AM RADIO RECEIVER

A MINI PROJECT REPORT

Submitted to

GONDWANA UNIVERSITY,GADCHIROLI

By

1.Muddassir Sheikh (34)

2.Gauri Mule (35)

3.Rohini Mundkar (36)

In partial fulfillment for the award of the degree of

BACHLOR OF TECHNOLOGY

IN

ELECTRONICS &TELECOMMUNICATION ENGINEERING

DEPARTMENT OF ELECTRONICS & TELECOMMUNICATION ENGINEERIG

GOVERNMENT COLLEGE OF ENGINEERING

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CERTIFICATE

This is to certify that the mini project entitled "**AM RADIO RECEIVER** " has been carried out by the team under my guidance in partial fulfillment of the degree of Bachelor of Technology in Electronics & Telecommunication Engineering of Gondwana University, Gadchiroli during the academic year 2025-2026.

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ABSTRACT

The AM (Amplitude Modulation) Radio Receiver is a fundamental electronic communication system designed to receive, detect, and reproduce amplitude-modulated radio signals transmitted over long distances. This project focuses on understanding the working principles, design, and implementation of an AM radio receiver circuit using basic electronic components such as transistors, capacitors, resistors, and diodes. The receiver is capable of tuning into a specific frequency, amplifying weak signals, and converting them into audible sound through the process of demodulation.

The objective of this project is to study the operation of each stage of the receiver — namely, the RF tuner, detector, and audio amplifier — and to observe how amplitude-modulated signals are processed to retrieve the original audio information. The design emphasizes simplicity, low cost, and educational value, making it ideal for students learning about analog communication systems. The successful construction and testing of the receiver demonstrate the practical application of communication theory and electronic circuit principles in real-world signal reception.

CHAPTER 1 : TNTRODUCTION

1.1 OVERVIEW

Radio communication is one of the oldest and most reliable forms of wireless communication used worldwide for transmitting voice, music, and information. Despite the rapid advancement of digital communication systems, Amplitude Modulation (AM) radio remains an essential and practical medium due to its simplicity, long-range capability, and ease of implementation. An AM Radio Receiver is a device that receives amplitude-modulated signals transmitted by broadcast stations, processes them, and reproduces the original audio information for the listener.

In amplitude modulation, the amplitude of a high-frequency carrier wave is varied in proportion to the instantaneous amplitude of the low-frequency audio signal. This modulated wave can travel long distances and be picked up by radio receivers operating within a specific frequency band. The receiver's primary function is to select the desired frequency, amplify the weak signal, extract the original audio content through demodulation, and convert it into sound using an audio transducer like a loudspeaker or earphone.

This project focuses on designing, constructing, and testing a simple AM radio receiver using discrete components. The purpose is to provide students with a hands-on understanding of how analog communication systems work and how signals are transmitted, received, and processed in real time.

1.2 IMPORTANCE OF AM RADIO COMMUNICATION

Amplitude Modulation was the first practical method of transmitting audio over radio frequencies and continues to play a crucial role in both broadcasting and education. Its importance lies in the following aspects:

1. **Simplicity of Implementation**:

AM transmitters and receivers can be designed using basic analog components, making them suitable for educational and experimental purposes.

2. Long Distance Coverage:

AM signals can travel vast distances, especially at night, due to ground and skywave propagation, making them ideal for regional and international broadcasting.

3. Cost-Effectiveness:

The cost of setting up and maintaining AM broadcasting stations and receivers is relatively low compared to other modulation systems.

4. Educational Value:

AM radio receivers help students understand the core principles of modulation, demodulation, signal amplification, and frequency tuning.

5. Emergency Communication:

AM radio serves as a reliable medium during disasters and emergencies when other communication networks fail.

- the AM Radio Receiver project provides a comprehensive understanding of analog communication principles and practical circuit implementation. Through this project, students learn to integrate theoretical knowledge with hands-on circuit design and testing. It lays the foundation for advanced studies in modern communication systems such as Frequency Modulation (FM), digital modulation, and wireless transmission technologies.

- AM radio receiver project involves building an electronic device that receives Amplitude Modulated (AM) radio waves and converts them into an audible sound. This project teaches the principles of AM radio, where the project's purpose is to pick up desired radio signals, reject unwanted ones, amplify the signal, and demodulate it to extract the original audio information. You can build a simple crystal radio, which is a basic and battery-free version, or a more complex one using transistors for amplification**.**

1.3 OBJECTIVE OF AM RADIO RECEIVER

1. To receive amplitude modulated (AM) signals efficiently:

The primary objective of an AM radio receiver is to receive amplitude-modulated electromagnetic waves transmitted by radio broadcasting stations and convert them into corresponding audio signals.

2. To select the desired radio frequency signal:

The receiver should be capable of tuning to a particular station frequency while rejecting all other unwanted frequencies using a tuning circuit or RF filter.

3. To amplify weak incoming signals:

The receiver amplifies very weak signals received by the antenna to a sufficient level so that further processing, such as detection and demodulation, can be performed effectively.

