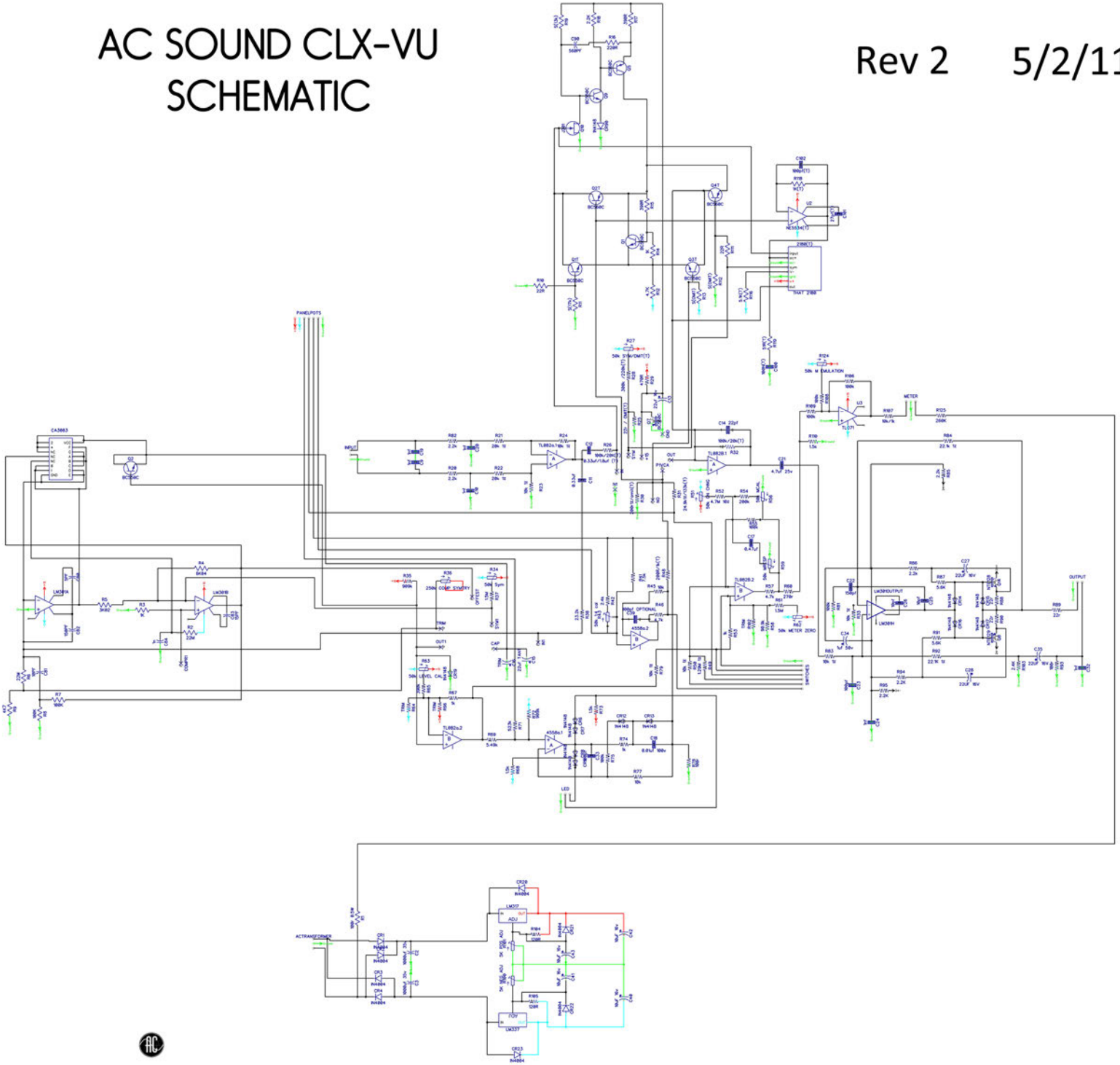
RESISTOR IN QUESITON

BOM

The original units used a center detented meter - when no signal is applied the meter rests at “0”. In order for the circuit to interface with reletivly inexpensive DC meters some compinsation circuitry must be implemented. This is that circuitry. 1ma and 0.1ma meters can be used. If using a 1ma meter be sure to install a 1k resistor in R107 to achive the proper sensitivity. If using a 100ua (0.1ma) meter use a 10k resistor in R107. When soldering resistors leave resistor R109 open on the right side to use later to calibrate the emulation circuit.

AC SOUND CLX-VU SCHEMATIC

Rev 2 5/2/11



AC SOUND CLX-VU COMPRESSOR BOM FOR COMPLETE THAT 2180 CHIP BUILD 5/2/2011

Refrence Definition	Value	Quantity
OPAMPS AND OTHER ICs		
CA3083	CA3083 or NTE929	1
2180(T)	THAT 2180 VCA	1
TL082a, TL082B	TL082	2
U2	NE5534	1
U3	TL071	1
4558a	RC4558	1
LM301A, LM301B, LM301OUTPUT	LM301	3
LM317	LM317	1
LM337	LM337	1
CHIP SOCKETS (HIGHLY RECOMMENDED)		
SOCKET	DIP 8	8
SOCKET	SIP 8	1
SOCKET	DIP 16	1
DIODES		
CR1-CR4, CR20-CR23	IN4004	8
CR6-CR9 , CR12-CR17, CR19	1N4148	11
TRANSISTORS		
Q8	NTE129 or 2N4037	1
Q14	NTE128 or 2N3053	1
Q2	BC550C	1
C0G/NPO TYPE CERAMIC CAPACITORS		
C80	5pf	1
C25, C26, C81	10pf	3
C83	15pf	1
C14	22pf / 150pf	1
C101	27pf	1
C23, C102, C33	100pf	3
C22, C82	150pf	2
POLYESTER FILM CAPACITORS(PIN SPACING)		
C24, C84 (7.5mm)	1nf	2
C18 (5mm, 7.5mm, 10mm)	10nf (0.01uf)	1
C100 (5mm)	100nf (0.1uf)	1
C11 (7.5mm, 10mm, 15mm, 22.5mm)	0.33uf	1
C17 (5mm, 7.5mm, 10mm, 15mm)	0.47uf	1

POLYPROPYLENE FILM CAPACITOR

C12 (7.5mm, 10mm, 15mm, 22.5mm)	1.8uf	1
C9, C10, C19, C20 , C32, (7.5mm)	1nf	5

ELECTROLYTIC CAPACITORS (SPACING)

C34 (2.54mm)	1uf 50v	1
C21 (BIPOLAR OR POLY FILM) (5, 7.5, 10, 15, 20, 22.5mm)	4.7uf 25v (BIPOLAR)	1
C40, C41, C42, C43 (2.54mm)	10uF 25v	4
C27, C28 C35 (2.54mm)	22UF 16V	3
C2,C3 (7.62mm)	1000uf 35v	2

TANTALUM CAPACITOR (SPACING)

C15 (5mm)	22uf TANT	1

OPTIONAL CAPACITORS

C39 **NEEDED FOR THIS BUILD**	100pf OPTIONAL	1
C50, C51 When using external power supply	1nf OPTIONAL	2
C53, C54 " "	470uf 35v OPTIONAL	2

RESISTORS (ASSUME ALL ARE 1%)

R88,R89,R90	22r	3
R119	51r	1
R78,R93	100r	2
R1 ***If using VU meter w/ LEDS just jumper w/ wire****	100r 0.5W	1
R104,R105	120r	2
R60	270r	1
R107 **(1k for 1ma meter/10k for 0.1ma meter)**	1k/10k METER	1
R3,R48,R53,R67,R74,R118	1k	6
R68,R73, R110	1.5k	3
R20, R82, R85, R86, R94, R95	2.2k	6
R42, R103	2.4k	2
R5	3.02k	1
R9, R46, R57	4.7k	3
R116	5.1k	1
R69	5.49k	1
R87, R91	5.6k	2
R4	6.04k	1
R41	7.5k	1
R23, R24, R33, R45, R50,R77,R79,R83	10k	8
R21,R22, R26, R32	20k	4
R84, R92	22.1k 1%	2
R38	23.2k	1
R58	90.9k	1
R106,R108,R109,R55,R7,R75,R8,R81	100k	8
R31	133k	1

R54	200k	1
R125	260k	1
R65	390k	1
R71	523k	1
R35, R72	909k	2
R49	1.29M	1
R37, R61	1.5M	2
R52	4.7M	1
R2, R6	22M	2

TRIMMER RESISTORS (0.1" STANDARD PIN SPACING)

R100, R101	5k	2
R124,R34,R43,R51,R56,R59,R62,R63	50k TRIMMER	8
R36 **(250k or 500k)**	250k COMP SYM TRIM	1

POTENTIOMETERS

THRESHOLD,RATIO,OUTPUT GAIN	20K (LINEAR)	3

MOLEX CONNECTORS

KK SERIES 2.54 mm SPACING (0.1")	3 PIN	4
KK SERIES 2.54 mm SPACING (0.1")	7 PIN	2
KK SERIES 3.96 mm SPACING (0.156") **(0.46" HOLE)**	3 PIN **(ROUND PIN ONLY)**	1

REMEMBER ALL PARTS FOR MOLEX CONNECTORS

EXTRA

METER SWITCHES 3 GANG	SPDT (TIMES 3)	
ABOVE AND BELOW LEDS	LED (COLORS OF CHOICE)	2
METER (CUSTOM SCALE)	1 or 10 ma DC	1
POWER TRANSFORMER	2 X 18V (AT LEAST 25VA)	1
INPUT/ OUTPUT JACKS	TRS/XLR	2
IEC Connector and Fuse	0.25 Amp	1

AC SOUND CLX-VU COMPRESSOR BOM FOR MAIN BOARD (NO RMS OR VCA) 4/20/2011

Refrence Definition	Value	Quantity
OPAMPS AND OTHER ICs		
TL082a, TL082B	TL082	2
U3	TL071	1
4558a	RC4558	1
LM301OUTPUT	LM301	1
LM317	LM317	1
LM337	LM337	1
CHIP SOCKETS (HIGHLY RECOMMENDED)		
SOCKET	DIP 8	5
DIODES		
CR1-CR4, CR20-CR23	IN4004	8
CR6-CR9 , CR12-CR17, CR19	1N4148	11
TRANSISTORS		
Q8	NTE129 or 2N4037	1
Q14	NTE128 or 2N3053	1
Q7	BC560C / OMIT (T)	1
C0G/NPO TYPE CERAMIC CAPACITORS		
C25, C26	10pf	2
C14	22pf	1
C23, C33	100pf	2
C82	150pf	1
POLYESTER FILM CAPACITORS(PIN SPACING)		
C24(7.5mm)	1nf	1
C18 (5mm, 7.5mm, 10mm)	10nf (0.01uf)	1
C11 (7.5mm, 10mm, 15mm, 22.5mm)	0.33uf	1
C17 (5mm, 7.5mm, 10mm, 15mm)	0.47uf	1
POLYPROPYLENE FILM CAPACITOR		
C12 (7.5mm, 10mm, 15mm, 22.5mm)	0.33uF/1.8uF(T)	1
C9, C10, C19, C20 , C32, (7.5mm)	1nf	5
ELECTROLYTIC CAPACITORS (SPACING)		

C34 (2.54mm)	1uf 50v	1
C21 (BIPOLAR OR POLY FILM) (5, 7.5, 10, 15, 20, 22.5mm)	4.7uf 25v (BI or POLY)	1
C40, C41, C42, C43 (2.54mm)	10uF 25v	4
C27, C28 C35 (2.54mm)	22UF 16V	3
C2,C3 (7.5mm)	1000uf 35v	2

TANTALUM CAPACITOR (SPACING)

C15 (5mm)	22uf TANT 16v	1

OPTIONAL CAPACITORS

C39 **NEEDED FOR THAT CHIP**	100pf OPTIONAL	1
C50, C51 When using external power supply	1nf OPTIONAL	2
C53, C54 " "	470uf 35v OPTIONAL	2

RESISTORS (ASSUME ALL ARE 1%)

R88,R89,R90	22r	3
R25 (OMIT IF USING PRE-TRIMMED VCA)	22r	1
R78,R93	100r	2
R1 ***If using VU meter w/ LEDS just jumper w/ wire****	100r 0.5w / WIRE (led)	1
R104,R105	120r	2
R30	200r/OMIT(T)	1
R48	200r/1K(T)	1
R60	270r	1
R29	470r / OMIT(T)	
R53,R67,R74	1k	4
R68,R73, R110	1.5k	3
R20, R82, R85, R86, R94, R95	2.2k	6
R42, R103	2.4k	2
R46, R57	4.7k	2
R116	5.1k	1
R69	5.49k	1
R87, R91	5.6k	2
R41	7.5k	1
R107 **(1k for 1ma meter/10k for 0.1ma meter)**	10k/1k METER	1
R23, R24, R33, R45, R50,R77,R79,R83	10k	8
R21,R22	20K	2
R84, R92	22.1k	2
R38	23.2k	1
R31	24.9K/133k(T)	1
R58	90.9k	1
R106,R108,R109,R55,R75,R81	100k	6
R26, R32	100K/20k(T)	4
R54	200k	1
R28 (OMIT IF USING PRE-TRIMMED VCA)	300K/220k(T)	1
R125	260k	1
R65	390k	1
R71	523k	1
R35, R72	909k	2
R49	1.29M	1

R37, R61	1.5M	2
R52	4.7M	1

TRIMMER RESISTORS (0.1" STANDARD PIN SPACING)

R100, R101	5k	2
R124,R34,R43,R51,R56,R59,R62,R63	50k TRIMMER	8
R27 (OMIT IF USING PRE-TRIMMED VCA)	50k TRIMMER	1
R36 **(250k or 500k)**	250k COMP SYM TRIM	1

POTENTIOMETERS

THRESHOLD,RATIO,OUTPUT GAIN	20K (LINEAR)	3

MOLEX CONNECTORS

KK SERIES 2.54 mm SPACING (0.1")	3 PIN	4
KK SERIES 2.54 mm SPACING (0.1")	7 PIN	2
KK SERIES 3.96 mm SPACING (0.156") **(0.46" HOLE)**	3 PIN **(ROUND PIN ONLY)**	1

REMEMBER ALL PARTS FOR MOLEX CONNECTORS

EXTRA

ABOVE AND BELOW LEDS	LED (COLORS OF CHOICE)	2
METER (CUSTOM SCALE)	1 or 10 ma DC	1
POWER TRANSFORMER	2 X 18V (AT LEAST 25VA)	1
INPUT/ OUTPUT JACKS	TRS/XLR	2
IEC Connector and Fuse	0.25 Amp	1

CLX -VU KNOWN ISSUES

REV 2. 4-30-11

A 150pF CAPACITOR IS NEEDED FOR C39 WHEN USING THAT CHIP

A 500K TRIMMER RESISTOR CAN BE USED FOR R36
INSTEAD OF THE SPEC'D 250K RESISTOR
- GIVING MORE RANGE WHEN CALIBRATING

TRANSISTOR NTE129 FOOTPRINT IS WRONG. MUST ROTATE PART
TO THE LEFT. SEE BUILD MANUAL FOR CORRECT PLACEMENT

SEE "QUITE MOD" TO INCREASE DYNAMIC RANGE OF THE REV 2
BOARDS. IT JUST REQUIRES A 2 PIECES OF WIRE AND GIVES YOU
ABOUT 10 DB OF REDUCED NOISE.

