Project Intercom

Circuits used in the project

1. Intercom

2. Amplifier

3. Power Supply

1. Project Intercom

Project Concept:

A tectophone is a small electronic device that amplifies sound to make it clearer and easier to hear. The tectophone contains a microphone that picks up sound from the surrounding environment, a speaker that amplifies this sound, and a battery to power the device. Some modern tectophones have advanced features such as noise cancellation technology, automatic volume adjustment, and Bluetooth connectivity to allow communication with other devices.

Tectophones can vary in size, shape, and functionality, allowing users to choose the type that best suits their specific needs.

Dictaphones are widely used in business, legal, and medical fields for recording notes, meetings, or conversations that can later be reviewed or transcribed.

Materials Required:

1. LM386 Audio Amplifier
2. Speaker (2Nos)
3. Microphone (2Nos)
4. Resistors (10k, 4.7k, 10k)
5. Capacitor (0.1uf, 0.1uf, 10uf, 10uf)

6. SPDT switch
7. Breadboard

The benefit of each electronic piece in the project

1.LM386 Audio Amplifier

The LM386 is a low-power audio amplifier commonly used in electronic circuits to amplify audio signals. It is easy to use and highly efficient, making it popular for a variety of applications.

Uses of LM386:

1. Audio Amplification in Portable Devices:
2. Intercom Systems:
3. Sound Systems in Games:
4. Educational Electronics Projects:
5. Music Applications:

Advantages of LM386:

Operates on low voltage (4 to 12 volts).

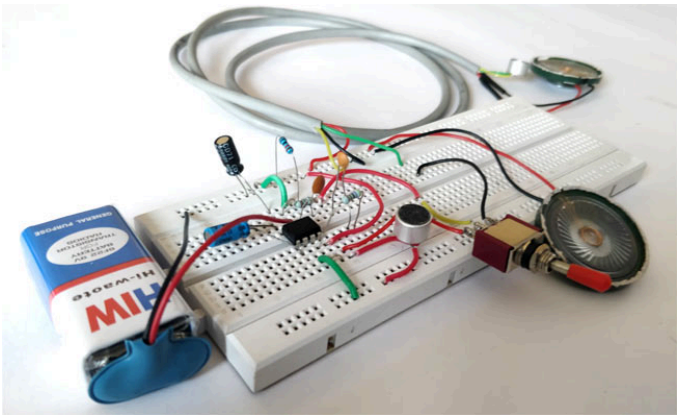
Requires few external components.

Provides a gain of up to 200 times, adjustable using a resistor or capacitor.

2.Speaker:

The speaker (or sound amplifier) has many different uses, including:

1. Listening to music: Speakers are used for listening to songs and music from different devices like phones, computers, and music players.
2. Conferences and voice calls: Speakers are used in sound amplifiers to clarify sound during voice calls and online meetings.
3. Movies and TV: They are used to enhance the sound experience while watching movies or TV shows.
4. Games: Speakers help improve the gaming experience by providing clear and immersive sound.



3.Microphone:

Microphones have a variety of uses, including:

1. Recording sound: Used in audio and music recording to capture sound from instruments, voices, or environmental noises.

2. Communication: Essential in telecommunication devices such as phones, radios, and video conferencing systems for transmitting voice data.

3. Public speaking: Microphones are commonly used in public events, speeches, and conferences to amplify the speaker’s voice to a larger audience.

4.Resistors:

Resistors are fundamental components in electrical and electronic circuits, used to control or reduce current, distribute voltage, and perform various other functions. Here are their main applications:

1. Current Limiting:

Resistors are used to limit the amount of current flowing through a circuit to protect components such as LEDs, transistors, or integrated circuits.

2. Voltage Divider:

Resistors are used to divide voltage into smaller levels as needed in electronic circuits.

5.Capcitor:

A capacitor is an electrical component used to store electrical energy in the form of a charge in an electrical or electronic circuit. Capacitors have a wide range of uses, including:

1. Energy Storage:

Capacitors are used to store electrical charges and release them when needed, such as in timing systems or camera flash units.

2. Filtering:

They are used to filter DC signals from ripples produced during AC to DC conversion in power supplies.

3. Coupling and Decoupling:

Capacitors allow signals to pass between two circuit stages without permitting DC current or isolate power sources from the main circuit to prevent interference.