4. To convert high-frequency signals to a lower intermediate frequency (IF):

In superheterodyne receivers, the incoming radio frequency is mixed with a locally generated oscillator signal to produce a constant intermediate frequency, which simplifies further amplification and filtering.

5. To provide effective selectivity:

The receiver must distinguish between closely spaced broadcasting stations by using high-quality filters and tuned circuits that enhance the selectivity performance.

6. To ensure high sensitivity:

The receiver should detect even the weakest signals from distant stations, ensuring clear reception under all atmospheric and noise conditions.

7. To provide stable and accurate tuning:

The receiver must include stable oscillators and tuning mechanisms to maintain accurate reception without frequency drift during operation.

8. To demodulate the AM signal:

The receiver must separate the audio (modulating) signal from the high-frequency carrier wave using a detector or demodulator circuit, such as a diode detector.

9. To minimize noise and interference:

The receiver is designed to reduce the effects of atmospheric noise, electrical interference, and adjacent channel interference to improve sound clarity.

10. To reproduce the original audio signal clearly:

The final goal of the receiver is to deliver a clear and distortion-free reproduction of the transmitted sound signal through the loudspeaker.

11. To provide adequate fidelity:

The receiver should reproduce the transmitted audio frequencies accurately, maintaining good fidelity so that the sound output closely matches the original broadcast.

12. To offer volume and tone control:

The receiver should allow users to control the amplitude (volume) and tonal quality of the output sound for comfortable listening.

13. To ensure efficient power utilization:

The receiver must operate efficiently, consuming minimal power, especially in portable or battery-operated sets, without compromising performance.

14. To provide automatic gain control (AGC):

The receiver should include an AGC circuit that automatically adjusts the gain of amplifiers to maintain a constant audio output level, even when signal strength varies.

15. To ensure stability, reliability, and ease of operation:

The receiver should operate reliably under varying environmental conditions, maintain frequency stability, and be user-friendly in tuning and operation.

1.4 NEED OF AM RADIO RECEIVER

An AM (Amplitude Modulation) Radio Receiver is an essential electronic device used to receive, detect, and reproduce information (like voice or music) transmitted through AM radio waves. The need for an AM radio receiver arises from several technical and practical purposes, explained below:

1. Communication Purpose

- The primary need of an AM radio receiver is to receive audio signals transmitted through amplitude modulation.
- It helps in mass communication, allowing information, news, and entertainment to reach wide audiences simultaneously.

2.Demodulation of AM Signal

- AM signals transmitted by broadcasting stations are modulated with information.
- The receiver is needed to demodulate (extract) the original audio signal from the modulated carrier wave.

3. Signal Amplification

- The incoming AM signals are very weak.
- The receiver amplifies these weak radio frequency (RF) signals to a level suitable for detection and audio reproduction.

4. Frequency Selection

- Many stations transmit signals simultaneously at different carrier frequencies.
- The AM receiver is needed to select the desired frequency (station) and reject all other signals using a tuned circuit.

5. Conversion to Audio Signal

After demodulation, the AM receiver converts electrical signals into sound waves using a loudspeaker or earphones, making them audible to the listener.

6. Simple and Cost-Effective Communication

- AM receivers are simple in construction and inexpensive compared to FM or digital receivers.
- Hence, they are widely used in rural and remote areas for basic communication needs.

7. Emergency Communication

AM radio receivers play a vital role during natural disasters or emergencies, as they can operate on battery power and receive important public alerts.

8. Educational and Technical Learning

AM radio receivers are widely used in academic and training laboratories for studying communication systems, modulation, demodulation, and electronics principles.

9. Wide Coverage

AM signals can travel long distances, especially at night, due to skywave propagation. Thus, AM receivers are needed to receive broadcasts over large geographical areas.

10. Entertainment and Information Source

They provide music, sports, news, and cultural programs, serving as a continuous source of information and entertainment.

The need of an AM radio receiver is to receive, amplify, select, demodulate, and reproduce amplitude-modulated signals transmitted through radio waves, enabling reliable, cost-effective, and long-distance wireless communication

CHAPTER 2 : COMPONENTS & EQUIPMENT REQUIRED

2.1 LIST OF COMPONENTS

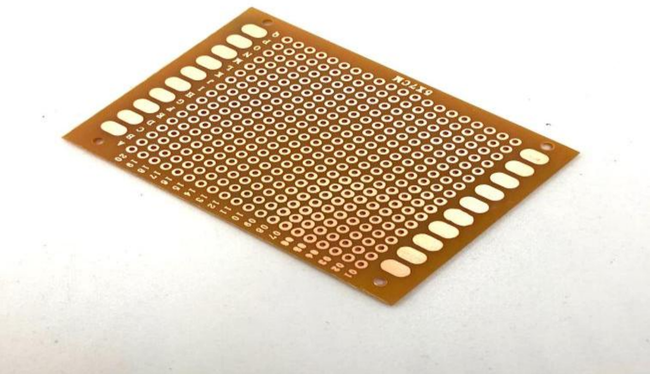
SR.NO.	COMPONENT & EQUIPMENT
1.	Protoboard (dot PCB)
2.	Soldering iron
3.	Soldering Wire
4.	Super enamelled copper wire roll
5.	A Schottky diode with low forward voltage drop (~0.2–0.45V).
6.	Electrolytic Capacitor Through Hole
7.	Mix Carbon Film Resistor Assorted Box
8.	Mix Ceramic Capacitors Assorted Box
9.	3pF – 18pF Trimmer Variable Capacitor
10.	Speaker
11.	Battery
12.	IC LM386

