DESIGN AND CONSTRUCTION OF

TV TRANSMITTER

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DELCLARATION

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DEDICATION

his work is dedicated to Almighty ALLAH for sparing my life up to this moment and for his finite mercy and blessings on me. To my caring parent, Mr. Abdulrasheed Adeyinka Shittu, Irs. Taibat Abdulrasheed Shittu and Mrs. Khairat Abdulrasheed Shittu Also to my brother and sters, Rasheedat Ganiyu.

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thank Almighty ALLAH whose in his infinite mercy has seen me through my undergraduate rogram despite all the rough and tough times, he still grant me life, guidance, protection, hope d success to crown my little effort..

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vish to further thank all my friends both home and abroad, that made my stay in FUT rthwhile, I make bold to thank Mohammed*(elect.)*, Mr. Olajide Kolawole Muftau, Saheed osu, Alfa Wasiu, Alfa Bilaminu, Abbas, Kazeem Omo't, Sister Rasheedat, Moh'd Yunusa, Shaba, Faderera, Balkis, Maryam, Mummy, 2simple, great lad, Bro. Gbenga.

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Abstract

The project started with an introduction of what a wireless transmitter is, in which a wireless TV transmitter in this respect.

It then gave some information about the various developmental stages of signal transmission down to TV signal transmission which in a way described wireless transmission. And then gave information on the basic principle of operation of a wireless TV transmitter, which is modulation in general.

A process of designing a TV wireless transmitter was then described, in which a TV modulator was used and some resulting built circuit, pre-amplifier stage, the driver stage and then the power amplifier stage coupled to the transmitting whip antenna at the power amplifier output. The preamplifier stage comprises of an amplifier (RF 2312), which amplifies the TV modulator signal to a power which can be acted upon by the Driver Stage. The driver stage creates the necessary transmission ground of the transmitter. Lastly, the power amplifier stage amplifies the signal for good transmission of the signal.

Lastly the method of construction with some test to achieving a good build of the wireless TV transmitter under consideration was then given.

CHAPTER ONE

1.0 Introduction

Electronic Engineering has been an avenue of relaxation in our modern environment. In our homes appliances like VCRs, VCDs etc have not only become invaluable assets in our homes in terms of unwinding and stress release, but also become tools of education amongst many notable uses.

It is paramount to state here that these equipment do not operate independent of each other and therefore, they have to be linked up somehow to each other, for example through cable and sometimes wireless communications. The use of cables in these connections may cause the house somehow untidy, consume space and constitute nuisance. The TV transmitter can be used to provide handy 'wireless' connections to TV sets.

Imagining the convenience of being able to sit outdoors of the house watching movies on a portable TV with a tape or laser disc playing indoors without having to string long cables between them. Also retransmission of cable satellite programmes within a house without wiring the whole house therefore the need to acquire large coils of cable is overcome and a vital area to consider during cable network installation, which is some cost, reduced.

A TV transmitter; achieves this by accepting video and audio signal from the VCR or satellite cables and generate a low power signal that can be picked up by a nearby TV set

within the range of transmission of the transmitter and tuned to the frequency of the transmitter.

All components used for this project can be sourced in electronic shops around the nation. A TV transmitter is actually two separate transmitter combined in one, which transmit both moving pictures (video) and the audio signals from an input device to a television over a wireless link. In order to do this, a TV modulator is used, which is bought as a component. This sets the frequency at which the transmission is made, frequency modulate the sound signal, amplitude modulate the video signal and then merge the two signals together for transmission at the 520MHz frequency equivalent to channel 27 on the TV channels.

This project is to show the wireless transmission of video signals from the transmitter (in this respect VCD) to a receiver (in this respect TV) as a prototype to the transmission of signal from television stations to our various homes and localities.

As a process, communication has synonyms such as expressing feelings, conversing, speaking, corresponding, writing, listening and exchanging. Communication is often formed around the principles of respect, promises and the want for social improvement. People communicate to satisfy needs in both their work and non-work lives. People want to be heard, to be appreciated and to be wanted. They also want to accomplish tasks and to achieve goals. Obviously, then, a major purpose of communication is to help people feel good about themselves and about their friends, groups, and organizations. For these types of communication, there must be a transmission of thoughts, ideas and feelings from one mind to another [1].

The transmission of signal to the receiver involves the processing of the signal by the transmitter, for the transmission channel through which the signal gets to the receiver without any reasonable error or distortion and the receiver being able to receive and decode the sent signal. Therefore, communication system comes into play in the project description. Before continuing, let us first define what communication is.

1.1 Communication: Communication is one of those activities that everyone recognises, but few can define satisfactorily. Communication is talking to one another, it is television, it is spreading information, it is our hairstyle, and it is literary criticism: the list is endless.

Communication is a process that allows organisms to exchange information by several methods. Communication requires that all parties understand a common language that is exchanged. There are auditory means, such as speaking or singing, and nonverbal, physical means, such as body language, sign language, paralanguage, touch, eye contact, or the use of writing [2].

Nonetheless, communication is usually described along a few major dimensions:

1. Content (*what type of things are communicated*)
2. Source (*by whom*)
3. Form (*in which form*)
4. Channel (*through which medium*)
5. Destination/Receiver (*to whom*)
6. Purpose/Pragmatic aspect (*with what kind of results*) [2]

1.1.1 Communication: can also be defined as the process of transmitting ideas, information and messages in the form useful to the receiver through communication systems. [3].

