

TELEPHONE INDICATOR

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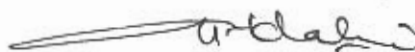
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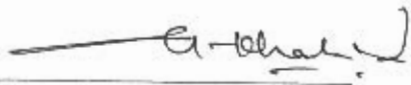
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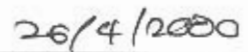
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Supervisor



Date

TELEPHONE INDICATOR

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ABSTRACT

People are trying everyday to develop new technology in telecommunication. The function of the telephone is increased everyday and extra features are being implemented to the telephone. The objective of this project is to design an indicator for a telephone which is to indicate the ringing of a telephone. When the telephone rings, a transmitter (FM transmitter) will send a signal to the indicator (receiver) using FM frequency. The indicator will light up the LED or produce sound to indicate that the phone is ringing and this device can be use even if you are a few metres away (another block/building) from the telephone. Thus, for this project three circuit needs to be design, the telephone circuit, FM transmitter circuit and FM receiver circuit.

ABSTRAK

Dari hari ke sehari pelbagai teknologi terkini cuba diimplikasikan dalam sistem telekomunikasi. Fungsi telefon sebagai alat telekomunikasi semakin penting dan banyak. Objektif projek ini adalah untuk mereka satu alat yang boleh digunakan untuk memberitahu seseorang yang telefonnya sedang berdering. Walaupun dia berada beberapa meter atau berada di bangunan yang lain, Apabila telefon berdering ia akan menghantar isyarat kepada penghantar gelombang FM dan seterusnya isyarat itu akan diterima oleh penerima gelombang FM. Bunyi akan dihasilkan ataupun LED akan menyala untuk memberitahu telefon tersebut sedang berdering. Untuk projek ini tiga litar harus dihasilkan iaitu litar telefon, litar penerima gelombang FM dan litar penghantar gelombang FM.

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CHAPTER 1

1.0 Introduction

1.1 Communication system

The main characteristic, which differs man from other animals, is their ability to communicate at a very high level of complexity and speed. Mankind had developed tremendously enabling to speech and eventually writing as means of communication. These techniques have the three main parts, which any communication system must have to be useful.

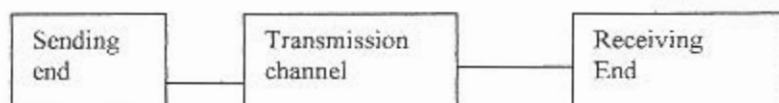


Figure 1.0 Basic parts of a communication system [6].

This is the simplest communication system man use, which has all the three main parts. The sending end is the person whom is speaking and converting thoughts into muscular movements which will then operate a transmitter (the vocal cords and voicing system), thus converting them into pressure variations in the transmission medium (the air). These pressure variations will travel outwards as a signal through the transmission channel (more air) to reach the receiving end which is the listener, where a receiver (the ear drum, etc.) converts the pressure variations back into first

movement, then electrical signals and finally thoughts. Thus the listener will plant in his brain a replica of the speaker's message. When this process is completed the information has been conveyed. Coding means that the speaker's message is conveyed in a language the receiver can understand. Noise is unwanted random signals added to the original message which mean that the listener has difficulty decoding it and noise can occur in all three parts of the system whether at the sending end, transmission channel or receiving end. Distortion means that the signal is changed but nothing is added.

This change may cause the receiver to decode the message wrongly. Some voice frequencies resonate which will cause reverberation. This will then introduce time delays and attenuation, which cause the instantaneous spectrum of the signal to become so distorted as to become unintelligible. Usually distortion occurs in the transmission channel even though it can also occur at other parts.

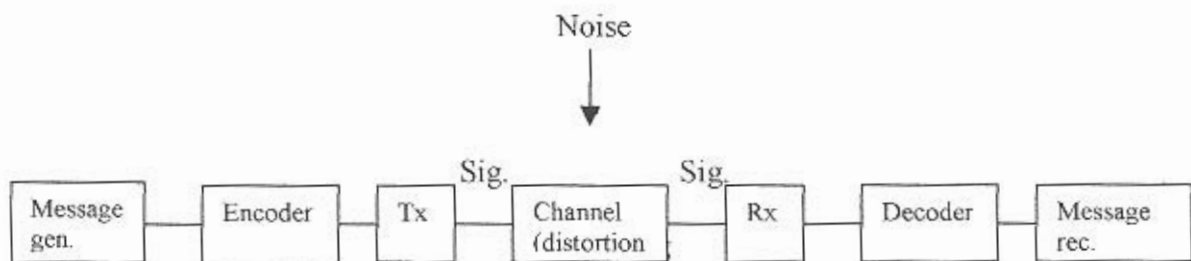


Figure 1.1 Parts of a communication system [6].