2.2. SPECIFICATION OF EACH COMPONENT

1.protoboard (dot PCB) : A protoboard, also known as a dot PCB, is a permanent printed circuit board (PCB) for prototyping that requires soldering. Unlike a solderless breadboard, which is used for temporary, reusable circuits, a protoboard creates a stable and durable prototype by soldering components into place.

A dot PCB is a thin, rigid sheet typically made from a phenolic resin or reinforced epoxy-fiberglass laminate (FR-4).

- **Pad-per-hole (Dot PCB):** This is the most common type, where each pre-drilled hole is surrounded by an individual copper pad. It offers maximum layout flexibility, as you must manually wire all connections. You can create connections by bridging pads with solder or by adding jumper wires.
- **Stripboard (Veroboard):** On this type, copper strips run in parallel lines across the board, connecting all the holes in each strip. This simplifies wiring for some circuits, but requires the user to cut or "break" the copper strips with a drill bit where connections should not exist.
- **Single or double-sided:** Protoboards can have copper pads on one side (single-sided) or both sides (double-sided). Double-sided boards can offer more routing options for complex projects.



2.Soldering Iron : A soldering iron is used to join electronic components on PCB with solder wire. For electronics, 25–40W rating is standard with a conical or chisel tip. It operates typically on 230V AC (India) or 110V AC (other regions).The tip heats up to ~350–400°C for melting solder. Lightweight and insulated handle ensures safe operation. It is essential for permanent assembly of circuits.

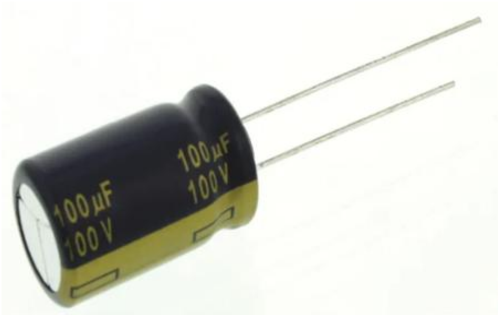
3. soldering Wire: Solder wire is a fusible metal alloy used to make reliable joints in circuits. The common composition is 60% tin (Sn) and 40% lead (Pb), though lead-free types exist .It comes with a rosin flux core that helps in smooth soldering. Typical wire diameter is 0.5–1 mm for electronic applications. Melting point ranges around 180–190°C for easy flow. It ensures strong, conductive, and durable electrical connections.

4.Super Enamelled Copper Wire Roll: Conductive copper wire coated with thin enamel insulation. Used for winding coils, transformers, inductors, and electromagnets. Available in different SWG (Standard Wire Gauge) sizes – 28 SWG (0.37mm) for fine winding, and 18 SWG (1.22mm) for heavy current use. Provides high mechanical strength and resistance to short circuits. Lightweight and flexible for circuit prototyping and RF applications.

5 . A Schottky diode with low forward voltage drop (~0.2–0.45V).).

Maximum current capacity: 1 Ampere, Reverse voltage: 40V. Fast switching speed, suitable for high-frequency applications. Package type: DO-41 (axial lead). Used in rectifiers, clamping circuits, and power conversion (DC-DC converters).

6.Electrolytic Capacitor Through Hole: Polarized capacitor used for DC filtering, coupling, and decoupling applications. Capacitance values: 100µF and 10µF, with 50V working voltage. Cylindrical body with two leads for through-hole mounting. High capacitance per unit volume compared to ceramic capacitors. Commonly used in power supplies, audio circuits, and timing applications



7. Mix Carbon Film Resistor Assorted Box : Contains A variety of carbon film resistors with standard values (ohms).Resistors limit current, divide voltage, and protect circuit components. Carbon film provides stability and tolerance (typically ±5%).**,**Colour bands on the resistor body indicate resistance value. Useful in prototyping, circuit testing, and hobby projects.

8.Mix Ceramic Capacitors Assorted Box : A collection of different ceramic disc capacitors with small capacitance values (pF–nF range). Non-polarized capacitors suitable for AC and DC applications. Provide high-frequency stability and low losses. Used in oscillators, tuning circuits, and RF applications. Assorted values help in experimenting and matching circuit requirements.

9. 3pF – 18pF Trimmer Variable Capacitor : Adjustable capacitor with capacitance range from 3pF to 18pF. Designed for fine-tuning resonance in RF and oscillator circuits. Small screw-type adjustment mechanism to vary capacitance. Used in AM/FM radios, filters, and matching networks. Through-hole mounting, lightweight, and easy to calibrate.