AC SOUND COMPRESSOR CLX-VU

REV 2

4/20/2011

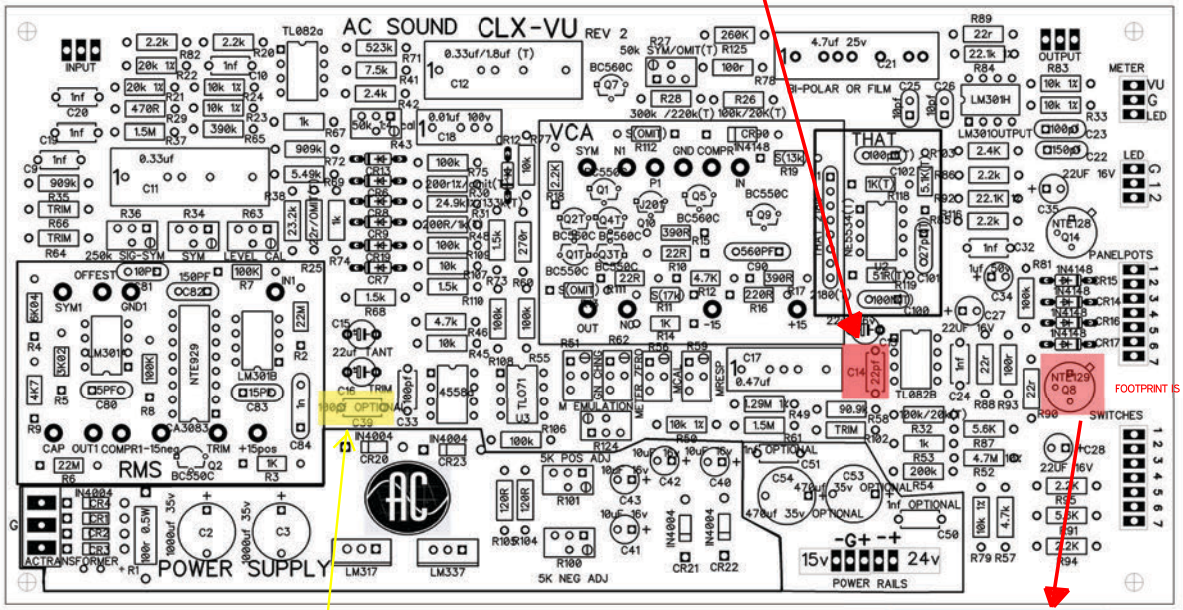
PIN:	GOES TO:
PIN 1	GND
PIN 2	IN (+)
PIN 3	IN (-)

1

PIN:	GOES TO:
PIN 1	GROUND
PIN 2	OUTPUT (+)
PIN 3	OUTPUT (-)

1

Change to 150pf when using THAT chip



PIN:	GOES TO:
PIN VU	(+) ON METER
PIN G	GROUND FOR METER/LEDS
PIN LED	TO + LED ON METER

PIN:	GOES TO:
PIN G	BELOW LED (-) AND ABOVE LED (+)
PIN 1	BELOW LED (+)
PIN 2	ABOVE LED (-)

PANEL POTS ALL 20K

PIN #:	GOES TO:
PIN 1	RATIO POT (CCW)
PIN 2	RATIO POT (CENTER WIPER)
PIN 3	RATIO POT (CW)
PIN 4	GAIN POT (CENTER WIPER)
PIN 5	THRESHOLD POT(CENTER WIPER)
PIN 6	THRESHOLD POT(CCW) AND GAIN POT(CCW)
PIN 7	THRESHOLD POT(CW) AND GAIN POT(CW)

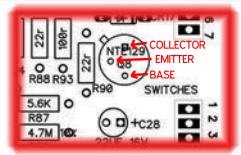
FOOTPRINT IS WRONG!!

PIN #	GOES TO:
PIN 1	IN - NOT ENGAGED
PIN 2	IN - MIDDLE
PIN 3	OUT - MIDDLE
PIN 4	OUT - ENGAGED
PIN 5	GR - NOT ENGAGED
PIN 6	GR - MIDDLE
PIN 7	IN - ENGAGED, OUT - NOT ENGAGED, GR - ENGAGED

NAME:	METER SHOWS:
SWA	GAIN REDUCTION
SWB	OUTPUT LEVEL
SWC	INPUT LEVEL

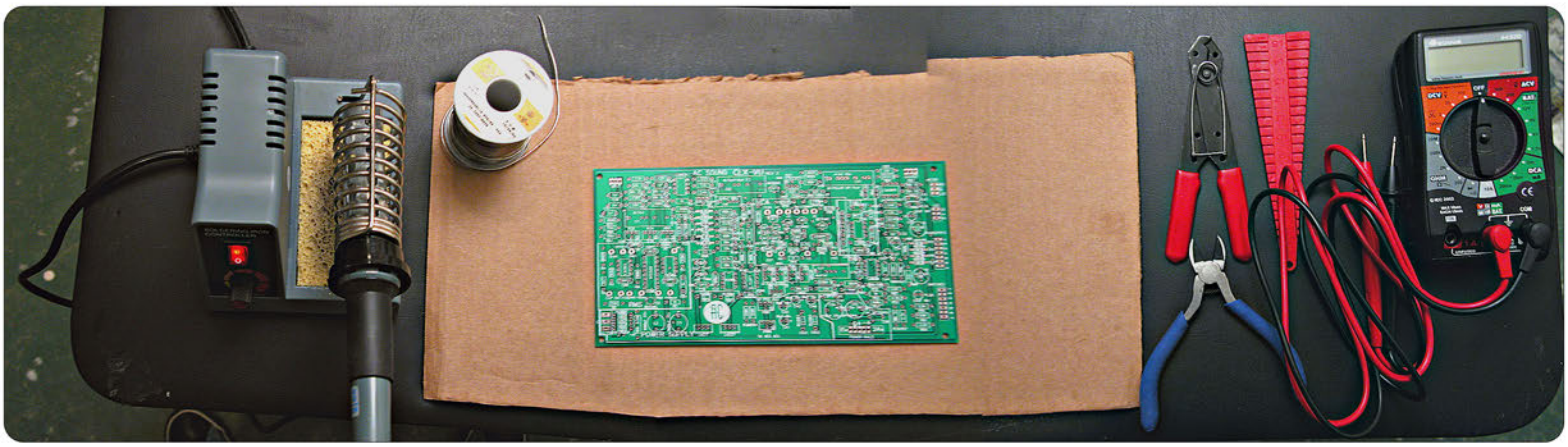
USE CAPACITOR WITH that chip BUILDS.

CORECTED TRANSISTOR PLACEMENT. MUST ROTATE AS SHOWN IN PICTURE.



SECTION 2

GETTING STARTED



WORKSPACE SETUP

Now your ready to start building your board. The first step is stuffing your board with all the components. This is probably the most critical step. It is important to be calm and give yourself plenty of time to complete this task. You are probably eager to finish your prject and start using it, but it is important to focus on the task at hand to decrease the chances of making mistakes.

Get yourself a relaxed working environment with lots of light. Put on a favorite album. Taking your time, check and double check your work. Any extra time spent at this step expotentially saves time in the long run.

Lets review some basics!

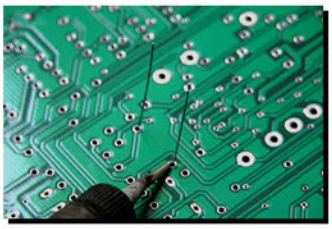
ITEMS NEEDED:

YOU WILL NEED A SOLDERING IRON, ROSIN CORE SOLDER, LEAD TRIMMERS, A MULTI-METER TO CHECK RESISTOR VALUES AND PREFERABLY A LEAD BENDER

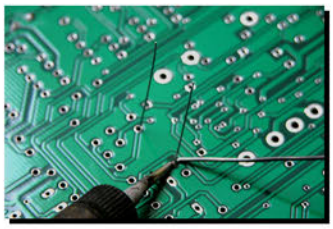
NOTE: THIS BUILD MANUAL IS JUST A REFRENCE. THERE ARE MANY DIFFERENT WAYS TO DO THE PROCEDURES OUTLINED IN THIS MANUAL DON'T BE AFAID TO FIND A WAY THAT WORKS FOR YOU.

HOW TO SOLDER:

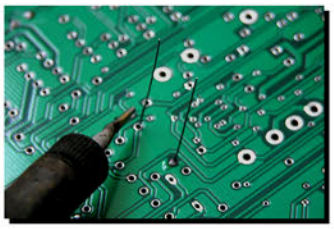
IN 3 SIMPLE STEPS



1. Allow you soldering iron to reach operating temperature. If you have a variable tempature iron, set the iron were the solder melts almost instantly when touched to the tip, but no hotter. Touch the tip of the soldering iron to the joint to be soldered. Allow the joint to reach the same temperature as the tip (1- 2 seconds).



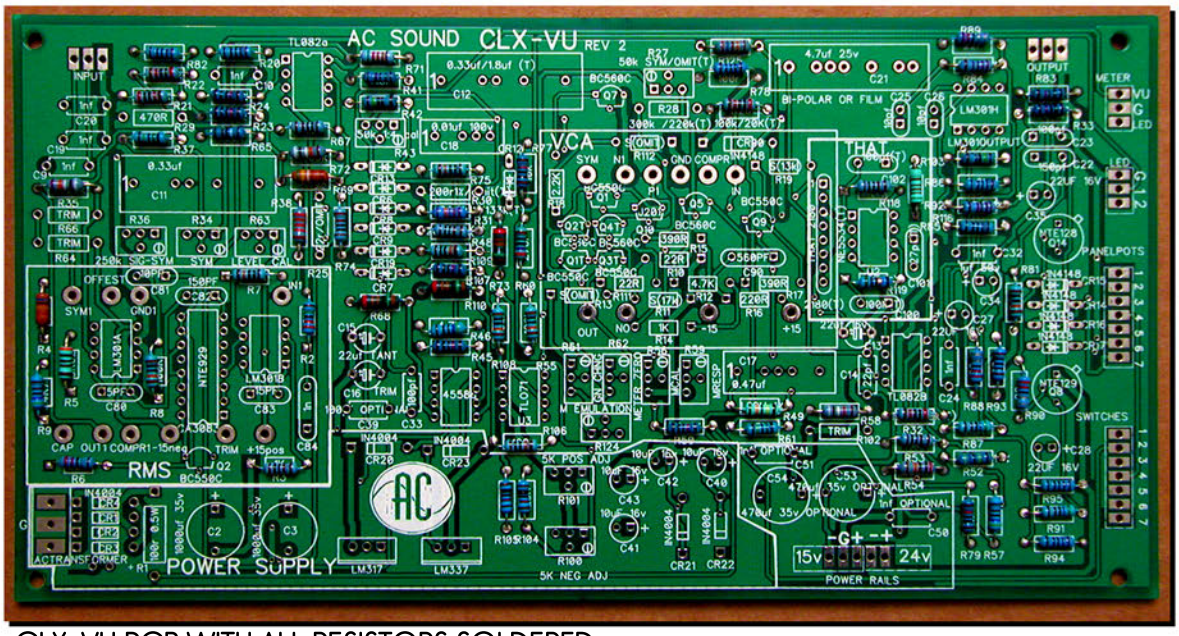
2. Touch the solder to the joint that is bieng soldered. Allow the solder to flow around the joint and in through to the otherside. The trick to soldering is leaving the iron on long enough to allow the solder time to flow to make a strong joint, but not too long where parts are damaged by the heat. The soldering tip should usually remain in contact with the material for about 3 seconds max.



3. Finally pull away the tip and allow the joint to cool. Inspect the solder joint. It should be nice and shiny. Also you don't want to use too much solder because it gets hard to control, but you don't want to use too little either. If you happen to use too much you can try to lead some away from the joint by pulling it upwards the parts' lead.

STUFFING THE BOARD

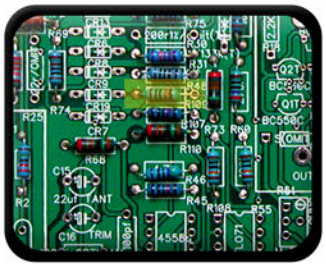
INSTALLING THE RESISTORS



CLX-VU PCB WITH ALL RESISTORS SOLDERED

Installing the resistors on your CLX-VU board is a very important step. This step can be very prone to errors and some errors won't result in a completely non-working unit, but the perfomance of your build could be severly comprimised. Its reccomened you measure each resistor with a correctly calibrated multimeter before it is installed on the board. It is also reccomneded that while you work you solder often, to minimize the chance of resistors falling out and getting mixed up.

NOTE:



RESISTOR R109 IS ONLY SOLDERED ON THE LEFT SIDE AS PICTURED. THE RIGHT SIDE IS LEFT OPEN FOR FUTURE METER CALIBRATION.

