FiveFish

Studios

PSU-2448Plus+
Assembly Guide

Revision 1.03 - 20210628

FiveFish Audio

www.fivefishaudio.com

Dear Customer,

Thank you for purchasing our PSU-2448Plus+ Power Supply Kit.

Great care has been taken to make this assembly guide complete and as accurate as possible. Our goal is to make your assembly work easy and trouble-free, and deliver to you a working, reliable, and high-performance power supply.

This assembly guide is a work in progress and we're continually working to improve it. As always, we welcome the input of the DIY community if you have any comments, suggestions, or additional information that you think will be helpful for inclusion in this assembly guide.

If you have any questions that are not covered by this assembly guide, please feel free to contact us at www.fivefishaudio.com, or via our facebook page.

Sincerely,

FiveFish Team

SAFETY CONSIDERATIONS

GENERAL

This assembly guide must be reviewed for familiarization with safety markings and instructions before assembly of the power supply kit.

BEFORE APPLYING POWER

Verify that all components and parts are inserted in the right location and correct orientation. Verify that the power transformer wiring is configured correctly to match the available AC line voltage in your country, i.e. wired correctly for either 110Volt or 220Volt operation.

SAFETY EARTH GROUND

An uninterruptible safety earth ground must be provided from the AC power source to your power transformer.

WARNING

The WARNING sign denotes a hazard. Pay attention to the procedure, instructions, or the like, which if not correctly performed could result in damage to your equipment, electronic component or personal injury.

WARNING

Any interruption or disconnection, or lack of connection of the protective earth terminal/safety ground may cause a potential electric shock hazard that could result in personal injury. (Grounding one conductor of a two conductor outlet is not sufficient protection). Connect the safety ground of your AC wall outlet to the metal case of your power supply enclosure.

Some voltage adjustments described in this assembly guide require power to be applied to the power supply unit.

Capacitors on the power supply board may still be charged even if the unit has been disconnected completely from it's source of power, i.e. unplugged from the wall, or switched off.

Properly drain the capacitor charge using a bleed resistor of sufficient power wattage and measure with a voltmeter/ multimeter to verify that no high voltages are present after disconnection from the main power source.

For continued protection against fire hazard, replace the fuse(s) with proper rating applicable for your chosen power transformer VA rating. Do not use repaired fuses or short-circuit the fuseholder with a wire to bypass the fuse.

GENERAL INFORMATION

1. DESCRIPTION

PSU-2448Plus+ Power Supply Kit is a four (4) rail power supply system designed to output a regulated and adjustable (+) positive, (-) negative, +48Volt, and an extra (+) fixed voltage output rail. It has a low-profile footprint, designed specifically to fit inside a 1u standard rack height.

The Printed Circuit Board is professionally manufactured, with double-sided copper layers, plated-through holes, solder mask, and silkscreen labels.

This Power Supply is designed to work with the FiveFish SC-1, X-12 Mic Preamp Kits, or any third-party preamp or opamp-based project requiring a dual split +/- power supply.

The three (3) voltage rails (V+, V-, +48V) are easily adjustable using onboard trimmers. The V+ and V- outputs can be adjusted for +/-15, +/-16, +/-18, or +/-24V projects…. or any other voltage you need.

The +48Volt DC output, used for phantom powering, can be finely adjusted to give you exactly 48 Volts.

A fourth voltage output is also available for powering auxilliary circuits. It's up to the end-user to select what voltage they want for this auxilliary output. The fourth voltage output can output either +5V, +12V, +15V or +18V, depending on the specific voltage regulator used for this section. (The only requirement is Vaux < V+ output.)

All voltage rails feature built-in current-limiting and short circuit protection provided by the 3-terminal regulator devices. The V+, V- and +48V voltage rails are additionally protected by in-line fuses against any accidental power supply short-circuit or overload/overcurrent condition.

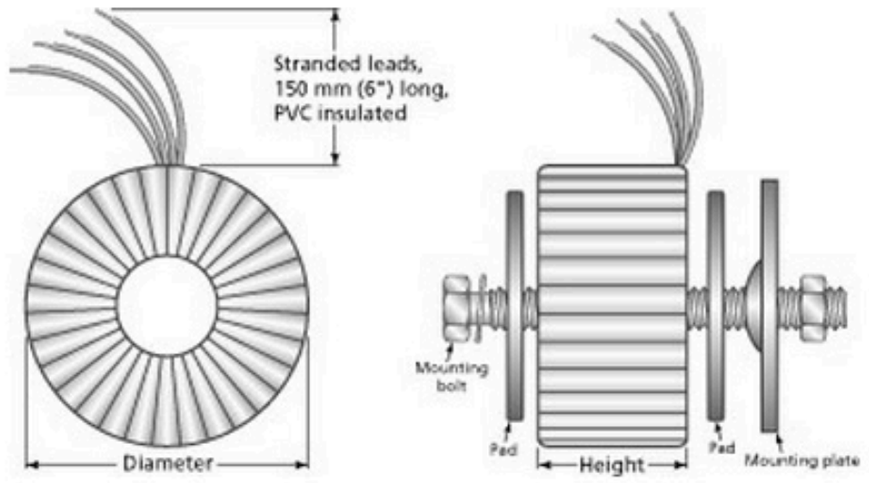
WARNING

A POWER TRANSFORMER IS REQUIRED FOR PROPER OPERATION

DO NOT CONNECT THE PSU-2448PLUS+ KIT DIRECTLY TO AC MAIN LINES

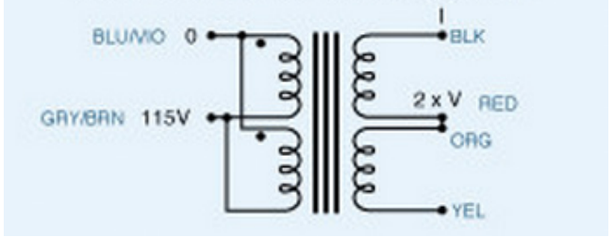
The instructions on this page are for the FiveFish Audio PWR-TRAFO kit. If you are using a different power transformer brand or model/part#, please consult your power transformer's manufacturer's documentation.

Y23 Range Transformer Mechanical Drawing

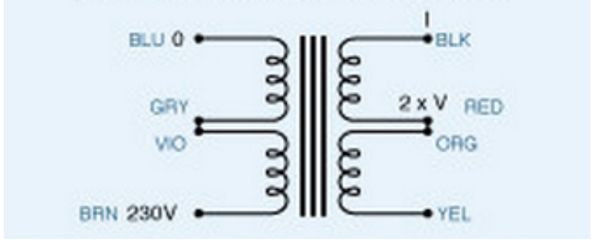


Y23 Range Transformer Mounting Specifications		
Load (VA)	Mounting Plate	Bolt
30	50 mm dia. x 1 mm thick (2.0"dia. x .04" thick)	M5 x 40 mm

110Volt Wiring Guide



220Volt Wiring Guide



2. TOOLS & EQUIPMENT REQUIRED

A few basic tools and equipment are required to assemble this kit. These basic tools are not supplied with the kit.

2.1. Soldering Iron and Lead - We recommend a temperature adjustable soldering iron. DO NOT USE A 100 WATT SOLDERING GUN. A small to medium-sized soldering tip is required to solder the small parts. You may use lead-free or 60/40 lead-based solder.