For communication to be meaningful, it has to get to the right person at the right time with the communication system responding at full capacity of keeping to time and right coding and decoding of sent message [3].

1.2 Communication Systems: a communications system is a collection of individual communications networks, transmission systems, relay stations, tributary stations, and data terminal equipment (DTE) usually capable of interconnection and interoperation to form an integrated whole[3].

1.2.1 **Component of a Communication System:** The components of a communications system serve a common purpose, are technically compatible, use common procedures, respond to controls, and operate in unison [2]

In electrical system, communication system involves the Transmitter, Transmission Channel and the Receiver. This contains the input and output transducers as a peripheral to it. Fig. 1 below shows the transmission system.

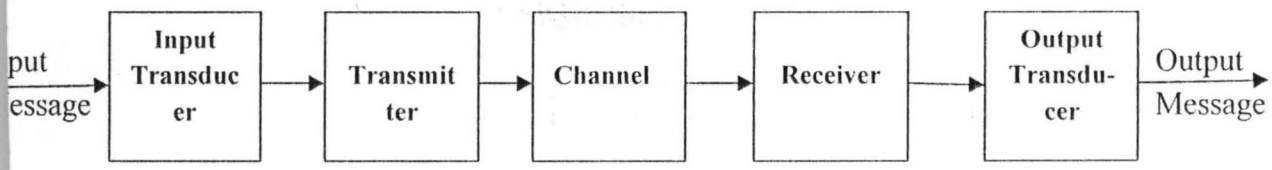


Fig. 1.0: Block Diagram of a Communication System

To get a good signal output, the transmitter is designed such that it tries to aovid/reduce the effect of noise, interference or distortion in the sent signal. This may require the use of very effective modulation and demodulation techniques suitable for the transmission channel [3].

1.3 Design Limitations

The greatest constraint of the project is in the design of the frequency of transmission and the mixing of the audio and video signals togeger for transmission. In solving this problem, with more research, a TV modulator was used in the input stage. Also to get a very sharp image on the TV was also a problem.

1.4 Aims and Objectives

The basic aim and objective of this project is to design and construct a wireless TV transmitter, which can be used to transmit video and audio signals in homes, offices, quarters, with transmission rang e specified during design state (10-20m) using 12V supply.

1.5 Design Specification

These include:

- Input voltage of 220V
- Power voltage of 12V to the circuit
- Maximum stable signal transmitted
- Frequency range within NCC regulations

CHAPTER TWO

2.0 Literature Review / Theoretical Background

This in its context contains some brief historical background about the development of video signal. But before continuing, let us first talk about the transmission of signals in general.

2.0.1 Introduction to Signal Transmission:

With the beginnings of modern understanding of the phenomenon of electricity in the 18th century, inventors started to search for ways in which electrical signals might be employed for the rapid relay of messages over long distances. The first practical telegraph system, however, was not produced until the 19th century;, when two such inventions were announced in the same year of 1837: one, in Britain, by Charles Wheatstone and William F. Cooke, and the other, in America, by Samuel F.B. Morse. Morse also develop the code system of dots and dashes –Morse Code- that was universally adopted for the new medium. Morse code was in world wide use until February 1, 1999, when it was replaced by the Global Maritime Distress and Safety System, which uses satellite and terrestrial radio communication [6].

Although telegraphy marked a great advance in rapid long-distance communication, early telegraph systems could convey messages only letter by letter. The search was therefore also on for some means of voice communication by electricity as well. Early devices that appeared in the 1850s and 1860s were capable of transmitting sound vibrations but not

true human speech. The first person to patent an electric telephone in the modern sense was the American inventor Alexander Graham Bell, in 1876. At the same time, Edison was also in the process of finding a way to record and then reproduce sound waves, paving the way for the invention of the record player [6].

The first radio broadcast was made in 1906, in the United States. The first broadcast of Opera, from the Metropolitan Opera House in New York, was transmitted by De Forest in 1910. By 1920, several radio stations began transmitting in the United States, and by 1923 the British Broadcasting Corporation (BBC) was transmitting in the United Kingdom; by 1925 there were 600 radio stations worldwide. Nowadays almost every home has a radio [6].

2.0.2 **Digital Telecommunication Network:**

In 1947, William Shockey, John Bardeen, and Walter Brattain invented the transistor. This enabled the electronics revolution to take place and provided the basis for a digitalized, rather than mechanical, telecommunications network.

In 1965 Charles Kao put forward the theory that information could be carried using optical fibres. These have subsequently been developed to provide a means of carrying huge amount of information at very high speed. Optical firbres form the backbone of the global transmission network [6].

2.0.3 **Invention of Television:**

... 1927 (before television), H. G. Wells condemned radio as useful only to "very sedentary persons living in badly lighted houses or otherwise unable to read...and who have no capacity for thought or conversation."

By 1961, Newton Minow (then chair of the FCC in the U.S.) had described television as a "vast wasteland...of game shows, violence...sadism, murder, western badmen, western good men, private eyes, gangsters, more violence, and cartoons." Whatever its achievements, or whatever its failings, there's no doubt that television is capable of exerting an influence that no other medium of communication can match. This is something to think about the next time you pull a dissolve lever, roll a tape, aim a camera, and slide an audio fader, count out a video, type a line of electronic text... [8].

