ELECTRONICS - The fun starts here.

Assembly Instructions for FK677 *(3W Stereo Power Amp)*

What it does:

This circuit is designed to amplify low level audio signals and play them out over the two speakers. It accepts two different channels in (stereo) and will play them out over separate speakers. This circuit operates from 5V DC supply.

What we are making:

This system is ideal for an audio docking station for mobile phones, radios, computers, etc.

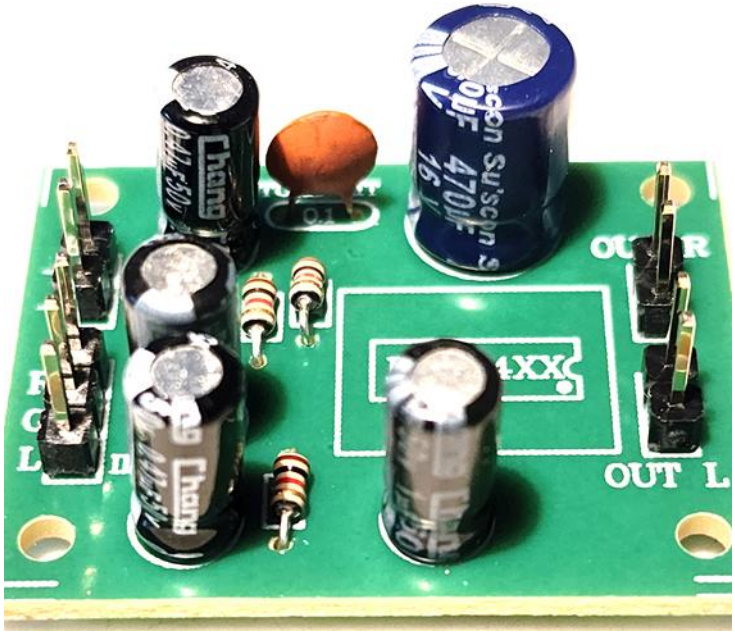


Fig 1: Finished Product

Technical Specs:

- Power supply: 5 VDC
- Current Average: 200mA when driving into 8Ohm speakers .
- Max output power: 3W
- Voltage Gain is fixed.
- S/N ratio: 80dB
- Frequency Response : 25Hz to 20kHz @ -3dB
- Total Harmonic Distortion < 0.15%
- PCB dimensions: 35.3 x 27.7 mm

How it works:

The input audio signals are passed through Capacitors (C1 and C2) which are designed to block any DC bias on the signal. The audio signals are then amplified by the IC (P/N PAM8403) , before being passed to the output which will drive the Speakers.

The gain of the IC is fixed, which means the user needs to apply any Volume Control via the input signal. (This is ideal when interfaced to a Bluetooth Receiver).

Circuit Diagram:

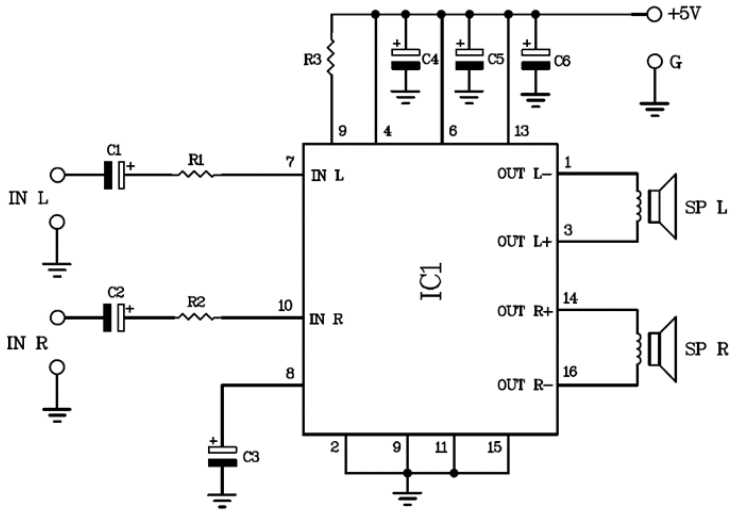


Fig 2: Circuit Diagram for one channel of the system.

