

Telephone:-

- A telephone or phone is a telecommunication device that permits two or more users to conduct a conversation when they are too far apart to be heard directly.
- It converts sound energy into electrical energy & vice versa.
- The signals are transmitted through cables or other transmission media over a long distance.
- In 1876, Alexander Graham Bell invented Telephone system.
- It has two essential parts i.e. transmitter & receiver.
- At transmitting end the ~~send~~ sound signal is converted to electrical signal & at ~~receiving~~ receiving end the electrical signal is converted to sound signal.

TELECOMMUNICATION SYSTEM

4.1 Electronic telephone set :-

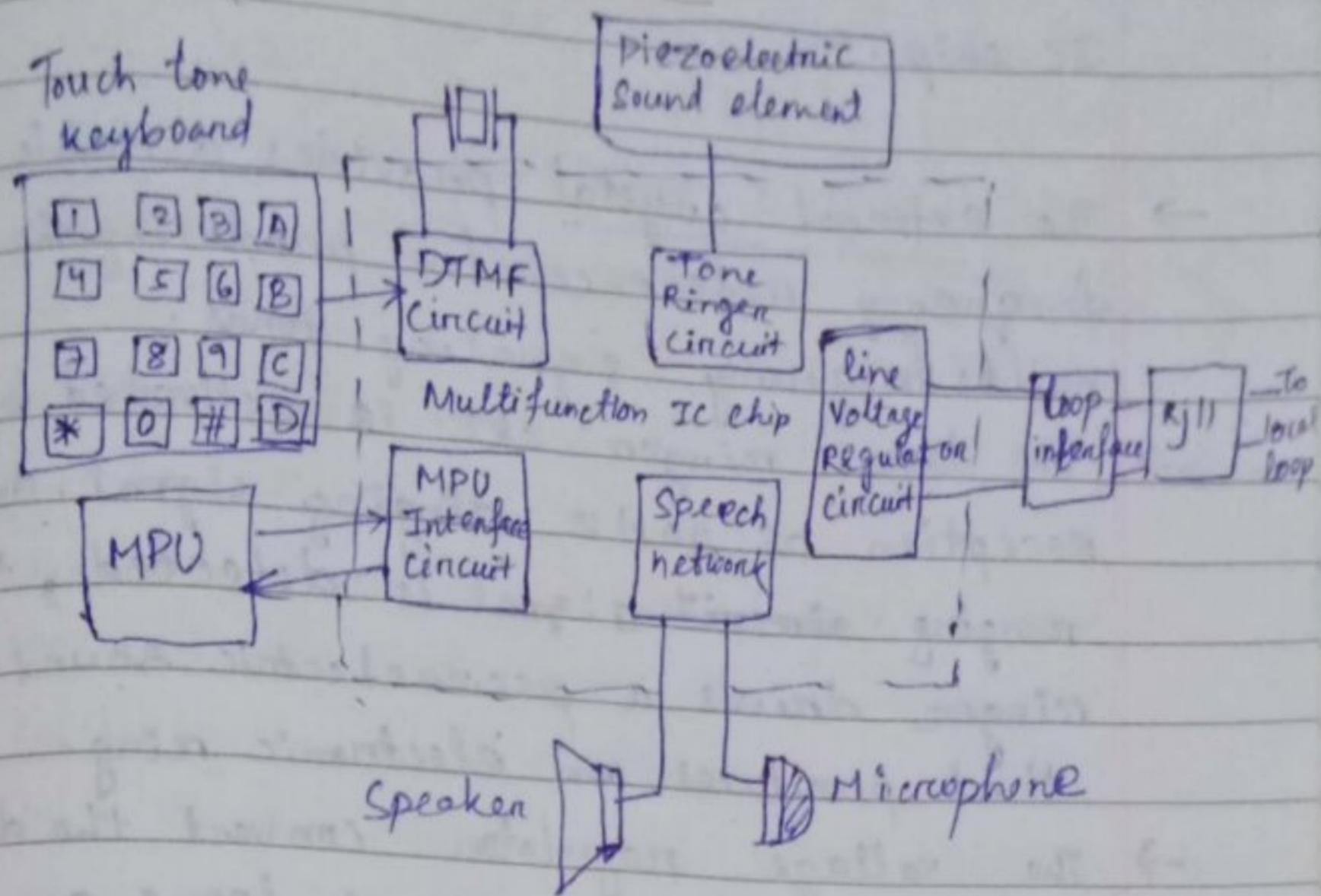


Diagram of Electronic telephone set.