2.2 Cutter - You will need a cutter to cut component leads and wires.

2.3. Solder Sucker Pump - If you need to desolder a component, you'll need one.

2.4. Multitester - Used for measuring resistance, continuity, and voltages.

2.5. Magnifier & Lamp - I recommend a clean and well-lighted space for your assembly area.

2.6. Other Tools (not required, but nice to have) - Component lead bender, vise, tweezers, wire stripper.

3. ASSEMBLY GUIDE

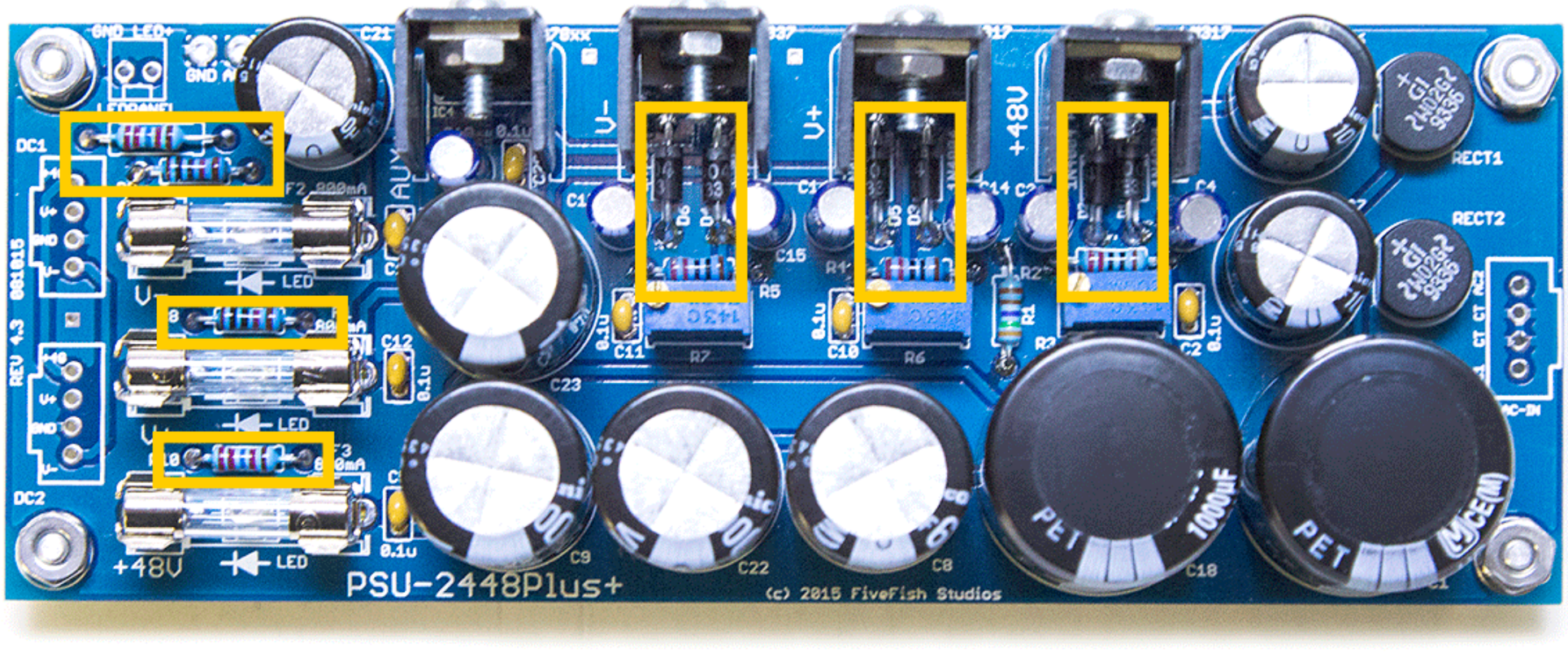
GENERAL INSTRUCTIONS: Open zip bag, insert component into board, solder.

All components are labeled in their own zip bags. There may be multiple components stored in each zip bag, with their quantity noted. The voltage regulator part numbers (LM317, LM337) are marked on the device. Make sure to insert each regulator into it's correct location.

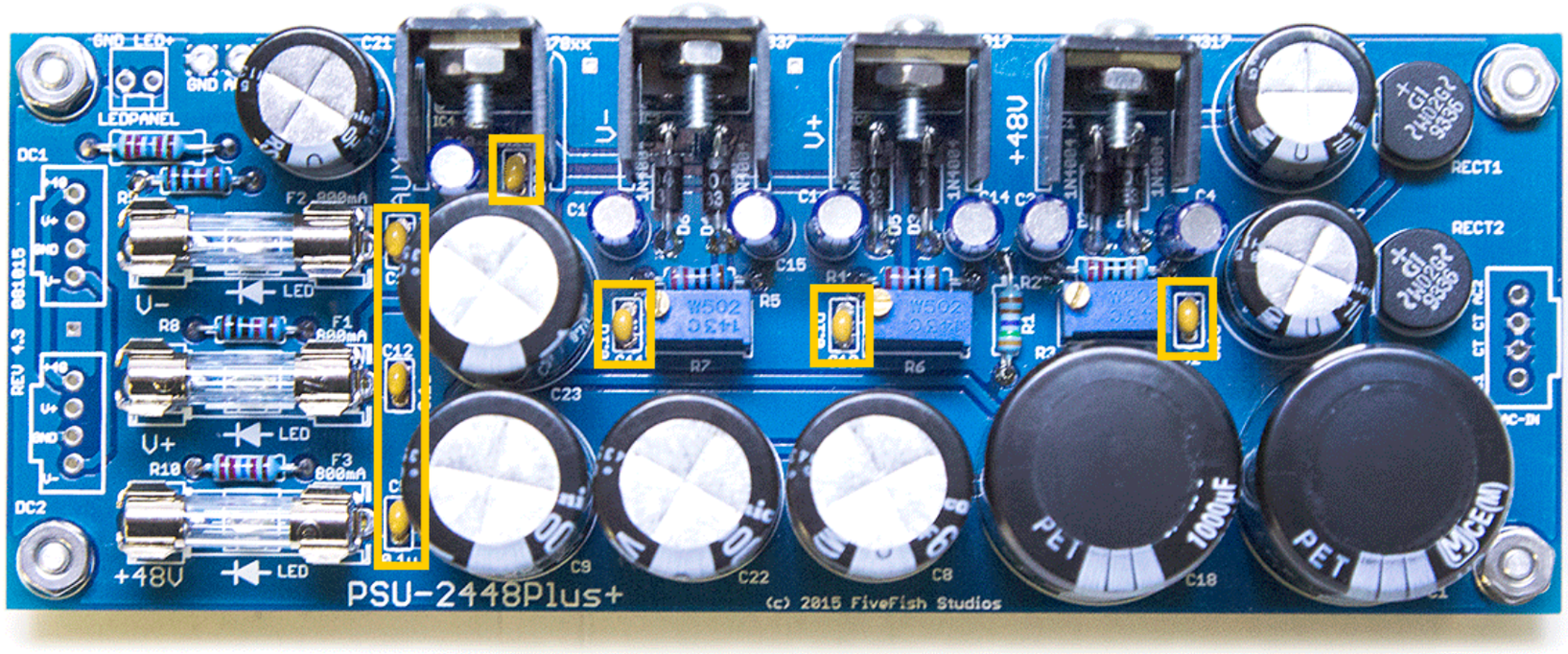
TIP: Solder smallest/shortest components first before the larger/taller components to make assembly work easier.

3.1 Solder all resistors and diodes.

WARNING Insert diodes in the correct orientation. Align the white band of diode with silkscreen on the PCB.