10.speaker : The speaker in an AM receiver is the final stage that converts electrical audio signals into sound waves. It usually uses a moving coil mechanism, where the voice coil placed in a magnetic field vibrates a diaphragm to produce sound. The amplified signal from the audio amplifier drives the speaker. It typically has an impedance of 4–16 Ω and works in the audio frequency range of 300 Hz to 3.4 kHz for AM. The speaker allows the listener to hear the original voice or music transmitted.

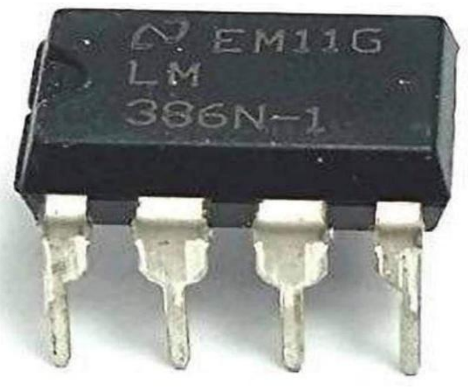
11. Battery :A mobile phone battery can be used to power an AM radio receiver project, but it requires a charging and protection circuit to be safe and effective. A typical mobile phone battery is a single-cell lithium-ion (Li-ion) battery, which operates around 3.7

12.IC LM386

The LM386 is a low-voltage audio power amplifier IC designed specifically for use in low-power audio applications. It is widely used in AM and FM radio receivers, portable audio devices, and other small electronic projects where amplification of an audio signal is required. The LM386 provides a simple way to amplify weak audio signals to drive a small speaker or earphone.

The LM386 is an 8-pin integrated circuit that operates with a power supply voltage between 4V and 12V (or up to 18V maximum). It requires very few external components, which makes it ideal for compact circuit designs. The internal gain of the LM386 is 20 by default, but it can be increased up to 200 by adding an external capacitor and resistor between pins 1 and 8.

It delivers a maximum output power of around 1 Watt (depending on supply voltage and load) and can drive an 8Ω or 4Ω speaker efficiently. The IC also includes features like low distortion, high gain, and low quiescent current.



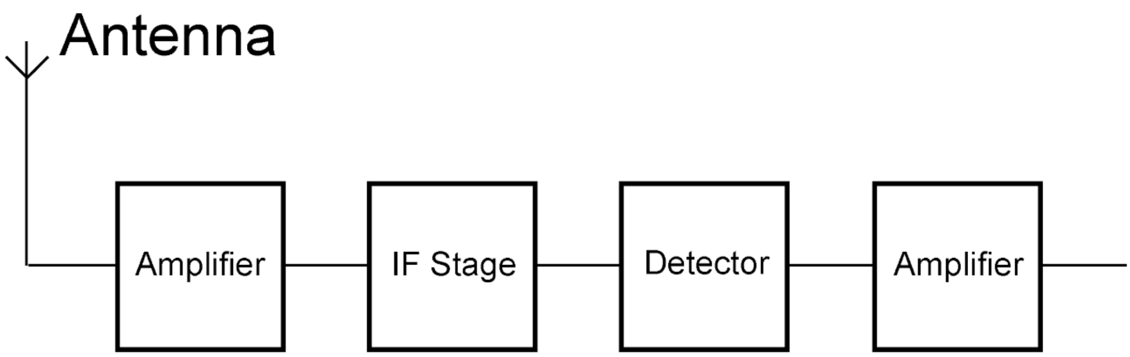
PIN CONFIGURATION OF LM 386

PIN NUMBER	PIN NAME	DESCRIPTION
1.	Gain	Used to adjust the gain (with capacitor between pins 1 and 8).
2.	Inverting input (-)	Connected to ground in most applications .
3.	Non inverting input (+)	Audio input signal terminal .
4.	Ground (GND)	Connect to circuit ground .
5.	Output	Audio output connected to speaker .
6.	vcc	Supply voltage terminal (4v-12v typical)b.
7.	Bypass	Used for bypassing or filtering the power supply (optional) .
8.	Gain	Used along with pin 1 to set amplifier gain .

CHAPTER 3. DESIGN

3.1 BLOCK DIAGRAM

The block diagram of an AM receiver is shown below



low power electric signals that have become low after the IF stage and the process of demodulation The basic description of all the parts of the AM receiver is as follows

Receiving antenna – A receiving antenna functions opposite to a transmission antenna and receives the amplitude-modulated wave and converts it into electric current and feeds it to the amplifier.

Amplifier – An amplifier is a piece of equipment that is used to amplify the signal received by the antenna.

IF stage – In the intermediate-frequency amplifier stage the intermediate frequencies of the amplified signals are filtered and amplified before feeding it the demodulator, this makes the process of demodulation easier.

Detector – It is a device or circuit, used to extract the desired signal from the carrier wave, a process called demodulation

Amplifier- It is a component that amplifies the.
This signal can now be used for the desired device (maybe a TV or a radio).