6.SPDT switch:

An SPDT (Single Pole Double Throw) switch has a variety of uses, including:

1. Control circuits:

It allows switching between two different circuits or power sources. For example, it can be used to switch between two devices or toggle between different operational states.

2. Selecting modes:

Often used to select different modes in electronics or electrical equipment. For instance, switching between different fan speeds, light brightness levels, or power settings.

3. Reversing polarity:

In some applications, SPDT switches are used to reverse the polarity of a circuit, such as in DC motors to change the direction of rotation.

7.Breadboard:

The Breadboard is a prototype board used in electronics to connect components together without the need for soldering. It provides a quick and temporary way to test and design circuits. Some of the uses of a Breadboard include:

1. Testing Circuits:

It is used to test electronic circuits before they are built permanently.

2. Designing Temporary Circuits:

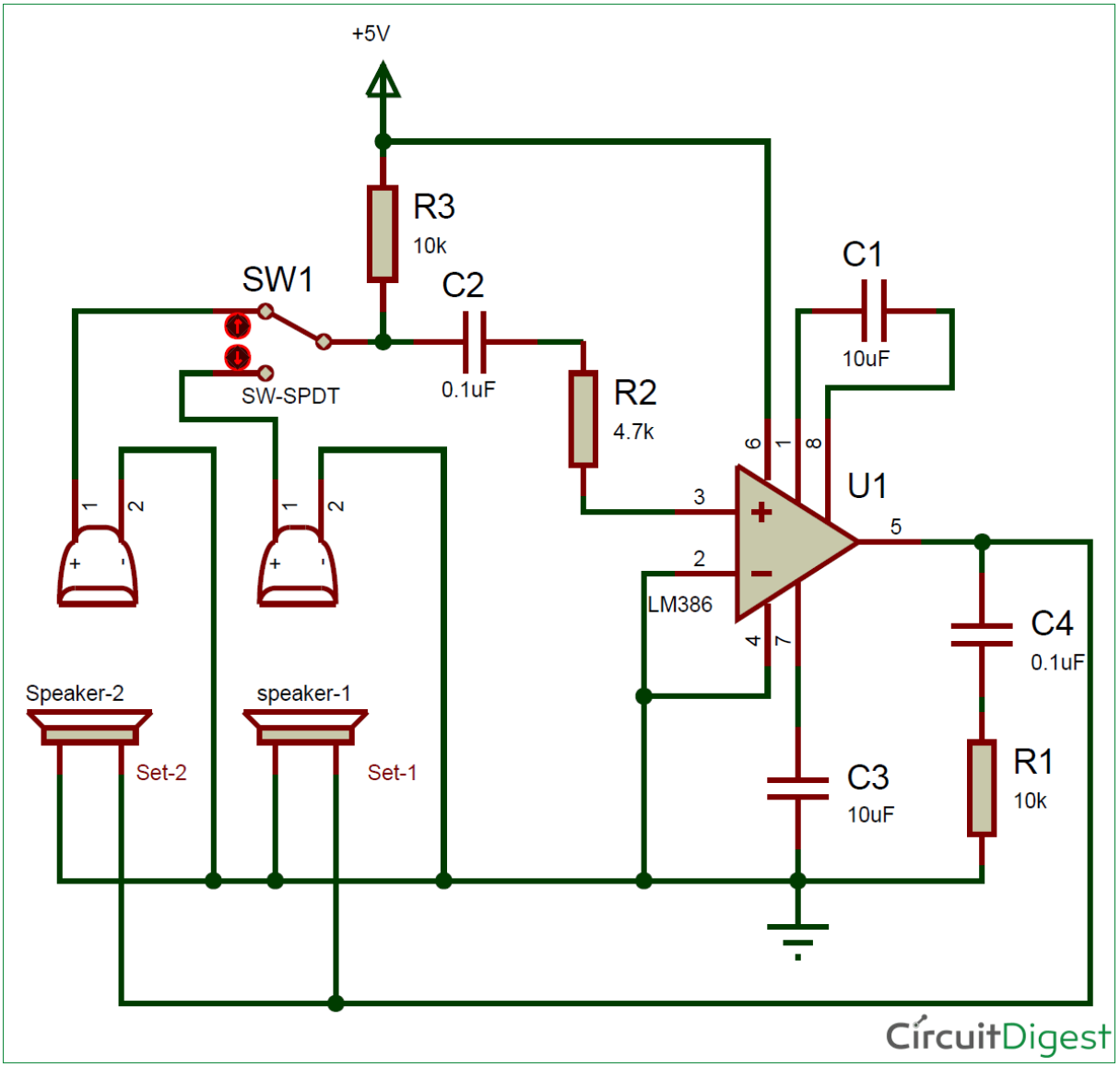
It helps in building prototypes of circuits with the ability to modify them easily.