The basic concept of television - the transmission of images over distances - had challenged scientists even before the invention of the movies or radio.

In 1875, George Carey in Boston proposed a system of **a grid of photoelectric cells** facing the image to be transmitted, connected up, in parallel, to a similar grid made up of light bulbs. It was, by definition, a very low resolution system, and would have required thousands of connections from the photocells to the bulbs.

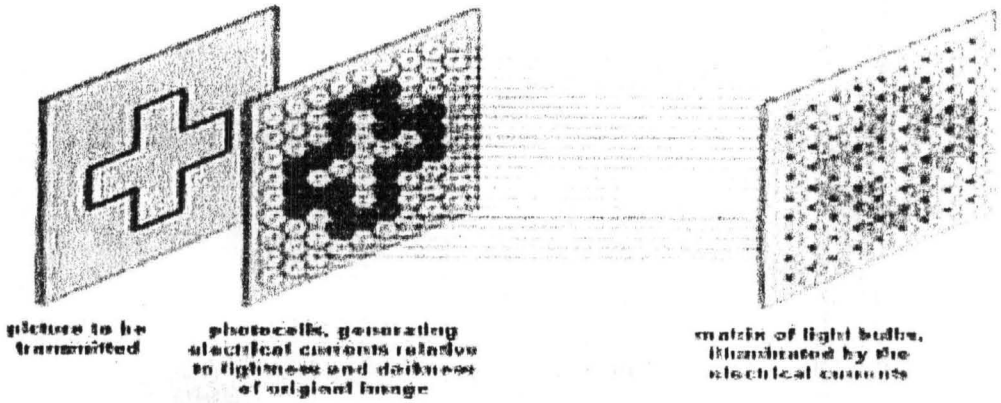


Fig. 2.0: **a grid of photoelectric cells**

The **Nipkow scanning disc**, the basis of mechanical television, was invented in 1883. It was simply a metal disc perforated by holes arranged in a spiral. When it revolved, the disc could scan a picture placed behind it. The resulting changes in light intensity were picked up by a photoelectric cell, which converted the changes in light to an electrical signal. This signal was then sent via electric wires to a receiver where there was an identical disc turning at the same speed in front of a lamp whose brightness changed according to the received signal. [8]

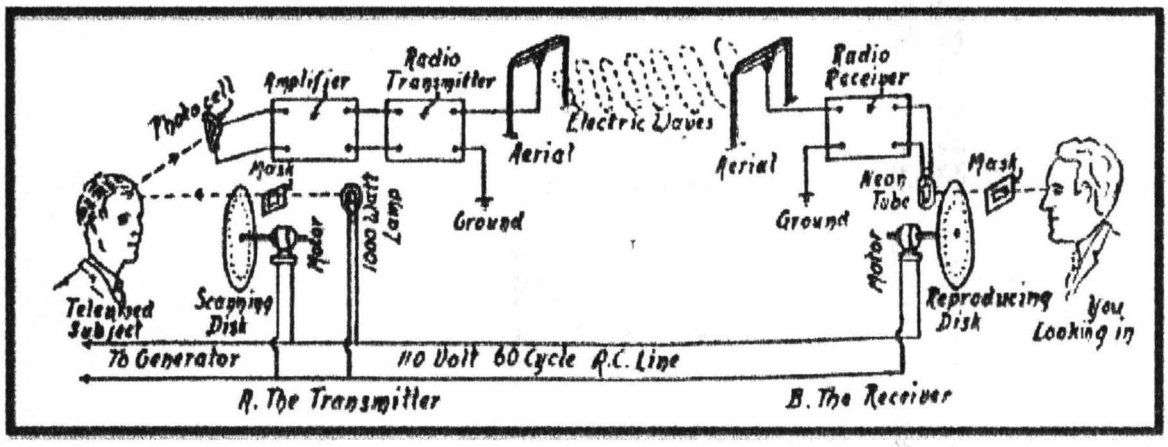


Fig. 2.1: **The Nipkow scanning disc**

The present system of electronic television was proposed in detail by a **Scotsman, A. A. Campbell-Swinton,** in 1908, but again, his ideas were theoretical in nature, since the ability to put together cathode ray tubes wasn't ready for prime time. [8]

As an aside, the many early television schemes envisioned transmission through wires, not over the air. **Guglielmo Marconi's** invention of the wireless radio (1895) spurred efforts toward over-the-air transmission of pictures, and in the late 1920s, radio and motion pictures were combined. [8]

Charles Francis Jenkins, the inventor of the modern motion picture projector, in 1928 began regular broadcasts of crude "radiomovies" in Washington, D.C., using motion-picture film as a source. [8]

Electronic television, which used cathode ray tubes as receivers and transmitters, was developed simultaneously and independently in the United States in the early 1920s by **Vladimir K. Zworykin** and **Philo T. Farnsworth**. They both built on the tube developed in 1897 by **Karl Ferdinand Braun** in Germany. [8]

The first **regular broadcasts of electronic television for the public began in 1936.** In London, England, they were using 405 horizontal scanning lines. France adopted a 455-line electronic system that year. As well, the Berlin Olympics were telecast with 441 lines, and watched in special viewing rooms by the people of Berlin and Leipzig. **In the United States, the first public showing of television was at the 1939 World's Fair in New York**, using a 340-line system. Two years later, **in 1941, an industry-wide engineering committee adopted standards for a 525-line system** based on specifications developed by the Radio Corporation of America (RCA). At that time there were about 7,000 television sets in the U.S., most of them in New York. However, during the Second World War, telecasting was reduced from 15 hours a week to just 4. [8]

