DESIGN OF A LOCAL 3 WAY EXCHANGE

By

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CERTIFICATE

This is to certify that the work entitled, "Design of a local 3 way exchange" submitted by Rohan Slathia (021031) in partial fulfillment for the award of degree of Bachelor of Technology in Electronics and Communication Engineering of Jaypee University of Information Technology has been carried out under my supervision. This work has not been submitted partially or wholly to any other University or Institute for the award of this or any other degree or diploma.

Prof. D.C Kulshreshtha

Project Guide

ACKNOWLEDGEMENT

The report on "Design of a local 3 way exchange" is made as a part of the course curriculum --- Major Project 8th semester. I would like to express gratitude to all those, without whom this project would have been a hard target to achieve.

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ABSTRACT

In this advanced age of information technology, it is highly imperative that means be devised such that the information transfer be as fast and as reliable as possible.

In the field of telecommunications, a **telephone exchange** or **central office** houses equipment that is commonly known as simply a **switch**, which is a piece of equipment that connects phone calls. It is what makes phone calls "work" in the sense of making connections and relaying the speech information.

With the advent of computer communication networks there has been a drastic increase in demand for communication networks which can serve the present day world with higher transmission rates .So the need of the hour is to transmit data in minimum possible time.

I have tried my level best to make the exchange and phone terminals. By no means is my work fool-proof. I have used my own imagination to build up the entire project. The design of the project is entirely proposed by me.

INTRODUCTION

In my project I have used three phone terminals each having a buzzer, LED speaker, a two way switch and a mic. The design of phone terminal is proposed by me. I have also made a central exchange box where all the phone terminals are connected. In the central exchange I have used six 12 V double relays, three step down 12 V Transformers, one 6 V step down transformer, two amplify circuits, three LED's and three switches.

I have used fully connected mesh network in my project. My project works on 220 V AC supply. I have used bridge rectifiers to convert my AC voltage into DC supply.

CHAPTER – I

HISTORY

1.1 Towards the End of 19th Century

Major Work in the field of telecommunication started Towards the end of 19th century. The data below shows the major advancements in Telecommunication.

1890 - - The Bell system begins to exchange its wire plant from single wire to two-wire circuits. The process will take most of the next ten years.

1891 - - The Strowger machine-switching system was patented. Almon B. Strowger, using a collar box and handy bits of metal, devised a central office switching system wherein the telephone user should not be dependent on the operators. His central office could serve only 99 subscribers. Once certain drawbacks were ironed out over the next few years, the Strowger switch came to be known as the step-by-step office.

1892 - - First commercial step-by-step machine switching exchange opens in La Porte, Indiana on November 3rd. The system is provided by the Automatic Electric Company under Strowger patents.

1893 - - Expiration of the first Bell patent makes it possible for anyone who so desired to make telephone equipment and sell telephone service. A combination of circumstances brought a great many independent exchanges and systems in being. In many cities, companies opened in competition with Bell exchanges and the public found it necessary to subscribe to both Bell and the competing service.

1895 - - A letter from J. W. Thompson, City Manager for the Chicago Telephone Company, to Miss Mesick, Chief Operator, Main, says "In answering calls the query 'Number Please?' spoken in a pleasant tone of voice and with rising inflection must be invariably employed.". This is the first official instruction we have found for this phrase.

Earlier responses of telephone operators appears to have been "What do you want?" or sometimes "Hello?".

1896 - - Dial telephones - the first machine switching telephones with finger wheels resembling those of today - were placed in service at the city hall of Milwaukee, Wisconsin by the Automatic Electric Company. Earlier version of the dial telephones by AEC actually used push buttons.

1899 - - AT&T takes over the business and property of the American Bell Telephone Company becoming parent company of the Bell system while continuing as the long lines operating company.

1.2 In Mid of 20th Century

In December of 1930, New York City became the first locality in the United States to adopt the two-letter, five-number format; it remained alone in this respect until well after World War II, when other municipalities across the country began to follow suit (in some areas, most notably much of California, telephone numbers in the 1930s through early 1950s consisted of only six digits, two letters which began the exchange name followed by four numbers, as in DUnkirk 0799). Prior to the mid-1950s, the number immediately following the name could never be a "0" or "1;" indeed, "0" was never pressed into service at all, except in the immediate Los Angeles area (the "BEnsonhurst 0" exchange mentioned in an episode of the popular TV sitcom The Honeymooners was fictitious).