3. Education and Training:

It is an essential tool for teaching students and beginners how to design and test circuits.

Circuit Diagram and Explanation:

The complete circuit diagram of this **Intercom Project** is given below.



As you can see the circuit is very simple and can be easily built over a breadboard. The main concept behind the circuit is the use of LM386 audio amplifier which receives the audio signal from microphone, amplifies it and plays it on the speaker. The **LM386** has a gain range from 20-200; by default the value of gain is 20 but can be increased upto 200 by using a capacitor across the pins 1 and 8. Here we have used a capacitor of 10uF to get the maximum gain of 200. The resistor R2 is used to control the volume of the speaker; here I have limited the volume to medium level using a 4.7K resistor. You can experiment with values from 1k-100k to get the volume of your choice.

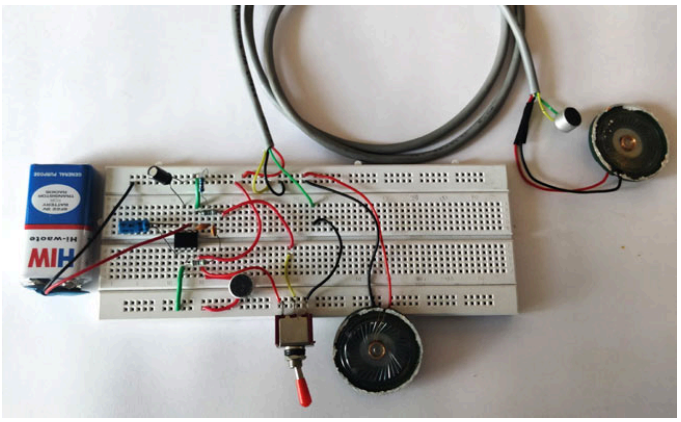
The output of the amplifier (pin 5) is connected to both the speakers. One speaker will be used in set-1 and the other in set-2 as show in the circuit diagram. The input of the amplifier

is the microphone (microphone has polarity so be careful while connecting it), We cannot amplify the sound from both the microphone at the same time, so we use a SPDT (single pole double throw) switch as shown above.

The **SPDT switch will connect only one microphone to the amplifier at a time**. So only one person can talk at a time, this type of communication is called **half-duplex communication** and this is what we see in **walki-talkies**. Each time after speaking something the user has to flip this SPDT switch for the person on other end to start talking.

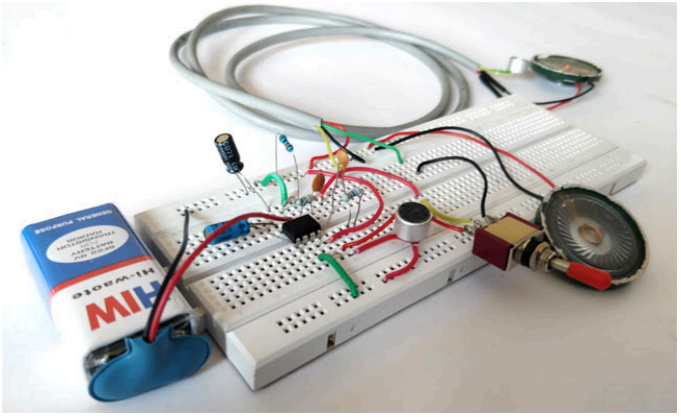
Explanation

1. **Microphone Connection**: Connect the microphones to the input of the LM386 amplifier IC. Ensure correct polarity.
2. **SPDT Switch**: Use the SPDT switch to select which microphone is connected to the amplifier at any given time. This ensures that only one person can talk at a time, making it a half-duplex communication system.
3. **Amplifier**: The LM386 IC amplifies the audio signal from the selected microphone.
4. **Speaker Connection**: Connect the output of the LM386 to the speakers. One speaker will be at the master station, and the other at the remote station.
5. **Power Supply**: Connect the 9V battery to power the circuit.