The telephone was invented in 1869 and it enable human to talk to someone miles away as easily and as quickly as if you were standing next to them. By using repeaters, exchanges and multiplexing, vast complex telephone networks were built

up culminating in long submarine cable links. Wireless communication started in 1895 when Hertz carried out some experiments using spark gaps in resonant loops. He manages to transmit near microwave frequencies. Although many others tries to develop the use of these new electromagnetic waves to provide telecommunications, but it was Marconi who succeeded and he was supported by the British Admiralty in its race to communicate with its fleets at sea. He was the founder of Marconi Wireless Telegraphy Company Ltd and he developed an enormous spark transmitter, which on December 1901, was able to signal across the Atlantic using very long wavelengths and without amplification at all. Two main areas were developed which are the hardware and software.

The main hardware changes have been the introduction of amplifiers, the use of higher frequencies, improvements in aerial design, optical fibers and cables and the use of satellites. Software changes have been mainly concerned with developing methods of modulation and coding to reduce bandwidth and power and to improve range, speed, and reliability. The basic parts of a communication system are very simple.

Electronic communication is the transmission, reception and processing of information between two or more locations using electronic circuits. The information can be in analog (continuous) form, such as the human voice or music, or in digital (discrete) form, such as binary coded numbers or alphanumeric codes. All form of information must be converted to electromagnetic energy before being propagated through an electronic communication system. In 1837 Samuel Morse developed the first electronic communication system. He used electromagnetic

induction to transmit information in the form of dots, dashes and spaces across a length of metallic wire. He called his invention the telegraph. Alexander Graham Bell and Thomas A. Watson were the first to successfully transmit human conversation over a crude telephone system in 1876. In 1894 Guglielmo Marconi introduced radio communication when he transmit the first wireless signals through Earth's atmosphere. Commercial radio began in 1920 when AM radio station began broadcasting and in 1933 Major Edwin Howard Armstrong invented FM. Commercial broadcasting of FM began in 1936. The methods used and the circuits have undergone considerable changes since the inception although the general principles of electronic communications have change very little. Linear integrated circuits have simplified circuit design allowed for miniaturization, improved performance and reliability and reduced overall costs. Modern electronic communication systems are primarily digital and include microwave and satellite radio as well as optical fiber systems.

There are two basic types of electronic communications systems; analog and digital. An analog communication system is a system in which energy is transmitted and received in analog form (a continuously varying signal such as sine wave). A digital communication system is a system in which energy is transmitted and received in digital form (discrete levels such as +5V and ground).

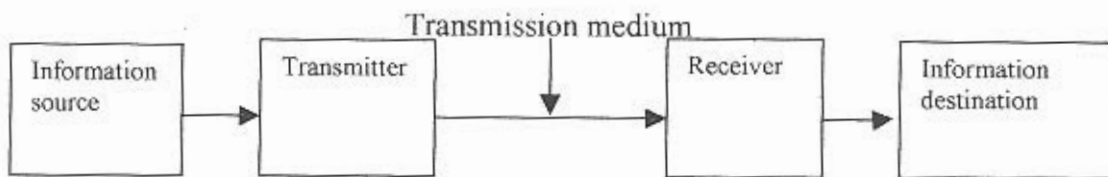


Figure 1.2 Simplified block diagram of an electronic communication system [1].

The simplified block diagram of an electronic communication system includes a transmitter, a transmission medium and a receiver. A transmitter is a collection of one or more electronic devices or circuits that converts the original information to a signal that is more suitable for transmission over a given transmission medium. The transmission medium provides a means of transporting signals from a transmitter to a receiver and can be as simple as a pair of copper wires that propagates signals in the form of electric current flow. Information can also be converted to electromagnetic light waves and propagated over optical fiber cables constructed from glass or plastic and free space can be used for transmission of electromagnetic radio waves over great distances or over terrain where it is difficult or expensive to install a physical cable. A receiver is a collection of electronic devices and circuits that accepts the transmitted signals from the transmission medium and converts them back to their original form [1].

