University of Rochester: Fundamentals of Audio and Music Engineering

Guitar Amplifier Kit Manual

Overview:

This kit is for a 10W guitar practice amplifier and was designed exclusively for the Fundamentals of Audio and Music Engineering: Part 1 course on Coursera. The amplifier itself is designed to teach about simple tone and distortion circuitry. A case for the amplifier is not included with the kit, and one can be made quickly out of foam board. A wooden case will sound slightly better but will also be more expensive and time consuming.

Tips and Warnings:

- Do not plug the unit in until it is fully assembled.
- Do not solder the TL072 chip directly to the perfboard. Solder the IC socket onto the board and, afterwards, plug the chip into it.
- Observe the polarity of the ¼" input jack – the "tip" is the positive end and the "sleeve" is the negative end. If this is soldered backward the amp will be noisier.
- In order to avoid shorting the pins of the op-amp, it will be necessary to break the connection of the metal strips under the chip. This can be accomplished by scratching the metal away with the sharp tip of a pin or knife.
- In order to solder the potentiometers directly to the perfboard it is necessary to bend the side brackets out of the way. The pins on the TDA2050 chip also need to be bent slightly to fit.

Possible Cabinet Design:

More resources and discussion of how to optimize your cabinet design can be found in the video lectures. However, for those who would like to build a basic cabinet without much additional design work, some reasonable dimensions are provided below:

1. A well rounded frequency response translates to a cabinet volume of roughly 5832 cm^3, or interior dimensions of 18 cm x 18 cm x 18 cm.

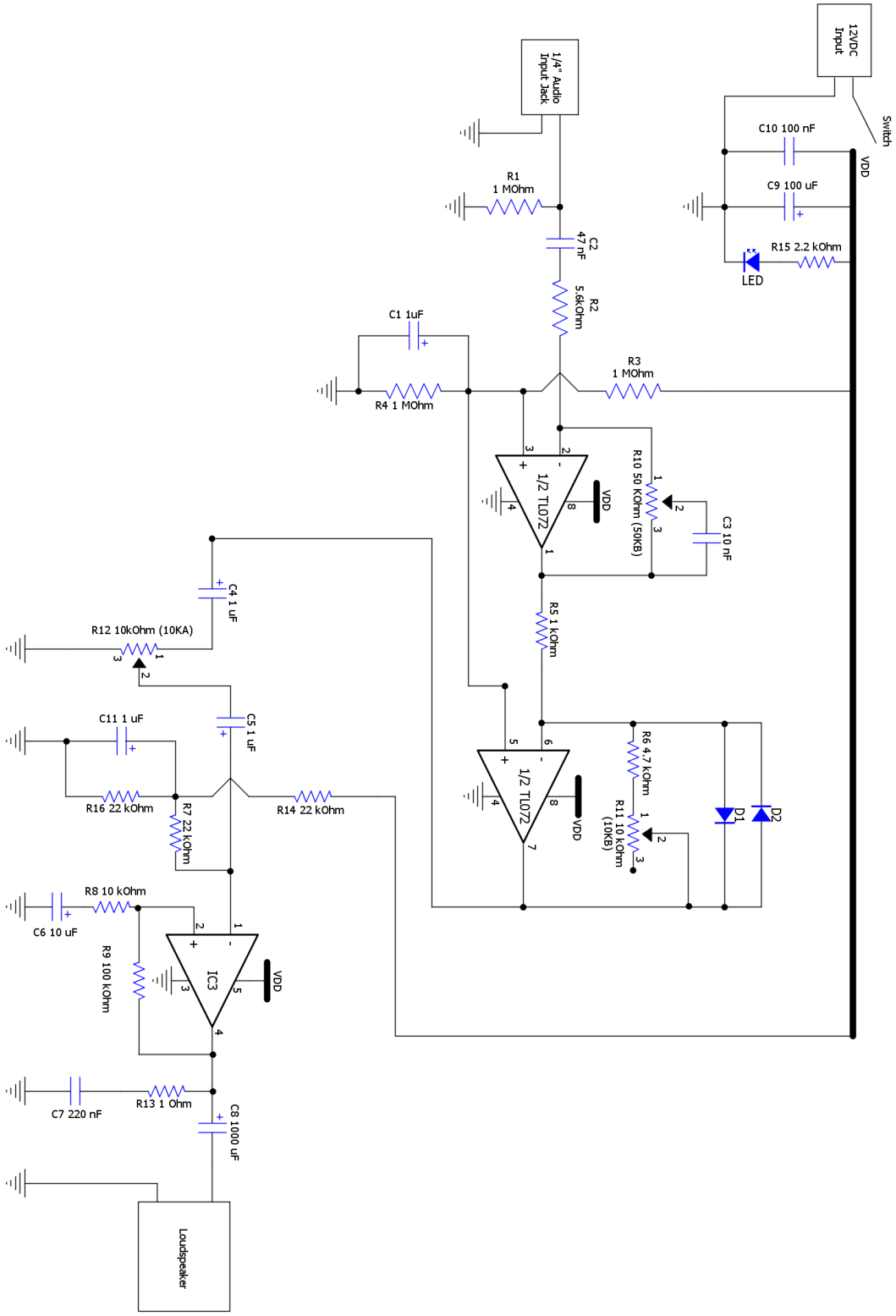
2. For a bass heavy amplifier, a cabinet volume of roughly 2754 cm^3 will work better. This corresponds to interior dimensions of 18cm x 18cm x 8.5 cm.