Working of Intercom Circuit:

Follow the circuit diagram above and make the connections. To make the project more attractive you can use long wires to increase the distance between the set-1 and set-2 microphone and speaker. You can use any normal wire for a decent length, but if you need cover higher distance use a twisted pair cable like CAT5 to avoid being affected by noise. I just used a normal wire for demonstration and the set-up looks something like this below:



The complete circuit is built on a bread board, and is **powered by a 9V battery**. The circuit can also run on voltage between 5V to 12V so choose a power supply which you are comfortable with. Now place the SPDT switch in a position and speak into the respective microphone your voice should be echoed on both the speakers. Similarly place the switch in opposite position and talk into the other microphone and check if you can hear the sound on the speakers. Initially you can experiment with the circuit by blowing air into the microphone and check if the speaker produces some noise.

You can also upgrade this project by adding another SPDT switch to turn of the speaker on your side when you are talking. Right now both the speakers will always be active to keep things simple, so do not worry if you hear yourself on the speaker on your end.

The complete working of the project is shown in the **video** below; you can also go through it if you are confused on how to use it. Hope you understood the project and got it working, if not feel free to use the comment section or the forums to post your doubt and I will try my best to resolve it.

2. Amplifier

Amplifier is one of the basic parts of the speakers system, where it is amputated the sound of the sound of the sound from the sound source, such as the operating system or the record, and is transformed into a powerful powerful signal to run the larger, which increases the power of sound and sound quality output from the larger. The subwoofer usually works by using its own speakers or electronic components, which contain specialized circles in the inflation of electrical signal. The volume and the subworation of the voice subsequent varies by type and size of the speakers according to the place where it will be used, affecting the quality and strength of the outlet of the system.

What is the types of amplifier?

Although amplifiers are sometimes classified according to input and output parameters (we'll get to that), there are 4 basic types, which are:

Current Amplifier: As the name suggests, an amplifier that makes the given input current higher. It is characterized by a low input impedance and high output impedance.

Voltage Amplifier: An amplifier that amplifies given voltage for a larger voltage output. It is characterized by a high input impedance and low output impedance.

Transconductance Amplifier: An amplifier that changes output current according to changing input voltage.

Transresistance Amplifier: An amplifier that changes output voltage according to changing input current. It is also known as a current-to-voltage converter.

Apart from the basic types, there are several other types of amplifiers, categorized by their operation, application or characteristics. Some of them are:

Power Amplifiers: Although not technically a type, power amplifier is a general term that refers to the amount of power provided by the power supply circuit or the amount of power delivered to the load. It is usually used in the last output stages of a circuit. Examples include: audio power amplifiers, servo motor controllers, push-pull amplifers and RF power amplifiers. Again, we'll look at the classifications of power amplifiers specifically in a little bit, since they're very important.

Operational Amplifiers (Op-Amps): Another very important type, an op-amp is an integrated circuit that acts as a voltage amplifier, and has differential input. It has a positive and negative input, but a single output with very high gain. Originally, op-amps were created using valves.

Please refer to this link to know more about operational amplifier MCQs

In this project we use amplifier with 13003transistor

What is transistor 13003?

The 13003 transistor is a type of bipolar transistor (BJT) that can be utilized for amplification and switching. This transistor has the ability to handle medium to high frequency signals, making it suitable for amplifiers that require high efficiency and stable performance.

Amplifier components using a 13003 transistor

Get a simple amplifier using a 13003 transistor, you will need the following components:

Transistor 13003: Main furnace in zoom work.