TIPS WHEN DEALING WITH RESISTORS:

*A LEAD BENDER IS VERY HELPFUL WHEN INSTALLING LEADED COMPONENTS SUCH AS RESISTORS.
*PCB HOLDERS A VERY NICE IF YOU HAVE ONE, THEY ALLOW ONE TO INSTALL THE RESISTORS AND THEN FLIP THE PCB OVER FOR EASY SOLDERING
*AN EXTRA PIECE OF CARDBOARD WORKS GREAT FOR COVERING THE TOP OF THE PCB, HOLDING THE UNSOLDERED RESISTORS IN PLACE AS YOU FLIP THE PCB OVER.
*AFTER INSERTING THE RESISTOR SOME PEOPLE LIKE TO BEND THE LEADS A BIT TO HOLD THE RESISTOR IN PLACE.
*RESISTOR DESIGNATIONS CAN BE: 6.8K = 6K8 = 6800R = 6800r = 6800
THEY ALL MEAN THE SAME THING.

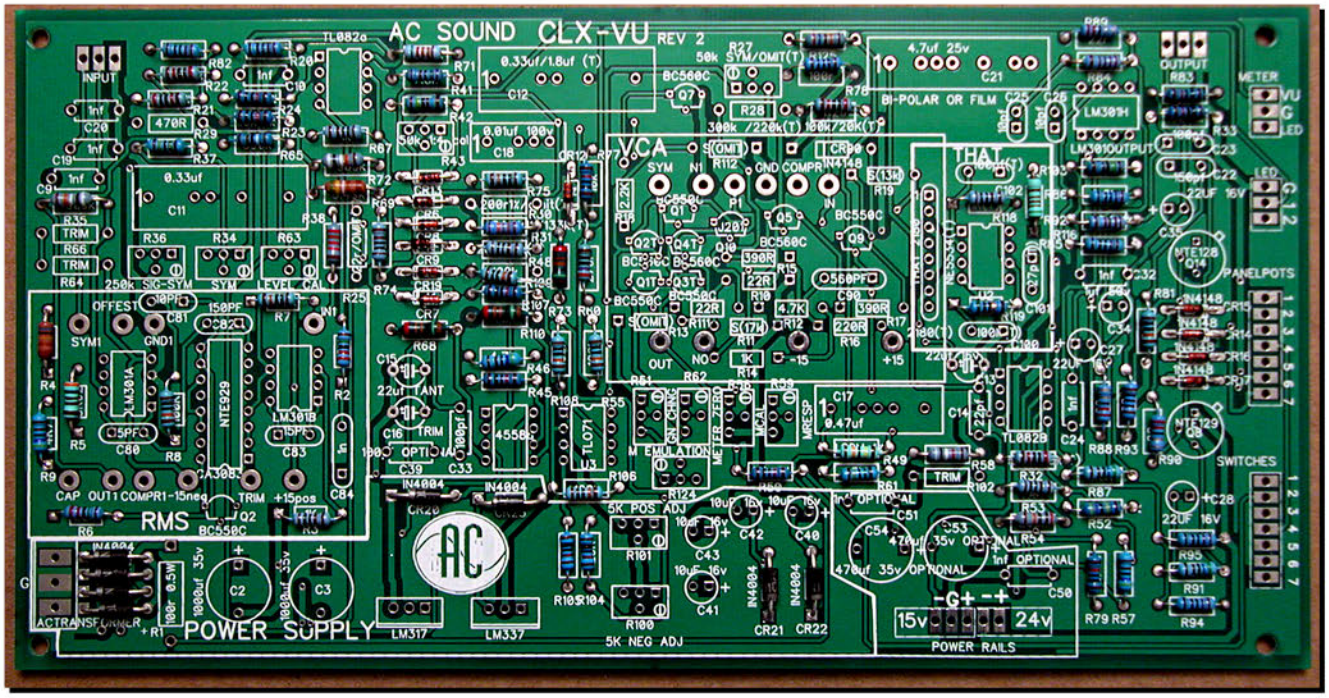
MORE NOTES:

Some resistors are labeled TRIM. They are for calibration and normaly are left unused.

Resistor R125 determines how much current your LEDS get.

Resistor R1 should be bridged with a piece of wire if your using LEDs or a 100ohm 1/2 watt resistor if using a lamp.

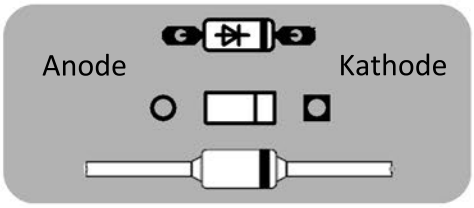
INSTALLING THE DIODES



CLX-VU PCB WITH ALL DIODES INSTALLED – NOTE POLARITY

The next step is to install the Diodes. Diodes allow voltage to flow only one way, therefor the inherently need to be installed in the correct direction. To determine the polarity of a diode look for the side with the white band around it. This ring marks the side that current flows to. When installing the diode be sure to install the ring on the correct side, as pictured.

NOTE THE POLARITY

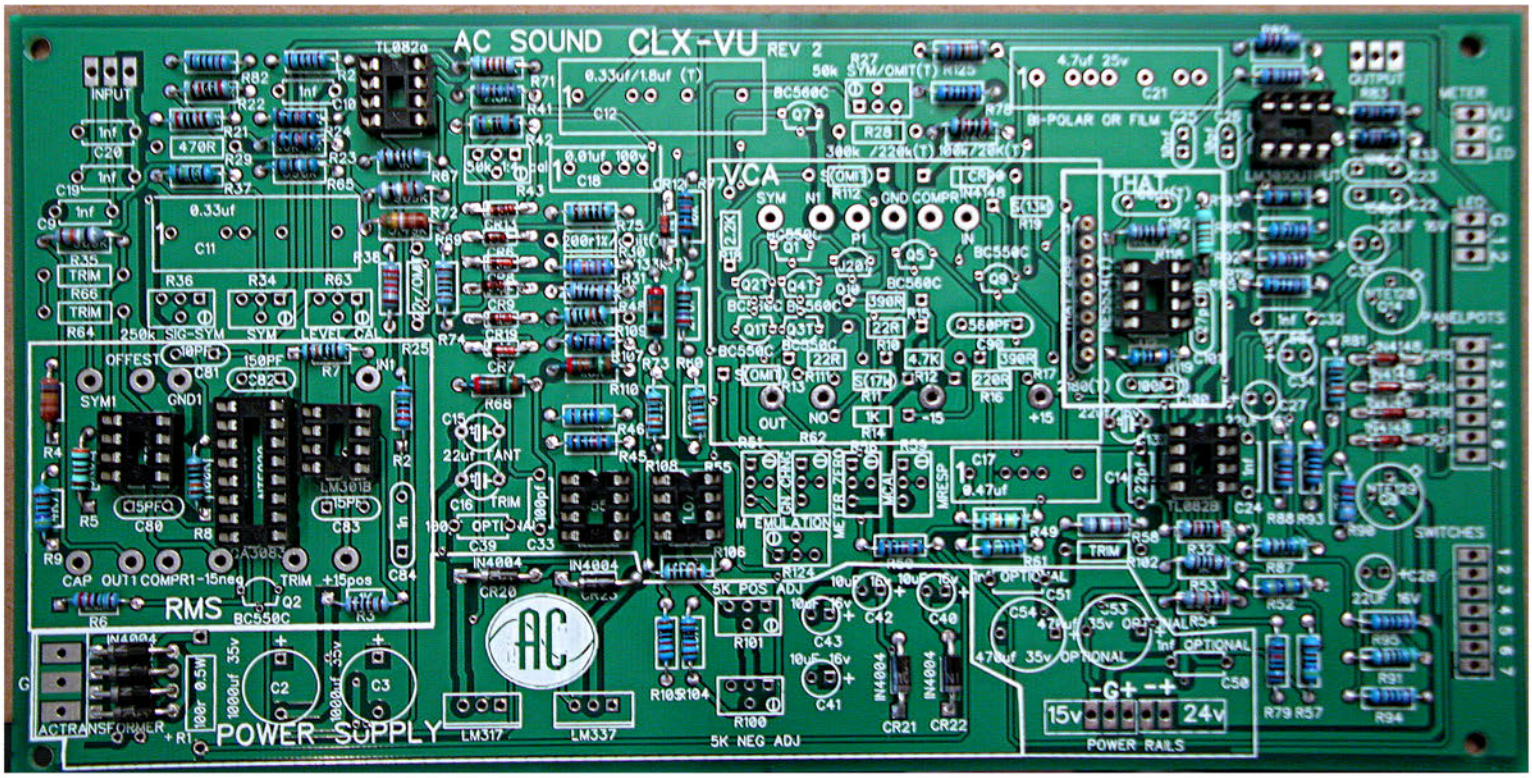


INSTALL DIODES IN THE CORRECT DIRECTION

REMEMBER:

- SILICON DEVICES, SUCH AS DIODES, ARE MORE SESPTABLE TO BEING DAMAGED BY EXCESSIVE HEAT FROM SOLDERING.
- ALSO MIND STATIC ELECTRICTY CAN HARM SEMI-CONDUCTOR DEVICE SUCH AS DIODES.

INSTALLING THE DIP ADAPTORS

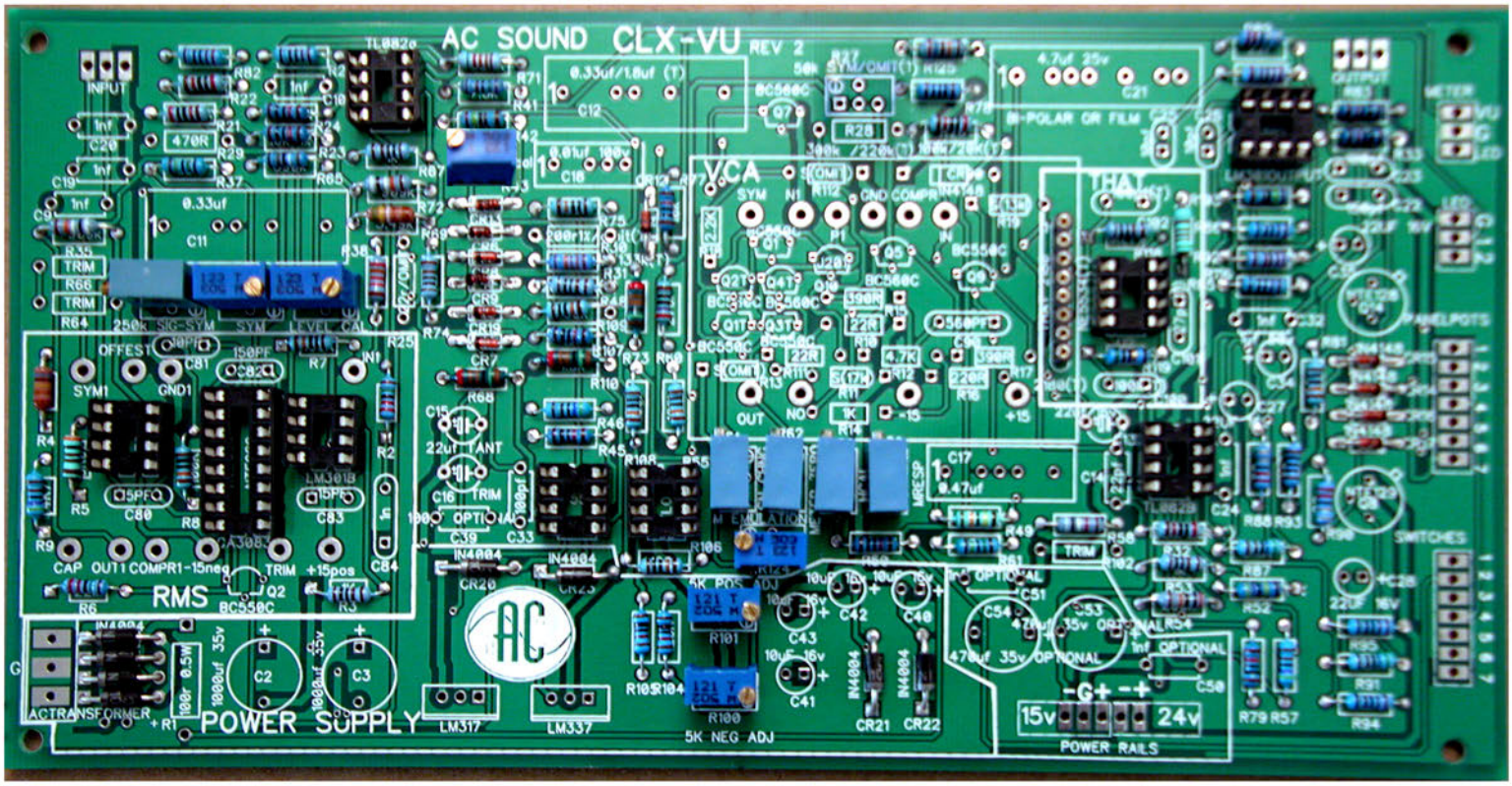


CLX-VU PCB WITH ALL DIP ADAPTORS INSTALLED

Dip adaptors are used for easy instalation of inter-gated circuits and other devices in the dip package. They are very important expesually whne building pro-jects that use plated through holes, such as the AC Sound CLX-VU. These holes are great for making a solid connection when soldering but are more difficult when unsodlering things (such as a Op-amp). Using Dip adapotors also protect opamps from heat and handleing of the soldering process. Dip adaptors are very recommened for this and any build.

NOTE: The adaptor for the transistor array in the RMS unit is for DIP 16, not the more common DIP 14.

INSTALLING THE TRIMMERS



CLX-VU PCB WITH TRIMMER RESISTORS INSTALLED FOR THAT 2180 BUILD

The CLX-VU uses 11 total trimmers for the THAT 2180 build. If you are using a THAT 2181 (un-trimmed) chip or a discrete 200 series VCA you will also need to install R27 to trim extra distortion from the VCA.