3.2 PERFORMANCE CHARACTERISTICS

3.2.1 selectivity :

Selectivity is the ability of a receiver to separate the desired signal from other unwanted signals (stations) that are close in frequency.

- It prevents interference from nearby stations.
- Determined mainly by the bandwidth and sharpness (Q-factor) of the tuned circuits and IF filters.
- Too much selectivity (very narrow bandwidth) can distort the signal; too little selectivity allows interference.

3.2.2 sensitivity :

Sensitivity of an AM radio receiver is its ability to receive weak signals and produce a usable output (sound) with minimum distortion and noise.

- A more sensitive receiver can detect and amplify very weak radio signals.
- It depends on the quality of RF amplifier, mixer, and IF stages.
- Sensitivity is usually expressed in microvolts (µV) — the minimum input voltage required to produce a specified output (e.g., 20 dB SNR).

3.2.3 Fidelity

Fidelity is the ability of a receiver to reproduce the original transmitted audio signal without distortion and with accurate frequency response.

- It measures how faithfully the output sound matches the input (original program).
- Depends on the audio amplifier, detector, and bandwidth of the receiver

- Higher fidelity gives better sound quality, but may reduce selectivity (because it requires wider bandwidth).

3.2.4 Signal-to-Noise Ratio (SNR)

Signal-to-Noise Ratio is the ratio of the strength (power) of the received signal to the strength (power) of background noise, usually expressed in decibels (dB).

- A high SNR means the signal is much stronger than the noise — giving clear reception.
- A low SNR means the noise is comparable to or stronger than the signal — resulting in poor audio quality.

3.3 WORKING PRINCIPLE

“An AM radio receiver works on the principle of receiving amplitude modulated (AM) radio waves, selecting the desired frequency, extracting the audio signal through demodulation, and amplifying it to produce sound.”

- The AM signal received by the antenna is amplified and tuned.
- The mixer and local oscillator convert the received signal to a fixed IF (455 kHz).
- The IF amplifier enhances signal strength and selectivity.
- The detector extracts the original audio information.
- The audio amplifier increases the signal level to drive the speaker, producing sound.

3.4 CIRCUIT DIAGRAM AND ITS SPECIFICATION

AM RECEIVER (model 1)

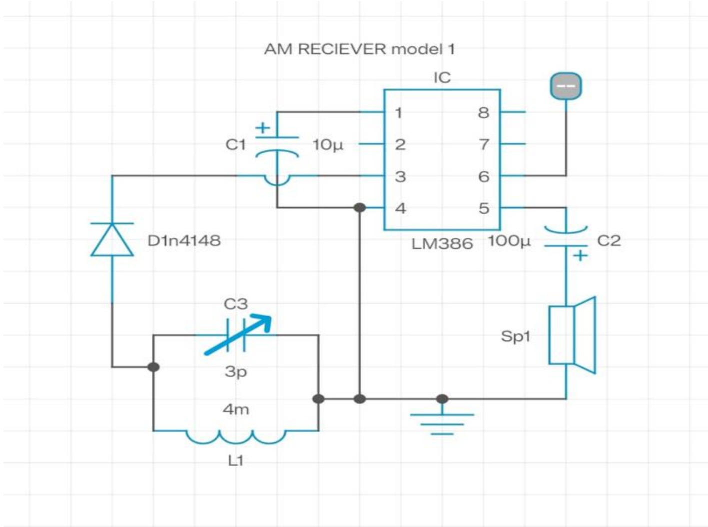


Figure .1 circuit diagram of model 1 AM receiver

This AM receiver circuit works by first tuning the desired radio frequency using the LC tank circuit formed by the inductor L1 and the variable capacitor C3. The selected AM signal is then passed to the diode D1N4148, which acts as a detector to rectify the signal and separate the audio information from the high-frequency carrier wave. The coupling capacitor C1 removes the RF components and allows only the audio signal to pass through. Since this audio signal is very weak, it is fed into the LM386 audio amplifier IC, which amplifies it to a level sufficient to drive the speaker. Finally, the amplified audio is sent through capacitor C2 to the speaker Sp1, where it is converted into sound. In this way, the circuit receives AM signals, demodulates them, and outputs the corresponding audio.

OR

AM RECEIVER (model 2)

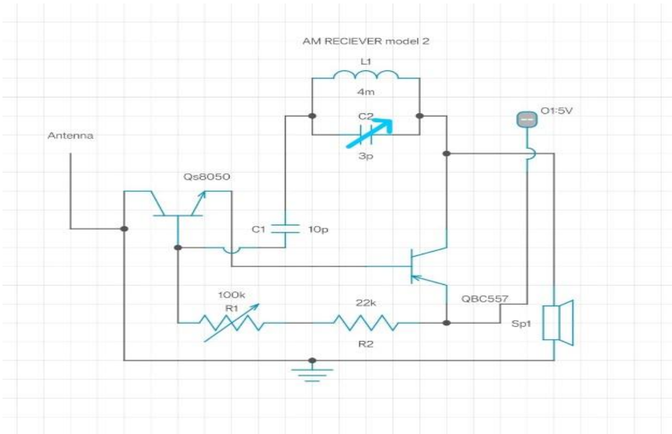


Figure .2 circuit diagram of model 2 AM receiver

This AM receiver uses an LC tank circuit (L1 and C2) to tune and select a particular AM radio frequency. The signal from the antenna is fed to the NPN transistor (Qs8050), which works as a detector to demodulate the AM signal and extract audio. The PNP transistor (QBC557) amplifies the weak audio, and the output is sent to the speaker (Sp1) for sound. The circuit operates on a 5V DC supply and provides a simple, low-power AM radio receiver.