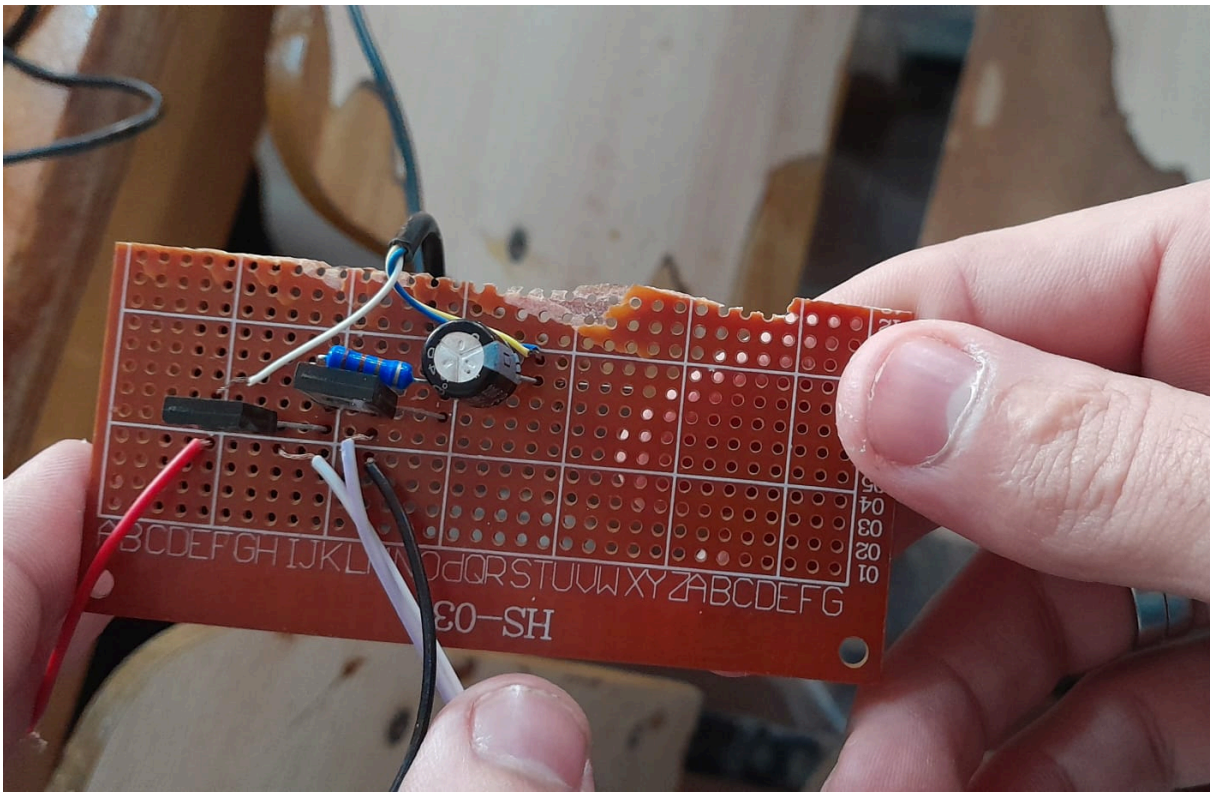
Resistors: current and voltage in the circuit.

Capacitors: to isolate emergency and operating frequencies.

Power source: Providing the necessary power for a long period of time.

Loudspeaker sound: Electric loudspeaker magnified to audible sound.

Connecting wires and circuit board: for all working personnel.



HOW TO DESIGN An AMPLIFIER?

Amplifier Design Steps 1. Design the Biasing Circuit The biasing circuit is essential to ensure that the transistor operates in the active region, allowing for amplification.

Steps of the Impervision design 1. Biasing Circuit (CiCision) The Category of Bias (CGIRI) is a basic base of ensuring that the transistor works in the active area, allowing the significant significance. The budgeting methods are specified using resistance to install the base, pool, and sender. 2. Connecting capacitors The capacitors use the procedure to replace the procedures of the ongoing currents (DC). For example, the intensity of the signal entry is used to prevent the continuous current of the impact on the signal, and is integrated on the transistor exit to move the magnifying signal to the speaker without going on the continuous current. 3. Connect the power source connects the power source in the department to ensure that the voltage and the right stream is available to run the transistor. You must choose a power source that suits the transistor and the ingredients of the circuit. 4. Connect the speaker connecting the speaker in the circuit out through the intensity of the rigidity to transfer the magnifying signal and turn it into audio voice. You must ensure that the speaker is suitable for the abrolving capability to ensure sound quality and efficiency. 5. Test the detection and adjustment