Before you start:

1) Make sure that you have all your equipment available. You will need:
    a. Soldering Iron (with a fine tip)
    b. Solder
    c. Cleaning pad (We recommend sponge which is wet with water).
    d. Side Cutters
    e. Multi-meter – set to ”Ohms” range
    f. Wire Stripper (This is desirable but not essential)
    g. Magnifying Lamp (This is desirable but not essential)
    h. Kit FK677
    i. Instruction sheet
    j. A waste bin (or bag) close by for a lot of small “off cuts”.
    k. We recommend a clean mat or surface protector for your desk.
    l. Ensure that you are in a well ventilated area. The fumes from the solder resin can become annoying (though they are not toxic to humans).
    m. Wash your hands after working with the electronics kits and the solder. Especially before you eat anything ! !

2) Ensure that you have plenty of space around you. (You are going to need to “spread out” your components at the start, and avoid getting them mixed with some-one else’s.)

3) Ensure that you have good lighting to see and read your components.

4) We recommend that you also have some spare “bags” (or other containers) to store your components and work between classes. This is in the event that you do not get everything finished in one session.
(It can be disappointing to spend some time sorting your components and then finding them all mixed up again when you return!)

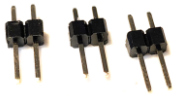
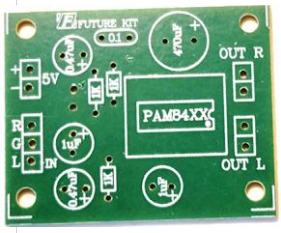
5) Do NOT rush! Time spent carefully sorting at the start and avoiding errors is wisely invested, rather than trying to fix problems later!

6) Read through the instructions for each “Step” before you start doing that step. There are often handy tips & advice in the instructions!

How to build it:

Step 1. Identify your components and sort them into groups.

Use the checklist below to ensure that you have all your necessary components. *(We recommend that you "tick off" each component when you know you have it clearly identified).*

FK677 3W SMD Stereo Amplifier				
For this task you are required to :				
	Identify all of the components within your kit, to ensure that your kit is complete			
	Assemble the kit so that it works as per the instructions			
Component Name	**Value**	**Qty**	**Identification Marking**	**Image**
Resistor 1kΩ	1,000 Ohms	3	Brown-black-red-gold	
Capacitor (Electrolytic) 0.47µF	0.00000047 Farads or $4.7X10^{-7}$ Farads	2	0.47µF	
Capacitor (Electrolytic) 1µF	0.000001 Farads or $1.0X10^{-6}$ Farads	2	1µF	
Capacitor (Electrolytic) 470µF	0.00047 Farads or $4.7X10^{-4}$ Farads	1	470µF	
Capacitor (Ceramic) 100nF	0.0000001 Farads or $1.0\ X10^{-7}$ Farads	1	104	
Integrated Circuit -Audio Amplifier		1	PAM8403	
Pin Headers - 2 Way		3		
Pin Header - 3 Way		1		
PCB (Empty)		1		

Step 2. Install the Surface Mounted IC underneath the PCB.

We recommend using a very fine tip Soldering Iron for this step. Also use "mag-Lamp" if you have access to one.

There are a few "tips and techniques" we recommend for this step.

- Align the IC correctly. *(Refer to Figure 4)*
- Solder only 1 leg of the IC and then check there has been no movement during the soldering process. (Start with one corner pin) *(Refer to Figure 5)*
- When satisfied , solder the diagonally opposite leg, to hold the IC firmly in place. *(Refer to Figure 6)*
- Then carefully solder the remaining legs. *(Refer to Figures 7 & 8)*

Technique advice:

- Heat the solder pad and the leg
- Then apply fresh solder and fresh "Flux".
- "Wipe" the soldering iron away from the pin, and pull excess solder with you.