3.2 Solder all ceramic capacitors. These are the small yellow components.

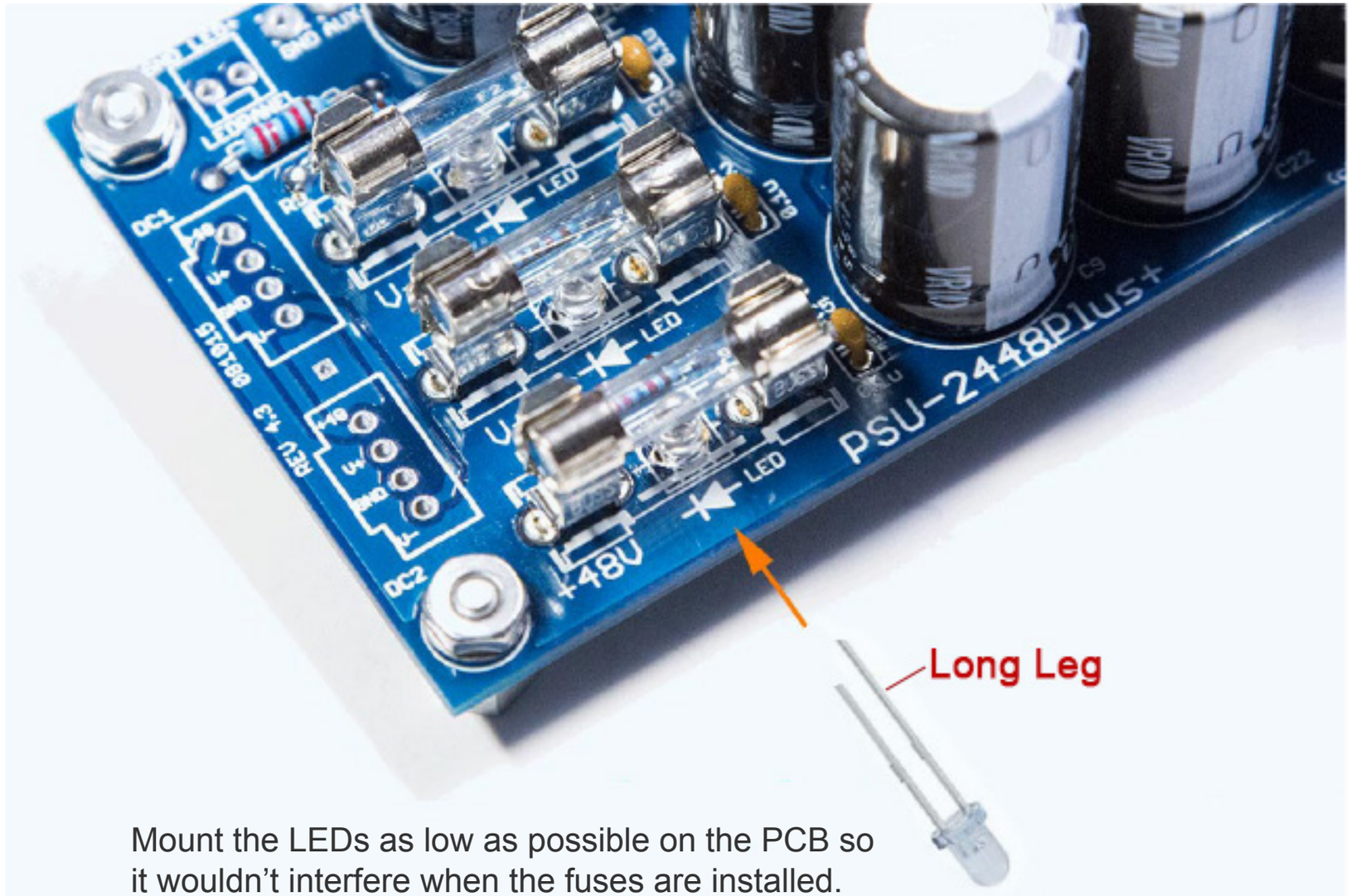


3.3 Solder Bridge Rectifiers.

WARNING The Bridge Rectifiers may be damaged if you apply too much heat for a long period of time.

3.4 Solder the (3) Light Emitting Diodes (LED).

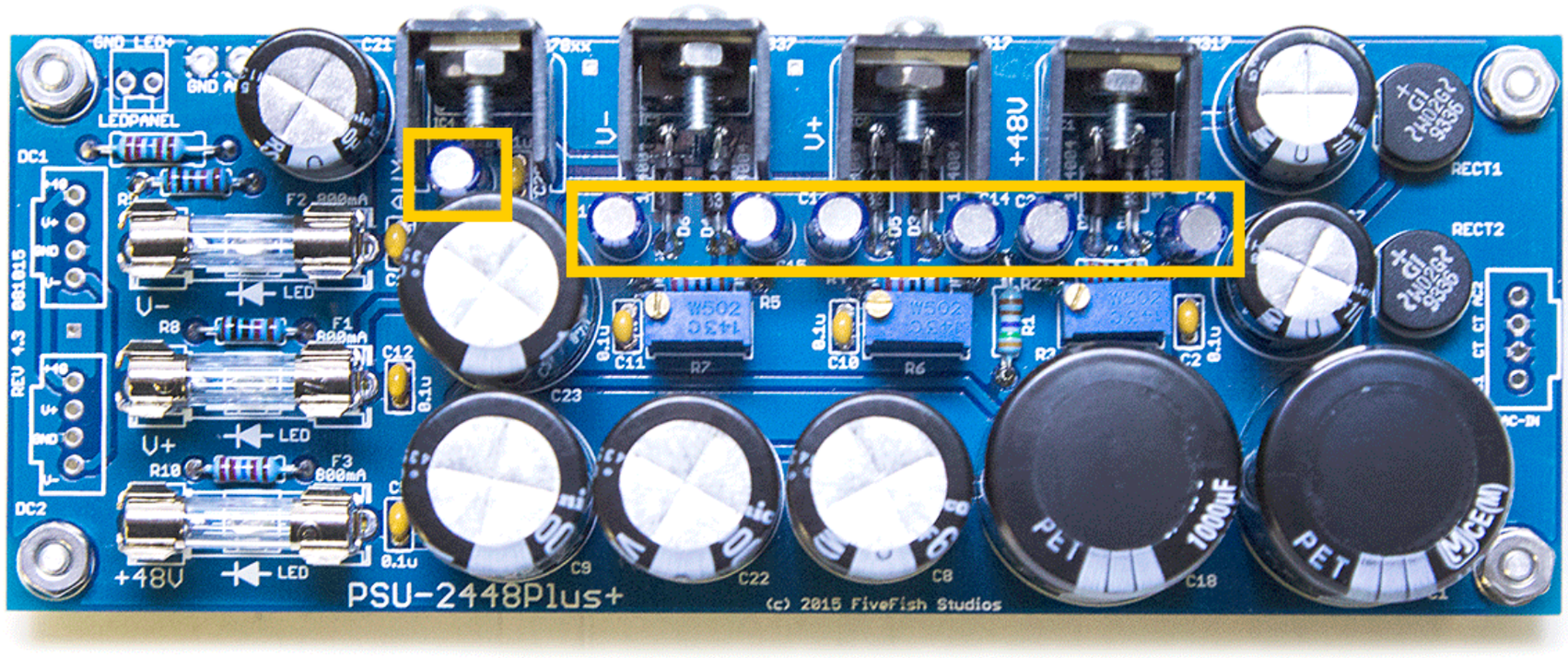
WARNING LEDs, like diodes, have polarity and must be inserted in the proper orientation. See additional photos below for correct orientation.



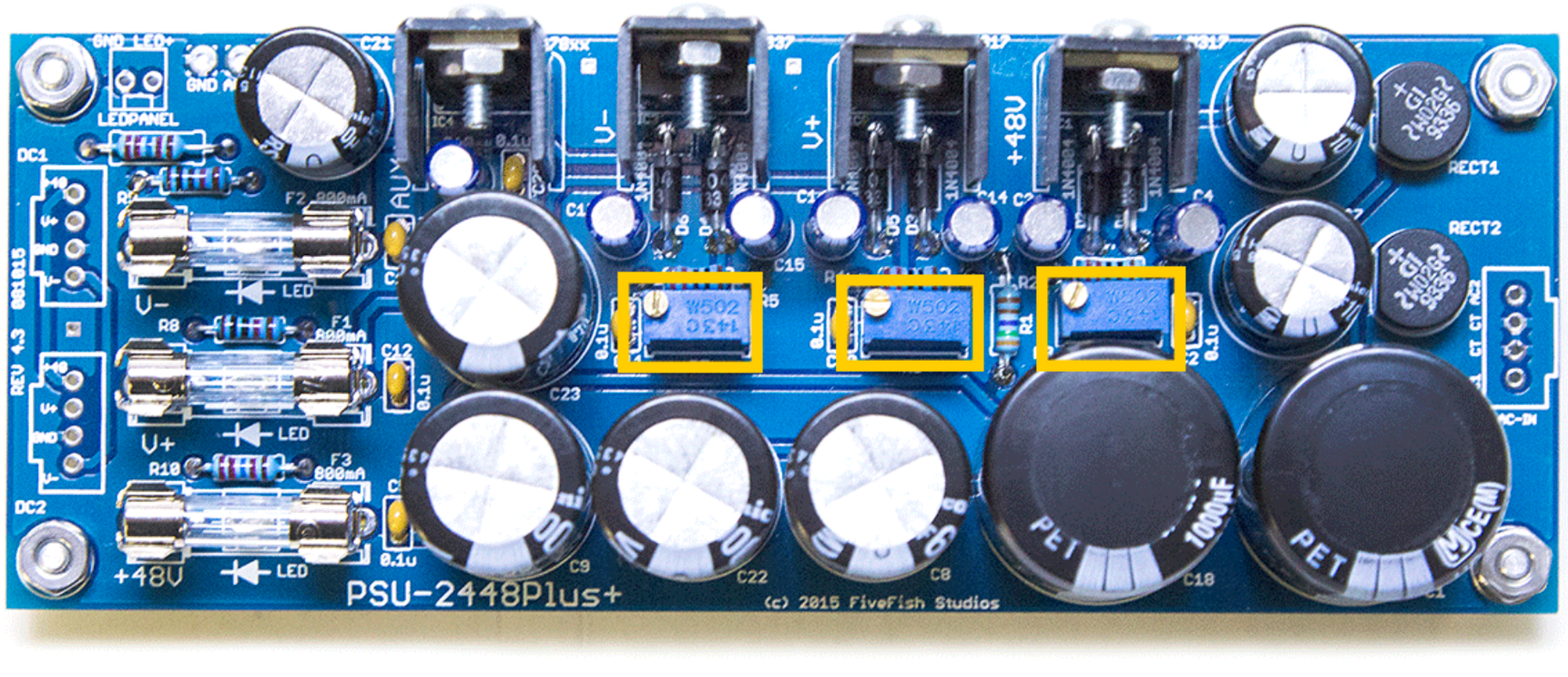
Mount the LEDs as low as possible on the PCB so it wouldn't interfere when the fuses are installed.