The system was authorized by the Federal Communications Commission (FCC) in the United States and became known as **NTSC**, named after the **National Television System Committee**, which developed it. But, it was after World War II that regular broadcasting actually began, and after 1945, television developed rapidly throughout the world, most of Europe choosing a 625-line system that was incompatible with the U.S. 525-line standard. [8]

When peacetime activities resumed, television mania quickly swept the continent, on both sides of the border. Etiquette columns in the local paper urged consumers to purchase sets for the dining room to prevent families from eating in the living room. Non-TV set owners watched several hours a week at other peoples' homes. Optometrists offered special TV-watching glasses to prevent "telestrain" and viewers were advised to shift their gaze when viewing for long periods. In polls of the day, two-thirds said they did less reading, and two-thirds also did less visiting. Magazine readership went down 25%, and local bars had their patronage reduced by the same amount (that is, until they got their own TV sets!) [8]

2.1 Theoritical Background

These involve most theories that enable the construction of the project to be realized.

2.1.1 Modulation: is a process of putting information into a high frequency carrier for transmission. This implies that the transmission is done at high frequency but modified to carry the lower frequency information (also called intelligence signal). Once the

information has been received, the intelligence signal is removed to get the original information back (Demodulation) [5].

Also, modulation is the process of varying a periodic waveform, i.e. a tone, in order to use that signal to convey a message, in a similar fashion as a musician may modulate the tone from a musical instrument by varying its volume, timing and pitch. Normally a high-frequency sinusoid waveform is used as carrier signal. The three key parameters of a sine wave are its amplitude ("volume"), its phase ("timing") and its frequency ("pitch"), all of which can be modified in accordance with a low frequency information signal to obtain the modulated signal.[4]

2.1.2 **Modulators, Demodulators and Modems:** A device that performs modulation is known as a modulator and a device that performs the inverse operation of modulation is known as a demodulator (sometimes detector or demod). A device that can do both operations is a modem (a contraction of the two terms). [4]

2.1.3 **Classification of Modulation:** Modulation can either be Analogue or Digital.

2.1.3.0 ***Analog Modulation:*** In analog modulation, the modulation is applied continuously in response to the analog information signal. Common analog modulation techniques are:

2.1.3.1 Amplitude modulation; Double-sideband modulation DSB, Double-sideband modulation with unsuppressed carrier (DSB-WC) (used on the radio AM band), Double-sideband suppressed-carrier transmission (DSB-SC), Double-sideband reduced carrier transmission (DSB-RC), Sing[illegible]deband modulation, Single-sideband modulation (SSB, or SSB-

AM), very similar to single-sideband suppressed carrier modulation (SSB-SC), Vestigial sideband modulation (VSB, or VSB-AM), Quadrature amplitude modulation (QAM).

2.1.3.2 Angle modulation; Frequency modulation (FM), Phase modulation (PM), General angular modulation(a mixture between frequency modulation and frequency modulation for best performance (for e.g. FM with preemphasis-deemphasis (PDE)). [4]. Digital modulation methods,

2.1.4 ***Digital modulation:*** is a type of modulation, which involves an ordered sequence of symbols selected from a finite set of discrete element e.g. text, number etc [3].

In digital modulation, an analog carrier signal is modulated by a digital bit stream of either equal length signals or varying length signals. This can be described as a form of analog-to-digital conversion. The changes in the carrier signal are chosen from a finite number of alternative symbols (the modulation alphabet) [4].

2.1.4.1 **Digital Modulation Techniques:**

The most fundamental techniques are:

- In the case of CW, groupings of on-off keying of varying length signals are used.
- In the case of PSK, a finite number of phases are used.
- In the case of FSK, a finite number of frequencies are used.
- In the case of ASK, a finite number of amplitudes are used.
- In the case of QAM, an inphase signal (the I signal, for example a cosine waveform) and a quadrature phase signal (the Q signal, for example a sine wave) are amplitude modulated with a finite number of amplitudes. It can be seen as a two channel system.

The resulting signal is a combination of PSK and ASK, with a finite number of at least two phases, and a finite number of at least two amplitudes [4].

Figure 1.1 below shows a pictorial view of digital and analogue signal respectively.

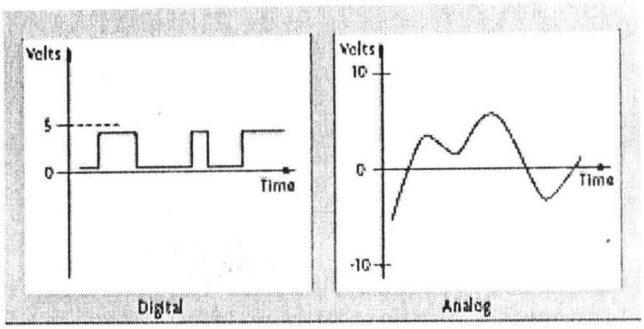


Figure 1.1:Digital and Analog Signal Representations

2.2 **Video Signal:** Video signal is an analogue signal and this implies that only analogue modulation is involved. The analogue modulation involved in this respect is the Frequency Modulation Technique to prepare the video signal for transmission.