Step-by-step photos:

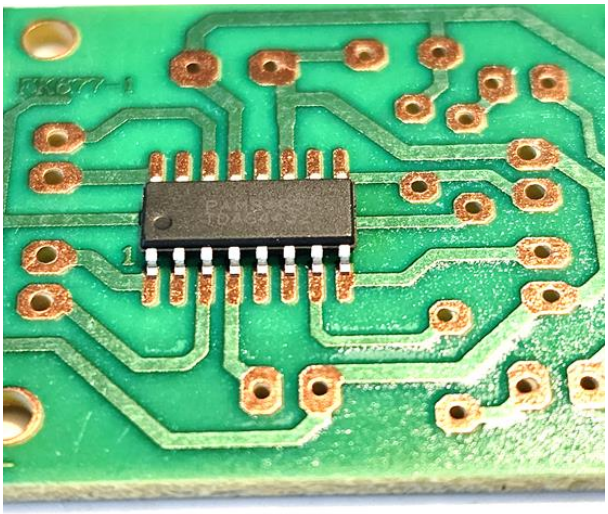


Fig 4.a. Align the IC with the Solder Pads.

Caution! The "Dent" on the IC (which indicates Pin 1) MUST align with the "1" marked on the PCB.

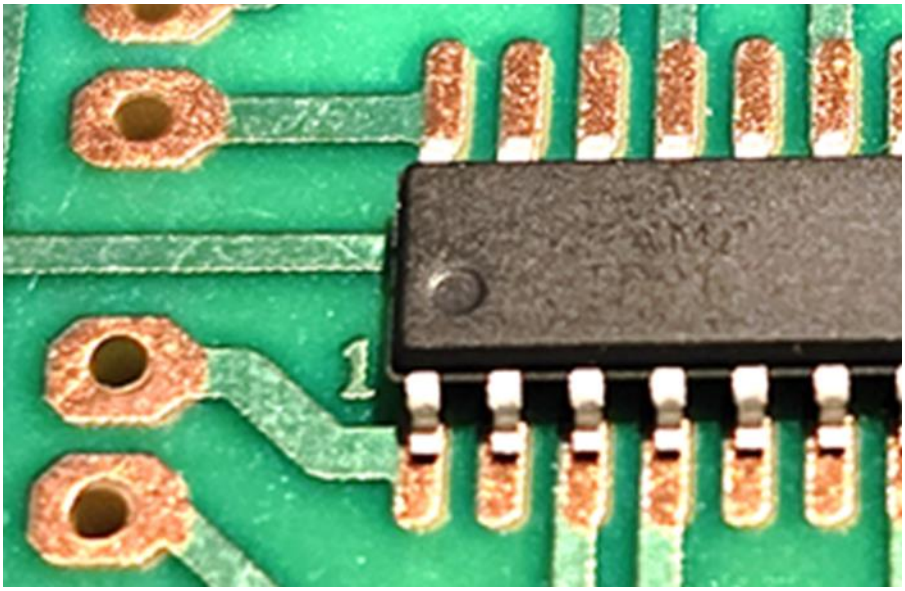


Fig 4.b. The Dent on the IC MUST align with the "1" on the PCB.

