General Purpose Audio Bench Amplifier

Some years ago I had a bench amplifier that I purchased from Tandy's (Do you remember them?) It wasn't the most powerful or highest quailty amplifier but it was extremely useful. From boosting the audio from simple radio circuits I made to playing music from a old tape deck with a blown amplifier. It was my go to amplifier for all sorts of purposes. Well that amplifer is now long gone but the need for such a item still remains. This Kit allows you to put together a small self contained amplifier/speaker unit that will sit nicely on your bench in a strong solid case .

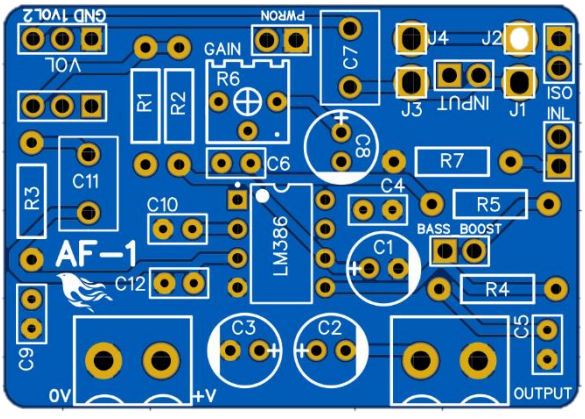
Fitted with a quaility 2 inch one watt internal speaker and 6v battery pack (4 x AAA cells) its ready to be used when needed.

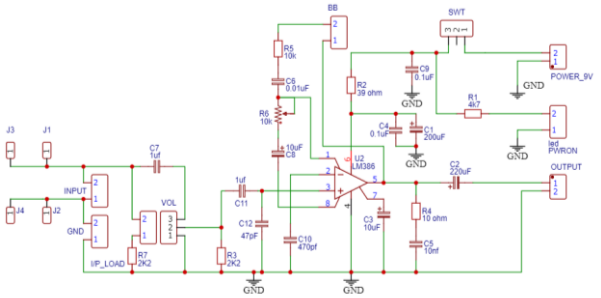
The kit is complete with its pre-drilled enclosure to help you build a professional looking amplifier that you can be proud of.

Specification:-

Power Source :-	6V DC
Amplifier: -	LM386
Features:-	Adjust internal Max Gain control (20-200dB)
	Selectable Bass Boost Circuit
	Quality 50mm/2 inch Speaker 1 watt constant/2 watts peak
	Combined Volume/Power Control
	Power ON LED indicator
	3.5mm Mono Audio Input socket

The Amplifier is built on a compact PCB .





Parts List

AF-1 PCB
Amplifier Case
50mm 1 Watt Speaker
3.5mm Audio Input Socket
Volume Control knob
9v Battery Clip
2 x 2 way PCB Terminal Blocks
Speaker Mounting hardware
1 x Set of case screws

R1	4K7 ¼ Watt
R2	Fit Link in place of Resistor
R3	2K2 ¼ Watt
R4	10 Ohm ¼ Watt
R5	10K ¼ Watt
R6	10K Trim Pot
R7	270 ohm ¼ Watt

10K Volume Control

C1	100uF 25v
C2	220uf 25V
C3, C8	10uf 16V
C4, C9	0.1uF
C5,C6	10nF
C7, C11	1uF (5mm spaced legs)
C10	470pf Disk
C12	47pf Disk
IC1	LM386
SK1	8 Pin DIL Socket
LED	3mm power ON LED
2 x	2 Pin Header & Jumpers

Amplifier Sticker
4 x Stick on Feet

Before you start work on the amplifier check you have all the parts listed, any problems contact me

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******* Very Important Note *******

Please make sure you read the instructions below about mounting the volume control or the PCB will not mount correctly into the case. You have been warned!!!

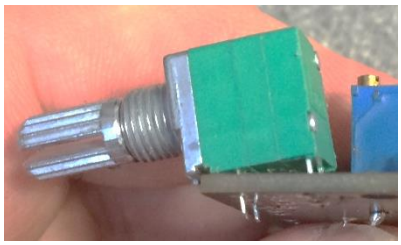
Building the Amplifier

The amplifier is an easy to build project BUT you must follow the instructions for the volume control.

The supplied case as a slight slope to the front panel, if we fit the volume control flush to the PCB the board will be sticking up at an angle that can cause problems with the speaker.

Before fitting the control you will see a small metal tag protrudes just below the adjustment shaft, it's only about 1-2mm long. Use pliers /cutters to snap this off.

Mounting the volume control. See the picture for this, the back of the control must sit higher than the front, the rear pins on the control must just be visible and no more, this will allow the PCB to sit correctly in the case. Make sure that you follow this section of the instructions if nothing else after it!

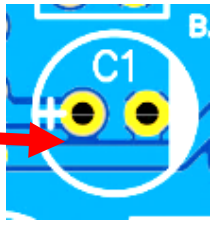


Next fit the IC socket, this has a small dimple on one of the shorter edges this end should be aligned with the layout printed on the PCB. When you do fit the IC make sure that that Pin1 of the chip is nearest to C6.

Now let's work on the resistors.

Start with R1 and work though to R5. Fit Link in place of R2
Next fit the small PCB trimmer control (R6). This trimer will allow you to change the max gain of the amplifier, at max resistance the gain will be low (about 20dB) with the min resistance it will be high at about 200dB.