→ Figure shows the block diagram for a typical electronic telephone, comprised of one multifunctional integrated circuit chip, a microprocessor chip, a Touch-tone keypad, a speaker, a microphone & a handful of discrete devices.

→ The major components included in the multifunctional integrated circuit chip are DTMF tone generator, MPU (microprocessor unit) interface circuitry, random access memory (RAM) tone ringer circuit, speech network, & a line voltage regulator.

→ The touch-tone keyboard provided a means for the ^{operation} ~~operation~~ of the telephone to access

the DTMF tone generator inside the multifunction IC chip.

→ The external crystal provides a stable & accurate frequency reference for producing the dual tone multi frequency signaling tones.

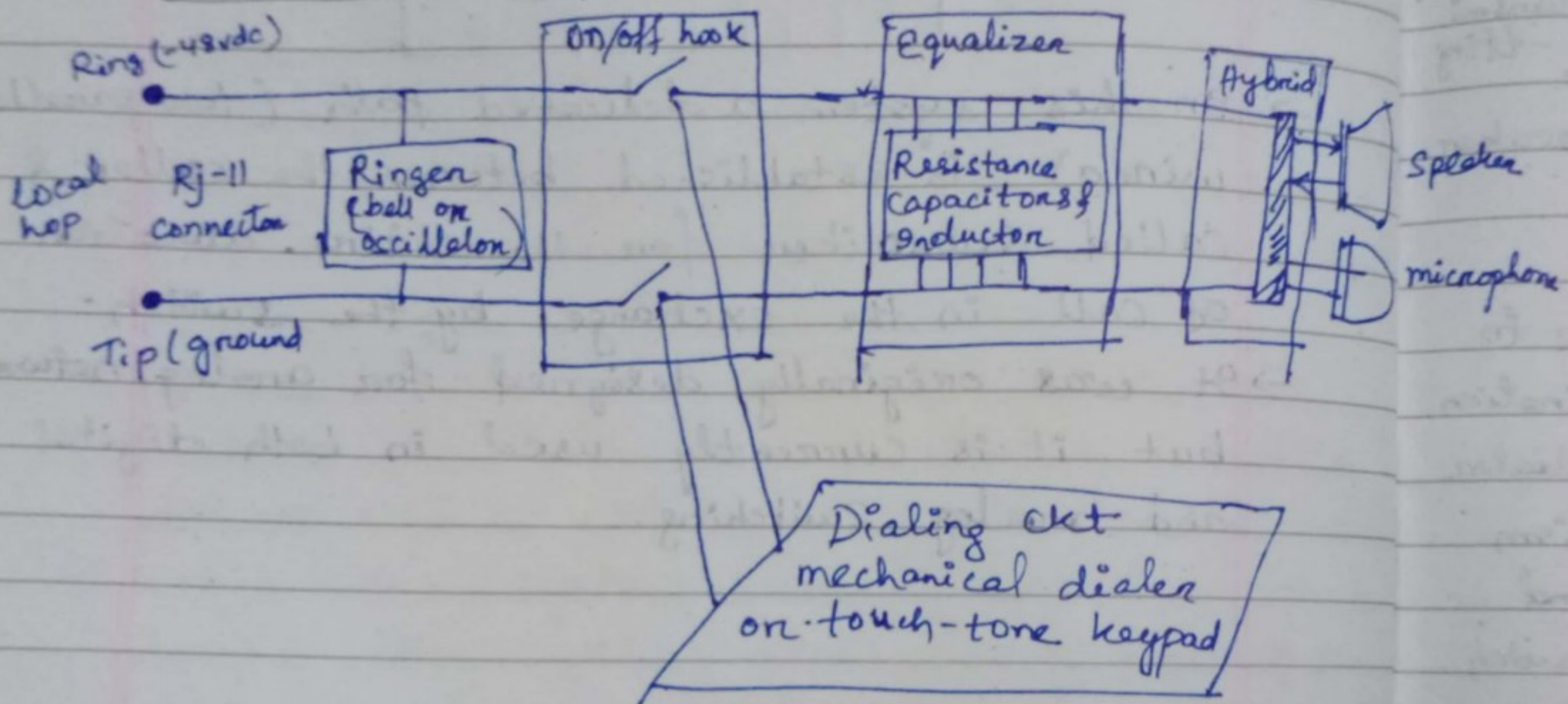
→ The tone ringer ckt is activated by the reception of 20Hz ringing signal. Once the ringing ~~circuit~~ signal is detected, the tone ringer drives a piezoelectric sound element that produces an electronic ring.