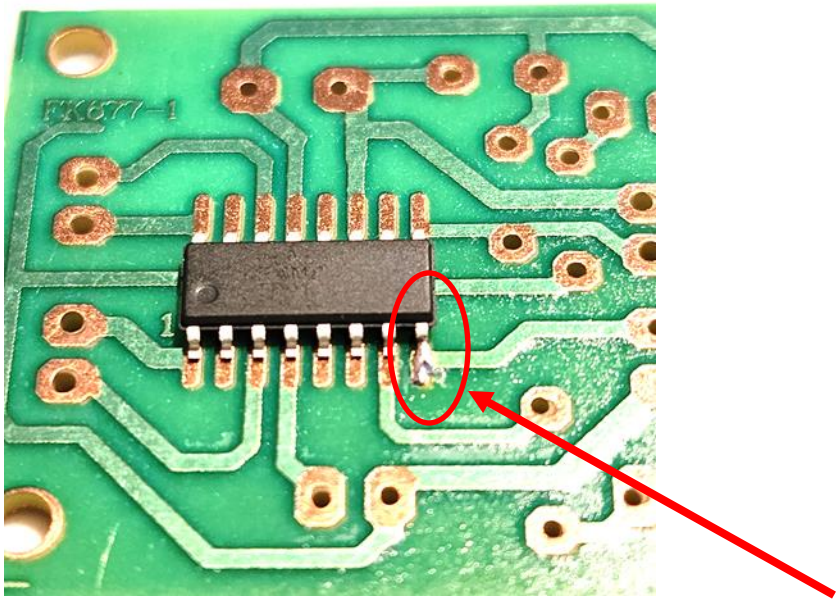


Fig 5. Solder 1 corner leg and then carefully check all the other legs remain aligned with their pads.

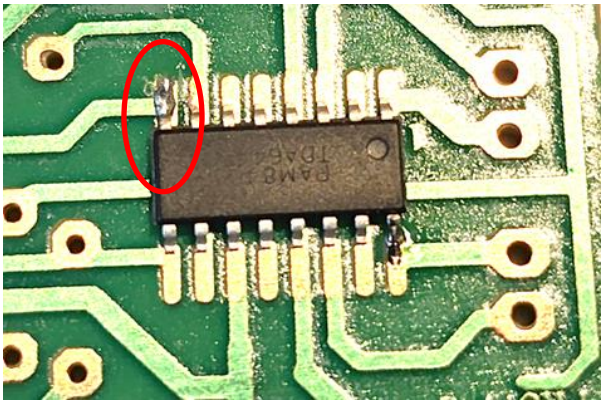


Fig 6. Solder the diagonally opposite corner leg so that the IC is now firmly held in place.

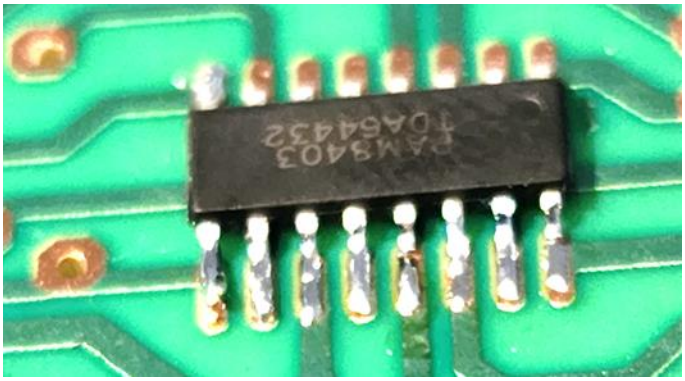


Fig 7. Carefully solder one side of the ICs legs to their PCB pads.

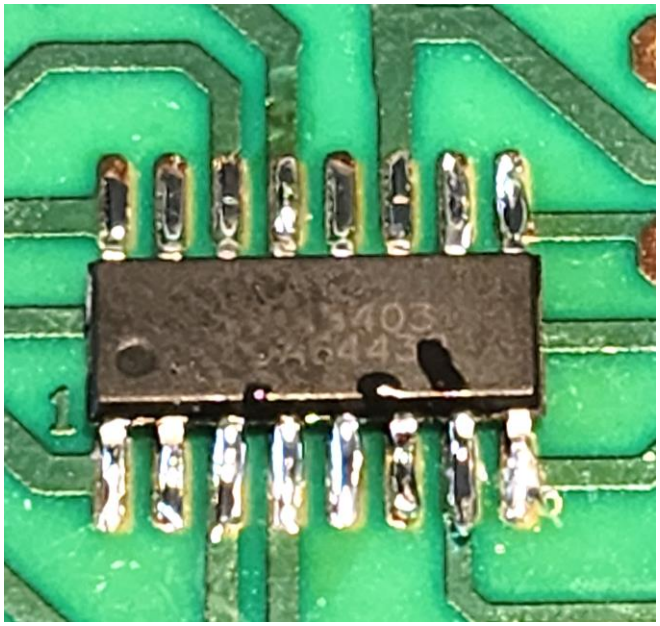


Fig 8. Now carefully solder all the other legs to their PCB pads.