1.2 Objective and project overview

The task is to design an indicator for a telephone (normal telephone or handphone). The indicator will be placed at any suitable place such as on a watch, lighter etc. When the telephone rings, an extra device (FM transmitter) will send a signal to the indicator (FM receiver) using FM frequency. The indicator will light up the LED or produce sound to indicate that the phone is ringing. This device can be use even if you are a few metres away (another block/building) from the telephone. The objectives are to study the characteristics of a telephone (parts of the telephone), study how a FM transmitter, FM receiver works and LED . Thus, be able to design the FM transmitter and a receiver.

1.3 Overview of thesis

The first chapter will explained about the origin of communication system, the technology used today and introduction to the telephone system. It also contains the objective and the project over view. The second chapter elaborate on the literature review. It will explain in detail about the telephone system, FM transmitter, FM receiver and the light emitting diode (LED). The third chapter will explain about the basic hardware component used in the circuit design. The fourth chapter contains the circuit design for the telephone, FM receiver and FM transmitter. It also contain the analysis of the circuits designed. The fifth chapter is the results and discussion obtained from the testing of the hardware. The sixth and final chapter is the conclusion and further works to be done on this project.

CHAPTER 2

2.0 Literature Review

This second chapter will consist of the literature review which discuss in detail the telephone system especially the ringing circuit, FM transmitters, FM receivers and LED. As these are the basic component used in the project for telephone indicator.

2.1 The telephone set

Telephone sets are used to originate and receive telephone calls. The most important functions of a telephone are [2]:

- i. It requests the use of the telephone system when the handset is lifted.
- ii. It indicates that the system is ready for use by receiving a tone, called the dial tone.
- iii. It sends the number of the telephone to be called to the system. This number is initiated by the caller when the number is pressed or the dial is rotated.
- iv. It indicates the state of a call in progress by receiving tones indicating the status (ringing, busy, etc.)
- v. It indicates an incoming call to the called telephone by ringing bells or other audible tones.

- vi. It changes speech of a calling party to electrical signals for transmission to a distant party through the system. It changes electrical signals received from a distant party to speech for the called party.
- vii. It automatically adjusts for changes in the power supplied to it.
- viii. It signals the system that a call is finished when a caller 'hangs up' the handset.

The telephone have to be connected to another telephone for a telephone to be of any use. Each subscriber telephone is connected to a central office that contains switching equipment, signaling equipment and batteries that supply direct current to operate the telephone.

A local loop of two wires called a wire pair connects each phone to the central office. One of the wires is called T (for tip) and the other is called R (for ring) which refers to the tip and ring parts of the plug used in the early manual switchboards. Switches in the central office respond to the dial pulses or tones from the telephone to connect the calling phone to the called phone. When the connection is established, the two telephones communicate over transformer coupled loops using the current supplied by the central office batteries.

Figure 1-2.
 Telephone Set and
 Central Office
 Exchange Simplified
 Circuits (Source: D. L.
 Cannon and G. Luecke,
 Understanding
 Communications
 Systems, SAMS, a
 Division of Macmillan
 Computer Publishing,
 1984)