→ The voltage regulator convert the dc voltage received from the local loop & converts into a constant level dc supply voltage to operate the electronic components in the telephone.

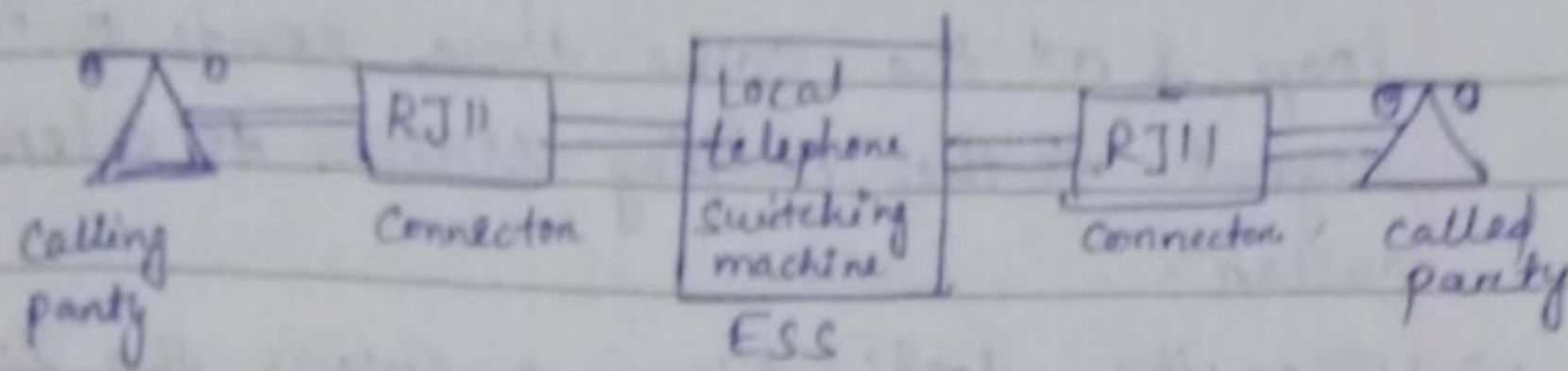
→ The internal speech N/w contains several amplifiers & associated components which separate the transmitted signal into ~~four~~ ~~wire~~ & ~~to~~ receiving signal. by converting the two wire signal into four wire signal.

→ The MPU with its internal RAM controls the functions of ~~top~~ telephone such as number storage, speed dialing, redialing & auto dialing.