3. Power Supply

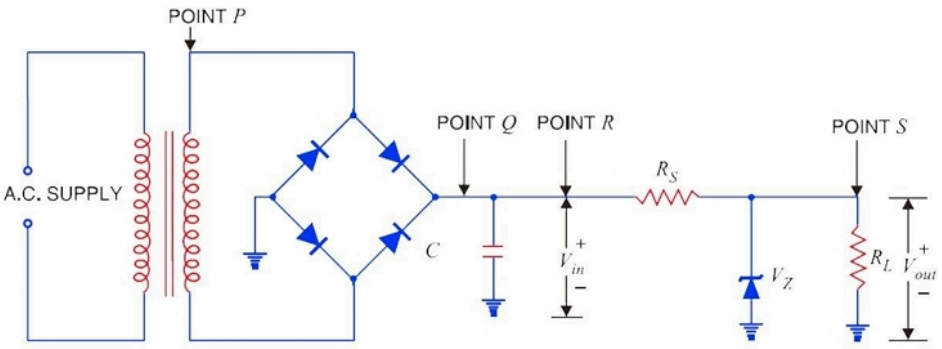
Project idea:

The power supply (PSU) is a very important device in electronic and electrical devices, as it converts electrical current from the source to a form that can be used to power devices. Here's a basic idea of how a power supply works

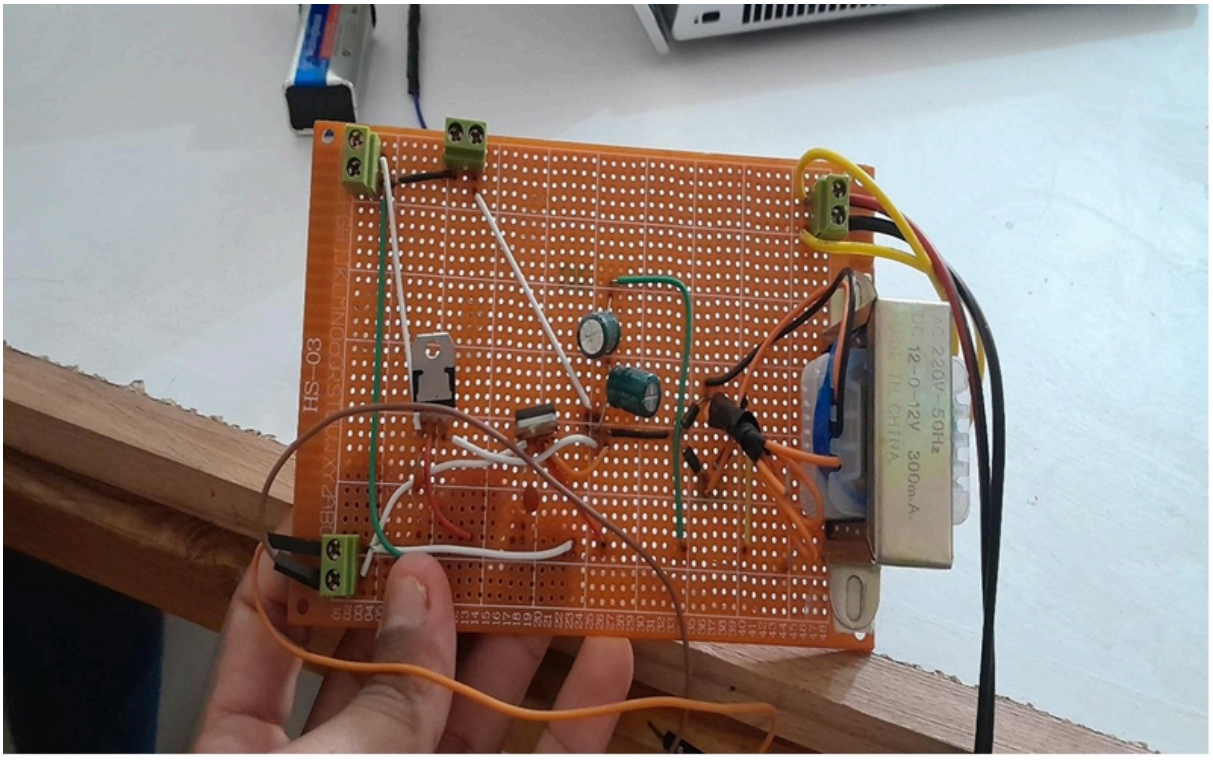
Materials Required:

