1 Basic Electronic Telephone

History

- 1876, Alexander Graham Bell invented the telephone. It was an outgrowth of experiments on a device to send telegraph signals over a single wire.
- 1876 March 10, the simple instrument being tested in Boston.
- 1878, the first commercial exchange was operated in New Haven.
- 1885, The American Telephone and Telegraph Company (AT&T) was started to manage the telephone network across the US.
- 1940, the U.S. government began to question the principles of the telephone monopoly.
- 1949 - 1956, an antitrust suit filed to force AT&T to restrict its business activities to the national telephone system.
- 1970, Federal Communications Commission (FCC) allowed other competitors to do long-distance telephone service.
- 1974 November 20, the Department of Justice filed a new antitrust suit against AT&T. The trial began in January 1981.
- 1982, AT&T agreed on terms to settle a suit. This would dissolve the monopoly held by AT&T for almost 100 years.

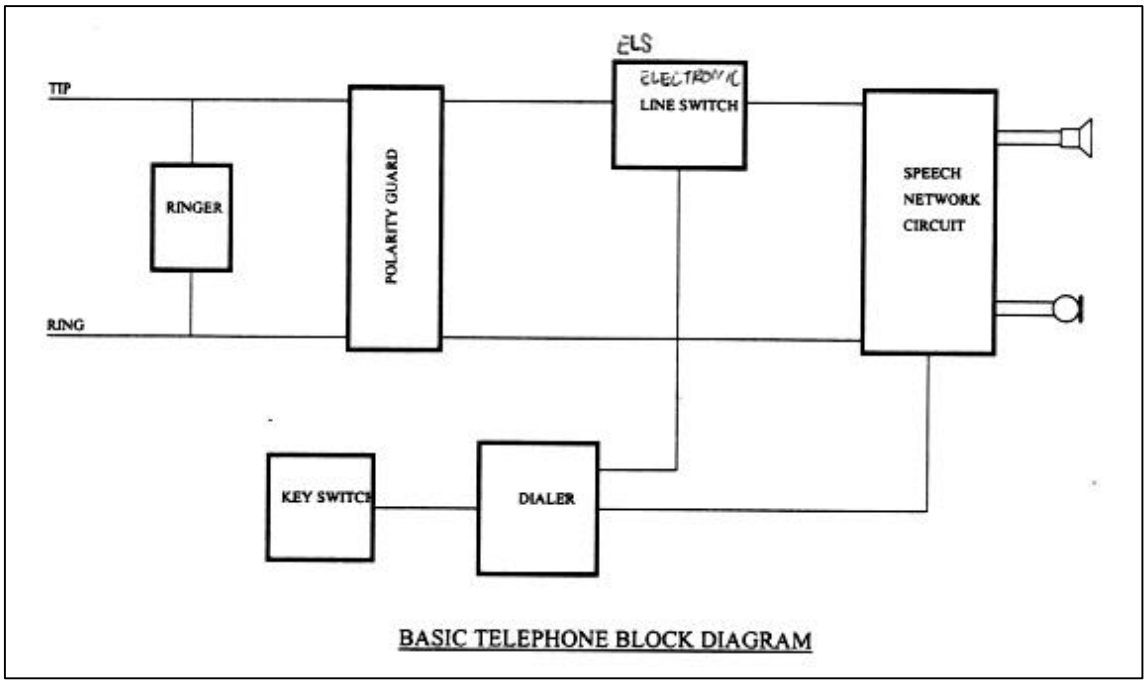
2 The Telephone System

There are three types of facilities to carry control and voice signals. They are Local network, Exchange Area network and Long-Hual network.

1. The Local Network consists of homes and business connected via wire pairs to central office
2. The Exchange Area Network fills the transmission gap between local and long-distance trunks. They may consist of open wire pairs on poles, wires pairs in cables, microwave radio links and fiber optic cables.
3. The Long-Haul Network replaces wire cable and microwave with fiber optic cables that connected between local and long-distance

3 The Telephone Set

3.1 Basic telephone block diagram



BASIC TELEPHONE BLOCK DIAGRAM

3.2 Functions of the telephone

The telephone set performs 8 electrical functions.