In 1955, the Bell System attempted to standardize the process of naming exchanges by issuing a "recommended list" of names to be used for the various number combinations. In 1961, New York Telephone introduced "selected-letter" exchanges, in which the two letters did not mark the start of any particular name (example: FL 6-9970), and by 1965 all newly-connected phone numbers nationwide consisted of numerals only (Wichita Falls, Texas had been the first locality in the United States to implement the latter, having done so in 1958). Pre-existing numbers continued to be displayed the old way in many places well into the 1970s. A Chicago carpet retailer frequently advertised their number National 2-9000 on WGN until the 1990s; not to mention, the number TYler 8-7100 for a Detroit construction company.

Most of the United Kingdom had no lettered telephone dials until the introduction of Subscriber Trunk Dialling (STD) in 1958.Only the director areas (Birmingham, Edinburgh, Glasgow, Liverpool, London and Manchester) and the non-director areas

adjacent to them had lettered dials, and the exchanges used the three-letter, four-number format until conversion to all-figure numbering in 1968.

CHAPTER – II

EQUIPMENTS USED

1.1 List of Components

Components	*Q.No*
Step down Transformer	4
12 V relays	3
1k resistor	6
Green LED	3
Red LED	3
Two way switch	3
Simple Switch	3
Mic	4
Speakers	4
Buzzer	3

1.2Step Down Transformer

Transformer:

A **Transformer** is used to transfer electrical energy from one circuit to another. A **transformer consists** of two coils, a primary and secondary. The primary coil creates a magnetic field when an AC current passes through. Through magnetic induction **principles, a transformer** is able to create a potential difference between the primary coil and secondary coil. The resulting effect from this magnetic potential is an electrical current is created in the second coil. The overall effect of this can be control by the power of the magnetic field, which is proportional to the surface area of the coils.

Transformers come in a variety of sizes, from the large 1000 gig watts transformer used by the power company to **smaller transformers** used in power plugs. **Transformers** are used to control the electrical current to the electrical device. **Every Transformer** has different electrical properties; therefore, it is imperative to review all the crucial information prior to selecting a transformer.

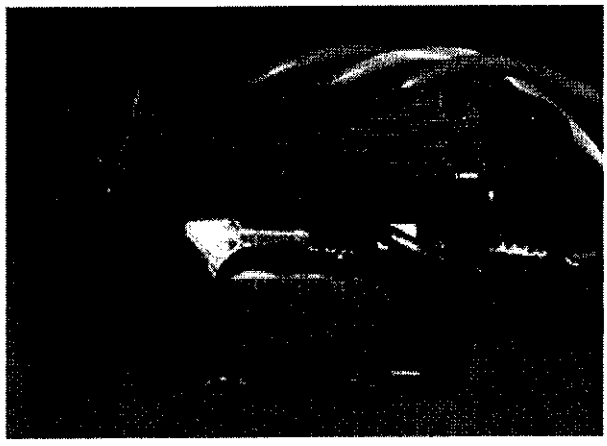

Figure – 1

Transformer

Step Down Transformer:

Step-down transformer, is evidenced by the high turn count of the primary winding and the low turn count of the secondary. As a step-down unit, this transformer converts high-voltage, low-current power into low-voltage, high-current power. The larger-gauge wire used in the secondary winding is necessary due to the increase in current. The primary winding, which doesn't have to conduct as much current, may be made of smaller-gauge wire.

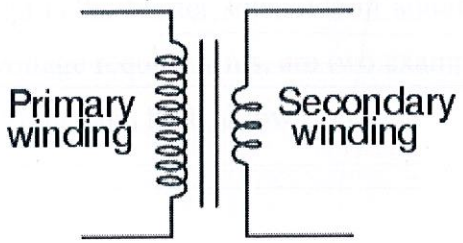

Figure – 2
Step down Transformer

1.3 Relays

Invented in 1835, relays are simple yet effective devices that operate as an electrical switch, opening and closing under electromagnetic conditions. Relays are used for electronics that have a low voltage power source but require higher voltage to turn them on and operate. In effect, when a circuit of low power needs to be converted into a circuit of higher power. In some instances the reverse is true. Higher voltage or current needs to be channeled into lower voltage or current.