WARNING Electrolytic capacitors have polarity markings. One side is marked (-) negative, and the other side is (+) positive. Insert the capacitors to the PCB following the correct polarity. NOTE: All capacitors in the PSU kit are oriented in the same direction.

3.5 Solder all small electrolytic capacitors.

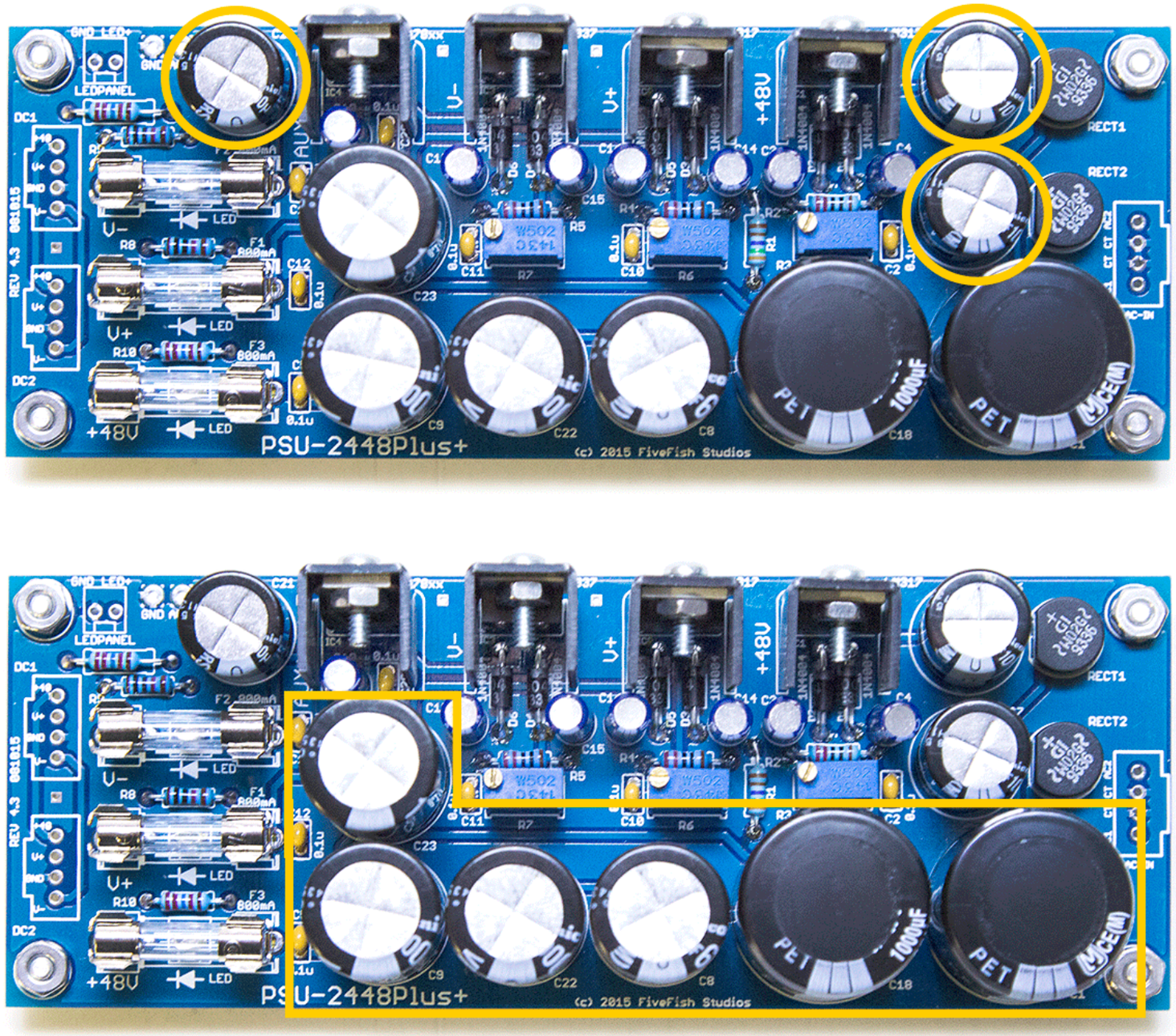


3.6 Solder all trimmer resistors. Trimmer resistors are used to adjust the final output voltages of the Power Supply Unit.



WARNING Electrolytic capacitors have polarity markings. One side is marked (-) negative, and the other side is (+) positive. Insert the capacitors to the PCB following the correct polarity. NOTE: All capacitors in the PSU kit are oriented in the same direction.

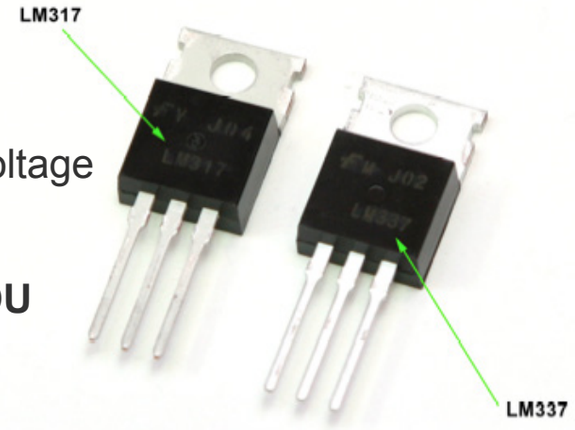
3.7 Solder all medium-sized electrolytic capacitors, then all large-sized electrolytic capacitors.
NOTE: The 1000uf/80V capacitors are twist-in type. Push them into the board with a rotating motion.



WARNING

For V+, and +48V section: Use the LM317HVT voltage regulator.
For V- section: Use the LM337 voltage regulator.
For the Vaux section: You may use any of the following -- 7805, 7812, 7815, or 7818 voltage regulators for +5V, +12V, +15V, +18Volts respectively.

DO NOT INTERCHANGE THE POSITION OF THE VOLTAGE REGULATORS OR YOU MAY DAMAGE THEM.



3.8 Solder the voltage regulators. The flat-side/metal-side of the voltage regulator should be facing towards the edge of the PCB.

3.9 Attach the provided heatsinks to the voltage regulators.

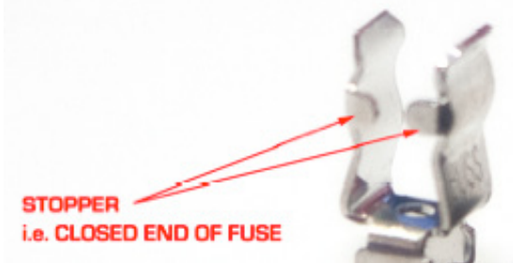
NOTE: If you use the provided heatsinks, there is no need to use TO-220 MICA or SIL-PAD insulators.

