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Overview

In this project, you'll learn how to build a passive mixer with four inputs and one main output to bring all of your audio devices together in perfect harmony. A passive mixer is an audio mixer that doesn't require any power because it doesn't have an amplifier. It's a circuit of audio jacks with potentiometers that are wired up to let the audio input signals flow to an audio output.

This build uses stereo potentiometers and stereo TRS audio jacks to accommodate both mono and stereo devices.

The potentiometers and audio jacks are panel mounted in a 3D printed case.
Parts

Panel Mount 10K Dual Log Potentiometer
This Panel Mount 10K Dual Log Potentiometer is a dual-ganged potentiometer that will satisfy all your stereo-signal needs. Instead of just one potentiometer, you...
https://www.adafruit.com/product/3394

Panel Mount 1/8" / 3.5mm TRS Audio Jack Connector
What is this TRS bit? Turtle Rock Studios? Transmission Raman...
https://www.adafruit.com/product/3692

Potentiometer Knob - Soft Touch T18 - White
Oh say can you seeBy the knob's early light...Sorry - we thought that...
https://www.adafruit.com/product/2047
Adafruit Perma-Proto Half-sized Breadboard PCB - Single
Customers have asked us to carry basic perf-board, but we never liked the look of most basic perf: it's always crummy quality, with pads that flake off and no labeling. Then we...
https://www.adafruit.com/product/1609

Solid-Core Wire Spool - 25ft - 22AWG - Black
Perfect for bread-boarding, free wiring, etc. This spool of solid-core wire is easy to solder to. When bent it keeps its shape pretty well. We like to have a few spools of this stuff...
https://www.adafruit.com/product/290

Silicone Cover Stranded-Core Wire - 30AWG in Various Colors
Silicone-sheathing wire is super-flexible and soft, and its also strong! Able to handle up to 200°C and up to 600V, it will do when PVC covered wire wimps out. We like this wire...
https://www.adafruit.com/product/2051

3.5mm Stereo Male/Male Audio Cable - Silver Metal - 1 meter long
Here is a gorgeous metal-covered audio cable straight from Blade Runner/cyberpunk heaven. And we have them in a couple different colors! They're a step up from plain rubber/ABS...
https://www.adafruit.com/product/4067
Circuit Diagram
Stereo Audio Jack Pinout

The stereo audio jack's three pins are numbered on the bottom of the jack. GND is connected to pin 1 and is the longest pin in the middle of the jack. Right channel audio is connected to pin 2 and left channel audio is connected to pin 3.

Wiring Connections

The passive mixer circuit consists of four identical audio inputs and one audio output. All GND connections are connected together.

Audio Input Wiring

- Audio jack GND (pin 1) to potentiometer GND
- Audio jack right channel (pin 2) to potentiometer wiper (front)
- Audio jack left channel (pin 3) to potentiometer wiper (back)

Potentiometer Output Wiring

The output signal from each audio jack input is wired to shared row on a perma-proto board so that they can be sent as one signal to the main output.

- Potentiometer front output to perma-proto board row 10
- Potentiometer back output to perma-proto board row 13
- Potentiometer GND to perma-proto board GND row
The shared left and right audio signals are wired to the main output potentiometer's wiper pin.

- Perma-proto board row 13 to main output potentiometer wiper (front)
- Perma-proto board row 10 to main output potentiometer wiper (back)
- Perma-proto board GND row to main output potentiometer GND

Audio Output Wiring

The main output signal is wired to the main output jack with a 1K ohm resistor on each channel.

- Potentiometer front output to 1K ohm resistor to audio jack right channel (pin 2)
- Potentiometer back output to 1K ohm resistor to audio jack left channel (pin 3)
- Potentiometer GND to audio jack GND (pin 1)

3D Printing

The passive mixer is housed in a 3D printed case. The case consists of two parts: a lid and main body. Both parts print with no supports.

The STL files can be downloaded directly here or from Thingiverse.

passiveMixer.zip

Thingiverse download
The lid has cut outs for the potentiometers and audio jacks to mount to.

The lid also has indented text on the front to label the potentiometer and audio jacks. You can program in a filament swap to your slicer so that the text stands out.

The lid and main body are designed to snap fit together, making it possible to open and close as needed without any additional hardware.

Alternate Case

You can use any box that will accommodate the components with the appropriate holes.