Relays have many applications. For example using the battery to operate the horn or headlights in an automobile. Relays are used for small appliances such as blenders where there is a switch to turn on a motor. In both instances the incoming power source is lower than that needed to start the motor or activate the headlights or horn. Relays are also used to make electric buzzers and bells. Starter solenoids in automobiles or modems, which have low current and low voltage requirements, are two examples of how relays are used to channel the voltage or current from high to low.

Relays are composed of a coil of wire around a steel core, a switch, and a spring that holds one or more contacts in place. When an electrical current flows through the coil it becomes energized, acting like an electromagnet. The resulting magnetic field opens the contacts, and closes the circuit. When the electrical current stops flowing, the opposite occurs.

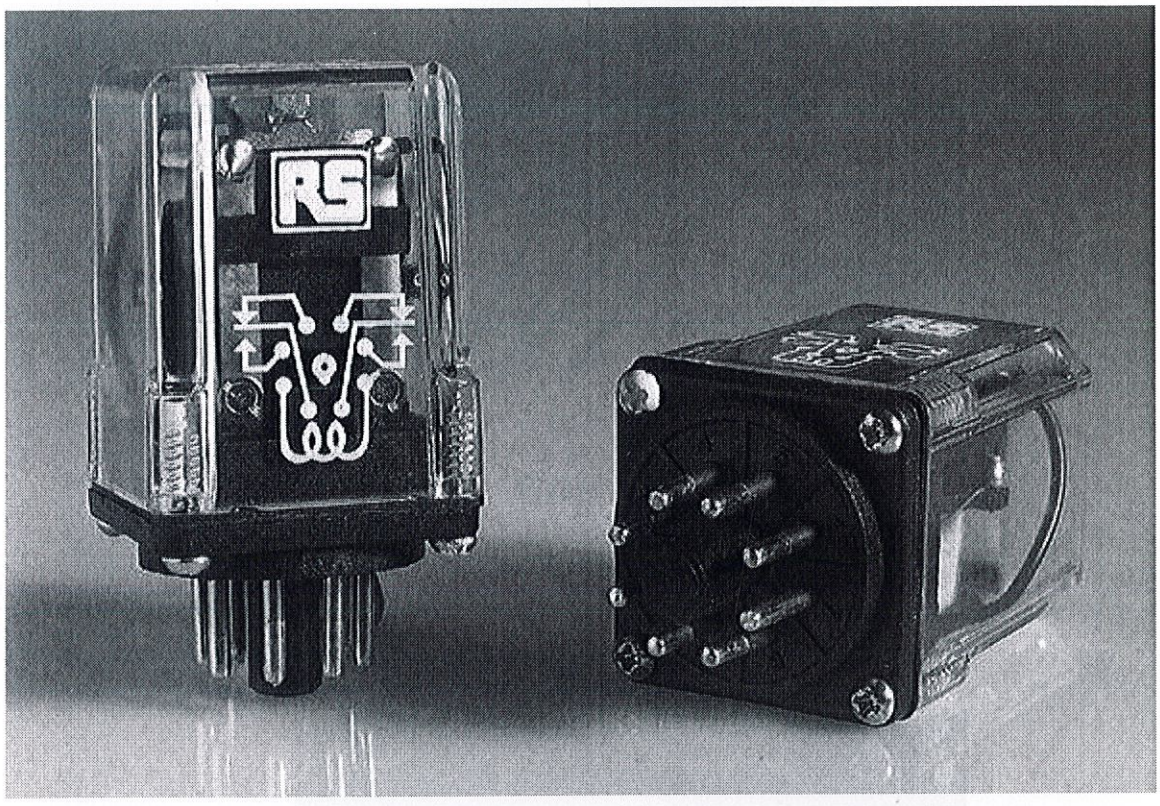

Figure – 3