AM TRENSMITTER (IF Required)

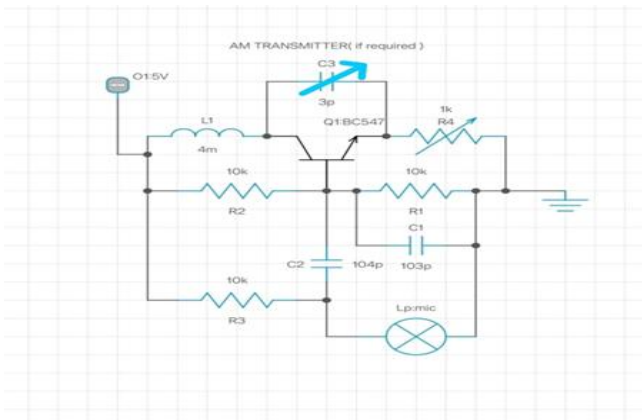


Figure .3 AM transmitter

This is a simple AM transmitter circuit that uses a microphone to capture sound and transmit it over an AM frequency. It works with a small power supply (5V) and uses basic components like a transistor, resistors, capacitors, and an LC tank circuit . The microphone (MIC) converts sound into small electrical signals. These signals are fed to the transistor BC547, which amplifies them. The LC tank circuit (L1 and C3) generates a high-frequency carrier signal. The amplified audio signal modulates the carrier, producing an AM wave. The modulated AM signal is then transmitted via the antenna, which can be received by an AM receiver.

3.5 ALTIUM CIRCUITMAKER

Altium Circuit Maker is a free, cloud-based PCB design tool for hobbyists and students, built on the same technology as Altium Designer. It features a simplified interface, real-time collaboration through the Altium 365 platform, and advanced tools like a topological autoroute. A key feature is its community-based approach, allowing users to work on projects together and build on existing designs. However, it requires a constant internet connection for full functionality

3.5.1 features

- **Free design tool:** Circuit Maker is available for free, making powerful PCB design technology accessible to makers and students.
- **Cloud-based collaboration:** It leverages the Altium 365 platform for project sharing and team-based design, with projects viewable via a web browser.
- **Built on Altium technology:** Circuit Maker uses the same powerful engine and technology as the professional Altium Designer software, including features like a topological autoroute, Native 3D™ technology, and DRC/DFM validated outputs.
- **Streamlined interface:** It has a more beginner-friendly ribbon-style interface compared to Altium Designer.
- **Integrated community:** The platform encourages community interaction by allowing users to fork and modify projects, and to collaborate with others.

CHAPTER 4 : IMPLEMENTATION

4.1 PROCESS PCB FABRICATION

1. Design: Circuit Layout using Altium Circuit Maker

- The first step is to design the circuit diagram (schematic) using Altium Circuit Maker, a professional PCB design software.
- You first create the schematic diagram showing the electrical connections between components (resistors, capacitors, ICs, etc.).
- Then, convert the schematic into a PCB layout, where the software automatically places the tracks (copper paths), pads, and vias according to the design rules and dimensions.
- The layout includes the board outline, track width, and spacing, ensuring the circuit functions correctly and safely.
- Once finalized, the layout is ready for printing.

2. Print: Track Layout Printing

- After completing the layout, the next step is to print the PCB design onto A4-size glossy paper using a laser printer (not an inkjet printer).
- The black tracks on the print represent copper paths that will remain on the board.
- Ensure that the print is in mirror format (for single-sided boards) so that when transferred onto the copper board, the orientation is correct.
- The laser printer toner (carbon-based) is used because it can later be transferred onto the copper surface using heat.

3. Toner Transfer: Ironing Process

- Take the copper-clad board (a board coated with a thin layer of copper) and clean its surface with sandpaper or steel wool to remove oxidation and dirt.
- Place the printed layout face-down on the copper surface.
- Using an electric iron set to maximum temperature, press and heat the paper for about 6–8 minutes.
- The heat causes the toner from the paper to melt and stick to the copper surface, creating the track pattern.
- Allow the board to cool before removing the paper.

4. Rectify: Paper Removal and Correction

- Once cooled, immerse the board in water for a few minutes to soften the paper.
- Gently peel off the paper, ensuring that the toner tracks remain on the copper surface.
- If any part of the printed track is missing or broken, use a permanent marker to manually redraw or correct the track.
- This toner/marker now acts as a protective mask, preventing those areas from being etched away in the next step.