After the resistors move onto the capacitors, start with the large electrolytic types C1 and C2. Now unlike the resistors these MUST be fitted the correct way round, on the body of the capacitor you will see the polarity markings. Look at the PCB and you will see that the +Ve pin side is marked. Make sure you fit them the correct way. (long leg is the +Ve leg)



Next fit C3 and C8, these too are electrolytic type and must be fitted the correct way as before.

The remaining capacitors can be fitted either way round so just work through the parts list until all the others are fitted as per the silk screen layout on the board.

Now fit the two 2 pin headers, fit one in the position marked 'Bass Boost' and the other where it's marked 'INL'.

Next use an off cut of wire and make a link between the two pads marked 'ISO'.

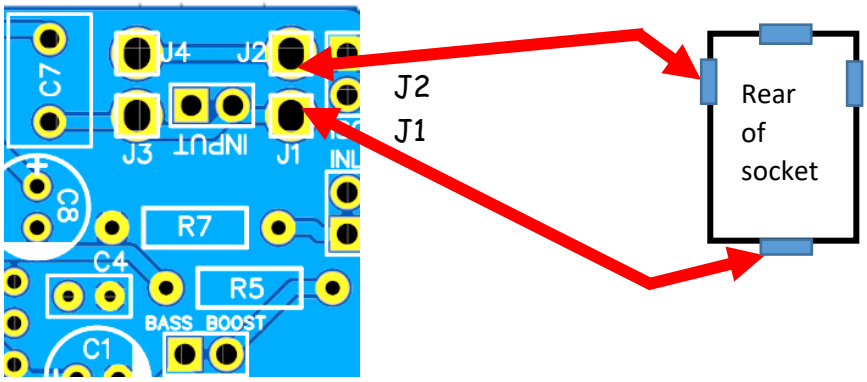
Next fit the power LED, you will see that this LED as two leads, and one is longer than the other. It is important that this is fitted the correct way or it will not work.

The Led is fitted just in front of the Gain control. You will see that there are two holes for it. One of the holes is square and the other is round. The LONG leg of the LED MUST go into the ROUND hole. Fit the LED so it stands with about 12mm of leg above the board.

Now we need to fix the two terminal blocks to the board. Arrange these so that the cable entry points are towards the edge of the board, fit and solder them in place.

Now to wire the input socket.

I have supplied a stereo socket for this, not because we need a stereo socket but this particular socket is a strong one that will withstand many in/out cycles but we will be wiring it as just a standard mono socket. See the picture below to make sure you connect it correctly.



When ready to fit the board into the case bend the LED over flat make sure you have removed the Nut and washer from the volume control and push the board into place from inside the case, the LED should fold back once its front is located in the 3mm hole in the case. (See picture) now pop the input jack into place and tighten, do this with care so you don't mark the front panel. You will not that the jack socket is slimmer one way compared with the other arrange it so that the jack isn't touching the PCB

Fit the speaker to the bottom panel, now follow these instructions, the speaker is a quality one for RS Components here in the UK, it's rated at 1 watt continually and 2 watts max. it's fairly waterproof if like me you spill coffee over the desk its sat on!. When I first built this amp it sounded terrible, the speaker rattled badly. If you look at the front of the speaker you will see a little raised edge near the start of the cone, this edge sits proud of the mounting flange. If you tight the speaker down as is it will bend the flange and this distortion of the speaker effects the sound. If found by using small plastic transistor insulators as spacers just filled the small gap between the flange and the case and cured this problem so I have supplied 4 such spacers.

Fit the four screws through the bottom panel and place the insulators over the screw so they act like a 1mm space for the speaker. Fit the speaker and secure with the four M3 nuts provided. Attach two wires (about 150mm long) to the speaker and connect to the speaker out terminals on the PCB, connect the battery holder leads to the other terminals (make sure you connect this the correct way.)

The battery holder sits at the back of the case and can slide forward so I have provided a foam stick on block to be placed just in front of the battery pack, also I have included a thin foam strip. One side is removable. Peel the strip and attach it inside the case just where the battery pack will sit, this stops any rattle from the battery when you move the amplifier around.

Fit 4 x AAA batteries into the holder and turn on the amplifier, the red LED should light up. You can test he amplifier at this stage but the audio quality will not be too good until the speaker is mounted inside a closed case. Now fix the speaker plate to the main body of the amplifier using the 4 small screws provided and then the stick on rubber feet. Carefully peel and fit the supplied sticker onto the top case (if not already done for you)

That's it you're done!

The amplifier is ready to use, do remember that there is an adjustable internal gain control and you may need to adjust this to suit your application.

Also don't forget the Bass Boost option, a internal jumper across the bass boost pins activates the circuit, give it a try. Personally I find that the boost acts like a top cut but seems to reduce the gain a little. Some people like this on, some off.

One important note,

The amplifier has another jumper on the PCB marked ISO, this jumper places a 270 Ohm load directly on the input socket, some devices like to see a load, like a pair of headphones etc. in order to work (The Phoenix TRF-1 AM Radio is one such device). The jumper needs to be in place for such items to work correctly, 90% of items this jumper can be left in place but if things aren't being amplified as you expect then try removing this jumper (remember to replace it later if you need to)

I hope the amplifier fulfils your needs and provides years of service for you.