Parts List and Descriptions

Type	Value	Qty	Label	Markings	Directional	Direction Indicated
	1 Mohm	3	R1 R3 R4	brown black green	NO	
	5.6 kOhm	1	R2	green blue red		
	1 kOhm	1	R5	brown black red		
	22 kOhm	3	R7 R14 R 16	red red orange		
	4.7 kOhm	1	R6	yellow violet red		
	2.2 kOhm	1	R15	red red red		
	100 kOhm	1	R9	brown black yellow		
	10 kOhm	1	R8	brown black orange		
Resistors	1 Ohm	1	R13			
	50KB pot	1	R10	B50K (linear)	NO*	
	10KB pot	1	R11	B10K (linear)		
Potentiometers	10KA pot	1	R12	A10K (logarithmic)		
	47nF	1	C2	473	NO	
	100nF	1	C10	104		
	10nF	1	C3	103		
Film Capacitors	0.22 uF	1	C7			
	100uF	1	C9		YES	Stripe on negative side (shorter lead)
	1000uF	1	C8			
	1uF	4	C1 C4 C5 C11			
Aluminum Capacitors	10uF	1	C6			
Integrated Circuits	TL072	1				See diagrams
	TDA2030	1				
Diodes	1N4001	2				silver stripe = negative end
LED	red LED	1				flat edge/shorter lead is negative
	IC socket	1			NO	
	switch	1				
	wall power plug	1				
	power jack	1				
	¼" Phono plug	1			YES	sleeve is negative
	speaker	1			NO	
Miscellaneous	perfboard	1				

* The Potentiometers will function equally well in either orientation. However, if you want to make the knob such that a clockwise corresponds to increased volume/distortion, then pin1 should be the one to the right as you look at the potentiometer from the knob direction