Double switch relays

1.4 Images of other Components Used

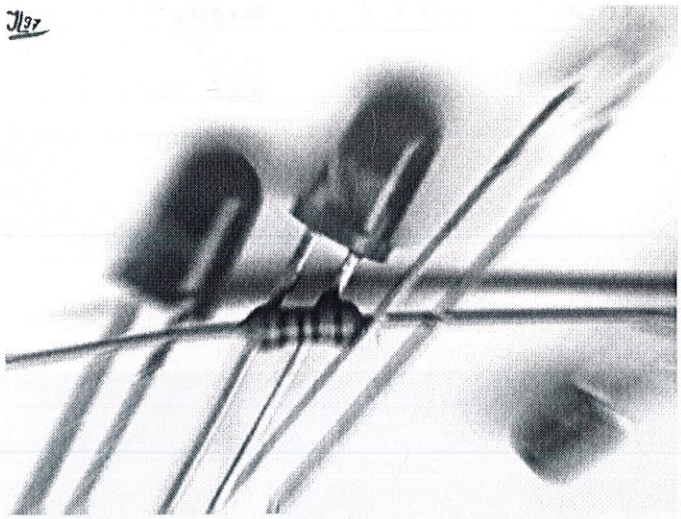

Figure – 4
LED

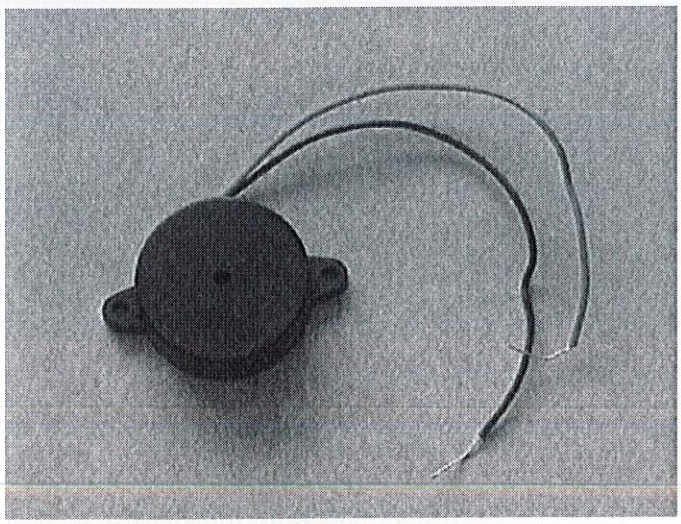

Figure – 5
Buzzer

CHAPTER – II

DESIGNING A 3 WAY LOCAL EXCHANGE

1.1 Model of 3 Way Local Exchange

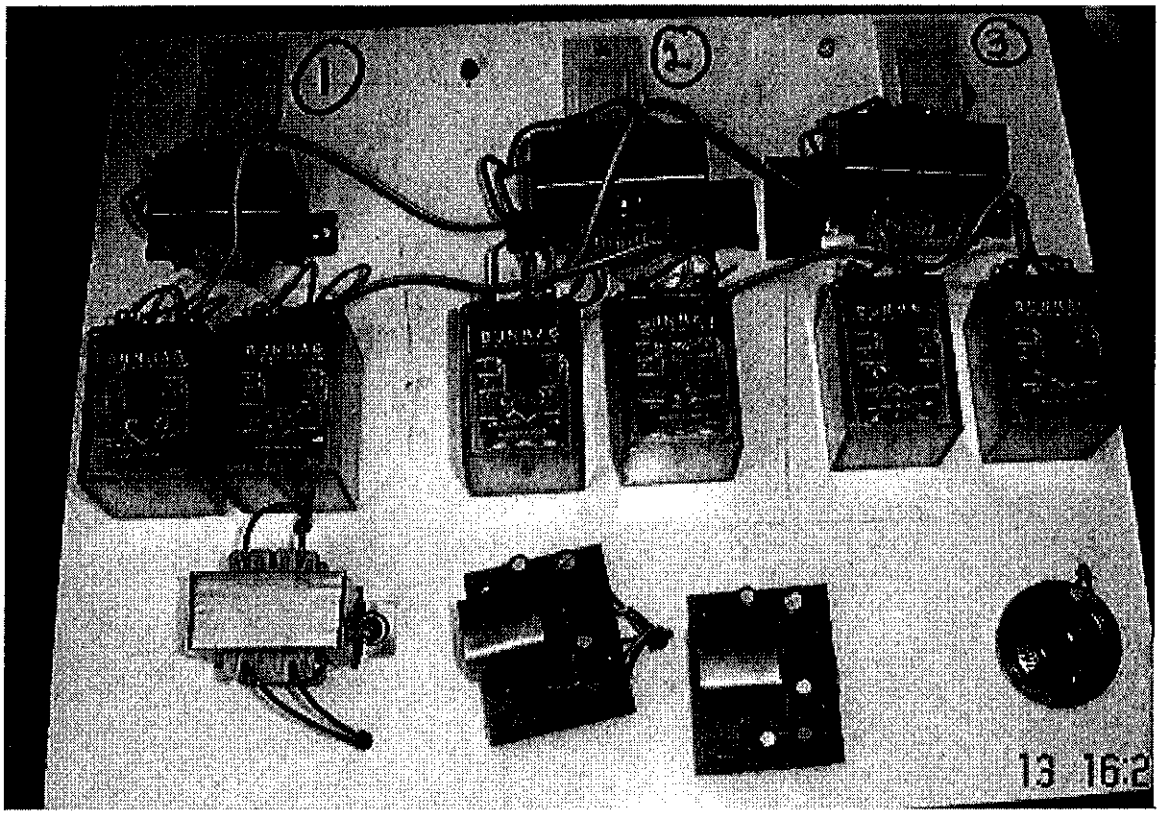

Figure – 6
Snapshot of exchange box

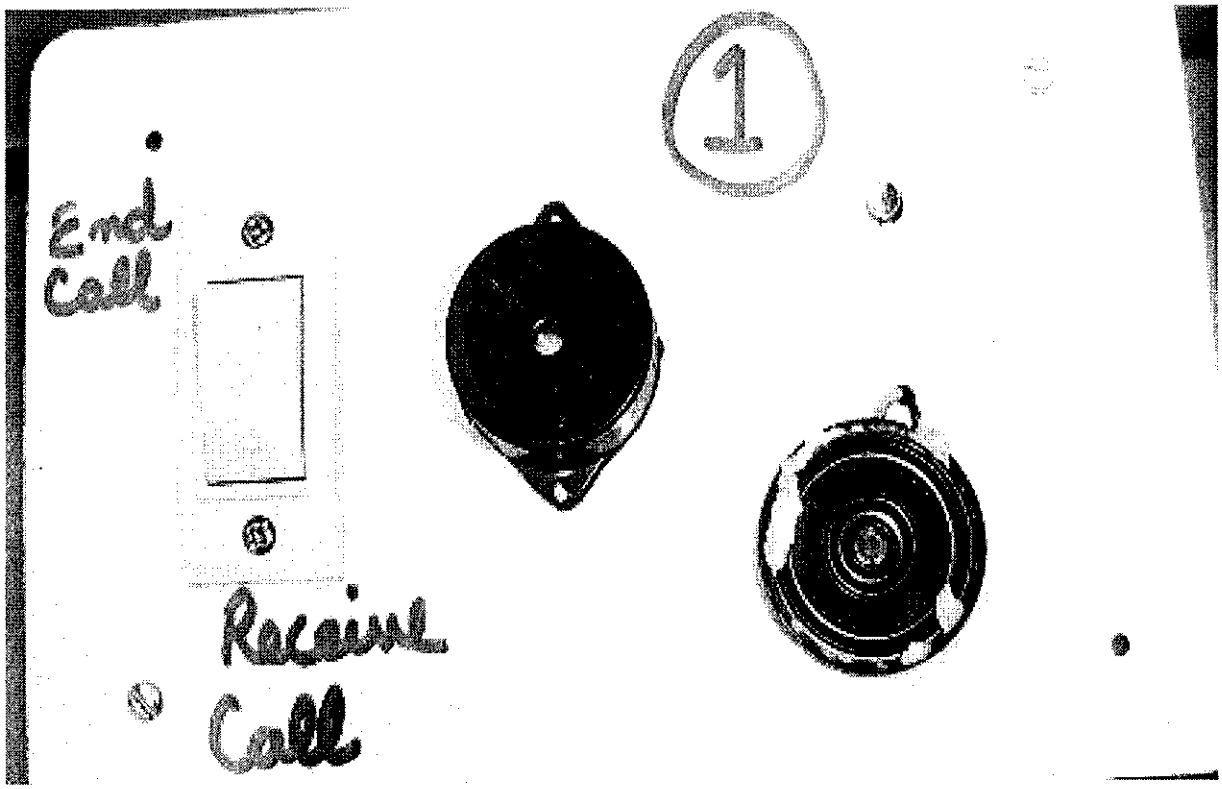

Figure – 7
Snapshot of phone receiver

1.2 Working Details

When the exchange is switched on , firstly the six volt transformer comes into play which drives the ampli circuits. The six volt step down transformer converts the 220V AC into 6 V AC.The bridge rectifier used here converts the AC into DC and drives the ampli circuit ON. Now the exchange is ready to be used. Suppose a call is to be made to user 2 .then the switch corresponding to terminal 2 is switched ON. As we switch ON the terminal 2 the 12 V transformers comes into play and converts 220v AC into 6 V DC with the use of a bridge rectifier. Now