If you need to operate this power supply at higher current, or experiencing high temperatures, you may need bigger heatsinks than the ones provided in the kit. Please read note below:

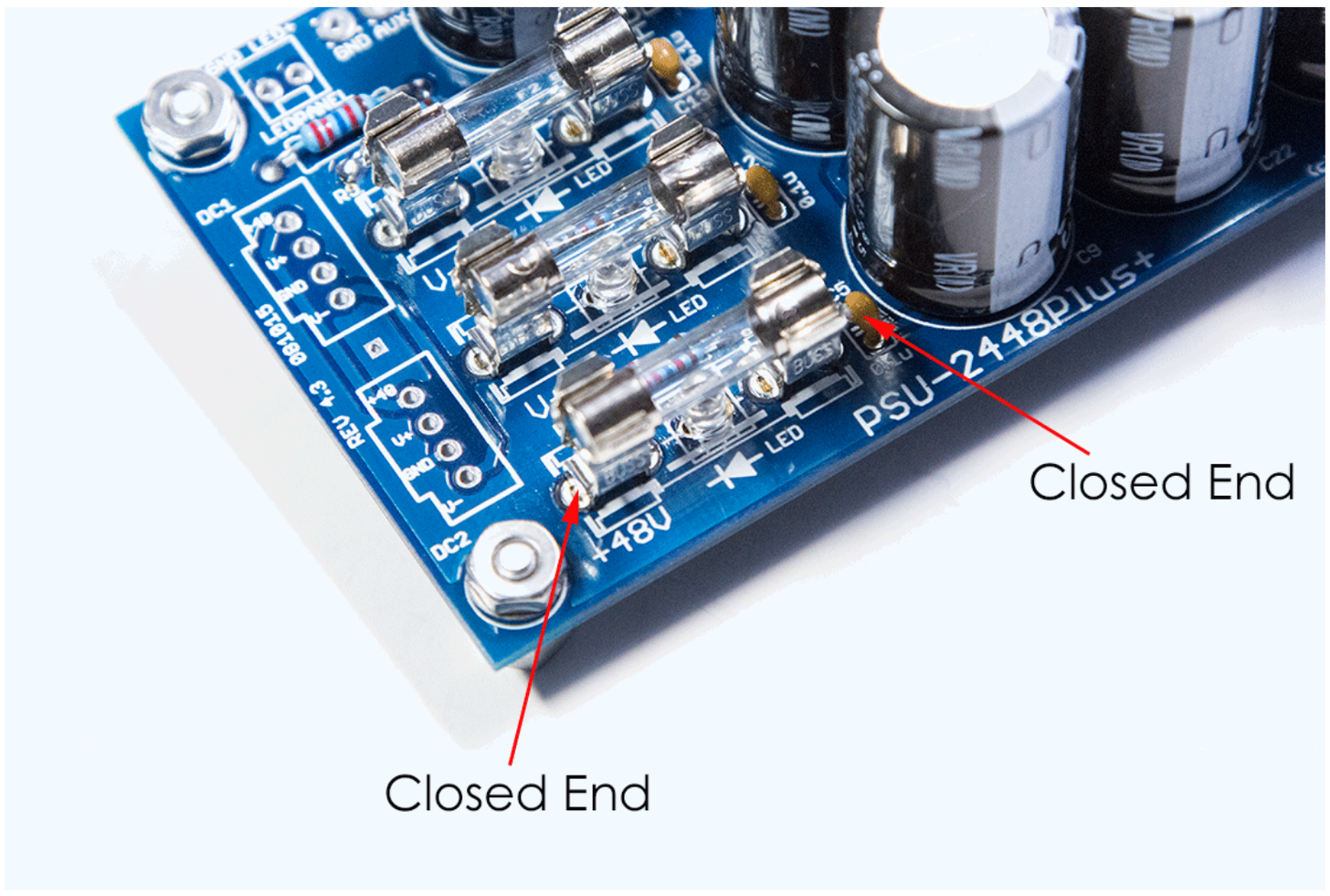
WARNING

If you want to use a single or common heatsink for all voltage regulators (for example: metal chassis case, or a big aluminum fin-type heatsink, you need to use MICA or SIL-PAD insulators and check that the regulator tab is *electrically isolated* from your aluminum or metal heatsink. **Failure to electrically isolate the metal tab from your common heatsink will result in a short-circuit and damage to your voltage regulators.**

3.10 Solder the (6) fuse clips. After soldering the fuse clips, insert the (3) fuses into the fuse holders.



NOTE: Observe the proper orientation of the fuse clip. One side has a “stopper” and the other side is completely open. The “stopper” side should be positioned at the outside edges (so the glass fuse cartridge can be inserted properly).



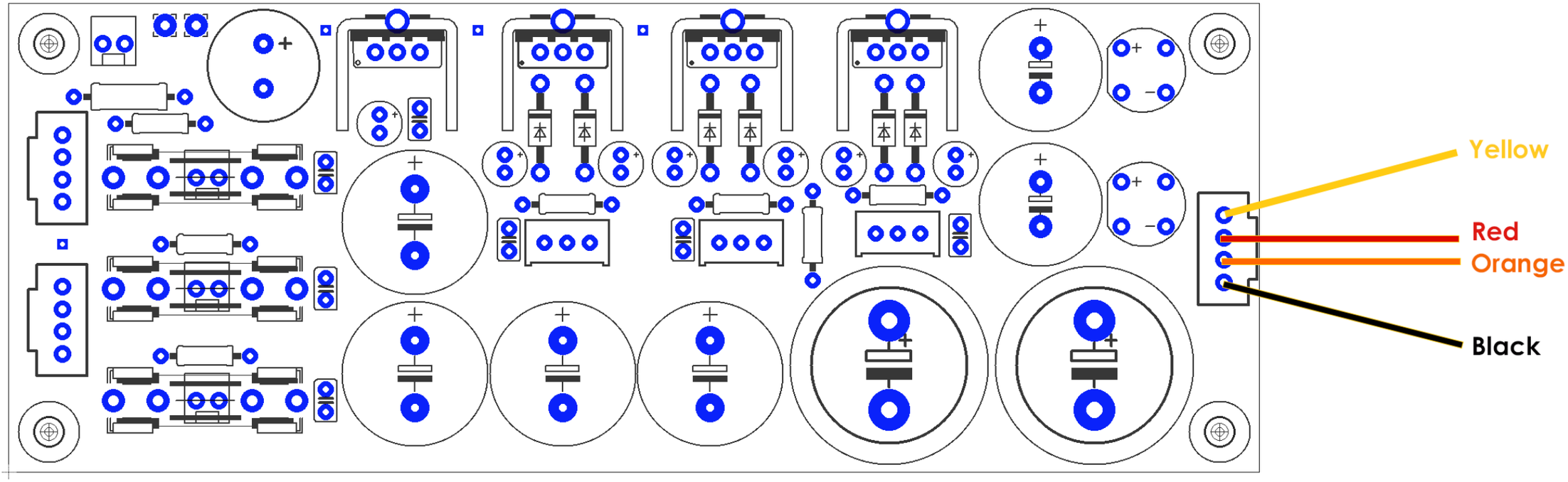
NOTE: The fuses are provided for short-circuit and overload protection. If an accidental short-circuit occured, the fuse will blow “open” before any permanent damage is done to the voltage regulators. While the regulators have built-in short-circuit protection, we think the fuses offer additional protection and will be much more convenient for the end-user to replace than a damage voltage regulator.

4. WIRING GUIDE

4.1 AC Input (from Power Transformer Secondary)

Connect the Power Supply Board to the power transformer secondary windings. Use the following wiring guide. Colors refer to the transformer secondary winding wire colors.

NOTE: Red and Orange wires are connected together at the PSU Board. You can interchange the Yellow/Black wire locations, since we're dealing with AC voltages and there is no polarity.



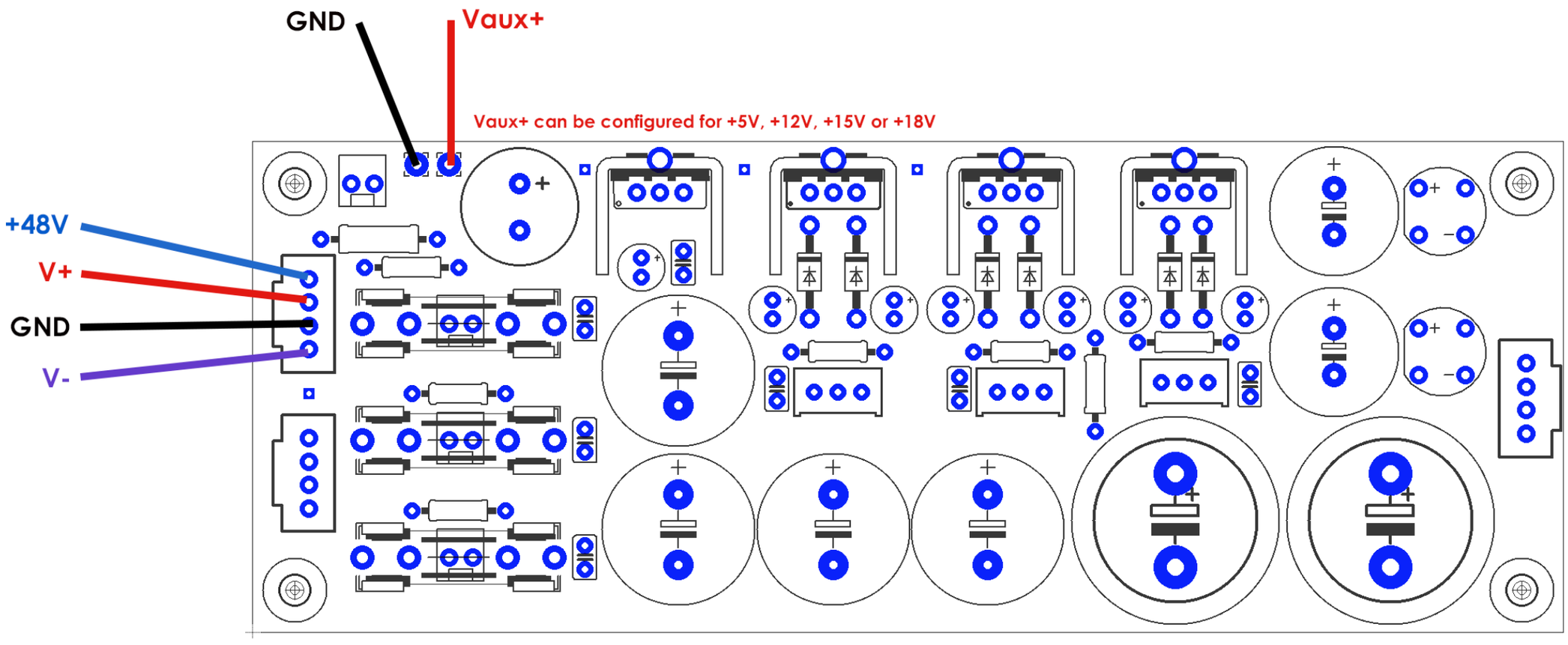
The PSU kit uses standard 0.1" pitch pads for all input and output connections. You can use standard 0.1" Molex headers to make connections.

