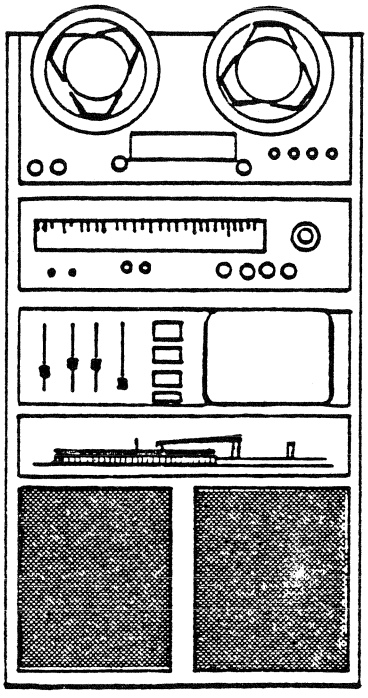
Energy & Power in Communication

Stereo phonographs, tape decks, radios, televisions, telephones, cameras, and computers all have something in common. They are devices that help people communicate. As you probably know, the activity of communication is a basic function of human beings. Over the centuries, people have invented devices and machines to improve this process. Technical systems must have an energy or power source to make them work. Whether a device uses batteries, solar cells, wall plugs; or processes sound waves, light waves, or radio waves; some form of energy is present. To find out more about the use of energy in communication, let's continue.

After studying this unit you will be able to:

- Describe how information is carried by a variety of energy forms through communication devices and machines.
- Name common devices in communication systems that transduce energy.
- Identify two sources of electrical energy used for communication systems.
- Explain the relationship between communication systems and energy use.

O.K. Let's tune in here . . .



ENERGY AND INFORMATION

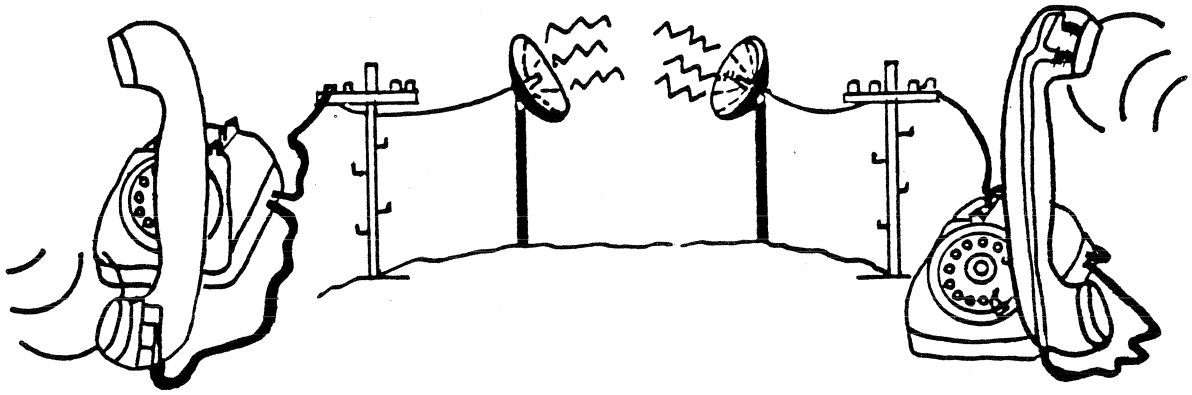
When people use devices or machines to communicate to one another, they are transferring ideas (information). **Information** usually is in the form of music, words, or video signals. Information also can be in the form of Morse code, numbers, or a variety of other forms. Consider the telephone conversation you had the other day. If you think of the spoken words as information, then the conversation represents the transfer of information. Just by speaking the word "hello," you sent information from your telephone to a telephone somewhere else. The music and words you hear over the radio are information. The television video and audio are information. And so on, and so on. . . .

Information often changes forms in a technical system from those that we commonly recognize (sound and picture) to forms that are not so common, for example, electrical pulse and radio waves.

What is a technical system?? Well, keep going, you'll find out. . .

A technical system is an arrangement of hardware devices or components that perform a particular function, such as transferring information. When you speak, information in the form of words is carried by sound waves. This is a form of energy caused by vibrating vocal cords. If you speak into a microphone or telephone, sound waves (acoustic energy) cause vibrations that are changed into electrical pulses (electrical energy) and transmitted along cables. A television camera changes light energy into radio waves (electromagnetic energy), which are sent out through the antenna.

Energy Conversion



Acoustical Energy → Electrical Energy → Electromagnetic Energy → Electrical Energy → Acoustical Energy

So you see, whatever the information, it is carried by some type of energy. Energy changes its form (acoustical to electrical, electrical to visual, etc.) in a technical system. Whenever the form of energy used to carry information is changed, the process is called **transduction.** A microphone and a television camera are examples of transducers.

What is the transducer on a sound system that changes electrical energy to acoustical energy? Read on and you will see. . .

As you may know, information can be stored. Books, magazines, and newspapers store information in a printed form. Photos represent the storage of visual information. Phonograph records, magnetic tapes, and video disks store both video and acoustical information.