Step 3. Installing the resistors.

Place the resistors into their correct positions as indicated on the printed circuit board (PCB).

Do this by carefully bending their wires down to form a 'U' shape and poke through the holes in the PCB as shown in *Fig3.2*.

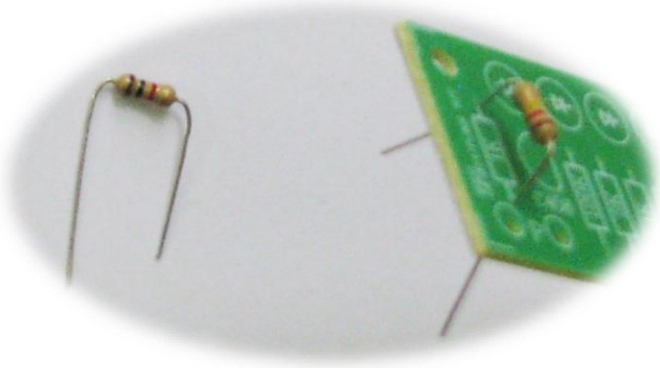


Fig 9.a Installing Resistors

As far as possible, try to keep the resistors "oriented" in the same direction. (Try to keep the gold band at the same end of the installed resistors.) See Fig 9.b for a suggested pattern.

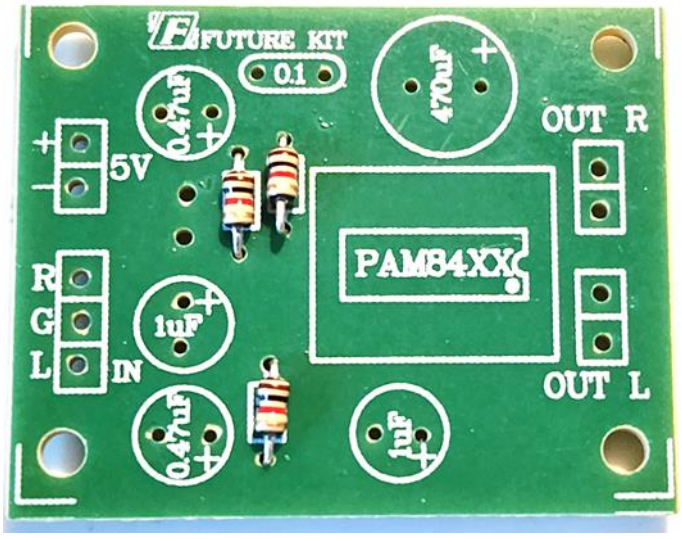


Fig 9.b Installing Resistors with consistent orientation.

Step 4. Installing the Capacitors

Carefully identify all the different capacitors to be used.

There are two “families” of capacitors used in this kit. These are “Electrolytic” Capacitors and one “Ceramic” Capacitor.
Refer to the Component identification table in “Step 1” to ensure you are installing the correct Capacitor at each of the marked locations.