2.3 **Frequency Spectrum:** Frequency signal ranges from the Very Low Frequency to the Extremely High Frequency as shown in the Table Below. [5]

Table 1.0: Radio Frequency and Its Wavelength

FREQU-ENCY	DESIGNATION	ABBRE-VATION	WAVELENGTH
3-30KHz	Very Low Frequency	VLF	100,000-10,000m
30-300KHz	Low Frequency	LF	10,000-1,000m
300-3,000KHz	Medium Frequency	MF	1,000-100m
3-30MHz	High Frequency (Short Wave)	HF	100-10m
30-300MHz	Very High Frequency	VHF	10-1m
300-3,000 MHz	Ultra High Frequency	UHF	1m – 10cm
3-30 GHz	Super High Frequency	SHF	10-1cm
30-300 GHz	Extremely High Frequency	EHF	1cm – 1m

KHz = Kilohert (1,000Hz) MHz = Megahertz (1,000 KHz) GHz = Gigahertz (1,000 MHz)

Amongst these frequencies, the VHFs and UHFs are mostly used for video signal transmissions.

No one can predict with certainty exactly how telecommunications will develop but certain trends can be noted. Some communication services currently provided by wire are migrating to radio means for greater convenience and flexibility. The short range radio standard (known as Bluetooth) will be used to connect a range of devices into a fixed network. Conversely, radio and television programmes, traditionally broadcast over airwaves, are moving on to cable networks [6].

Hence, the only way to effectively carryout communication is through Modulation, which allows low frequency intelligence propagation with a high frequency carrier. The high frequency carrier chosen are done so that reasonable antenna size is used [7].

4 Importance of Modulation includes:

1. Multiplexing
2. Channel Assignment
3. Reduction of Noise and Interference
4. Easy Radiation and Reception of Signal by reasonable sized antenna
5. To overcome Equipment Limitations e.g. size and weight.

CHAPTER THREE

3.0 Design and Construction

This contains two main parts; the input/TV modulator segment and the transmitter segment as shown by the block diagram shown below.

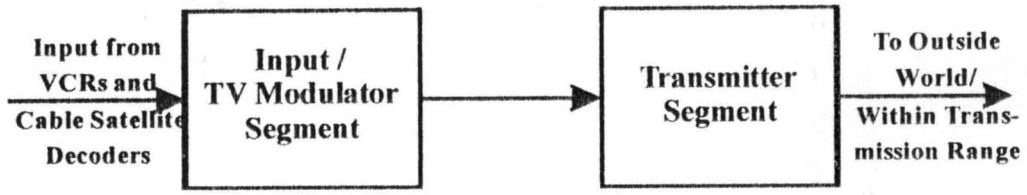


Fig. 3.0 Block Diagram of the Transmitter Circuit

The Input / TV modulator segment receive the audio and video signal, modulate the signal to the required frequency and also combine the signal into one single signal.

The modulated signal is very low in magnitude and so it is pre-amplified by the radio frequency (RF) integrated Circuit (IC). The output is then fed to transistor TR1 which is acting as an RF driver to transistor TR2, which is then finally RF power amplifier that radiates RF power into space via an antenna.

The transmitter segment comprises of three segments; the preamplifier stage, the RF driver stage and the power amplifier stage supplied by a 12V rectified power supply as shown by the block diagram below.