Assembly
Potentiometer Ground Connections

First, you will connect each pot's stereo ground signals together.

Cut and splice five pieces of solid core wire. Each piece should be approximately 15 mm long.

Bend the wire into a U shape. Bend the spliced ends so that they are sticking out at a 90 degree angle from the U shape bend.

Insert the wire into the potentiometer's two ground pins.
Solder the wire to the potentiometer's two ground pins.
Repeat for the remaining four potentiometers.

Mount the Pots and Jacks

You can use the 3D printed front panel as a jig for soldering the passive mixer together.

Insert a potentiometer into the first larger hole on the front panel of the 3D printed case. Secure it with the included nut.

Mount the remaining four potentiometers.
Insert an audio jack into the first smaller hole on the front panel of the 3D printed case. Secure it with the included nut.

Mount the remaining four audio jacks.
Wire the Jacks

Stereo Audio Jack Pinout

The stereo audio jacks have three pins. The longest pin in the middle is wired to ground and the two shorter pins are wired to the left and right audio signals.

Solder the Ground Connections

Cut, splice and tin five pieces of stranded core wire that are approximately 35 mm in length.

Solder the first audio jack's ground pin to the first potentiometer's ground pin.
Solder the remaining four audio jacks' ground pins to their corresponding potentiometer's ground pin.

Solder the Input Jacks

Cut, splice and tin four pieces of stranded core wire approximately 40 mm in length.

Solder the wire from the first audio jack's left channel input (marked 3 on the jack) to the first potentiometer's front wiper (middle) pin.
Solder the remaining three input jacks' left channels to their corresponding potentiometer's front wiper pin.

Cut, splice and tin four pieces of stranded core wire approximately 35 mm in length.

Solder the wire from the first audio jack's right channel input (marked 2 on the jack) to the first potentiometer's back wiper (middle) pin.
Solder the remaining three input jacks' right channels to their corresponding potentiometer's back wiper pin.

Solder the Output Jack

Cut, splice and tin two pieces of stranded core wire; one approximately 35 mm in length and one approximately 40 mm in length.

Solder the longer wire from the output jack's left channel pin (marked 3 on the jack) to the output potentiometer's back output pin.

Solder the shorter wire from the output jack's right channel pin (marked 2 on the jack) to the output potentiometer's front output pin.

Wire the Output Signals

This step takes the output signals from the four input jacks and connects them so that they are sent to the main output jack.
Left Channel Output Signals

Cut, splice and tin four pieces of stranded core wire, approximately 90 mm in length.

Solder a wire to each of the four input potentiometer's front output pins.

Solder the other ends of the four wires to a shared row on the perma-proto board. These are the left channel outputs.
Right Channel Output Signals

Cut, splice and tin four pieces of stranded core wire, approximately 85 mm in length.

Solder a wire to each of the four input potentiometer's back output pins.

Solder the other ends of the four wires to a shared row on the perma-proto board. These are the right channel outputs.

Solder a 1K ohm resistor to each of the shared rows on the perma-proto board.
Main Output Signal

Cut, splice and tin two pieces of stranded core wire; one approximately 85 mm in length and one approximately 90 mm in length.

Solder the shorter wire to the resistor connected to the right channel outputs. Solder the longer wire to the resistor connected to the left channel outputs.

Solder the right channel output wire to the main output potentiometer's back wiper pin.

Solder the left channel output wire to the main output potentiometer's front wiper pin.
Mount the Perma Proto Board

Insert two M3 screws into the two holes at the bottom of the mixer enclosure.

Attach two M3 stand-offs to the M3 screws.
Align the perma-proto board's mounting holes on top of the M3 stand-offs. Secure the perma-proto board with two M3 nuts.

Close the mixer enclosure by snapping the lid onto the main enclosure. Now you're ready to get mixing!
Mix!

First, plug in your audio sources. You can use up to four and any device can be plugged in as long as it had a standard line level output.

Then plug your output into a speaker or other gain stage.

The individual input potentiometers affect the volume of the individual devices. The main output potentiometer affects the overall volume of all of the individual devices combined.

Going Further

You could modify this build to use 1/4" jacks or mono jacks, depending on your needs. You could also add additional outputs, such as dedicated left and right channel outputs or aux outputs. Mute and solo buttons could also be added. There are a lot of options out there for you to create the perfect passive mixer for your DIY music needs.