4.2 DC Output

There are (2) power ports available on the PSU board. They are identical and the same.

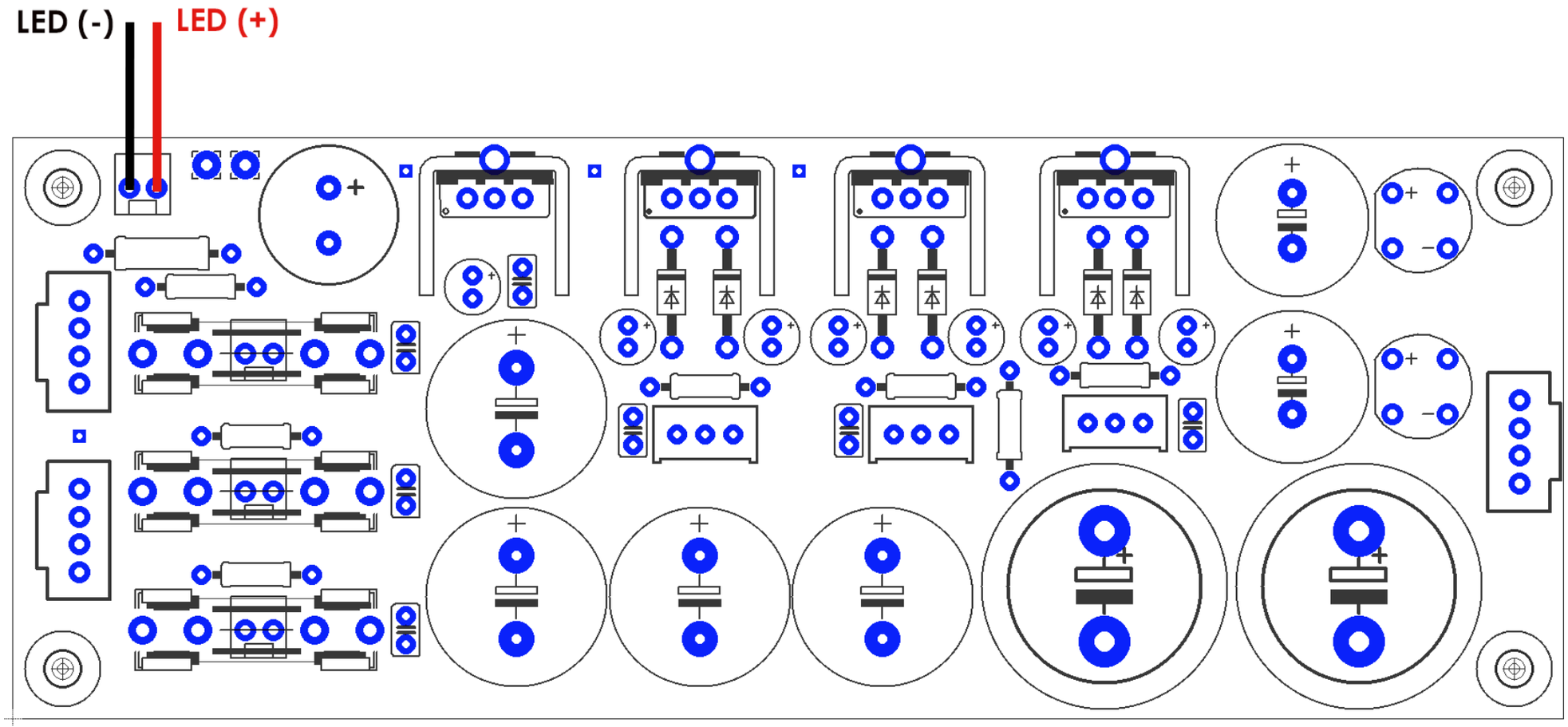
Vaux+ output can be configured by using the appropriate voltage regulator part# for IC4 location.

+ 5V -- 7805 Voltage Regulator in IC4 location
+12V -- 7812 Voltage Regulator in IC4 location
+15V -- 7815 Voltage Regulator in IC4 location
+18V -- 7818 Voltage Regulator in IC4 location