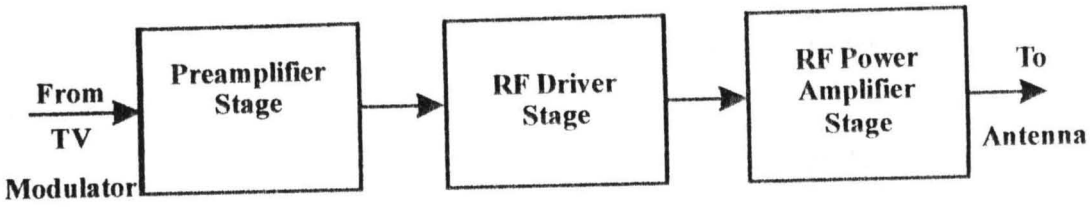


Fig. 3.1 Circuit Diagram of the Transmitter Segment

Discussing these stages in detail, we have

1. **Preamplifier Stage**

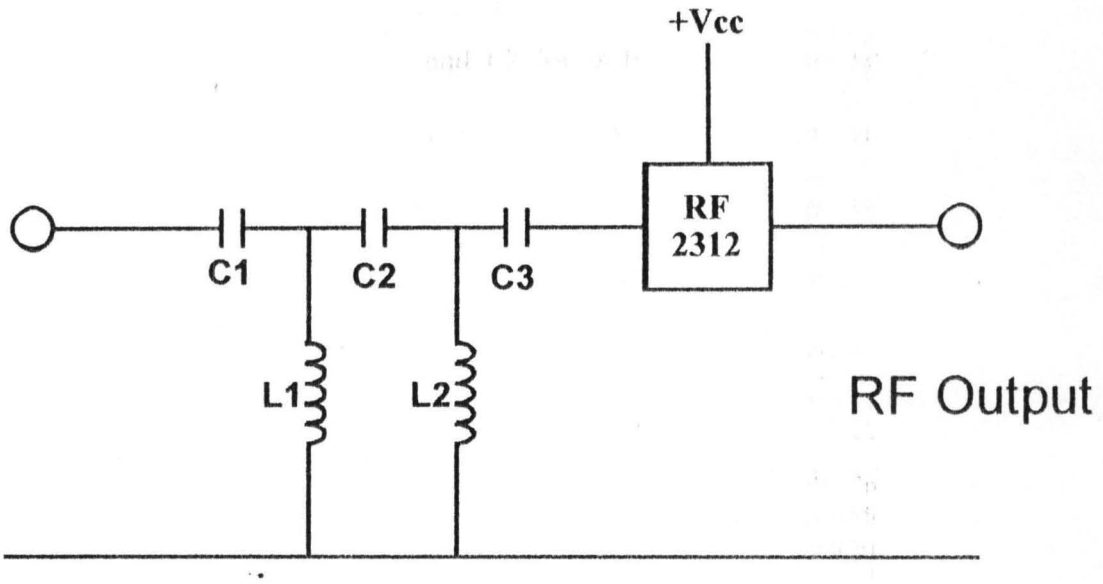


Fig. 3.2 Circuit Diagram of RF Preamplifier Stage

C2 and C3 together with L1 and L2 forms the RF filter network to load match the 75ohms impedance of the TV modulator for maximum power transfer. C1 is acting as a coupling capacitor to block dc signal but allow AC signals to pass to the driver stage. The values of C1 is not critical the values 5.6 and 10pF were selected for C2 and C3 respectively, while the values of L1 and L2 were selected experimentally, it was observed

experimentally that two turns of standard wire guage SW6 24 gave a good load match and good frequency response.

The Data sheet specification for IC1 is given below.

Description: Linear general purpose amplifier.

Power Supply: 5V to 12V

Operating Current Range: 40 to 120mA

Operating Frequency Range: DC to over 2500MHz

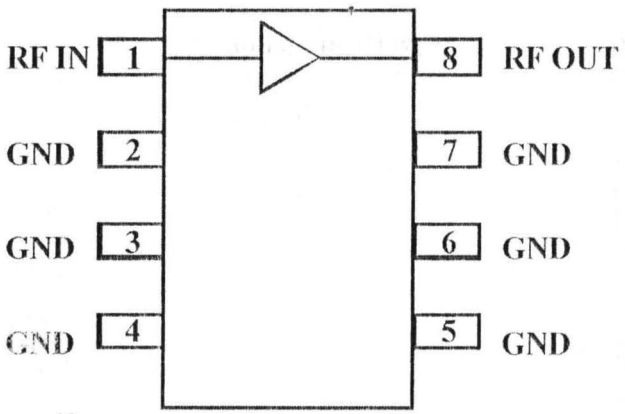


Fig. 3.3 Functional Block Diagram of RF 2312

RF Driver Stage

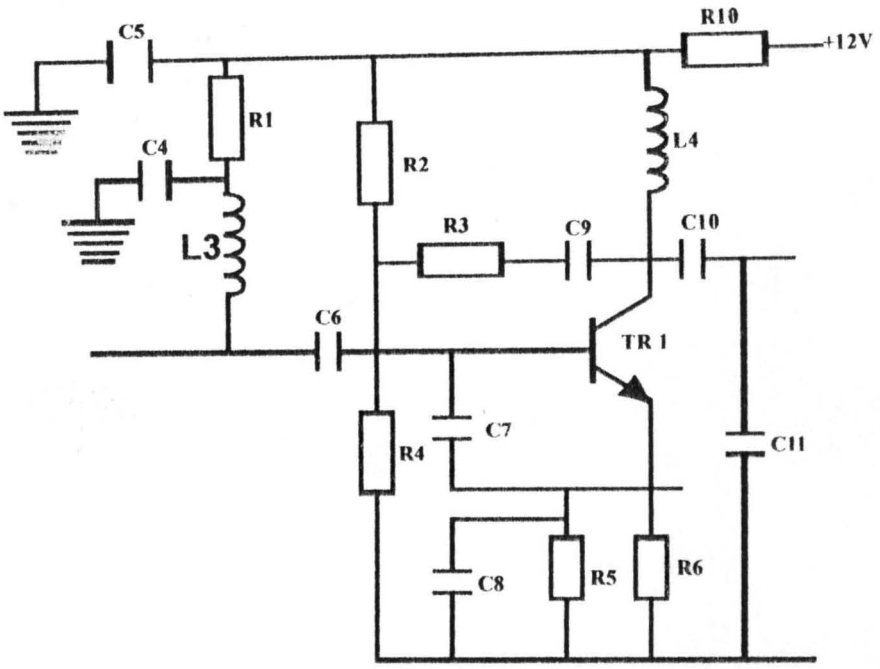


Fig. 3.4: Diagram of RF amplifier

C6 is a dc blocking capacitor to couple the RF output signal from the RF preamplifier to the RF driver. Its value is not critical since at very high frequencies a series resistor behaves as a shunt to ac signals and an open circuit to DC signals the value 2.2pF was selected, C5 and C4 act as high frequency ripple filters to improve the transient stability of the RF driver stage, which may lead to distortion. 100nF was chosen for C4 and C5.