the 12 V DC supply is given to the phone terminal which has a buzzer and a red LED, due to which buzzer starts and red LED glows. The two way switch which is connected to the buzzer and LED is used to receive the call. When the call is received 12v supply is fed back to the exchange and the green LED glows in the exchange indicating that call has been received. Now the 12 V supplies which are fed back to the exchange is used for switching purposes. Switching is done in such a way that the mic and the speaker of the ampli circuit are connected accurately so that the talk can be carried out between the desired users.

1.2 Circuit Diagram

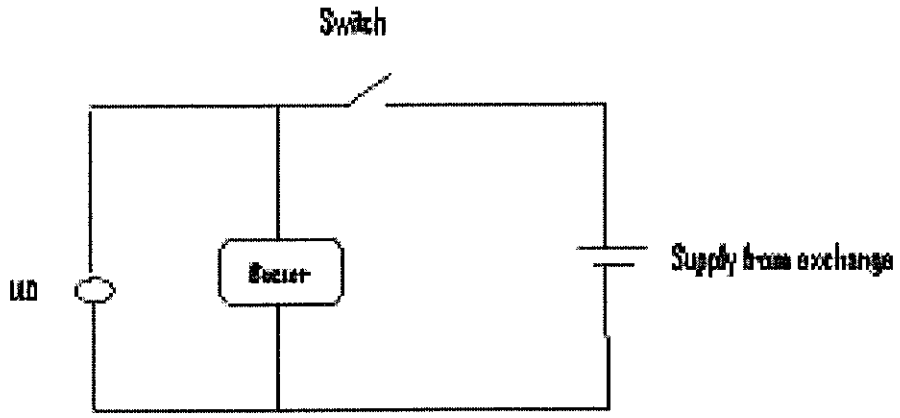

Figure – 8
Circuit diagram of phone receiver

FUTURE ENHANCEMENTS

- Addition of a back up system

  Provision for a back up can be made so that during power cut offs the whole system can run on battery and batteries will be charged simultaneously.

- Interconnectivity between different users

  Switching can be done in such a way that the users can talk between themselves.

- Using numbers to call a person

  Unlike in my project instead of using a switch for calling a person numbering system can be implemented so that each user is assigned number specifically.

- Teleconferencing system

  All the users can be made to talk simultaneously.

CONCLUSION

In this project I showed the implementation of 3 way local exchange and how it is superior in various terms with the 2 way local exchange. I believe that this project will help in the further developments in enhancements and integration of various tools available with us. Although there is a lot of scope in the field of telecommunication since there are no limits to creativity and innovation but the perfect use of technology and that too under given constraints is the fact to be stressed on which will remain a challenge for anyone in the field, no matter what technology he is working on.

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