5. Etching: Copper Removal

- Prepare an etching solution using Copper(II) Chloride ($CuCl_2$) or other etchants like Ferric Chloride ($FeCl_3$).
- Dip the board in the $CuCl_2$ solution, and gently agitate it so that the unprotected copper (not covered by toner or marker) dissolves away.
- Continue until only the toner-protected copper tracks remain on the board.
- Rinse the board with water and remove the remaining toner using acetone or thinner, leaving clean copper tracks.

6. Drill: Component Holes

- Use a drilling machine with a 1 mm drill bit to make holes where the electronic components' leads will be inserted.
- The drilling must be precise, matching the positions of component pads in the layout.
- Clean the board again after drilling to remove copper dust.

7. Solder: Component Mounting

- Insert the components (resistors, capacitors, ICs, etc.) into the drilled holes according to the circuit diagram.
- Flip the board and solder the component leads to the copper pads using a soldering iron and solder wire.
- Ensure all connections are clean, shiny, and properly joined without any short circuits.

8. Mark: Component Labelling

- After soldering, label each component on the board by marking its name or reference number (e.g., R1, C1, IC2) near its position using a permanent marker or silkscreen.
- This labelling helps in easy identification, troubleshooting, and repair in the future.

4.2 WEEKLY IMPLEMENTATION

Week 1 : Component Collection & Initial Setup

- **Identify required components:** Resistors, capacitors, inductors (coil), diodes, transistors/ICs (e.g., LM386 for audio amp), antenna, speaker, breadboard, power supply, jumper wires. Arrange them on the breadboard without soldering to get an idea of placement.

- **Do theoretical calculations:** Calculate resonant frequency of LC tank circuit ($f = 1 / 2\pi\sqrt{LC}$) to tune to AM band (typically 530 kHz – 1600 kHz). component values (capacitors in pF range, inductors in µH range**).**
- **Outcome:** Ready with all components, datasheets, and approximate design values**.**

Week 2 -3 : Circuit Prototype on Breadboard & Point PCB

- **Step 1 (Breadboard) :** Build the RF tuning circuit (LC tank). Add detector stage (diode + capacitor for envelope detection). Add AF amplifier stage (transistor or IC). M Connect output to small speaker/earphone.
- **Step 2 (Point PCB) :** After breadboard testing, transfer working prototype to point PCB for stronger connections. Use soldered jumpers/wires to replicate breadboard circuit**.**
- **Outcome :** Basic working AM receiver prototype**.**

Week 4 : Testing the Prototype

- **Test with antenna to receive AM signals.** Adjust variable capacitor/coil to tune stations. Measure audio output with multimeter or oscilloscope (if available).
- **Debugging:** No signal → check antenna & tuning.
- Weak audio → check amplifier stage.
- Noise → check grounding and shielding**.**
- **Outcome**: Fully functional prototype**.**

Week 5 : Circuit Diagram & PCB Design

- Draw complete schematic (manually or using software like Proteus, Ki Cad, Easy EDA).
- **Add all connections neatly**: Antenna → Tuning circuit → Detector → Audio amplifier → Speaker.
- **Design PCB layout**: Place RF components (coil, capacitor) close together to reduce noise. Keep audio amplifier separated to avoid interference.
- **Prepare for etching**: Print layout on glossy paper (for toner transfer method) or use UV photoresist board.
- **Outcome:** PCB layout ready for fabrication.

Week 6 : PCB Etching, Soldering & Testing

- **Etching Process :** Transfer PCB design on copper-clad board. Use Ferric Chloride ($FeCl_3$) to etch. Drill holes for through-hole components.
- **Soldering Components :** Start with resistors, capacitors, diodes → ICs/transistors → connectors → final speaker output. Use proper soldering technique (clean tip, avoid excess solder).
- **Testing:** Power up with correct supply voltage. Tune the receiver and verify performance.
- **Outcome**: Fully working AM receiver on PCB.

Week 7 : Project Casing & Submission

- **Choose a casing/box (plastic/metal project enclosure).** Cut openings for antenna, tuning knob, speaker, and power supply. Mount PCB securely with spacers/screws. Label input/output ports.
- **Prepare final documentation/report:** Project Title, Objectives, Circuit Diagram, Components, Working, Results, Applications.
- **Outcome:** Professional-looking AM receiver ready for submission

- # CHAPTER 5 : TESTING AND RESUILT

5.1 TESTING PROCEDURE

STEP	TEST NAME	METHOD	EXPECTED RESULT
1.	Power test	Check voltage using multimeter .	Correct supply voltage (e.g. 9 V).
2.	Continuity test	Check wiring using multimeter .	No open / short circuit
3.	Tuning test	Tune across frequency band	Clear reception of AM stations .
4.	Sensitivity test	Feed weak signal from signal generator .	Detect weak signal (~1uV) .
5.	Selectivity test	Apply to near by frequencies	Separates close stations cleanly .
6.	Fidelity test	Observe waveform or listen to audio .	Clear , distortion – free output .
7.	SNR test	Measure using analyser .	SNR >= DB (GOOD).