For a potential driver network

$Ve = Vb - Vbe$

For an NPN Silicon Transistor, $Vbe = 0.6V$

∴ 2.2 - 0.6V = 1.6V

Base current of transistor TR1 = $= \frac{V_b}{R_2/R_4}$

Where $R_2/R_4 = \frac{2.2K \times 10K}{2.2K + 10K} = 1.8K\Omega$

$\therefore \quad I_{b1} = \frac{2.2K}{1.8 \times 10^3} = 1.2mA$

For current gain of TR_1 = 60 and

$I_E = (\beta + 1) I_{b1} = (60 + 1) \times 1.2 \times 10^{-3} = 0.0732A$

$= 73mA$

$\therefore \quad R_E = \frac{V_E}{I_E} = \frac{1.6}{73 \times 10^{-3}} = 21.9 = 22\Omega$

But since 22Ω was not readily available, two 4.7Ω resistor R5 and R6 were connected in parallel to achive the value of 23.5Ω, which is close to 22Ω.

C8 is a decoupling capacitor while C_7 is an emitter base feedback resistor for frequency stabilization.

L3 is a radio frequency choke to isolate the RF from the power supply. R5 and C9 forms a feedback network known as boot stracting which boasts the RF signal gain of the driver stage. R3 and C[illegible]e 270Ω and 1nF respectively. L4 is an RF choke to prevent the RF output of the driver stage from deteriorating into the power supply while R10 isolates the driver stage from the RF output stage with a value of 47Ω.

R2 and R4 form what is called potential divider bias for TR1 such that

$$V_b = \frac{V_{CC} \times R_4}{R_2 \times R_4}$$

Where V_b is the base voltage and V_{cc} is power supply voltage.

For R2 = 10kΩ and R4 = 2.2kΩ

$$V_b = \frac{12\Omega \times 2.2k\Omega}{10k\Omega + 2.2k\Omega} = 2.16V = 2V$$

Data sheet specification for TR1 C2570

Type = NPN – Si, low noise, UHF/VHF Amplifier

Vcbo = 25V hfe = 40 minimum

Vceo = 12V

Vebo = 3V

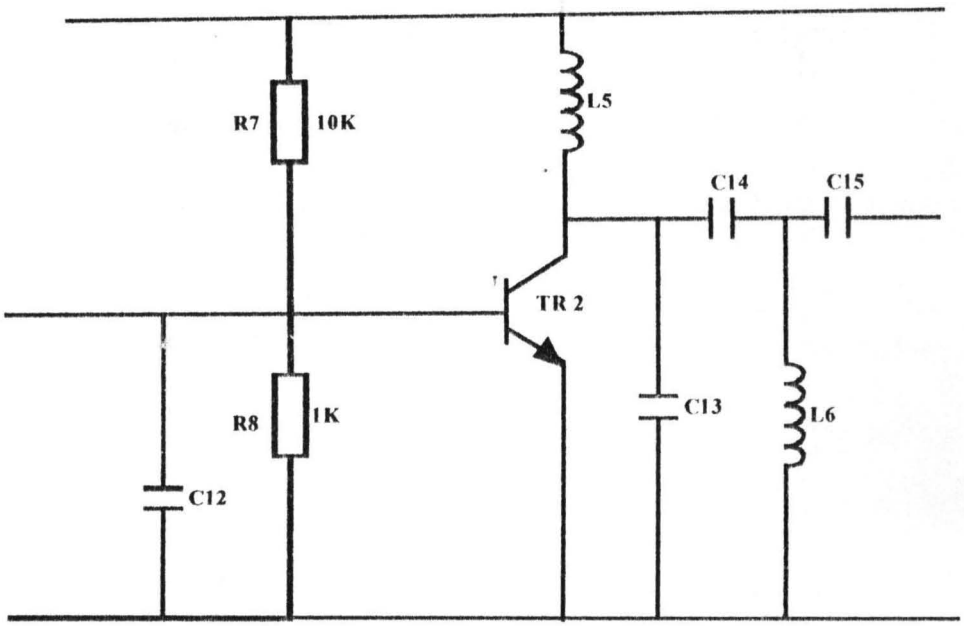
ICmax = 70mA

PDmax = 0.6W

Ft = 56Hz

C10 is a dc blocking capacitor whose value is 2.2pF to couple the RF output from the driver to the final RF power amplifier stage.

Power Amplifier Stage



Data sheet specification for TR_2

Type NPN – Si, Sw, General Purpose Amplifier

Vcbo = 70V

Vceo = 70V

Vebo = 4V

ICmax = 0.4A

PDmax = 0.6watts

Ft = 200MHz

hfe = 120min

R7 and R8 form a potential divider bias for TR2

The base voltage $V_b = \frac{V_{CC} \times R_B}{R_B + R_7}$

$V_b = \frac{12 \times 1K\Omega}{1k\Omega + 10K\Omega} = 1.09 = 1.1V$

:. Base current $I_b = \frac{V_b}{R_B}$

But $R_B = R_8/R_7 = \frac{1K \times 10K}{1K \times 10K} = 0.9K\Omega = 900\ \Omega$

Hence, $I_b = \frac{1.1}{900} = 1.2 \times 10^{-3} = 1.2mA$

Since β of TR2 is 120Minimum. An RF signal imputed at the base of TR1 will be amplified by at least 120 times.

L5 is an RF choke to prevent RF signal drift to the power supply. C12 is a feedback capacitor for frequency stability. C12 is a decoupling capacitor for that it prevents flow of RF output signal to ground. C4 is a blocking capacitor to block the passage of dc but allow the passage of AC signal to the output. It also forms part of the output load matching network with C13 and L6. the load matching is necessary to enable maximum power transfer from the output to the radiating antenna.

