

Power Distribution System for a CubeSat

*Project report to be submitted in partial fulfillment of the
requirements for the degree*

of

Bachelor of Technology in Electrical and Electronics Engineering

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DECLARATION

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We, the undersigned, hereby declare that the mini project report titled *Power Distribution System for a CubeSat*, submitted for partial fulfillment of the requirements for the award of degree of Bachelor of Technology of the APJ Abdul Kalam Technological University, Kerala is a bonafide work done by us under the supervision of Prof. Rajesh M, Department of Electrical and Electronics Engineering, Government Engineering College, Barton Hill. This submission represents our ideas in our own words and ideas and words of others have been included, we have adequately and accurately cited and referenced the original sources. We also declare that we have adhered to ethics of academic honesty and integrity and have not misrepresented or fabricated any data or idea or fact or sources in submission. We understand that any violation of the above will be a case for disciplinary action by the institute and/or the University can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been obtained. This report has not been previously formed the basis for the award of any degree, diploma or similar title of any other university

Place: TVM

Date: December 24, 2022

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CERTIFICATE

This is to certify that the report titled **Power Distribution System for a CubeSat** submitted by **Mary Angel Gomez, Mayoogha SL, Naveen AB, Navya S** of the **Department of Electrical and Electronics Engineering** to the APJ Abdul Kalam University in partial fulfillment of the requirements for the award of the Degree of *Bachelor of Technology in Electrical and Electronics Engineering* is a bonafide record of the project work carried out by them under my guidance and supervision. This report in any form has been submitted to any other university or institute for any purpose.

Prof. Rajesh M Assistant Professor	Er. Karthika B Assistant Professor-Adhoc	Er. Thara Mohan Assistant Professor-Adhoc
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ABSTRACT

FM transmitter is a small device that can transmit Frequency Modulated signal over short range. This document consists of most simple and economical technique for building a FM transmitter using basic electronic components like resistor, capacitor, inductor etc. The FM transmitter receives human voice signals through microphone. It further amplifies it, modulate it over carrier and finally transmit it. Assuming favorable conditions, output of transmitter can be received by anyone who tunes it in frequency of our transmitter. Here, we have described the circuit diagram, its working, components required, uses of various components in our circuit, its practical applicability. This design is capable of transmitting signal for distance of 200 m, tuned at FM range (88 MHz- 108 MHz). One could clearly hear sound produced at microphone of transmitter.

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Chapter 1

Introduction

FM TRANSMITTER is an electronic device, which produce frequency modulated waves with the help of an antenna. A transmitter generates FM waves for various purpose such as communication, broadcasting a message etc. Furthermore, FM signals are less prone to interference as compared to AM signals due to higher bandwidth. Also, it less susceptible to noise. The signal transmitted has a limited range for its reception, as we increase our distance from source, the signal received is merged with noise and further more noise component dominates the signal transmitted and hence message cannot be received successfully after certain distance due to obstacles. The source of power is 12V dc battery. The information that is provided to the transmitter is in the form of an electronic signal. This includes audio from a microphone. The transmitter combines the information signal that is to be carried with the FM signal. This is called modulation. In an FM transmitter, the information is added to the radio signal by slightly varying the radio signal's frequency.

Chapter 2

Literature Review

Information transmission is very vital to human life just as the early men used sticks to produce sound which indicates the location of each other as they wander about also down to the middle era when town crises come into play for the same information propagation to be transmitted from one point to another with the aid of radio communication which necessitates the application of radio transmitter and receiver.

Frequency modulation (FM) is a technique for wireless transmission of information where the frequency of a high frequency carrier is changed in proportion to message signal which contains the information. FM was invented and developed by Edwin Armstrong in the 1920's and 30's. Frequency modulation was demonstrated to the Federal Communications Commission (FCC) for the first time in 1940, and the first commercial FM radio station began broadcasting in 1945.

A radio transmitter is device whose major function is to send information (intelligence) from one point to another in most cases the information to be transmitted are voice music and code signals. However the transmission of radio signal is done with the aid of electrical resonance this is when the frequency of the receiver is equal to the incoming one from the transmitter resonance is observed which is the totality of radio communication, frequency modulation (FM) transmitter is less distorted than other wave bands like amplitude modulation and short wave band. The frequency on the tuning dial ranges from 88MHZ to 108MHZ.

Chapter 3

Aim

To build a simple two transistor FM transmitter that can be powered by any power source in the range of 6-12 V DC.

Chapter 4

Components Required

- Resistor $86\text{k}\Omega$ - 1 nos
- Resistor $10\text{k}\Omega$ - 1 nos
- Resistor $3.3\text{k}\Omega$ - 1 nos
- Resistor $2.2\text{k}\Omega$ - 1 nos
- Resistor 100Ω - 1 nos
- Capacitor $1\mu\text{F}$ - 2 nos
- Capacitor 2.2 nF - 2 nos
- Inductor $200\mu\text{H}$ – 1 nos
- Capacitor 4.4 nF – 1 nos
- Capacitor 100pF – 2 nos
- Variable Capacitor 10pF – 2 nos
- Transistor BC108 – 2 nos
- Transistor 2N2369 – 1 nos
- Antenna – 1 nos