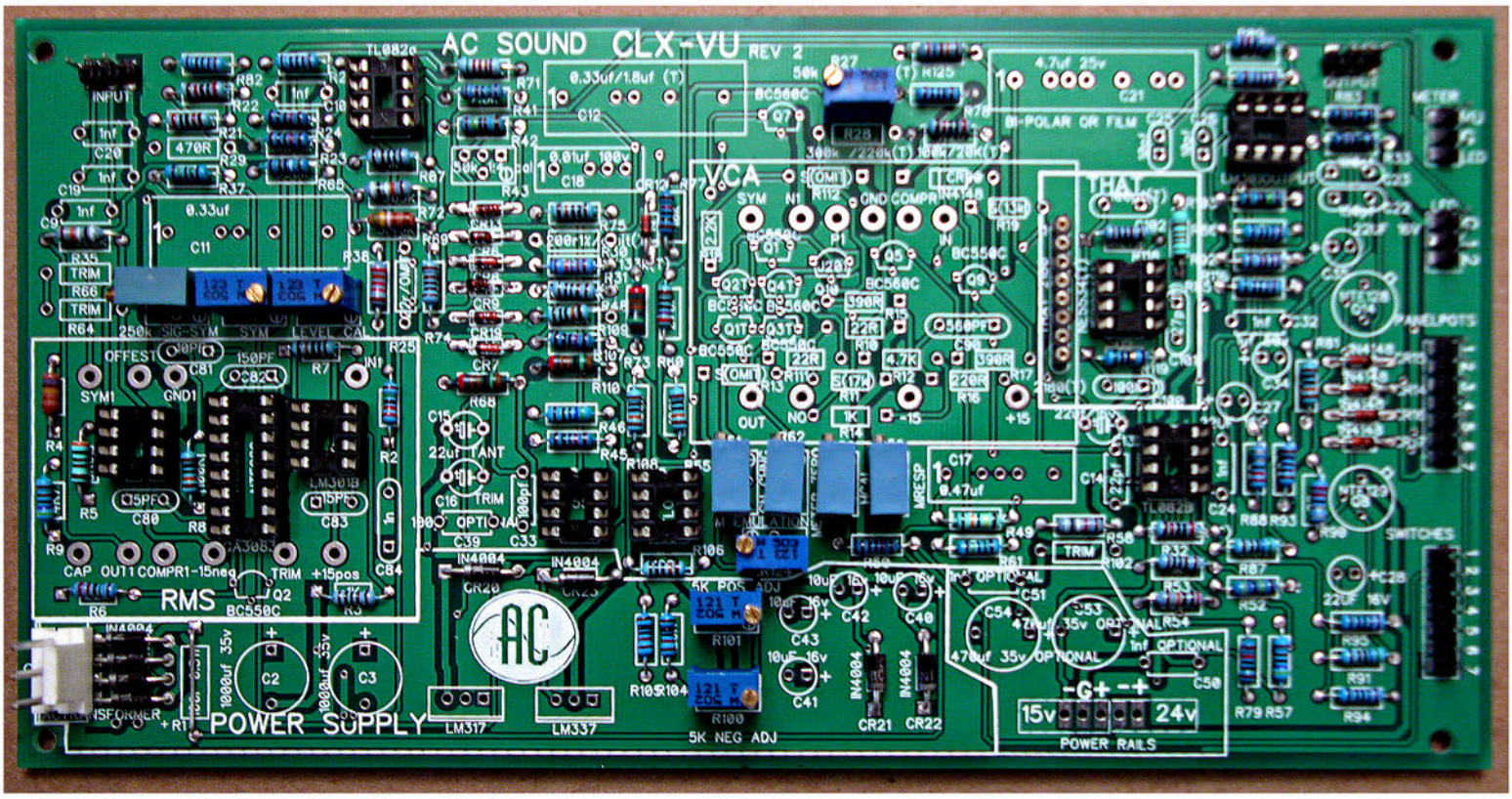
1 There are two 5k trimmers that can be found in the power supply section of the PCB. These are used to vary the voltage for the plus and negative supply rails.

2 There are eight 50k trimmers that can be found all over the board, used to trim extra distortion from the RMS unit, to set ratio calibration, to set threshold calibration and to set various aspects of the meter circuit.

3 There is one 250k (or 500k for more variation, but a slightly touchier setup) used during calibraiton to correctly set up the RMS unit.

NOTE: It is a good idea to measure the resistance of the the two trimmers intalled in the power supply (R100 & R101) to about 1.3k to avoid high voltages on intial power up.

INSTALLING THE HEADERS

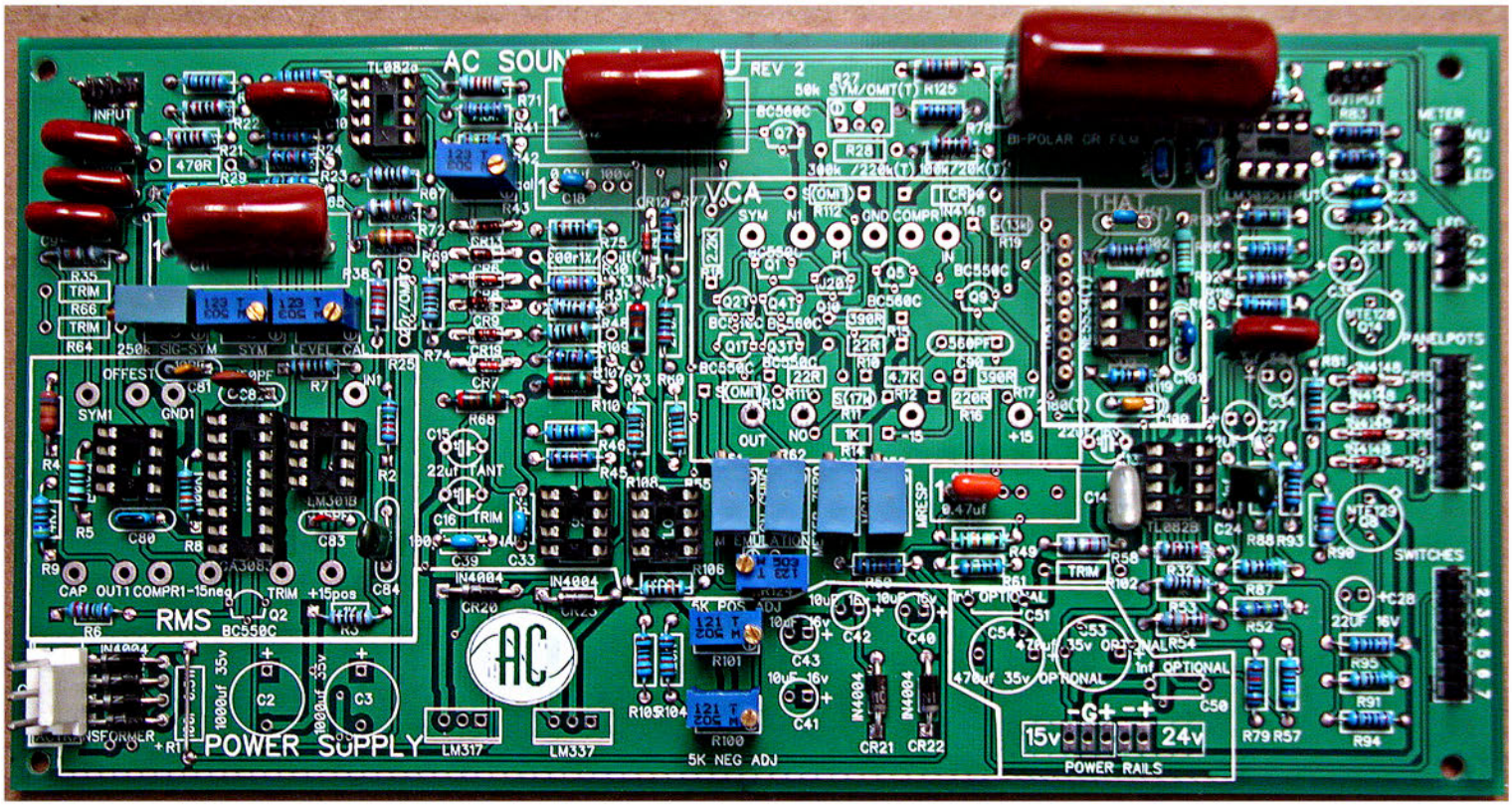


CLX-VU PCB WITH HEADERS INSTALLED

There are two type os headers on the CLX-VU. 0.1” spaced headers and the larger 0.156” spaced 3 prong header for the power supply. Not the power supply header must be round pin and not square pins.

Remeber to get the correct housings and crimp terminals.

INSTALLING FILM & CERAMIC CAPACITORS



CLX-VU PCB WITH FILM & CERAMIC PARTS INSTALLED

BASIC FILM CAPACITORS COME IN TWO TYPES:

Polyester -

Cheap to make, great for bypassing power supplies, good for audio but people tend to prefer:

Polypropelene -

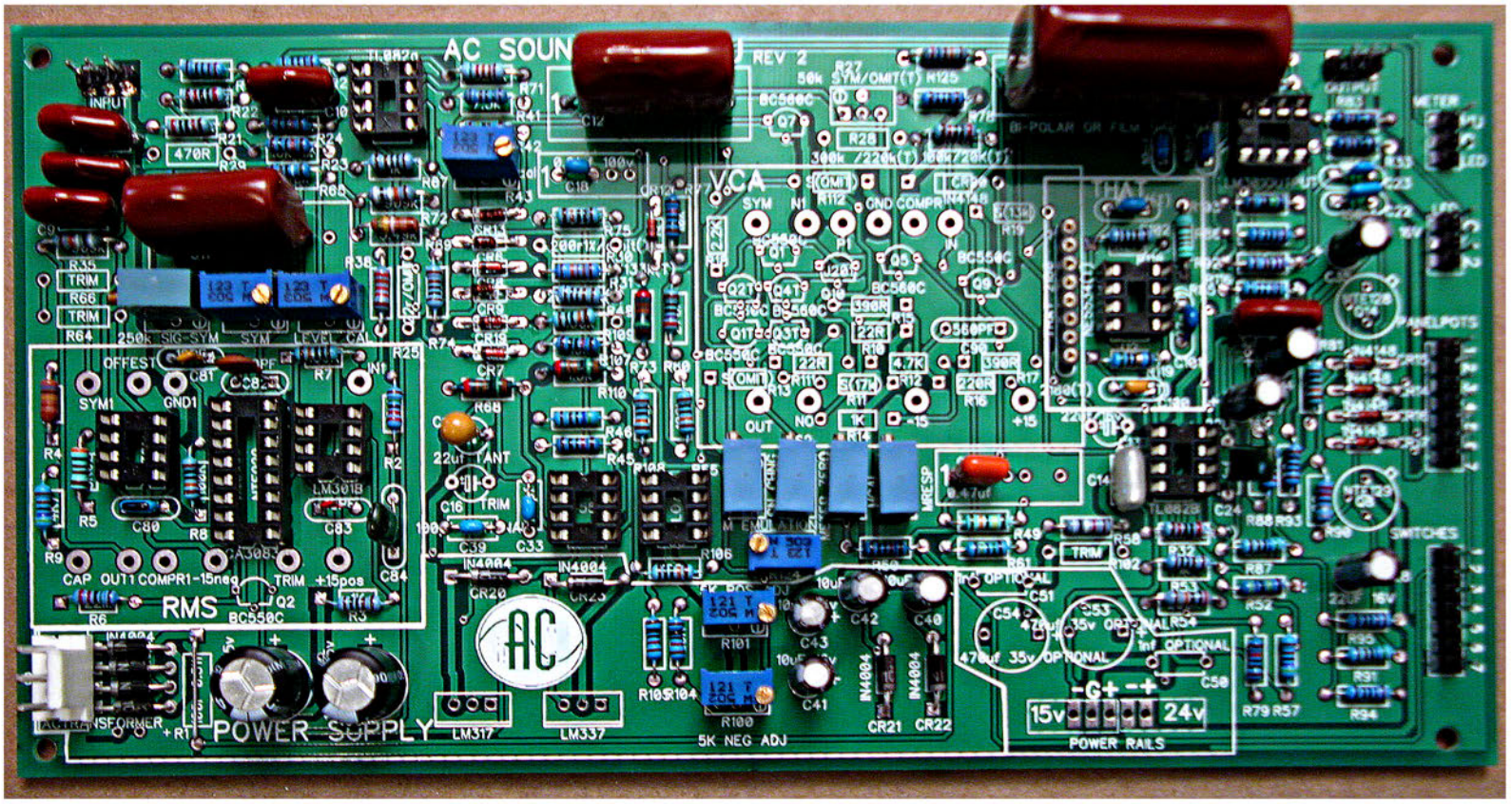
for capacitors directly in the audio signal path. They out preform most any other type of capacitor in listening and measurement tests.

NOTE: CERAMIC AND FILM CAPACITORS ARE NOT POLARIZED., MEANING THEY CAN BE INSERTED ANY DIRECTION.

CERAMIC CAPACITORS:

Come in many different types but the ones we want are the c0g/nPo types. These types are higher quality and are more stable at different temperatures. Ceramic capacitors are usually founf in very small values and excel at passing very high frequency signals. They are used throughout the CLX-VU design to stop occilations inthe circuits and bypass ultra high frequencys.

INSTALLING POLARIZED CAPACITORS



CLX-VU PCB WITH POLARIZED CAPACITORS INSTALLED

POLARIZED CAPACITORS COME IN TWO TYPES:

Electrolytic - Most common type of polarized capacitor. Can fit a large amount of capaci-tance in a small package.

Tantalum - Very fast discharge rate. Used in timing circuit of the CLX-VU.