C13, C14 and C15 were chosen experimentally. With the best performance obtained with C13 = 1.5pF. C14 = 5.6pF and C15 = 56pF. L5 is 5 turns of SWG. 24 while L6 is 2 turns of SWG 24.

Antenna

An antenna provides a transition from a guided wave on a transmission line to a free space wave and it provides for the collection of electromagnetic energy. In a transmitting system, a radio frequency signal is developed, amplified, modulated and applied to the antenna. The RF currents flowing though the antenna produce electromagnetic waves that radiate into the atmosphere. After the transmitter amplifies the video signal, it sends the signal via the antenna.

To have adequate signal strength at the receiver either the power transmitted must be extremely high or the efficiency of the transmitting and receiving antennas must be high because of the high losses in wave travel between the transmitter and the reliever. All antennas have a gain factor expressed in decibels. Usually, this factor is relative to an isotropic radiator. An isotropic radiator radiates uniformly in all directions, as does a point charge. All the power that the transmitter produces ideally is radiated by the antenna; however, this is not generally true in practice because there are losses in both the antenna and its associated feedlines. The transmitter power is effectively multiplied by the antenna system gain, which is the sum of the line losses and the antenna's gain (or loss for many small simple antenna). The gain in decibel is directly added and may be expressed as a numerical factor. The transmitter power and the antenna gain when multiplied equal the effective radiated power (ERP).

The antenna being used for this system is a whip antenna. It is an antenna with adjustable length. If more range is needed, the length of the whip antenna can be increased or an external antenna can be connected to the jack to the antenna.

For a whip antenna:

This design is for a whip antenna operating at 520MHz.

It is recommended that the length of the antenna be $l = 0.05\lambda$

L = antenna heigh

λ = wavelength

f = frequency (Hz) = 520MHz

v = speed of light = 3×10^8 m/s

$$\lambda = \frac{v}{f} = \frac{3 \times 10^8}{520 \times 10^6} = 0.5769\text{m}$$

$l = 0.05\ (0.576\text{m})$

$l = 0.0289$ m

$l = 2.09$cm

CHAPTER FOUR

4.1 Construction

The construction of the wireless TV transmitter involved the buying of the necessary components and the making of some other components, such as the number of turns of the inductors wound, buying of components such as the TV modulator, Transistors, Resistors, Capacitor.

The power circuit was built by using a 220/12V step down transformer, a bridge rectifier, then a smoothening capacitor and a voltage regulator of 12V. This is used to supplier +Vcc to the transmitter.

The TV modulator was bought and the input cords from the Signal Generators such as VCR (i.e. the video, audio cords) was soldered firmly to the TV modulator input, which as the jack to the VCR.

The transmission segment was first built on the breadboard segment by segment i.e. pre-amplifier stage, the driver stage and then lastly the power amplifier stage. This was then being transferred to the Ferro board where soldering was done permanently to form the full transmitter segment.

The casing, which was made of wood of dimension 3 x 4 x 4.5 all in inches, was used to case the whole transmitter including the power segment of the transmitter.

4.2 Test and Result

To test the work, the test started from the power section of the design. The input voltage measured (220V), and then the rectified output voltage of 12V was then measured.

The components were tested with a digital multimeter to ascertain that they were in good working condition, the modular units of the design were connected on a bread board and tested first before transferring to the Ferro board. The modular connections were checked and tested for the accurate performance of each module.

The transmission frequency of the circuit was tested using the TV and was found to be 520MHz.

At first when the transmitter was on, the sound was not coming out i.e. there was a lot of noise and after a series of troubleshooting, the noise was removed and the transmitter started working properly.

The casing was then constructed and the circuit placed inside the casing.

It was noted that as the distance from the transmitter to the TV increases, the strength of the transmission/brightness of the signal on the TV reduced, i.e. signal strength is inversely proportional to distance.

CHAPTER FIVE

5.1 Conclusion, Summary and Recommendation

The TV transmitter designed is a prototype of the design of signal transmission via space to its various destination at a particular frequency and voltage for better transmission of signal depending on the purpose of building of the transmitter as the case may be, making the whole world a global village as a live event is transmitted immediately all over the world.

5.2 Problems Encountered

1. Working with small fragile components was quite cumbasome and tiresome. Every little rough handling led to bent pins which were a little frustrating.

2. Any mistake in the transfer of the circuit to the ferro board led to the burning of some items when powered and this gave more problem of troubleshooting each time the transmitter is on and buying of components several times.

3. Since I was poor at soldering, soldering joints were poorly done thus a not to perfect circuit.

Precaution

1. I ensured all soldering joints were well done

2. I ensured correct orientation of all transistor flat sides

3. I ensured proper power source of 12 volts supply to the circuit

4. I ensured proper transfer of the circuit from the breadboard to the ferro board.

5.3 Conclusion

The solution to stringing cables around the house, office etc to enhance watching of TV programs, satellite, VCR is found simply in the wireless TV transmitter accepts normal video and audio signals from output transducers such as VCRs, VCDs, etc and generate a low power TV signals that can be picked up by nearby TV sets. This wireless form of transmission is suitable for home and office use.

5.4 Recommendation

The TV transmitter is a more suitable and far neater means of transmission of signals around homes, offices etc than stringing cables all about.

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