1. It requests the use of the telephone system when the handset is lifted
2. It indicates that the system is ready for use by receiving a tone, called the dial tone
3. It sends the number of the telephone when pressing a number
4. It indicates the state of a call in progress by receiving tones such as ringing, busy, etc.)
5. It indicates an incoming call by ringing sound
6. It changes voice signal to electrical signal and vice versa
7. It automatically adjusts for changes in power supply to it
8. It signals the system that a call is finished when a caller hang up the handset

4 Conventional Telephone Set

The telephone is part of the telephone system that connecting between it and the CO (Central Office) or RSU (Remote Switch Unit). Therefore the telephone has to be designed to meet or be compatible with the CO's requirements.

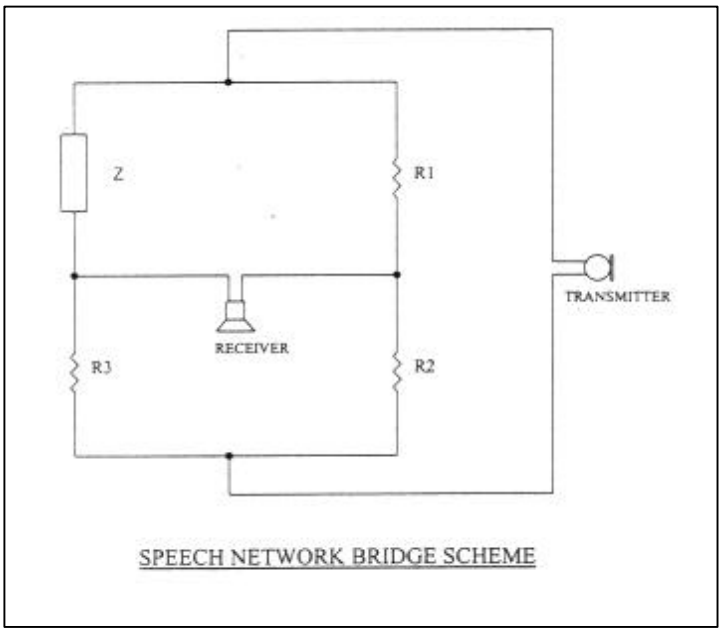
- On-Hook
- Off-Hook
- Pulse Dialing
- Tone Dialing
- Transmit
- Receive
- Compensation for loop length
- Return Loss
- Impedance of a telephone

5 Electronic Telephone Set

In the old day all telephones were mainly in electrical and using some bulky mechanical devices. As new technology of microelectronic has rapidly improved, then the telephone has also changed to use all electronic devices for better in every ways. A low cost acoustic transducer, piezo (PZT) replaces the mechanical bell for ringer. A small IC and transistors replace the slow and bulky mechanical dial pulse. An expensive hybrid transformer is no longer needed an electronic circuit called speech network is now widely used to replace it.

The telephone system is a full duplex communication that communicates on a pair of two wires. These two wires carry both DC to supply the telephone as well as voice signals (AC) for speech and control. These AC signals are from transmitter and to a receiver. The major task of the telephone function then is to convert the two wires to four wires system. This circuit is called the speech network circuit.