So, you can see that devices and machines used to transmit, store, retrieve, and receive information really are processing information carried by some form of energy—light (visual) energy, acoustical energy, electrical energy, or magnetic energy.

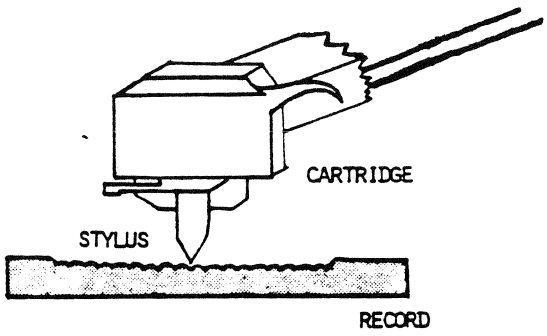
TYPES OF ENERGY USED

Communication devices and machines did not operate always as they do today. For example, until about the 1920s, music was stored and retrieved by music boxes and handcrank gramophones. The devices had windup springs, much like clock mainsprings, which turned the record disk. The sound was not amplified, but was focused by a wooden or metal megaphone.

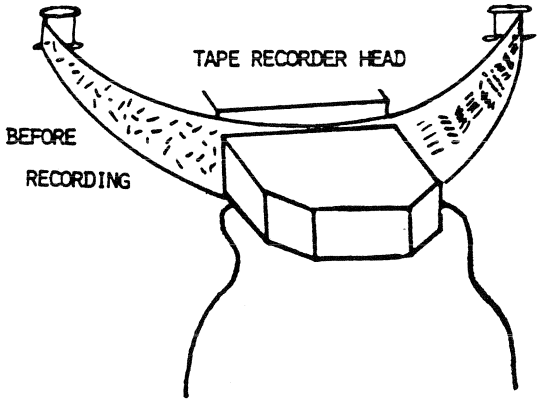
Contemporary communication devices need power sources for two purposes:

1. To perform functions, such as to **move** magnetic tape past the record, playback heads of a tape machine, and power to turn the record turntable.
2. To **process and amplify** the information signals through the system.

Mechanical Storage



Magnetic Storage



Do you know that . . .

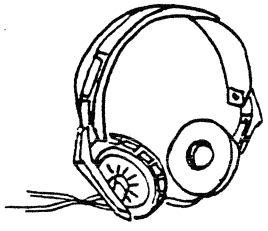
The energy used to amplify signals and to provide power for the speakers of a sound system is measured in watts. Many home sound systems require up to 100 to 150 watts to drive speakers. Concert sound systems require greater amounts of power to drive their speakers at high sound levels.

These power needs commonly are met with electricity. Electricity supplies power to electric motors, which physically move things, and to components, which switch or amplify information signals.

Electrical power for communication is supplied either by storage batteries or by the 110-volt current found in wall sockets in U.S. homes and businesses.

Size D batteries (1.5 volts) generally are used to supply power for moving parts. Batteries commonly used for solid state electrical circuits are the 9-volt "transistor type." A variety of other battery sizes also are used. Devices that are plugged into the wall or operate from batteries have converters and transformers to supply the type and amount of power needed.

Listen to this . . .



IMPACTS OF COMMUNICATION SYSTEMS ON ENERGY

The amount of **energy** and **time** that can be conserved is considerable when communication systems are compared to traveling. If you live more than 20 miles from school, it would take 60 times more energy to ride back and forth to school than to communicate by using a telephone/computer system.

Now, can you communicate this information that you've been storing? With your own energy and paper, write the answers to this quiz.

SELF-QUIZ

1. Explain what happens to the type of energy used when you speak into a telephone.
2. What is the name of the device that changes the form of energy in communication systems?
3. Name and describe 3 types of energy forms commonly used to process information.
4. For what two purposes do *modern* communication devices need a power source?
5. What form of energy is used most frequently to provide power for communication devices?

Turn this page upside down; you will find the answers at the bottom of the page. Go back and read again about the ones you missed.

THINGS TO DO

Connect a microphone to a power supply and a multimeter. Create a carrier voltage through the microphone and record it on the meter scale. Talk into the microphone, and watch the voltage fluctuate. (Also, try a microphone and oscilloscope.)

Light bulbs are rated in lumens/watts. Find out how 9-volt transistor batteries are rated, and compute the amount of energy it takes to play a 60-minute cassette tape.

How much energy does it take to make a 3-minute local telephone call, including switching, bells, and transmission? Consult your local telephone company.

FOR FURTHER STUDY

DuVall, J.B.; Berger, E.; & Maughan, G. *Getting the message: Communication technology.* Worcester, Mass.: Davis Publications, 1980.

Martin, J. *The wired society.* Englewood Cliffs, N.J.: Prentice-Hall, 1978.

Papallo, G. *What makes it work.* New York: Arco Publishing, 1976.

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Answers:

1. *acoustical/electrical.*
2. *transducer.*
3. *visual (light acoustical elec.).*
4. *to move equipment (i.e., magnetic tape of record turntable to process and amplify information).*
5. *electricity.*

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