Full Schematic

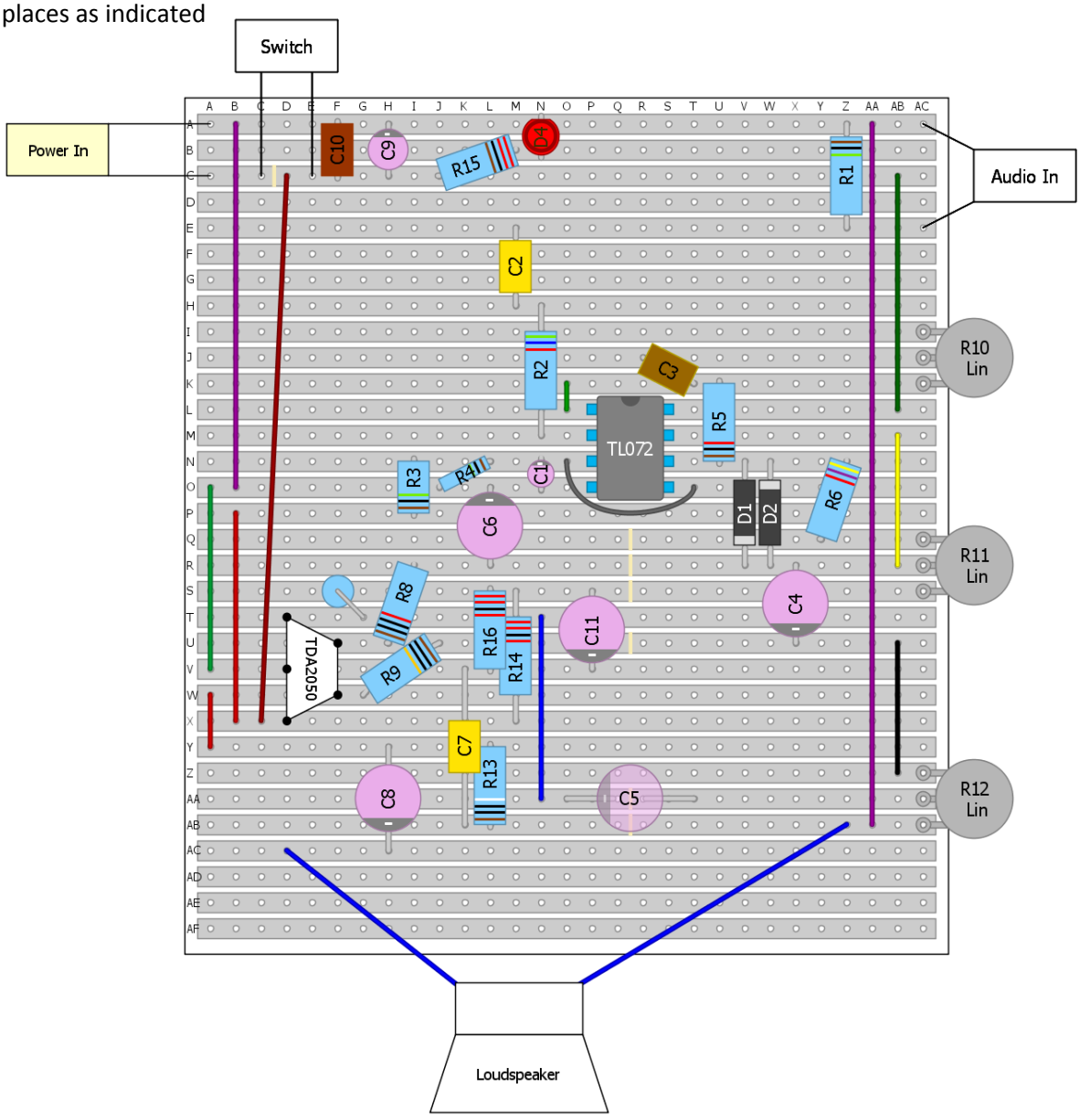


Possible Perfboard Layout

There are a number of possible ways to lay out the amplifier circuit on the perfboard provided. This design is one that we developed and used; however, there are certainly other possibilities that work well.

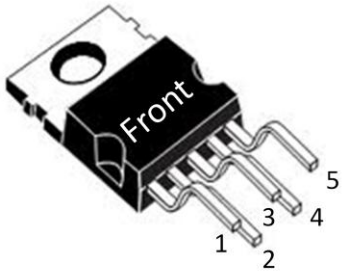
Considerations:

- When bringing wires from external components (particularly inputs), it is best to twist the two insulated wires together to avoid picking up electronic noise from the room and sending it into the amplifier.
- Note: Although the copper stripes are shown here for reference, the components should be placed on the top of the board (side with no metal strips), with the leads soldered on the back side.
- Cuts in the metal strips need to be made between the pins of the switch, under the IC and in a few other places as indicated



Pin Diagrams and other Images

TDA 2050 Op Amp



TL072 Dual Op Amp Package