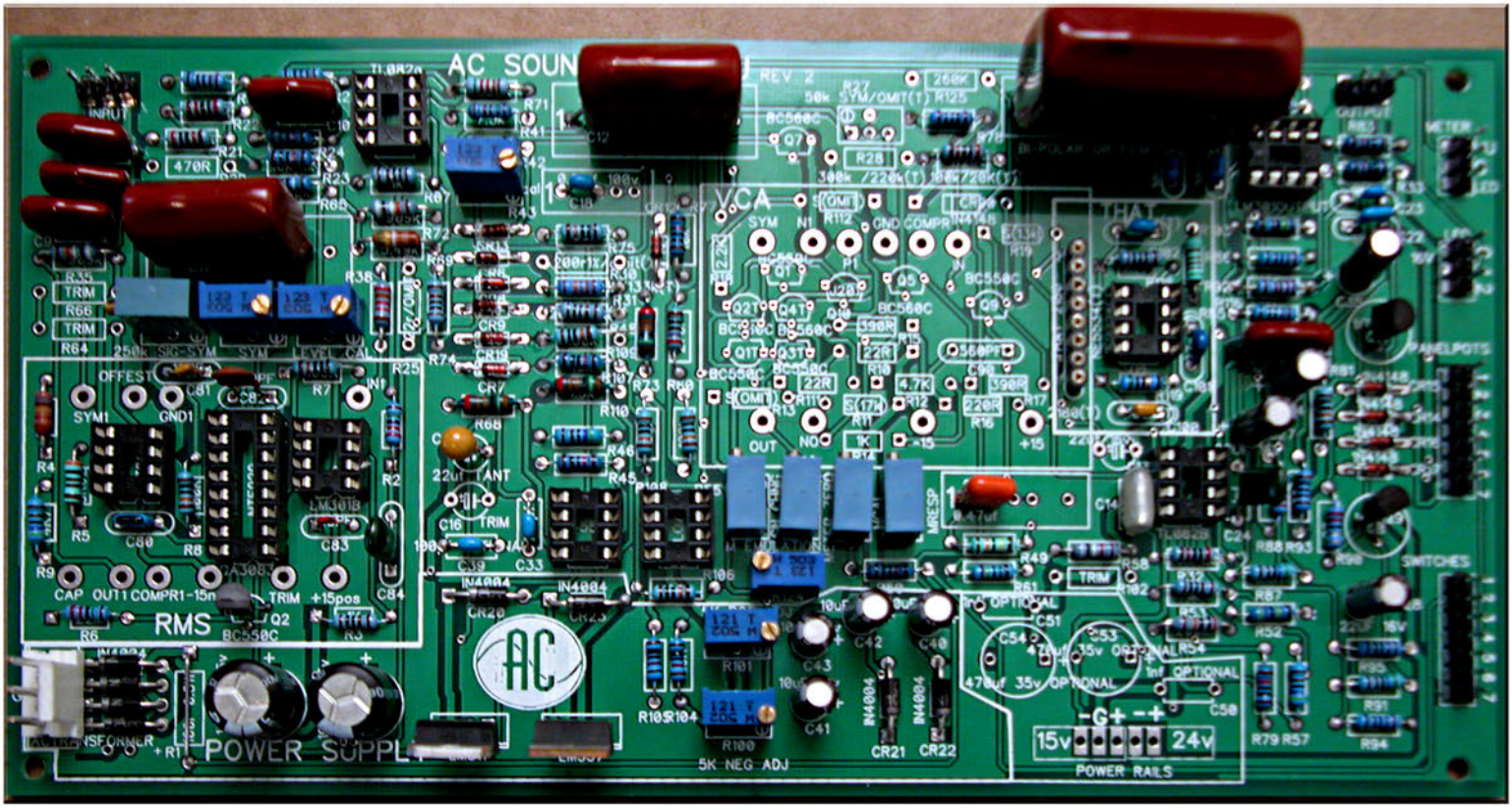
NOTE: ELECTROLYTIC AND TANTALUM CAPACITORS ARE PO-LAROIZED AND MUST BE INSERTED THE CORRECT WAY ROUND.

ELECTROLYTIC CAPACITORS:

Can store a great amount of electricity in a relativly small place. Be warned these capacitors can be very un-linear when not used properly. The most common complaint from the over use/improper use of these componets is a “smeared” or un-focused sound. That is usually when parts are directly in the signal path. The CLX-VU has no electrolytic capacitors directly in the signal path. Electrolytic capacitors are also very frequently used in power sup-plies and in that position there effect on the overal sound is negilable.

Take note of polarity!

INSTALLING TRANSISTORS AND POWER ICs



CLX-VU PCB WITH POWER ICS AND TRANSISTORS INSTALLED

IMPORTANT!!! The footprin for Q8 (NTE129) is incorrect. Consult this page during insulation for correct orintation. Sorry for the inconvience.

ORIGINAL FOOTPRINT

WRONG!!

<-EMITTER
<-BASE
<-COLLECTOR

CORRECT FOOTPRINT

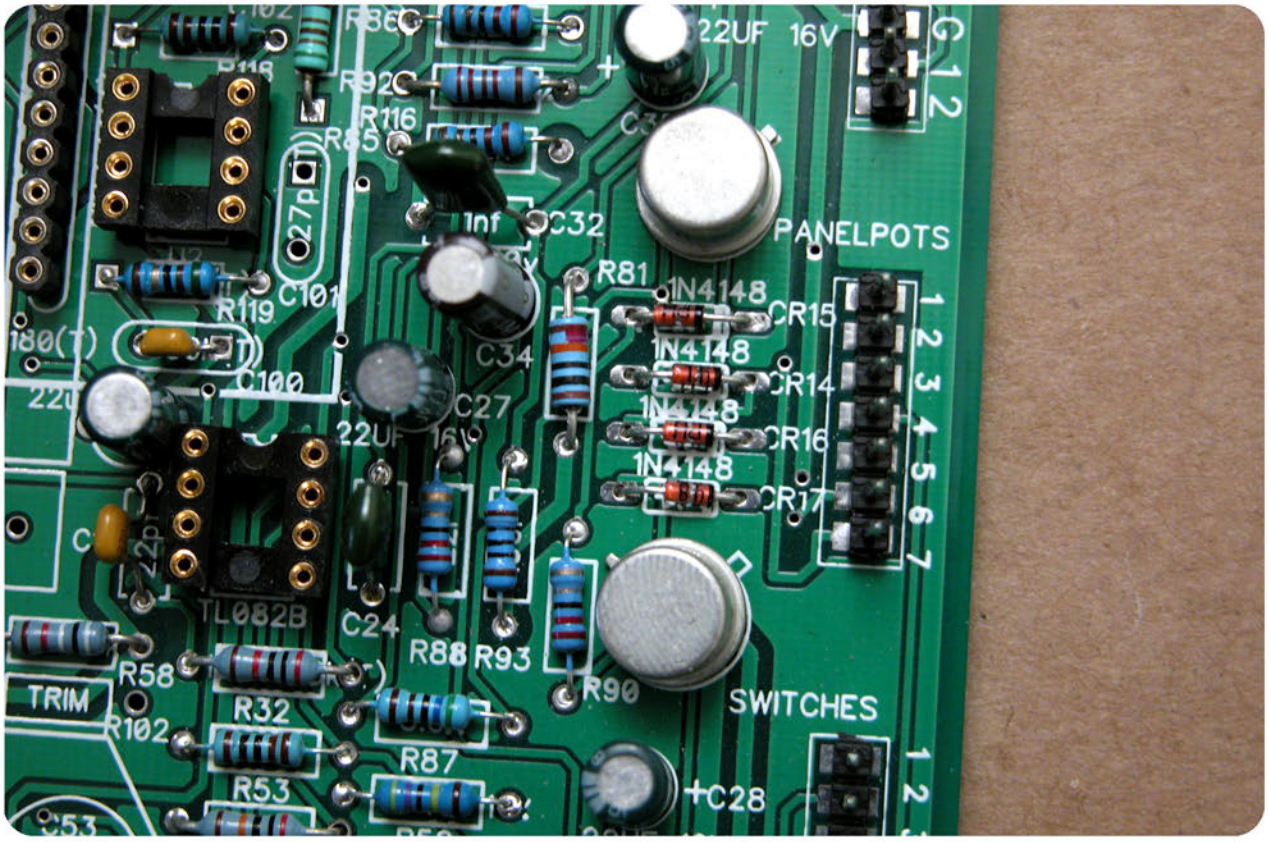
<-COLLECTOR
<-EMITTER
<-BASE

Q9 AND ALL OTHER FOOTPRINTS ARE CORRECT.

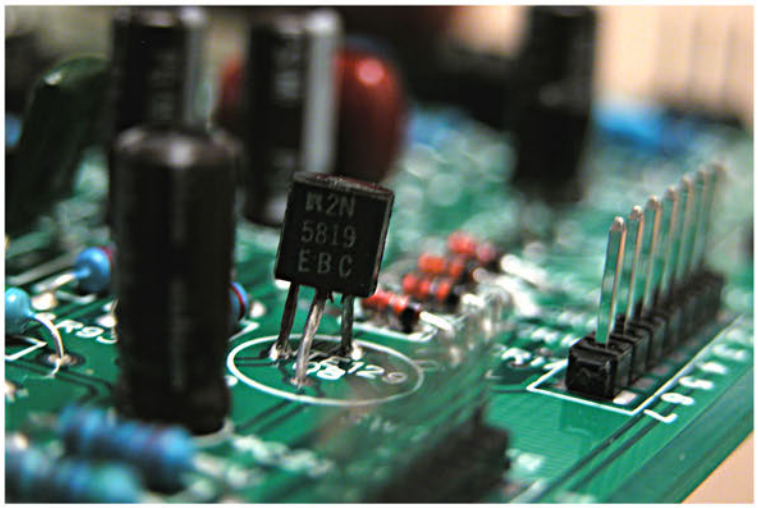
POSSIBLE TRANSISTOR SUBSTITUTES:

Q14 NTE128:	Q8 NTE129:
2N3053	2N4037
2N5818	2N5819

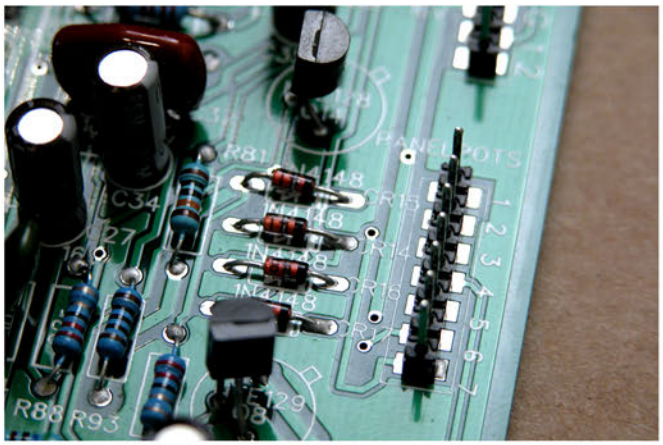
TRANSISTOR PICTURES



NTE128 AND NTE129 TRANSISTOR PAIR



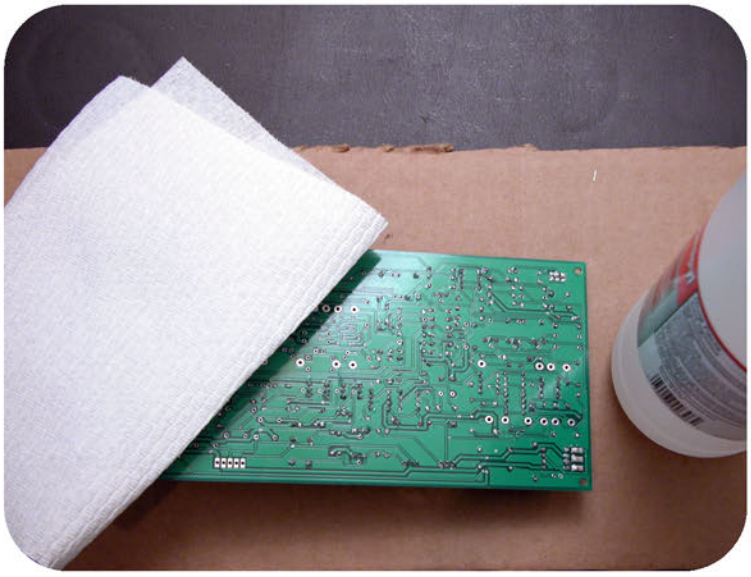
2N5818 AND 2N5819 TRANSISTOR PAIR



FINISHING UP STUFFING YOUR BOARD

Congradulations, you finished stuffing your board!

But we're not finished yet. We still need to clean the board of rosin and check for any possibilty of bad solder joints or solder blobs.



You will need paper towels and rubbing alcohol

NOTE: THIS CAN GET MESSY!

Then wet the paper towel and rub the rosin away! The alcohol lifts the rosin and the paper towel absorbs it.

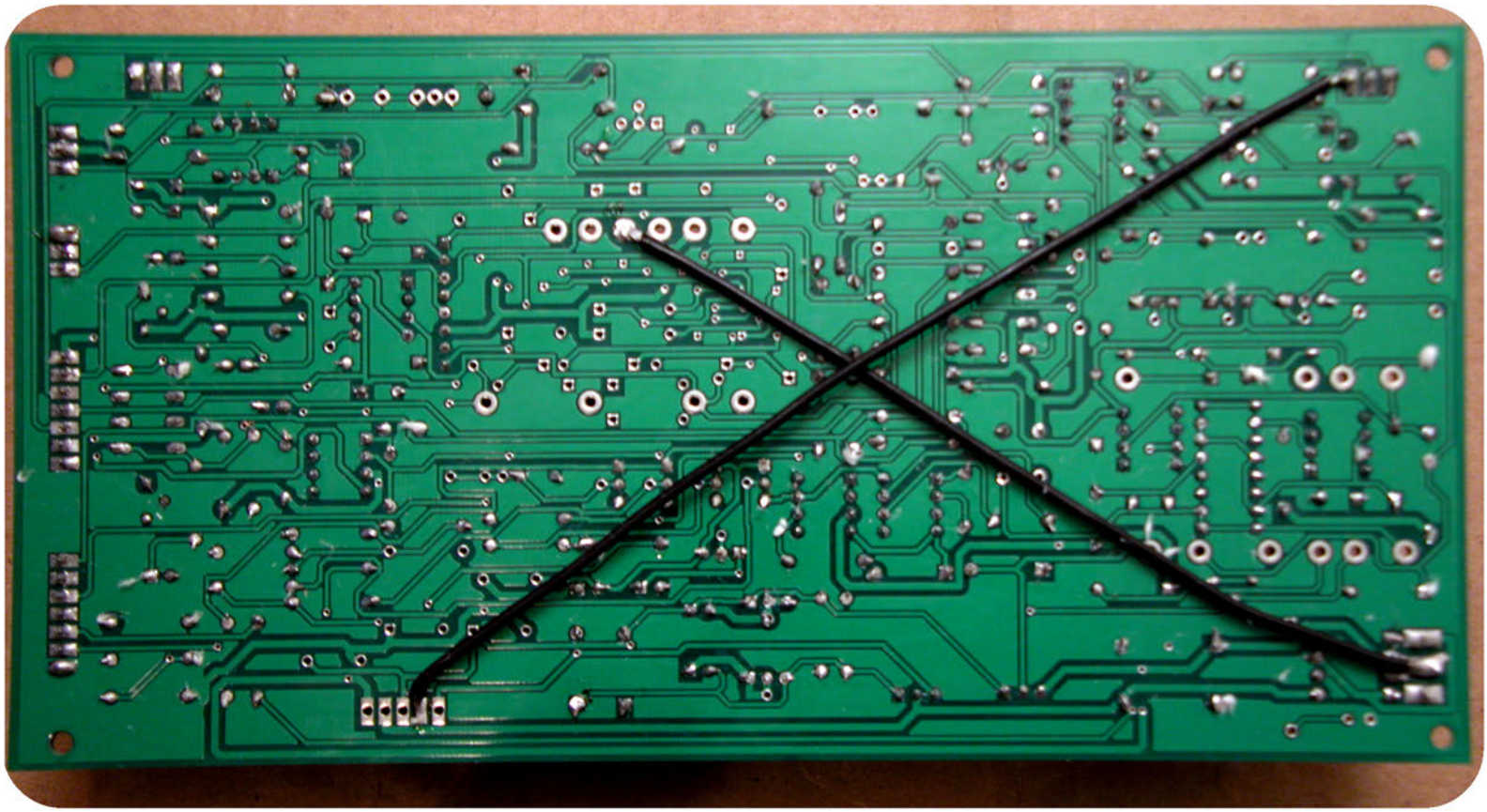
Now is a great time to inspect your circuit board for any cold solder joints or blobs. If in doubt, reflow the solder by touching the tip of your soldering iron to the joint. A cold solder joint can be very hard to track down and they do happen!