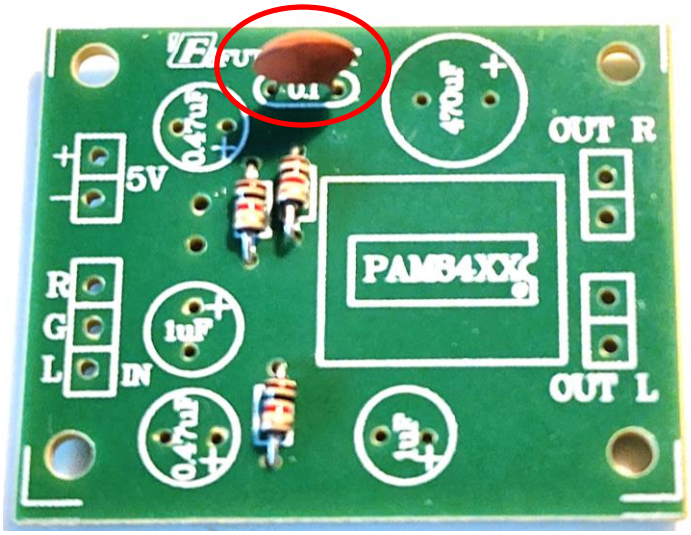


Fig 10 . The small Ceramic Capacitor is installed.

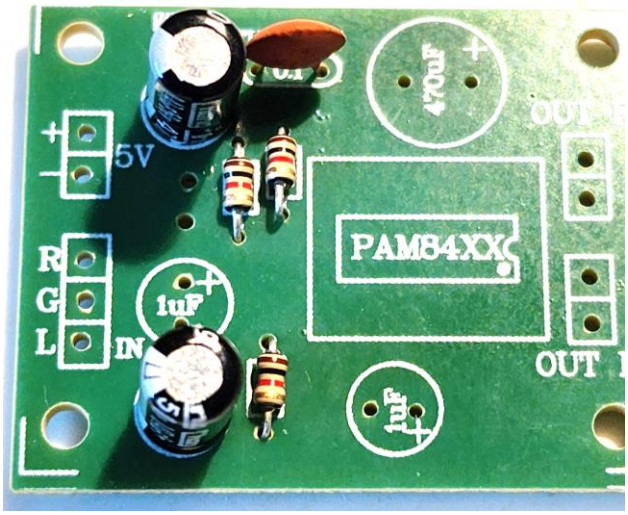


Fig 11 . The two 0.47µF Capacitors are installed.

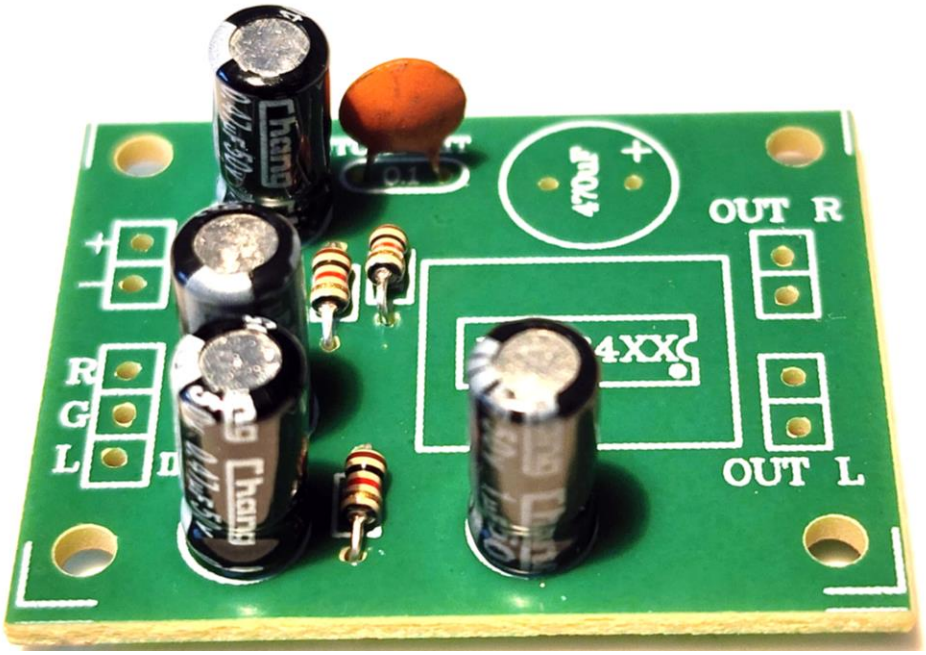


Fig 12 . The two 1 μF Capacitors are installed.