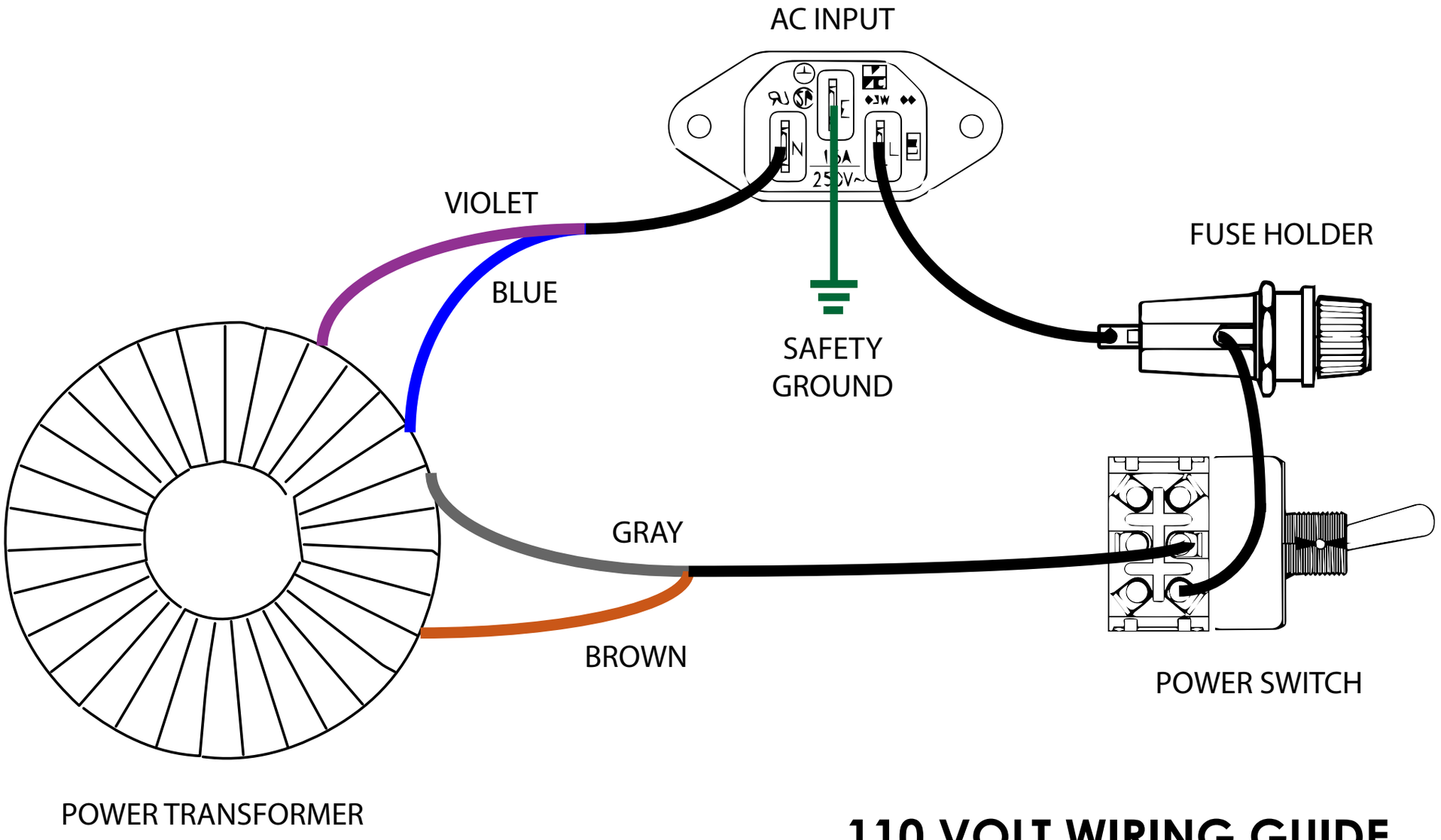
4.3 Panel LED

For your convenience, solder pads are provided for wiring to a Panel LED to indicate Power ON. You may replace the resistor behind the LED headers if you need more/less current for your chosen LED indicator. The supply voltage is 48V. Compute for the appropriate value of R using the formula R = V x I ; where I is the current required for LED illumination.



4.4 Power Transformer Primary / High Voltage AC Wiring Guide

WARNING If you are not comfortable following this step, please hire a professional electrician to complete this section. You will be working with high-voltage AC mains line. Depending on your location, this may be 110Volts or 220Volts. These voltages can seriously injure or kill and I strongly suggest following all safety precautions.



110 VOLT WIRING GUIDE

For 220V Wiring Guide, refer to page 6 of this assembly guide.

5. ADJUSTMENT AND CALIBRATION GUIDE

Equipment Required:
Multimeter or Voltmeter
Test Leads or Probe

5.1 Adjustment procedure for +48V output

Set multimeter to DC Volts reading.
Connect multimeter (+) probe lead to DC1-pad1 (labeled +48V).
Connect multimeter (-) probe lead to DC1-pad3 (labeled GND).
Adjust R3 trimmer until you get a reading of +48 Volts.

5.2 Adjustment procedure for V+ output

Set multimeter to DC Volts reading.
Connect multimeter (+) probe lead to DC1-pad2 (labeled V+).
Connect multimeter (-) probe lead to DC1-pad3 (labeled GND).
Adjust R6 trimmer for your desired output voltage.

5.3 Adjustment procedure for V- output

Set multimeter to DC Volts reading.
Connect multimeter (+) probe lead to DC1-pad4 (labeled V-).
Connect multimeter (-) probe lead to DC1-pad3 (labeled GND).
Adjust R7 trimmer for your desired output voltage.
Note: Polarity will be reversed and you will get a negative voltage reading.

5.4 Fixed Output - Vaux

Vaux is a fixed voltage output. Use the table below to set the fixed output voltage you want by using the appropriate part# for IC4.

Vaux Output	IC4 Part#
+5V	7805
+12V	7812
+15V	7815
+18V	7818

NOTE: V+ output must be greater than Vaux.

6. TROUBLESHOOTING GUIDE

6.1 Adjusting the trimmers do not change the output voltage.
Check for open connection, or cold-solder joints.

6.2 The output voltages are at maximum reading. Adjusting the trimmer does not lower the voltages.
It seems the voltage regulators are not working/damaged. Damage could have been caused by a short-circuit. Check solder job for any shorts. Replace damaged voltage regulator for the particular section (V+, V-, +48V).

6.3 Power Supply was previously working. But now there is no output voltage for V+ / V- / or +48V.
Check if the fuse is blown. Check if LED is lit up below the fuse. If the LED is OFF, then that particular fuse is broken. Replace fuse with a new one. If the replacement fuse blows open again, you have a short-circuit somewhere... either down the line/load, or in the PSU. Remove offending short-circuit.

6.4 No output voltage. Fuse is blowing open.
Check orientation of all the diodes if they are placed correctly. A diode in the wrong direction will cause a short circuit in the PSU output.

6.5 V+ and V- sections are working but the +48V section is not working, no output voltage.
Check C6 and C7 capacitor. Check if RECT1 Bridge Rectifier is working by checking for presence of DC volts across capacitor C1. If there is DC voltage across C1, but no output voltage, then IC1 voltage regulator is damaged/open. Replace IC1 with LM317HVT.

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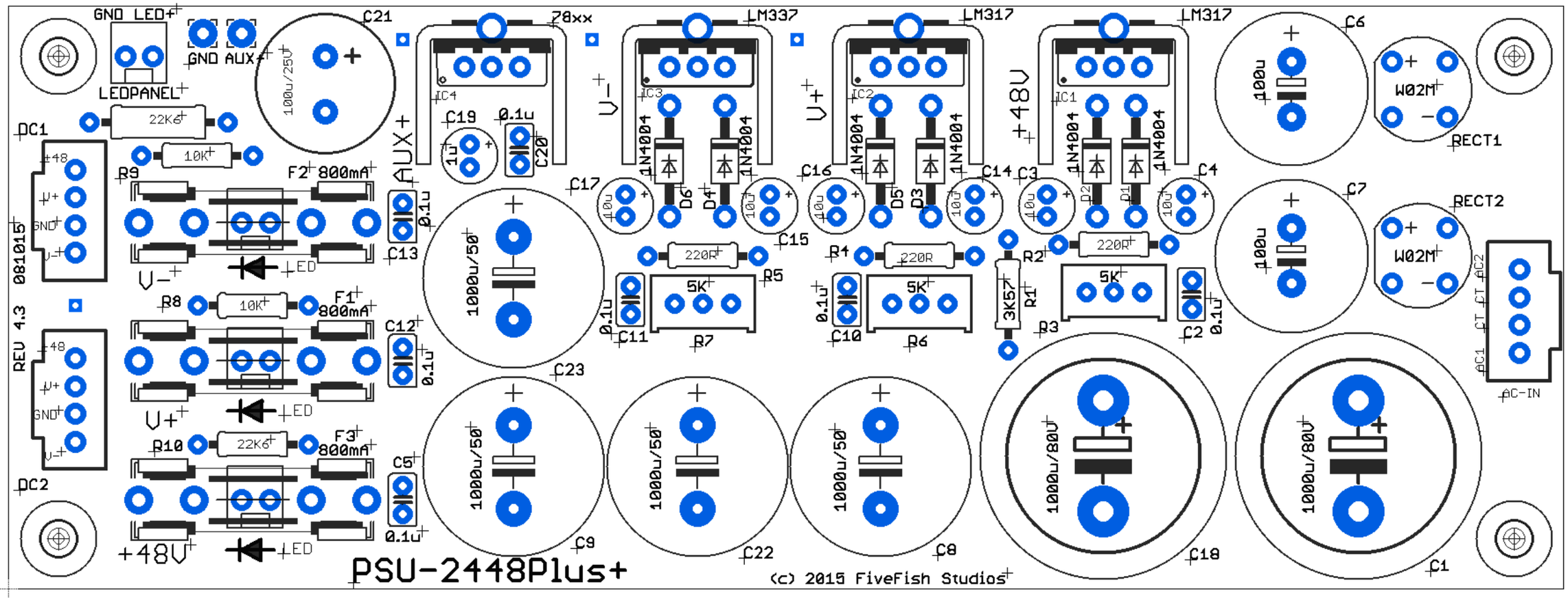
7. PARTS LIST