You are FINISHED stuffing your board!!

LOW NOISE MOD

To enhance your build it is recommened you use this low noise mod. While it is not neccesary, it will drop the noise floor of your unit about 10dB.

This modification only requires some wire



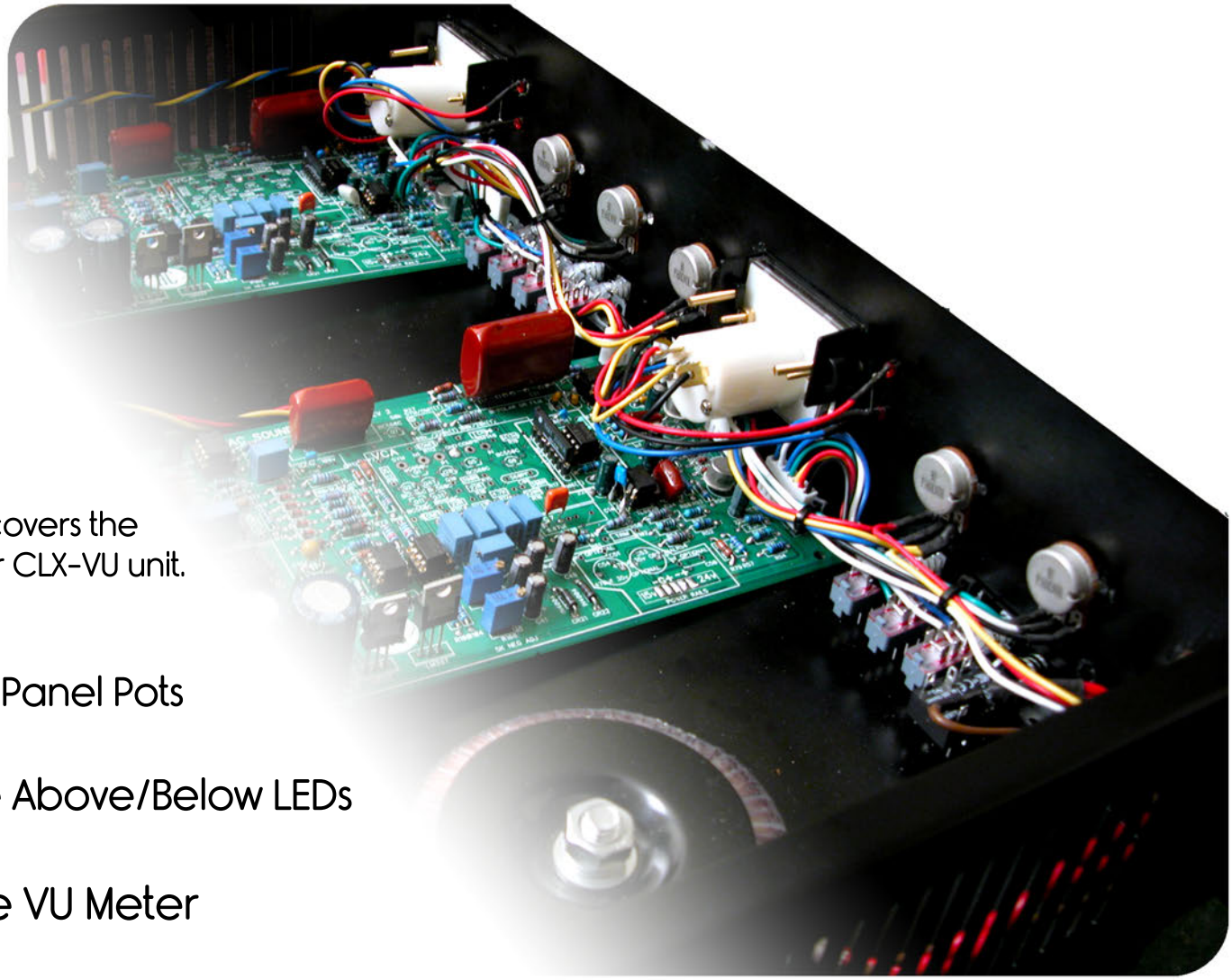
CONNECT THE GROUNDS AS SHOWN

NOTE: THIS MOD REINFORCES THE GOUNDS OF THE CIRCUIT BOARD

- Transformer center-tap to discrete vca ground.
- External Power strip ground to input ground

You can also try experimenting with what INPUT/OUTPUT pad your ground to the chassis. There are probably a number of ways to lower the noise floor using different grounding techniques, but after trying lots of options this combination gives the best results we could find.

SECTION 3 WIRING



This section covers the wiring of your CLX-VU unit. Namely:

Wiring the Panel Pots

Wiring the Above/Below LEDs

Wiring the VU Meter

Wiring the Input and Output

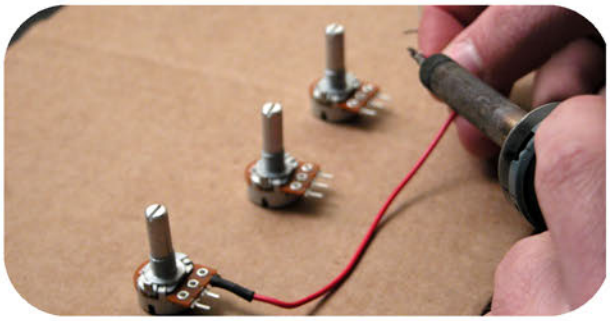
Wiring the Meter Switches

Wiring the Power Transformer

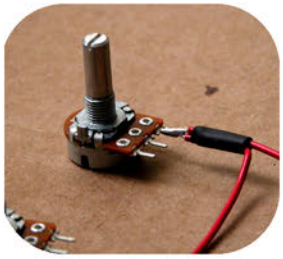
NOTE: WHEN ASSEMBLING YOUR UNIT IT IS PROBABLY BEST TO WAIT UNTIL AFTER INITIAL POWER UP AND CALIBRATION BEFORE PERMENTANTLY MOUNTING EVERYTHING IN YOUR CASE. ALSO YOU MAY CHOOSE TO ARRANGE THE BOARDS IN YOUR CASE DIFFERENTLY THAN PICTURED.

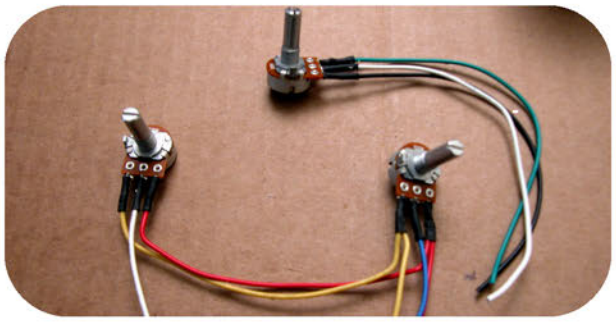
WIRING THE PANEL POTS

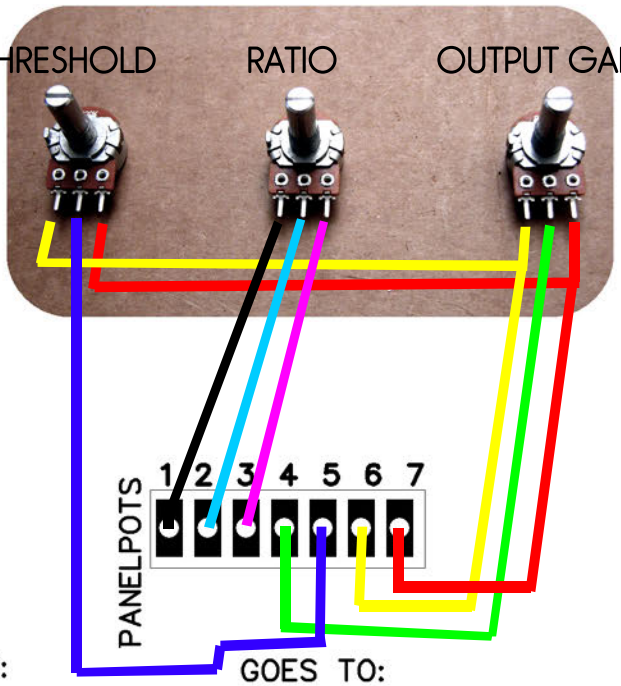
START WITH THREE 20K LINEAR POTS



EXAMPLES OF SOLDERING

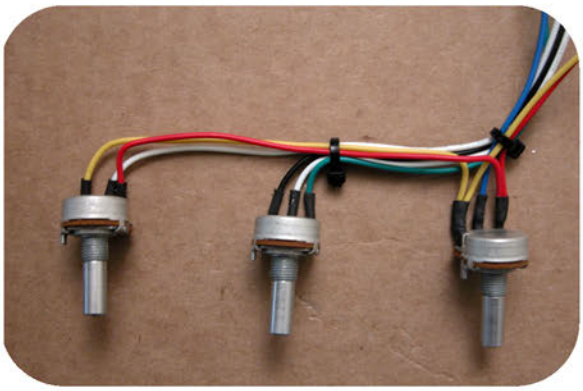






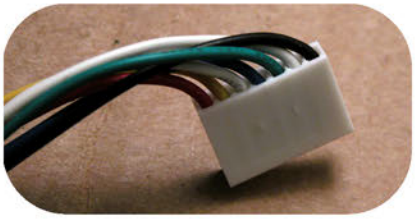
PIN #:	GOES TO:
PIN 1	RATIO POT (CCW)
PIN 2	RATIO POT (CENTER WIPER)
PIN 3	RATIO POT (CW)
PIN 4	GAIN POT (CENTER WIPER)
PIN 5	THRESHOLD POT(CENTER WIPER)
PIN 6	THRESHOLD POT(CCW) AND GAIN POT(CCW)
PIN 7	THRESHOLD POT(CW) AND GAIN POT(CW)

WIRE ACCORDING TO TABLE AND PICTURES



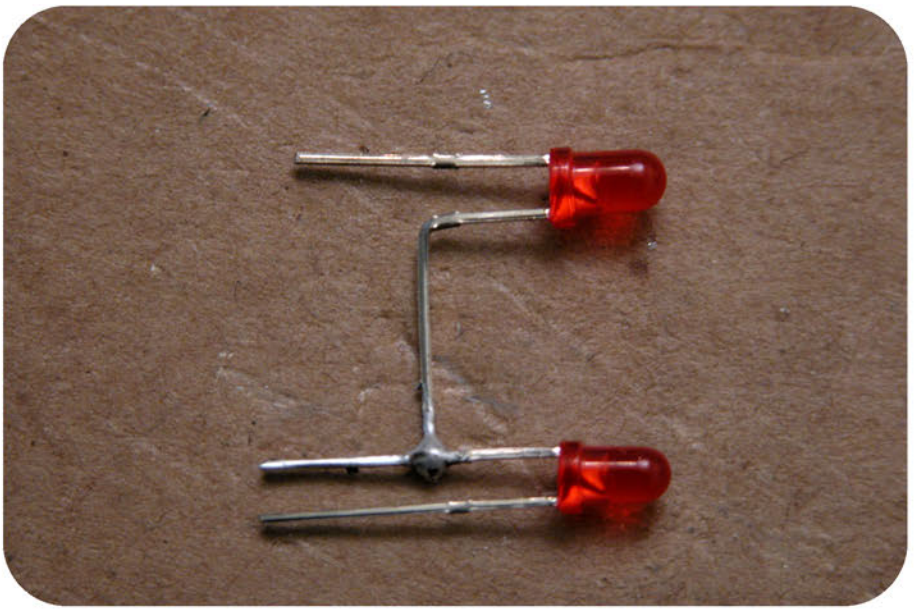
PICTURES OF PANEL POTENTIOMETER ASSEMBELY

NOTE: IF USING CENTER-DETENTED KNOBS USE THOSE FOR MAKE UP GAIN.