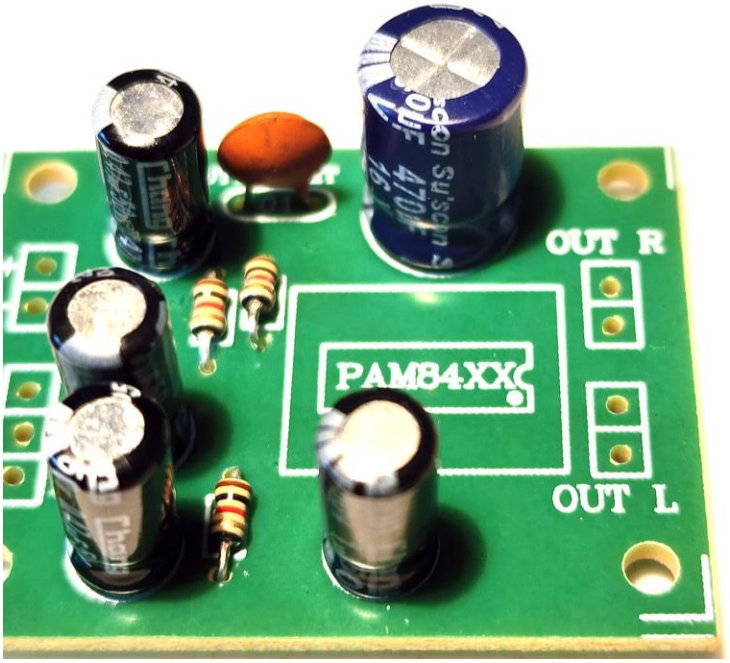


Fig 13 . The large 470μF Capacitor is now installed.

Step 5. IDE Pins are installed

Carefully install the IDE Pins.
Refer to Figure 14 .

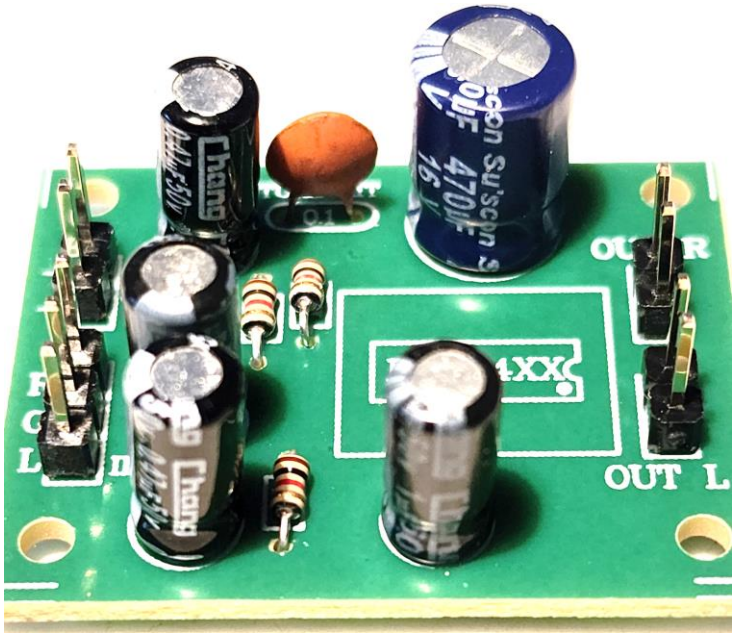


Fig 14 . All 4 of the IDE Pins have been installed.

ASSEMBLY IS NOW COMPLETED !

Step 6. Testing!

Do not connect any input sound source yet!

We must first check the system has been constructed correctly!

Apply the power supply at 5 V DC.