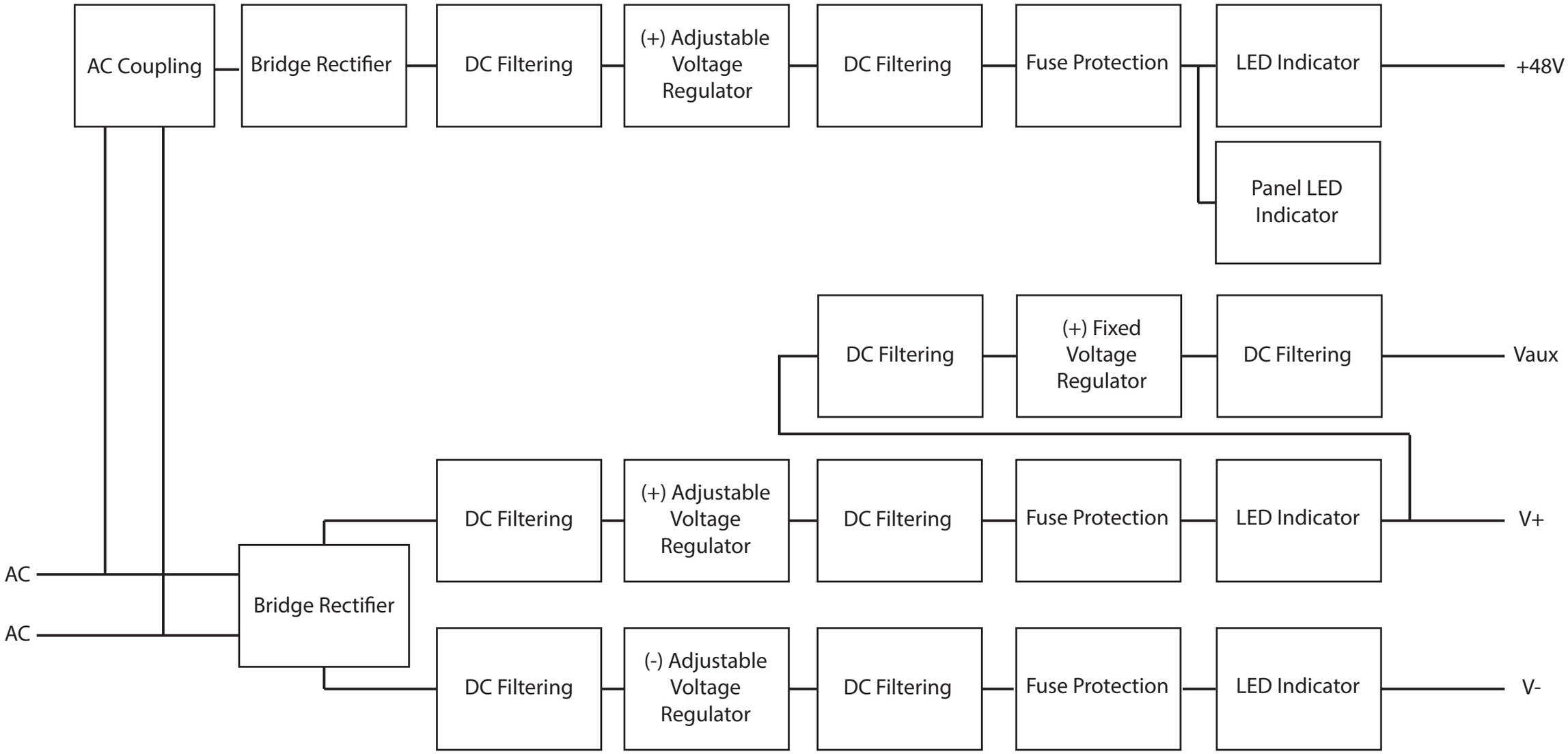
See Section 8.0 for component locations on PCB.

QTY	VALUE	REFERENCE	NOTE
1	3K57	R1	
3	220 ohm	R2, R4, R5	
3	5K Trimmer	R3, R6, R7	Voltage Adjustments
2	10K	R8, R9	
1	22K6	R10	
1	22K6	LEDPANEL	Resistor for Panel Mount LED
7	10uf 63V	C3, C4, C14, C15, C16, C17, C19	
7	0.1uf 100V	C2, C5, C10, C11, C12, C13, C20	
3	100uf 100V	C6, C7, C21	
4	1000uf 63V	C8, C9, C22, C23	
2	1000uf 80V	C1, C18	Snap-in type Capacitors
2	LM317HVT	IC1, IC2	Positive Voltage Regulator
1	LM337	IC3	Negative Voltage Regulator
1	78xx	IC4 (not included)	Use either 7805, 7812, 7815, 7818
2	W02M	RECT1, RECT2	Bridge Rectifier
6	1N4004	D1, D2, D3, D4, D5, D6	Protection Diodes
3	LED	LED1, LED2, LED3	Light Emitting Diode
1	Panel Mount LED	LED4	*Not included in this kit but in PWR-TRAFO KIT*
4	Heatsink	HS1, HS2, HS3, HS4	Black Anodized Aluminum Heatsink
6	Fuse Clips	Fuse Clips	3 pairs of Fuse Clips
3	Fuse	F1, F2, F3	

8. COMPONENT GUIDE

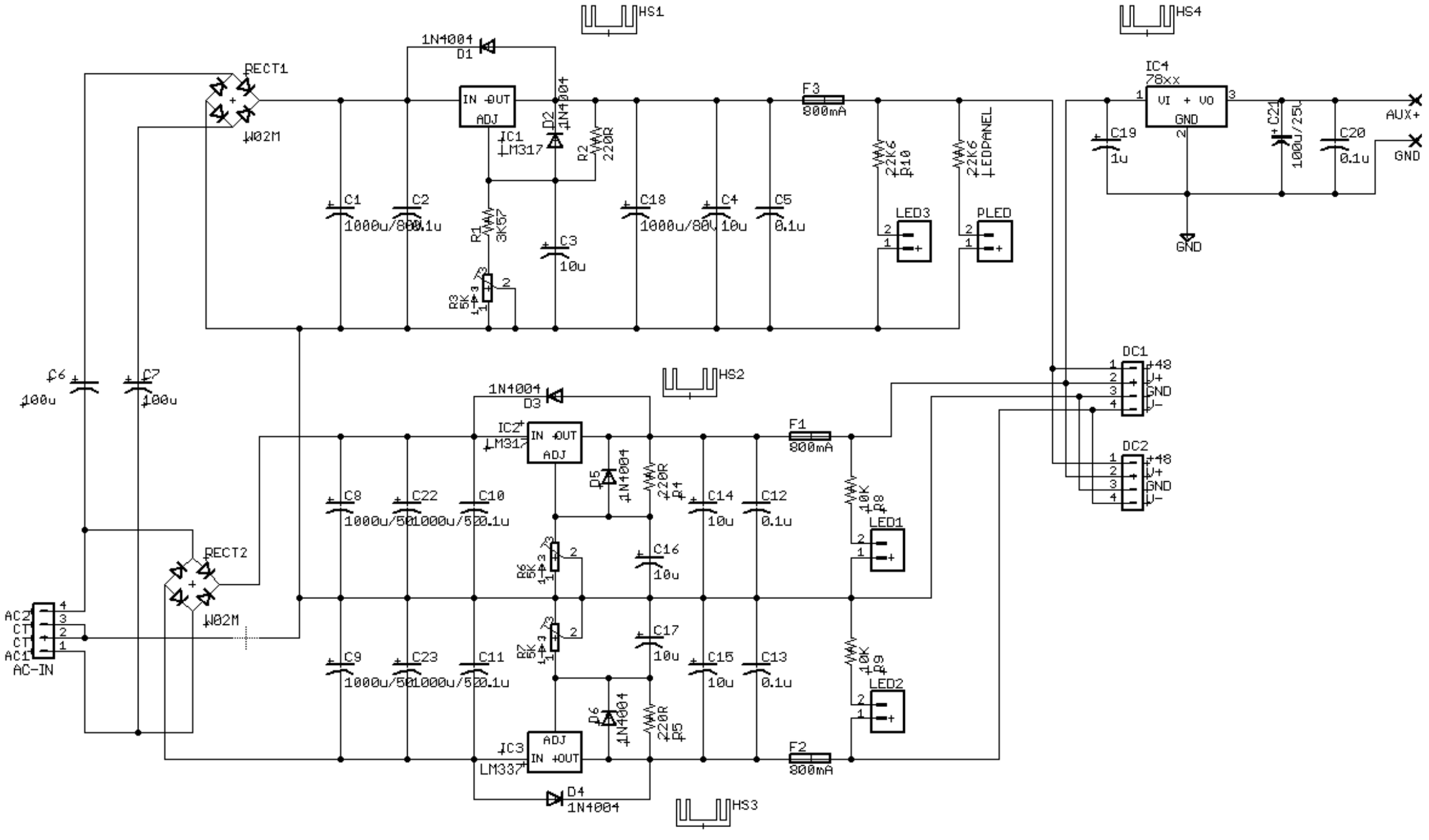


9. BLOCK DIAGRAM



NOTE: The AC voltage depicted in block diagram above comes from the low-voltage secondary winding of the power transformer.

10. SCHEMATIC DIAGRAM



11. ERRATA / MANUAL CHANGE INFORMATION

If you have a Revision 4.3 board, and experiencing shutdown/overheating on the V+ rail, please apply ths fix.
NOTE: The current board revision does *NOT* need this fix.