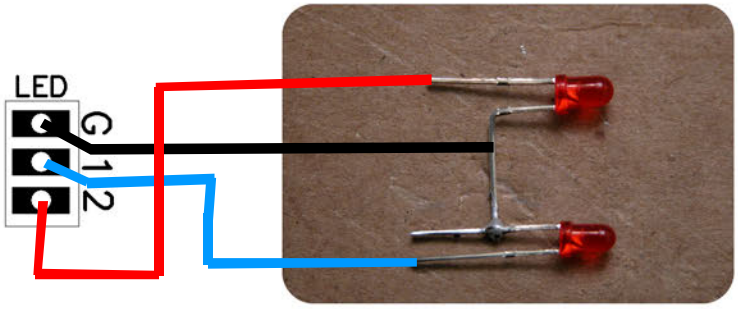
WIRING ABOVE/BELOW LEDS

REMEMBER: The anode (+) of an LED is the long LEAD (like on electrolytic capacitors) and the small side in the LED houseing

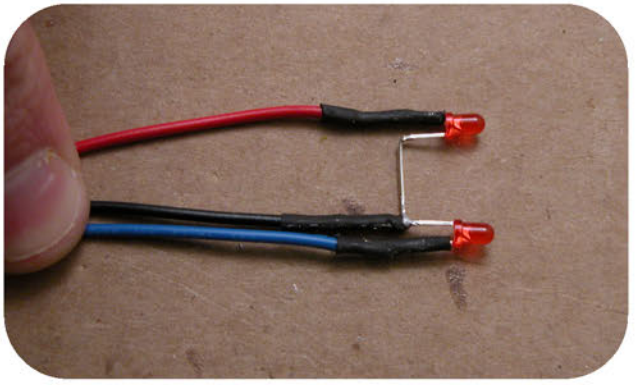


Prepare your two LEDS as show. With the Anode (+) of the above LED going to the Cathode (-) of the below LED

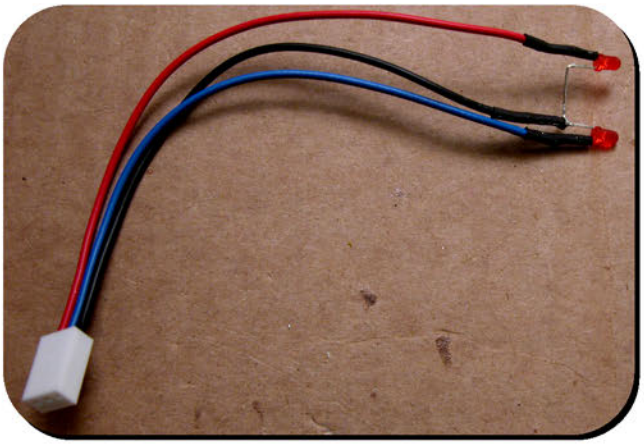
PIN:	GOES TO:
PIN G	BELOW LED (-) AND ABOVE LED (+)
PIN 1	BELOW LED (+)
PIN 2	ABOVE LED (-)



LED HOOK-UP DIAGRAM



FINISHED LED ASSEMBLY

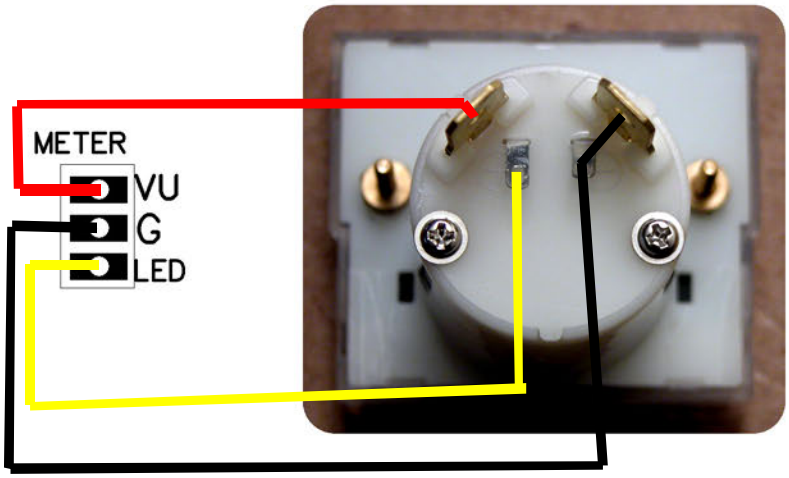


WIRING THE VU METER

The VU meter in your CLX-VU unit should be a DC 1ma or a DC 0.1ma meter. The unit requires a custom scale that can be printed out. It goes from -40dB to +20dB!

PIN:	GOES TO:
PIN VU	(+) ON METER
PIN G	GROUND FOR METER/LEDS
PIN LED	TO + LED ON METER

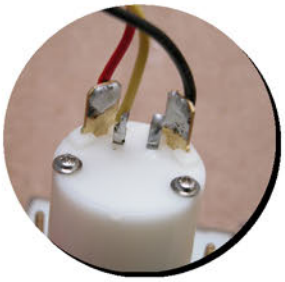
Note:
If using a 1ma DC meter use a 1k resistor for R107.
If using a 0.1 ma use a 10k resistor for R107.



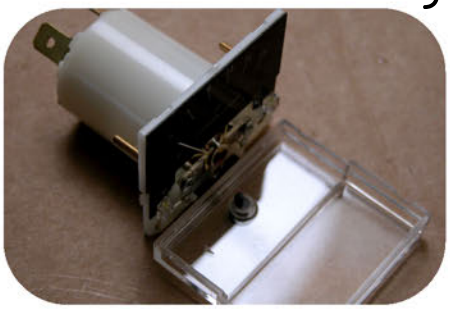
If using a meter with built in LEDs connect a wire across R1.

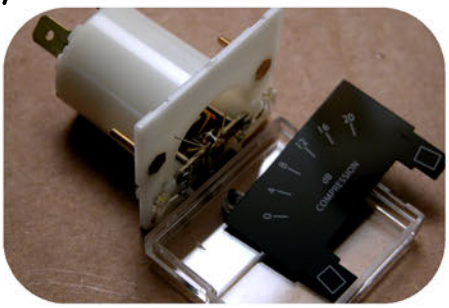
R125 controls LED brightness. For Brighter LEDS use 10k.

If using a meter with Lamps use 100ohm 1/2watt for R1 and wire for R125



Inserting your own custom meter scale



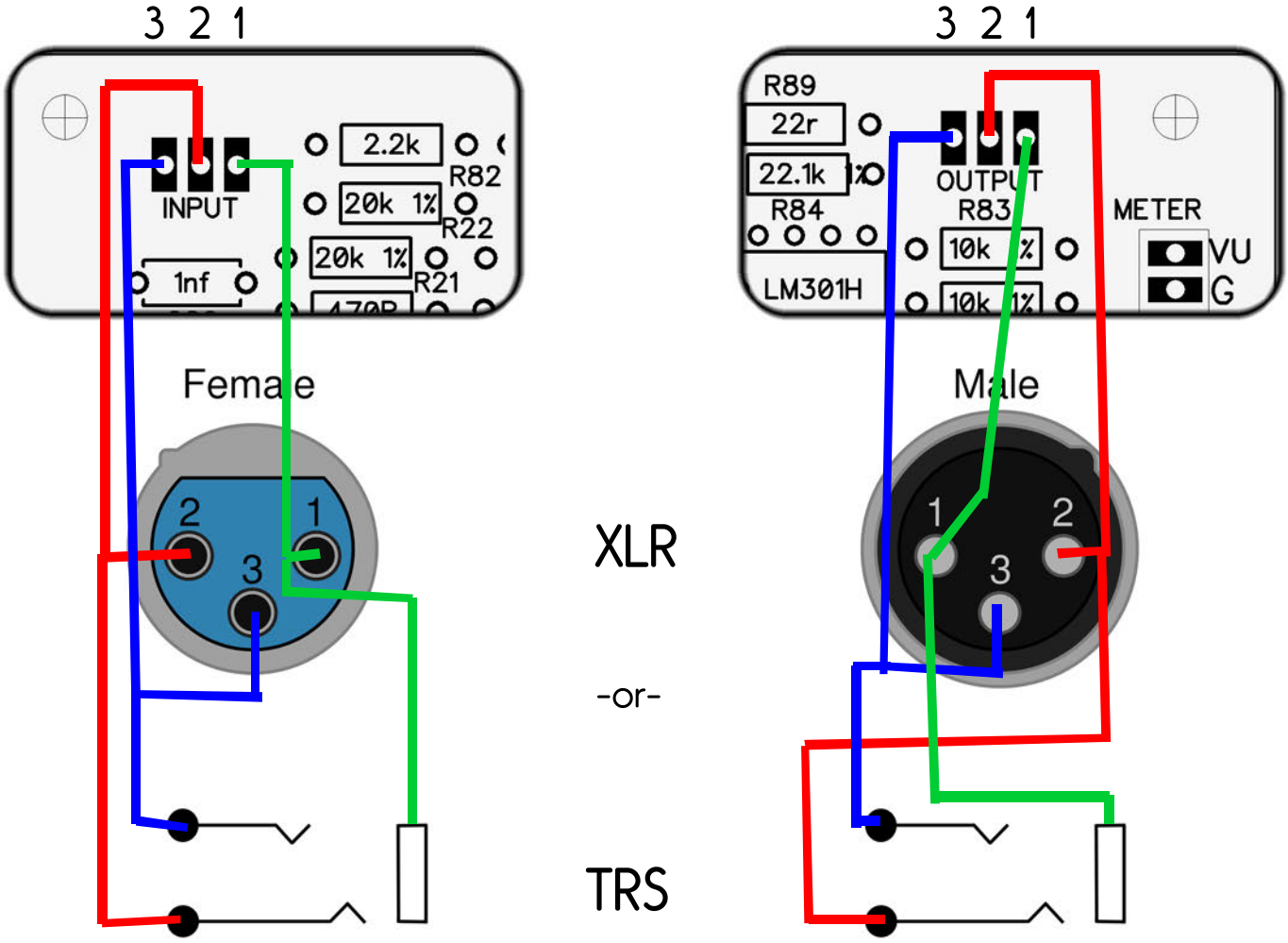


SEE NEXT PAGE FOR METER PRINT OUTS

VU CUSTOM SCALE INSERT

WIRING THE INPUT AND OUTPUTS

The inputs and outputs of the CLX-VU compressor are electronicly balanced. This means the reject noise but reqiure 3 conductors. The input/output pins are not labeled on the board but just remeber ground is the pin closest to the side of the board with all the molex connectors for the pots and switches are. The middle pin is the Hot pin and the far left pin is the nuetral or common pin.



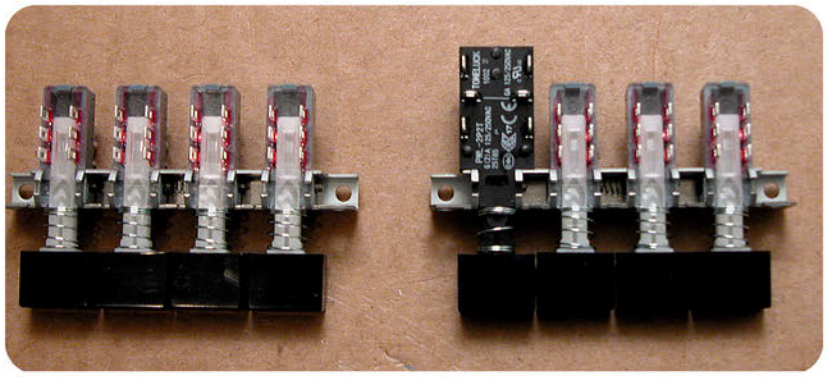
PIN:	GOES TO:
PIN 1	GND
PIN 2	IN (+)
PIN 3	IN (-)

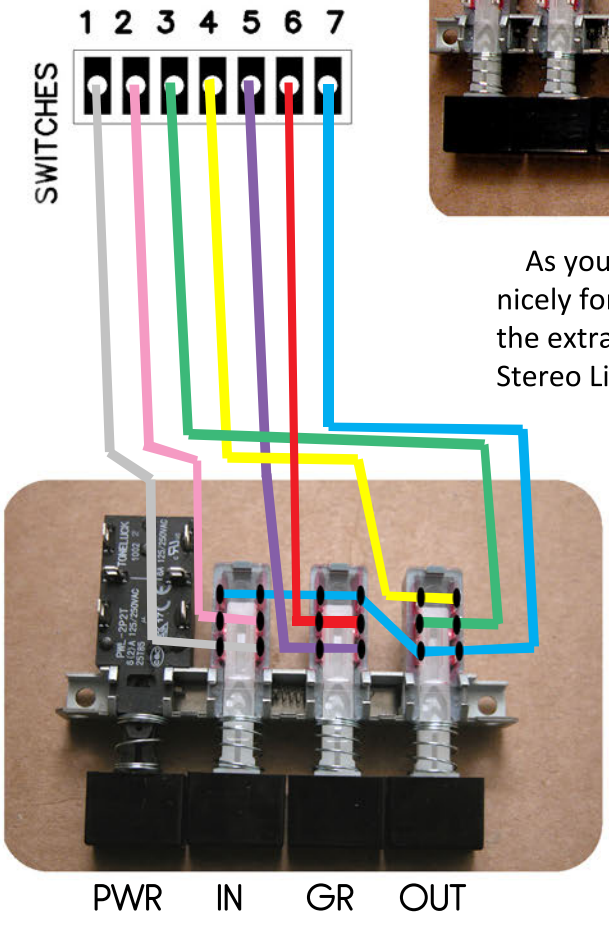
PIN:	GOES TO:
PIN 1	GROUND
PIN 2	OUTPUT (+)
PIN 3	OUTPUT (-)

NOTE: It is a good idea to tightly twist the wire connecting the jacks to the PCB for best noise performance. Also when mounting the AC power and you find you need to cross input/output lines it is a good Idea to cross at a 90 degree angle and also remember in this design the output wires are less susceptible to noise than the input wires.

WIRING THE METER SWITCHES

Correctly wiring the meter switches is an important step to getting your meter working correctly. You first need to decide how what order you will want your switches to be in. The original unit had it switches (in order from left to right) IN/OUT/GR.
You might choose to wire your units in IN/GR/OUT as it seems to make more logical sense and some premade cases are slikscreened in this manner. Either wway the basic idea is the same.