4.1 Standard Telephone Set :-



4.2 Call procedure:



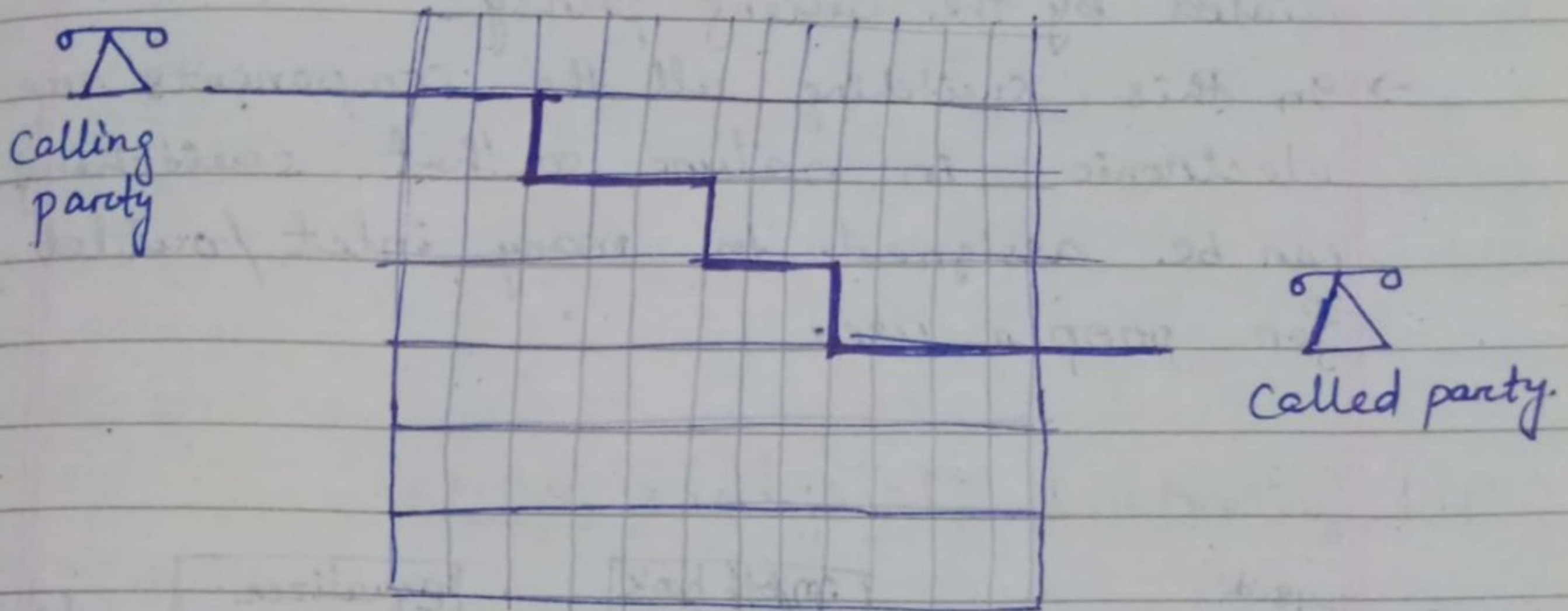
- Calling party station goes off hook i.e. lifting the handset off the cradle.
- Then there will be a closed path formed to current flow between tip & ring and the switching machine returns an audible dial tone to the calling station which acknowledges that the caller can access the switching machine.
- Then the caller dials the destination telephone number using one of two methods such as mechanical relay, dialing or touch tone dialing.
- When the switching machine detects the first dialed number, it removes the dial tone from the loop.
- The switch interprets the telephone number & then locates the local loop of the destination telephone number.
- Before ringing the destination telephone, the switching machine tests the ~~the~~ destination telephone loop for dc current to check if it is idle (on hook) or in use (off hook).
- At the same time, the switching machine locates a signal path through the switch between local loops.
- If the destination telephone is off hook,

the switching machine sends a ringing signal to the destination telephone on the local loop & at the same time sends a ring back signal to the calling station to alert the caller.

→ when the destination answers the telephone, it completes the loop, causing dc current to flow.

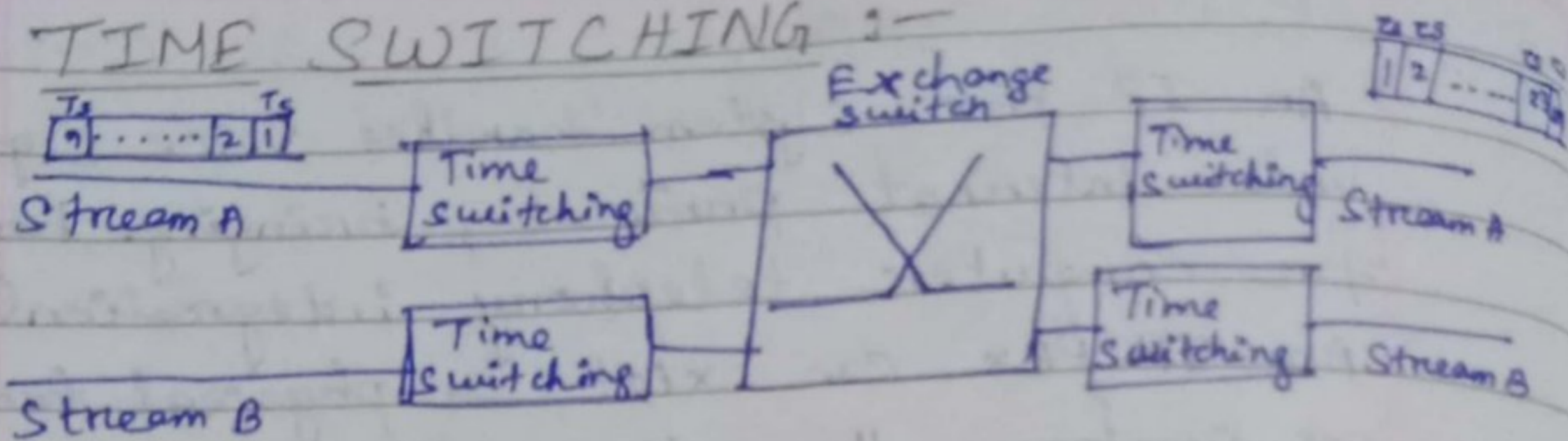
→ when either end goes on hook, the switching machine detaches the open circuit on that loop & then drops the connection through the switch.