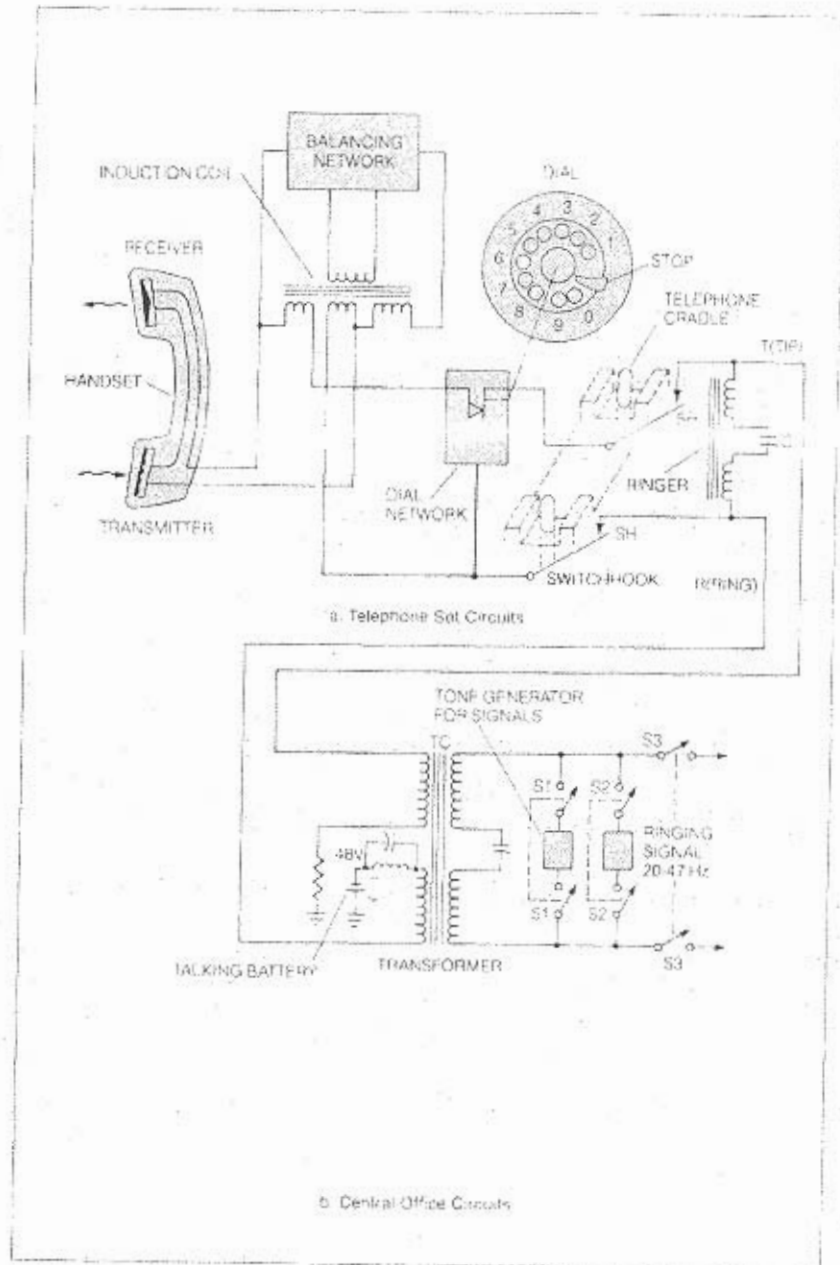


Figure 2.1 Telephone set and Central Office Exchange Simplified [2].

2.1.1 How a telephone works

Initiating a call

When the handset is rested on its cradle, the handset will hold the switchhook buttons down and the switches are open. This condition is called the on hook condition. The circuit between the telephone handset and the central office is open but the ringer circuit in the telephone is always connected to the central office. As in the figure above the capacitor C, blocks the flow of DC from the battery however it passes the AC ringing signal.

For the off hook condition the handset is lifted from its cradle. When the handset is removed the spring loaded buttons come up and the switchhook closes. This completes the circuit to the exchange and current flows in the circuit. The off hook signal tells the exchange that someone wants to make a call. The exchange returns a dial tone to the called phone to let the caller know that the exchange is ready to accept a telephone number. Most modern telephones use the newer method audio tones to send the telephone number and have push button keypad with 12 keys. Pressing one of the keys causes an electronic circuit in the keypad to generate two output tones that represent the number.

Connecting the phones

The central office has various switches and relays that automatically connect the calling and called phones. If the called phone handset is off hook when the connection is attempted, a busy tone generated by the central office is returned to

the calling phone. Otherwise, ringing signals sent to the called phone to alert the called party that a call is waiting. At the same time, a ring back tone is returned to the calling phone to indicate that the called phone is ringing.

Answering the call

When the called party removes the handset in response to a ring, the loop to that phone is completed by its closed switchhook and loop current flows through the called telephone. The central office then removes the ringing signal and the ringback tone from the circuit.

Talking

The part of the telephone into which a person talk is called the transmitter. It converts speech (acoustical energy) into variations in an electric current (electrical energy) by varying or modulating the loop current in accordance with the speech of the talker. Receiver is the part of a telephone that converts the electric current variations into sound that a person can hear. The signal produced by the transmitter is carried by the loop current variations to the receiver of the called party. There is also a small amount of the transmitter signal that is fed back into the talker's receiver called sidetone. Sidetone is necessary so that the person can hear his/her voice from the receiver to determine how loudly to speak.