1. Transformer: To convert the voltage from a high level (AC) to a low usable level (AC).
2. Rectifier: To convert alternating current (AC) to direct current (DC).
3. Capacitors: To smooth the DC current and reduce ripples.
4. Voltage Regulator: To adjust the electrical voltage to a stable level.
5. Resistors: To adjust the current and provide protection for circuits.
6. Inductors: To help regulate the current and reduce noise.
7. Wires: To connect the components together.
8. Printed Circuit Board (PCB): To mount and connect components in an organized way.

9. Enclosure: To protect the electronic unit and provide a suitable form.



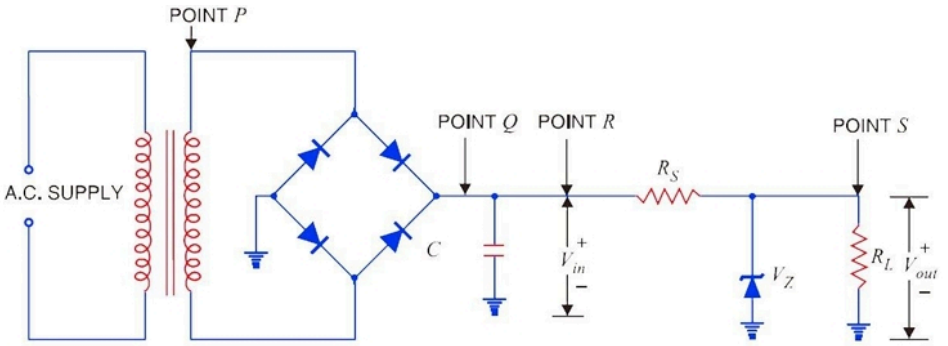
Circuit Diagram and Explanation:



Basic Steps to Connect a Power Supply Circuit:

Prepare the PCB or Breadboard :If using a Printed Circuit Board (PCB), ensure you have the correct design printed.

If using a breadboard, make sure you know how to arrange the components correctly.
Connect the Transformer: Connect the transformer to the AC power source from the socket.
Connect the output wires from the transformer to the input of the rectifier.



Connect the Rectifier: The rectifier typically consists of four diodes connected in a bridge configuration.
Connect the transformer output (AC) to the rectifier input.The rectifier will convert AC to DC.
Connect the Capacitor: Connect the smoothing capacitor across the rectifier output.
The capacitor helps reduce ripples and smooth the DC current.
Connect the Voltage Regulator:
Connect the capacitor output to the input of the voltage regulator.
The voltage regulator will adjust the voltage to the desired stable level.
Connect the Resistor: In some cases, you may need to connect resistors to adjust the current and provide protection.
Connect the Load: Connect the output of the voltage regulator to the device you want to power
(the load).
Ensure that the voltage and current are suitable for the connected device.

Verify Connections and Test the Circuit: Ensure all connections are secure and correct,Use a voltmeter to check the output voltage, Test the circuit by powering a small device to ensure it works properly.

Workind of Power Supply:

To enhance the performance and ensure the efficiency and stability of a power supply circuit, you can follow these tips:
Use High-Quality Components: Choose reliable and high-quality components to ensure good performance and long lifespan of the circuit.

Effective Heat Dissipation: Make sure to use proper heat sinks to dissipate heat generated by active components such as voltage regulators and transistors.
Better Ripple Filtering: Use capacitors with high capacitance and appropriate values to filter out
ripples and ensure a stable DC current.
Add Extra Protection Circuits: Add protection circuits like fuses, low voltage resistors, and reverse polarity protection to safeguard the circuit and connected components from damage.
Good Wire Organization: Arrange wires in an organized manner to reduce electromagnetic interference and ensure stable circuit operation.
Use a Printed Circuit Board (PCB): Using a PCB helps in properly mounting and connecting components in an organized way, which improves the overall performance of the circuit.
Regular Testing: Regularly test the circuit at different stages of assembly to ensure all components are functioning correctly and there are no faults. Verify Voltage and Current Specifications: Ensure that the output voltage and current are in line with the requirements of the connected devices.