Chapter 5

Circuit Diagram

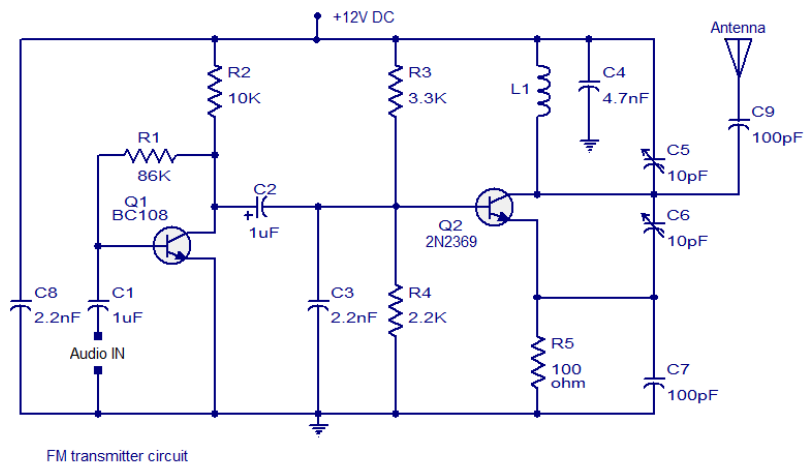


Figure 5.1: FM transmitter circuit diagram

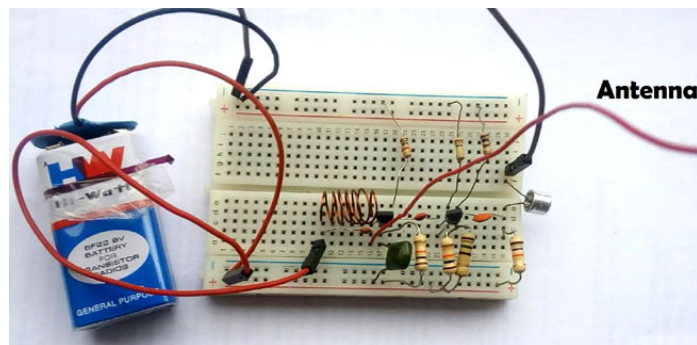


Figure 5.2: FM transmitter hardware

Chapter 6

Working

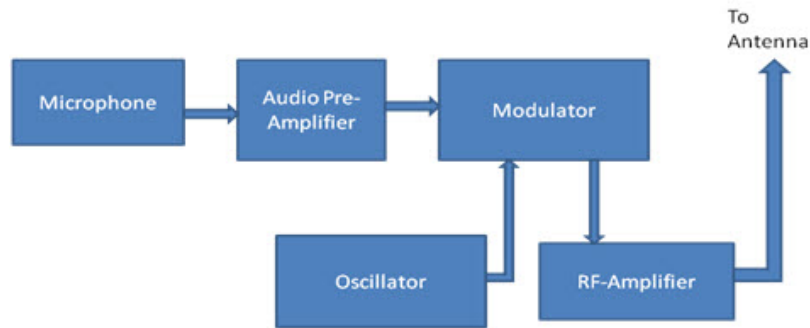


Figure 6.1: FM transmitter circuit block diagram

6.1 Pre-amplification stage

- The first stage of the circuit is a preamplifier stage based on transistor Q1 which can be any low noise npn transistor.
- This is a collector to base biased amplifier stage where resistor R2 sets the collector current and R1 provided the necessary collector to base bias.
- C1 is the input DC decoupling capacitor which couples the input audio signal to the Q1 base.
- C8 is the power supply bypass capacitor.
- If you are going with a battery eliminator, then it must be well filtered and regulated. C3 and C4 are for suppressing the ripple if any.

- C3 prevents any noise disturbance to pass into the input of transistor
- Q2 and C4 suppresses voltage spikes and noise disturbance in the power supply.

6.2 Modulator & Oscillator stage

- Next stage is the oscillator cum modulator stage.
- Modulation stage is served by transistor Q2. Q2 can be 2N2369, 2N2219, 2N1711.
- Electrolytic capacitor C2 couples the output of the first stage to the second stage.
- R3 and R4 are the biasing resistors of Q2.
- R5 is the emitter resistor of Q2.
- Inductor L1 and trimmer capacitor C5 form the tank circuit which is necessary for creating oscillations.
- The modulated FM signal is available at the collector of Q2 and it is coupled to the antenna using capacitor C9.
- L1 can be constructed by making 4 turns of 1mm enamelled copper wire on a 10mm diameter plastic former.
- Trimmer C5 can be used for adjusting the transmission frequency.
- Trimmer capacitor C6 can be adjusted for obtaining the maximum range.
- The antenna can be a 1m copper wire.

Chapter 7

Result

The circuit was setup as per the circuit diagram & found to be working in good condition without any problem.

Chapter 8

Conclusion

So, far the test result of this project which is the outcome of construction procedures has revealed the successful achievement of the primary objective; the design and construction of the FM transmitter is now ready for either constructional or entrepreneur purposes. The successful completion of this study has indicated that practical FM transmitter can be designed and constructed.

Chapter 9

Applications

- Non-commercial broadcasting and commercial broadcasting
- Simple to build and use
- Most of the components required for this circuit can be procured from your junk box.
- The circuit can be powered from anything between 6 to 12V DC.
- Useful during natural disasters to broadcast warnings or other messages when other communication techniques fail
- Range of antenna and frequency can be extended by choosing the wanted components
- Can also be used as an FM bugger circuit by taking advantage of Capture effect in FM waves.

REFERENCES

- Two transistor FM transmitter : <https://www.circuitstoday.com/simple-fm-transmitter-circuit>

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