5.1 Speech Network Circuit

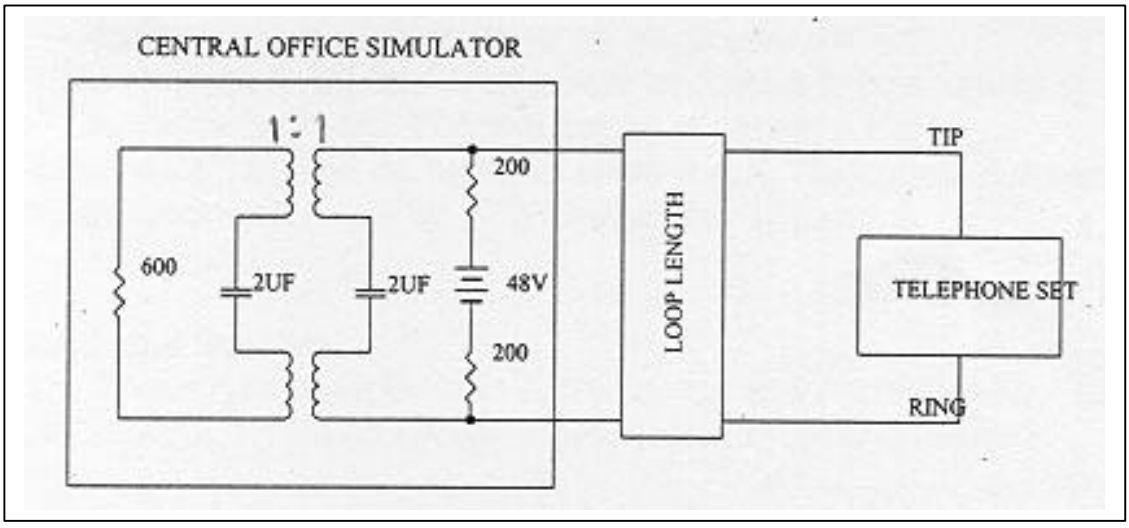


5.2 Side-tone

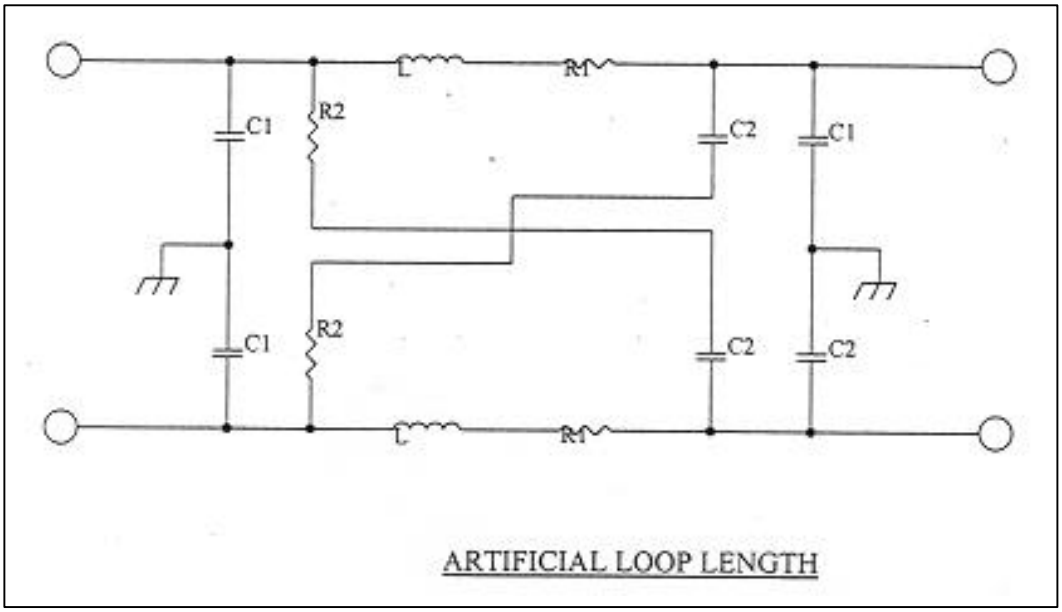
The balancing network circuit in the Speech network is adjusted so that no transmit signal appears at the receiving terminal and no receiving signal appears at the transmit terminal. However, in the actual the balancing network is intentionally unbalanced slightly so that a small amount of the transmitted signal fed also to the receiver. This signal is called the side-tone.

Side-tone is necessary so that the person can hear his/her own voice from the receiver to determine how loudly to speak. The side-tone must be at the proper level because too much side-tone will cause the person to speak too softly. Conversely, too little side-tone will cause the person to speak so loudly.

Central Office Simulator



Artificial Loop Length



ARTIFICIAL LOOP LENGTH

Loop Length Equivalence

Component	QTY	3000 FT.	6000 FT.	9000 FT.
R1 (Ohm)	2	124	245	
R2 (Ohm)	2	174	312	
C1 (uF)	4	0.0229	0.0453	
C2 (uF)	2	0.0121	0.0246	
L (uH)	2	230	660	