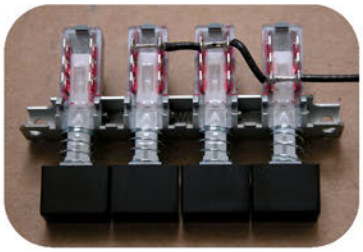


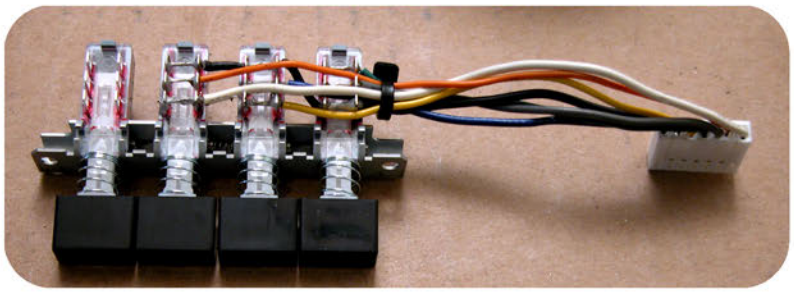


As you can see we think 4 gang switches work nicely for this project. They are readily available and the extra switch allows for a power switch and a Stereo Link if creating a stereo unit.

PIN #	GOES TO:
PIN 1	IN - NOT ENGAGED
PIN 2	IN - MIDDLE
PIN 3	OUT - MIDDLE
PIN 4	OUT - ENGAGED
PIN 5	GR - NOT ENGAGED
PIN 6	GR - MIDDLE
PIN 7	IN - ENGAGED, OUT - NOT ENGAGED, GR - ENGAGED

COMPELTED SWITCH ASSEMBLY



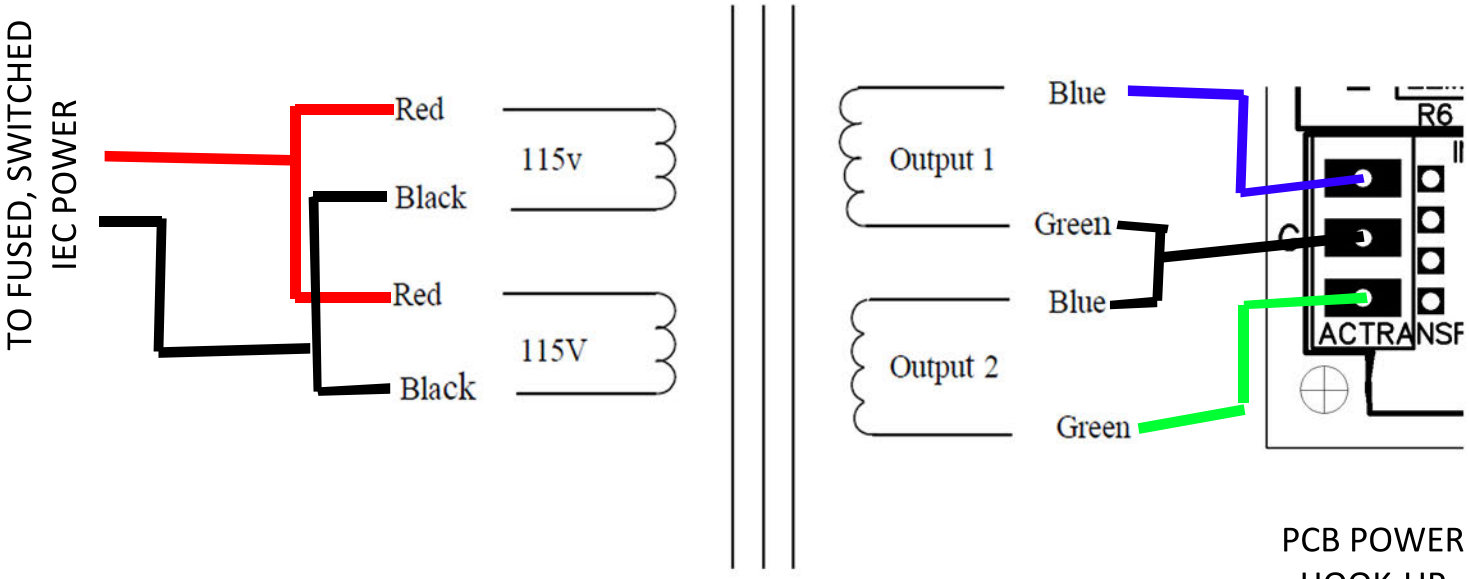


NOTE: Depending on how you choose to mount your PCBs your switch wiring might look different.

WIRING THE POWER TRANSFORMER

REMEMBER! ELECTRICITY KILLS! NEVER WIRE UP POWER WITH THE POWER ON! NEVER POWER ON WITHOUT ALL WIRES PROPERLY INSULATED.

EVEN CHUCK NORRIS IS CAREFUL!



PCB POWER HOOK-UP

You will need a power transformer that is rated at 18v - 0 - 18v. And is capable of outputing at least 25VA per CLX-VU board you want to power. Example: if you wanted to run 2 CLX-VU PCBs from one transformer your transformer should be rated at least 50VA.

Choosing a fuse:

1 CLX-VU PCB = 0.25amp

2 CLX-VU PCB = 0.5amp

NOTE: When hooking up more than one CLX-VU circuit board to one transformer be sure to run the wires in parallel from the transformer. This ensures that each PCB is recieving the power it needs from the transformer.

SECTION 4

CALIBRATION

Remember all those trimmers you had to install and solder? Well now you are going to have to painstakingly adjust each one. Don't its not too hard, just take a step at a time and once your done you should never have to do it to your unit again!

STEPS OF CALIBRATION

Power up and adjustment
Power Rails

RMS and Level Calibration
RMS Unit
RMS Symmetry
Level Calibration
Threshold Calibration

Meter Calibration
Meter Circuit Emualtion calibration
Meter Calibration
Input and output calibration
GR calibration

TEST EQUIPMENT NEEDED

SMALL SCREWDRIVER

MULTIMETER

OSCILLISCOPE (OR EQUIVALENT FREE COMPUTER SOFTWARE)

HARMONIC DISTORTION METER (OR EQUIVALENT FREE SOFTWARE)

A VU METER (OR A MULTIMETER CAN WORK IF YOU DON'T HAVE AN EXTRA VU LAYING AROUND)

FOR CALIBRATION OF THE CLX-VU THE NEG(-) PIN OF THEOUTPUT SHOULD BE GROUNDED.

NOTE: IT IS PROBABLY A GOOD IDEA TO WAIT MOUNTING YOUR CIRCUIT AND SWITCHES IN YOUR CASE TILL AFTER POWER UP AND CALIBRATION. THIS MAKES CALIBRATION AND POTENTIAL TROUBLESHOOTING EASIER.

POWER UP AND ADJUSTMENT

So this is the moment you've been waiting for. The intial power up of you CLX -VU! Maybe you feel like a gambler with the dices loaded, or like a kamakzi fighter pilot. Either way double check all your connections and measure the resistance between the power rails and make sure it is above at least 1000 ohms to avoid any obvious shorts. (if it is very low try adjusting R100 and R101 the power adjustment trimmers, if that doesn't help then double check your soldering for any sodler shorts). Also at this point leave all the socketed ICs out until you confirm your power rails are working and properly adjusted.

FIRST STEPS

Your unit should now pass audio.

The controls should respond as expected, and the unit should compress.

At this point your meter should not be responding. That is because we left R109 disconnected.

The Above and Below lights should behave as expected.

MEASURE RESISTANCE BETWEEN POWER RAILS. SHOULD BE HIGHER THAN 1000 OHMS.

LEAVE OUT ALL SOCKETED ICS UNTIL POWER RAILS ARE ADJUSTED.

ADJUST POWER WITH R100 AND R101 TO +/- 50 mV OF 15 VOLT RAILS.

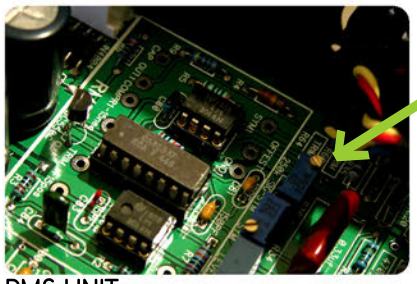
POWER OFF, INSERT ICS CORRECTLY AND APPLY POWER AND RE ADJUST R100/R101.

ALLOW UNIT TO WARM UP FOR 15 MINUTES OR SO AND DOUBLE CHECK VOLTAGES. READJUST IF NECCISARY.

NOTE: IF YOUR UNIT IS NOT WORKING CORRECTLY, DON'T WORRY 9/10 IT IS SOMETHING SIMPLE. GO BACK AND CHECK EVERYTHING METHODICALLY. ALSO CONSULT THE TROUBLESHOOTING SECTION.

CALIBRATING THE RMS UNIT

The RMS unit could be called the heart of your compressor. It is waht converts your audio into a DC control voltage. If your RMS unit is off the whole CLX-VU is going to sound a little off. To avoid this we are going to calibrate the RMS unit using R36.



RMS UNIT


RMS UNIT WITH OFFSET PIN PROBED.

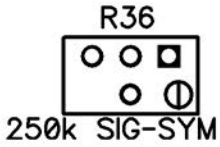
Things you will need:
Small screwdriver
Signal generator
Oscilloscope

STEPS

1) INSERT A -60 dB 100HZ SINE WAVE AT THE INPUT OF YOUR UNIT.

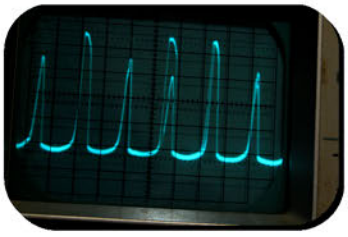
2) PROBE THE "OFFEST PIN" OF THE RMS UNIT WITH AN OSCILLOSCOPE.

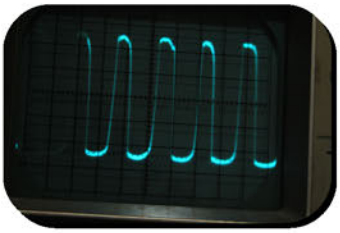
3) ADJUST R36 UNTIL WAVEFORM IS SYMMETRICAL.

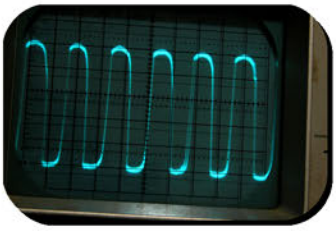


If you don't access to a real oscilliscope / signal generator you can try a software version and a soundcard such as:

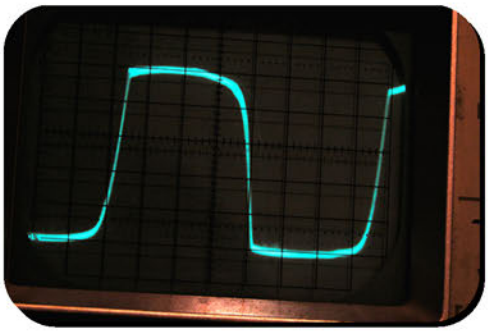
http://www.zeitnitz.de/Christian/scope_en


Waveform mis-adjusted


Getting closer


Looks better

NOTE: Sometimes if there is nothing on your oscills-cope try adjusting R36 till a waveform appears.


Zoom in and adjust till waveform is Symmetrical.

GREAT!

RMS SYMMETRY

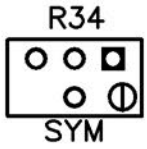
STEPS

1) Get Rightmark AudioAnalyzer software:
http://audio.rightmark.org/index_new.shtml
(or a distortion meter)

2) Set the test tone of RMAA to 100Hz, and start the "Playback/Recording" screen, so its beeping its test tones.

3) Adjust your unit so its compressing about 20db.

3) Look on the screen at the 2nd harmonic and 3rd harmonic distortion. Adjust R34 until lowest distortion is achieved.

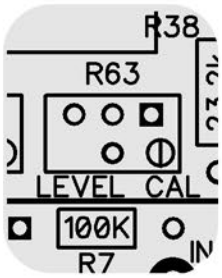


LEVEL CALIBRATION

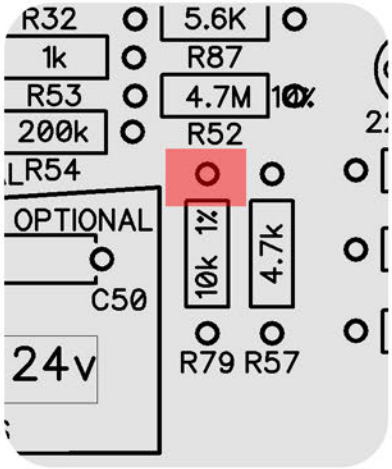
STEPS

1) Set oscillator to 100 Hz @ 1.228 VRMS and apply to input of the CLX-VU

2) Turn R63 until the voltage at the end of R79 is -0.011 VDC



R36



TEST POINT

THRESHOLD KNOB ADJUSTMENT:

WITH THE 1.228VRMS SIGNAL STILL ON INPUT TURN THRESHOLD CONTROL TILL BOTH FRONT LEDs ARE OFF.

ADJUST KNOB TILL IT READS JUST PAST 1V OR ABOUT 90% ROTATED CLOCKWISE.

1:4 RATIO CALIBRATION

1) Adjust RATIO control to 4 and THRESHOLD all the way counterclockwise.
2) Input the CLX-VU with a -30dB 100hz sinewave with no compression. Adjust output for a convient reading on an external VU meter (-30dB)
3) Step-up output of oscillator to +10dB
3) Output of CLX-VU should be only be 10dB louder. Adjust R43 until this is true.

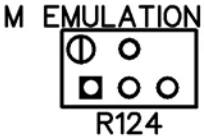
METER CALIBRATION

Now time for the Meter calbration. The first step is to set up our “center-detented” meter emulation circuit. Then we need to calibrat the unit for input, output and gain reduction. Its al very simple if you just take it a little at a time!

METER EMULATION CALIBRATION

1)Confirm that the right side of R109 disconnected.

2)Adjust R124 until the meter reads “0”.



3) Connect R109

GR & INPUT CALIBRATION

1) Set oscillator to 100Hz @ 1.228VRMS

2) Set “THRESHOLD” clockwise, “RATIO” counter-clockwise and set meter into “GR” mode.

3) Adjust R51 for “0” on the meter.

4) Set meter to “IN” and adjust R62 for “0” on the meter.

Rinse and Repeat.

ENJOY!

OUTPUT KNOB ADJUSTMENT

WITH 1.228VRMS ON INPUT SET METER INTO “OUTPUT” MODE.

ADJUST GAIN CONTROL SO METER READS “O”.

ADJUST KNOB IF NECESSARY.