Watch for any sparks or signs of overheating.
If you see any sparks:

- Disconnect the power immediately.
- Test for any "hot spots".
- If no obvious hot spots, then
    - Reconnect the power and watch for sparks a second time.

  - If NO sparks a second time, this is normal! Things are looking good!
  - If you continue to see sparks, you will need to recheck all your soldering for any "short Circuit" bridges.
- If you find a "hot spot" :
  - Check for solder bridges which are causing a short circuit somewhere.
  - Check that all components have been inserted correctly.
  - Check for any loose "wire" off cuts which may be causing a short circuit.

Once you have the power connected and no signs of other problems, it is time to apply an audio signal. Turn OFF your supply before this next step !

- Now apply the audio source.

- Connect 2 speakers to the output.

NOW turn on the power supply and listen for audio output !

- If the quality of the output sound starts to deteriorate, it is possible that the volume of the input is exceeding the limits of the system. Therefore it may be that you need to reduce the input!

Care and Warnings:

The audio amp IC (PAM8403) is rated to a maximum of +6V DC. Do not apply any voltage above this. *(We recommend operating with a 5V DC supply as the power source for the first testing!)*

Most of the problems we have experienced with this kit are one of three kinds:

1) Soldering induced problems. (Short circuit bridges as well as poor quality "cold solder joints")
2) Component misplaced or misaligned.
3) Wire connections intermittent.

Step 7. Connecting wires, Speakers and Power Supply.

The input should be connected onto the three input stakes.

Finally, the four standoffs can be connected to the speakers.

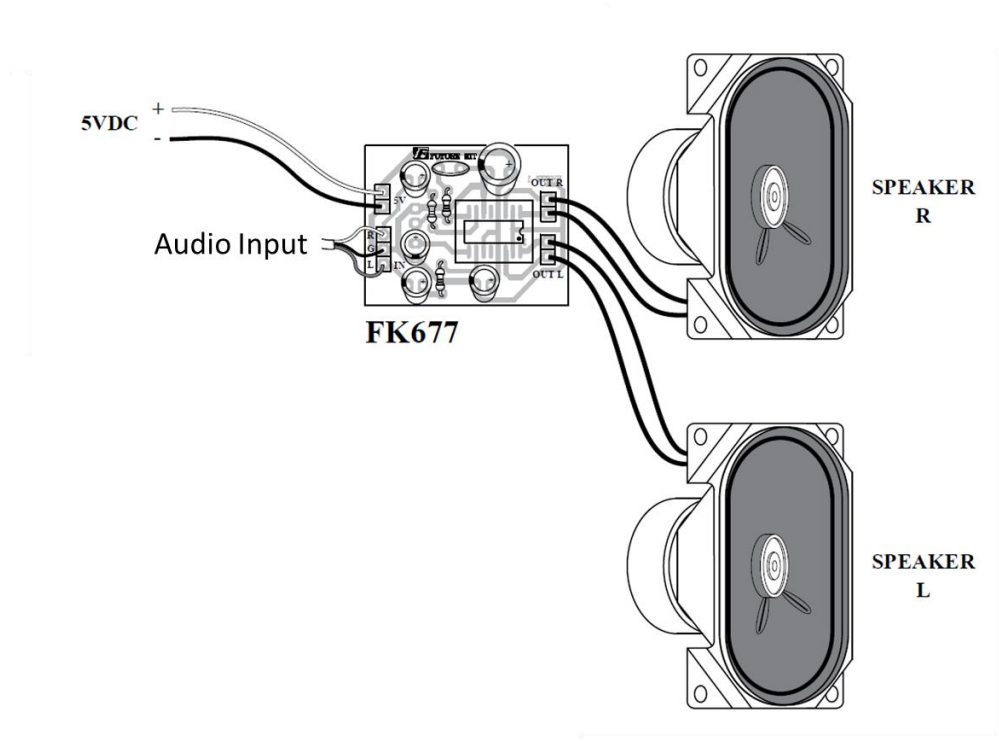


Fig 15 Attaching the wires