4.3 SPACE SWITCHING :-



- In this system a dedicated path (two parallel wires) is established between the caller & called subscriber for the entire duration of call in the exchange by the switch.
- It was originally designed for analog network but it is currently used in both digital and analog switching.

4.3 TIME SWITCHING :-



It involves the sharing of cross points for shorter periods of time.

It uses time slots interchange technique, when the signals are coming to the switch.

It provides the path according to the number dialed by the calling party.

→ In this switching all the components are electronic in nature so that switching element can be assigned to many inlet/outlet pairs for proper use.

4.4 Telephone numbering Plan :-

A telephone numbering plan is a type of numbering scheme used in telecommunication to design telephone numbers to subscribe telephones or other telephony end points.

→ Telephone numbers are the addresses of participants in a telephone network, reachable by a system of destination code routing.

→ Telephone number plans are defined in each of administrative regions of the public switched telephone network (PSTN).

→ Many numbering plans subdivided by their territory of service into geographic regions designated by an area code, which is a fixed length.

→ The north American numbering plan is a closed numbering plan which prescribes "10" digit for each complete routing & it is divided into three parts.

(i) The most significant part is a 3-digit numbering plan Area (NPA) code (or area code).

(ii) within each plan area, central offices are numbered with a three digit central office code.

(iii) The remaining 4 digit represents the specific line assigned to each telephone.

→ The International Telecommunications Union (ITU) has established a comprehensive number plan which is operated by its State members or regional administration. It is an open numbering plan having maximum length of 15 digits to telephone numbers. It has a specific country code for each country attached with the national numbering plan.

4.5 PBX (Private Branch exchange):

PBX stands for Private Branch Exchange which is a private telephone network used within a business.

→ A PBX connects the internal telephones within a business and also connects them to the public switched telephone network (PSTN)

→ It is a telephone exchange or switching system that serves a private organisation and performs concentration of central office lines or trunks and provides intercommunication between a large

- number of telephone stations in the organisation.
- The central office lines provides connections to public switched telephone network (PSTN) and the concentration aspect of a PBX permits the shared use of these lines between all stations in the organization.
 - The intercommunication aspect allows two or more stations to establish telephone or conferencing calls between them without using the central office equipment.
 - Each PBX - connected station, such as a telephone set a fax machine, or a computer modem are interconnected to send the data to each other
 - A PBX employs an organization numbering plan for its station.

Main functions for call process :-

- Establishing connections between the telephone sets of two users.
 - Maintaining such connections as long as the users require them (i.e. channelling voice signals between the users).
 - Disconnecting those connections as per the user's requirement.
 - Providing information for accounting purposes (eg. metering calls)
- Apart from this PBX provides other functions like :-
- Auto dialing.
 - Automatic call distributor
 - Call blocking

- Call forwarding on busy.
- call logging.
- call waiting
- conference call
- Speed dialing.
- Do not disturb (DND) System.
- Voice mail.
- Voice message broadcasting.

Types of PBX :-

There are different PBX System such as

- Hosted PBX system
- Mobile PBX system
- IP PBX system.

Hosted PBX system :-

→ It is provided by a telephone company or service provider, using equipment located in the premises of a telephone exchange or the provider's data center.

→ It allows a single number to be presented for the entire company so that the workers can connect their home telephone to each other.

Mobile PBX system :-

→ A mobile PBX is a hosted PBX service that extends fixed-line PBX functionality to mobile devices such as cellular handsets, smartphones.

→ Mobile PBX systems are different from other hosted PBX systems that simply forward the data or calls to mobile phones through the use of buttons, keys and other IP devices.

IP PBX system:-

- An IP-PBX system handles voice signals under Internet protocol, bringing benefits for computer telephony integration (CTI)
- An IP-PBX can exist as physical hardware, or perform the call-routing activities of the PBX or key system as a software system.

4.5 EPABX (Electronic Private Automatic branch exchange)

The electronic private automatic ~~branch~~ branch exchange is equipment that has made day-to-day working in the offices much simpler especially in the area of communication.

- The EPABX may be defined as a switching system that makes available both internal and external switching function of any organisation.
- EPABX can broadly used in microprocessor system and advance computer system. The feature of a call transferring and forwarding is another area enabling mobility of the users.
- The selection of an EPABX for an organisation should be preceded by a through study of the needs of the office.
- So EPABX is a telephone exchange that serves a particular business or office or telephone operators for many business or for the general public.