Table 1. testing procedure

5.2 OBSERVATION TABLE

PARAMETER	MEASURED VALUE	EXPECTED VALUE	REMARK
Sensitivity	1.5 uV	>= 2uV	Good
Selectivity	10 kHz	9-12 kHz	Ok
Fidelity	Clear	Clear	Ok
SNR	38 dB	>= 30 dB	Excellent
Output	Clear audio	Clear audio	Working properly

Table 2. observation table

5.3 RESULT

- The AM radio receiver was successfully designed and tested.
- The circuit received multiple AM broadcast stations clearly.
- Sensitivity and selectivity were found satisfactory.
- The receiver produced clear and distortion-free sound output.

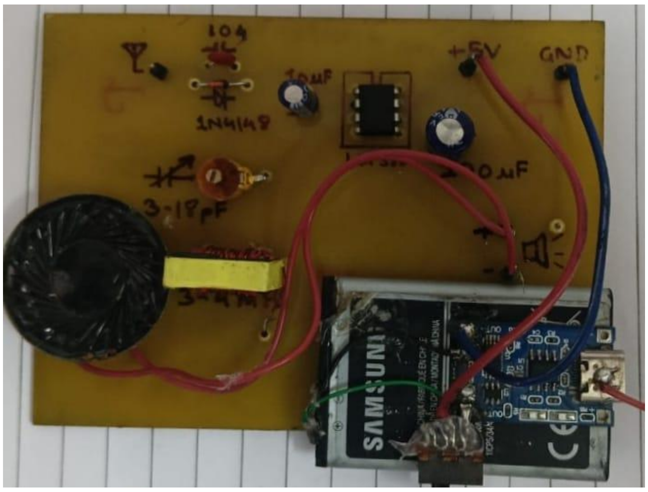


Figure . 4 AM radio receiver

Figure 5. layout of AM radio receiver

The printed circuit board (PCB) for the AM Radio Receiver was successfully designed, etched, and soldered. All the required circuit connections were made as per the layout, and the components were mounted correctly. After testing, the AM Radio Receiver circuit was found to be working successfully, receiving amplitude-modulated (AM) radio signals clearly within the designed frequency range.

The project demonstrates the practical implementation of radio frequency amplification, detection, and audio amplification stages. The PCB layout ensured minimal noise and proper signal flow, confirming the accuracy of the circuit design.

Thus, the AM Radio Receiver mini-project was successfully developed and tested, fulfilling the design objectives.

CHAPTER 6 : CONCLUSION AND FUTURE SCOPE

6.1 CONCLUSION

The Amplitude Modulation (AM) radio receiver is a fundamental electronic device that has played a crucial role in the evolution of communication technology. Through this project and analysis, it becomes evident that the AM receiver is designed to capture electromagnetic waves transmitted through the air, selectively tune to the desired frequency, amplify the received signal, and convert it back into audible sound. The working principle of the AM receiver relies primarily on the processes of modulation and demodulation, where the amplitude of the carrier wave is varied in accordance with the information signal and then extracted at the receiver.

During the design and implementation of the AM radio receiver, several key components and stages are identified as critical for its proper functioning. The antenna serves as the initial interface, capturing the radio frequency signals from the environment. This is followed by the tuning circuit, which ensures selectivity, allowing the receiver to isolate a particular frequency while rejecting others. The intermediate frequency (IF) amplification stage enhances the signal strength, improving the overall sensitivity of the receiver. Demodulation is then achieved through envelope detection or other appropriate circuits, extracting the audio information from the modulated carrier. Finally, audio amplification ensures that the recovered signal can drive the speaker to produce clear and audible sound.

6.2 FUTURE SCOPE

Although AM radio technology is one of the oldest forms of wireless communication, it continues to have significant relevance in both practical applications and educational contexts. The future scope of AM radio receivers is extensive and can be viewed from multiple perspectives, including technological enhancements, educational utility, emergency communication, and integration with modern digital systems.

One major aspect of the future scope is technological enhancement. Advances in semiconductor technology, microelectronics, and low-power circuits can improve the efficiency, sensitivity, and selectivity of AM radio receivers. Modern AM receivers can be designed with integrated circuits that reduce size, cost, and power consumption while increasing performance. Moreover, the use of digital signal processing (DSP) techniques allows AM signals to be demodulated with higher accuracy, improving audio clarity and reducing noise interference. These enhancements make AM receivers more reliable, even in challenging signal environments such as rural areas or locations with high electromagnetic interference.

Another important area is educational and training applications. AM radio receivers provide a simple and effective platform for teaching fundamental concepts of electronics, communication, and signal processing. Students and engineers can gain hands-on experience in tuning circuits, amplification, demodulation, and audio processing. Even in the era of digital communication, AM radio receivers remain a practical tool for demonstrating analog principles, helping bridge the gap between theoretical learning and real-world applications. This educational utility ensures that AM receivers will continue to be relevant in technical laboratories and training programs.

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