普通高等教育“十二五”创新型规划教材

Special English for Electronics and Information

电子信息专业英语

主　编　刘睿强
副主编　龚　恒

北京理工大学出版社
BEIJING INSTITUTE OF TECHNOLOGY PRESS

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内 容 简 介

本书共分6个单元，内容涉及电子信息行业诸多领域（如微电子、电信、通信、计算机等）的新技术，选材新颖实用，所有文献均出自海外原文资料。主要内容包括电子基础知识，电子电路，现代数字设计，芯片制造、封装测试，表面贴装，个人通信系统，无线局域网，蓝牙技术，无线网站等。每个主题单元由课文、阅读材料、课文词汇组成，在书后还附有课文参考译文，并配有大量直观简明的专业性插图，通俗易懂；除了教材、论文这些常见的文体外，还有技术说明、产品使用、经典英文电影对白以及歌曲的赏析，增强了趣味性，目的在于使读者能够多方面接触各种不同类型的英文资料，不仅使读者掌握常用的专业英语词汇和翻译技巧，而且可以用英语的形式熟悉相关专业知识，提高阅读和理解原版专业英语文献的能力与速度，掌握英语翻译技巧，开阔视野。

该书内容覆盖面宽，实用性强，可作为高等院校、专科、职工大学、业余大学、函授大学、成人教育学院等层次的电子信息类专业英语课程的教材，也可供广大自学者及相关行业英语爱好者学习参考。

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前言 Preface

随着时代的发展，电子信息技术已渗透于人们工作和生活的各个方面，电子信息英语也随之独立成为一门专业外语，并在电子信息技术应用中发挥巨大的交流作用。此外，我国高等教育正处于全面提升质量与加强内涵建设的重要阶段，而教材建设是其中的重要一环。本教材紧紧围绕高等教育教学的要求，根据电子信息大类不同类型的人才培养目标，国家高等教育发展方向和教学质量要求及企业需求，以知识够用为原则，突出实用性、针对性，融入实用技术和先进产品及工艺说明等，更好地指导相关人才培养及实践工作。

本教材的特点是选材新颖、知识面广、趣味性强。选材立足专业性、实用性，兼顾发展热点和本专业主流技术，课文内容取自英语原文杂志、网上或书刊中的文章或章节，经编写而成，涉及电子信息类专业的电子基础知识，电子电路，现代数字设计，芯片制造、封装测试，表面贴装，个人通信系统，无线局域网，蓝牙技术，无线网站，电子类仪器仪表使用说明，实用英文写作等内容。所选资料突出技术内容的正确性、完整性，兼顾读者的接受能力，按知识结构体系组织编排，由浅入深，表现形式上注重形象化、直观化，提升阅读者的兴趣和学习效果。

本书在编写过程中得到了重庆西永微电子产业园相关企业、行业专家的指导、审核，本校微电子技术教研室全体教师及相关院校教师的热情帮助，参加本书编写的还有冯筱佳、隽昌薇、赵淑平、卢静、黄睿、陈学平、袁勇、林涛、毛小群、尹洪剑、徐雪刚、吴娟、王宝英、汪小华等，在此表示衷心的感谢。

本书承蒙北京理工大学出版社的大力支持，感谢编辑们对本书出版过程给予的热情关怀和帮助。由于水平有限，书中难免存在不足之处，敬请读者予以批评指正。

编　者

目录 Contents

Unit One

- 主要内容：电子技术基础知识包括基本电子元器件、基本电路原理、模拟电子、数字电路等电子学科基础知识。
- 学习目标：掌握基本的电路知识，包括电路元件，如电阻、电容、二极管等，以及电路基本定理、专业基础知识等。

Lesson 1 Analog and Digital Signal

Key words

- analog 模拟
- output 输出
- gate（逻辑）门
- NOT 逻辑非
- inverter 反向器
- AND 逻辑与
- OR 逻辑或
- digital 数字的
- binary 二进制的
- bit（二进制数）位
- pulse 脉冲
- clock 时钟
- data 数据
- serial 串行
- parallel 并行
- logic 逻辑
- input 输入
- timing diagram 时序图

- 工作任务：声音是如何被记录到电脑里的？电脑里面的声音又是如何播放出来的？
- 学习目标：掌握模拟信号和数字信号各自的特征以及相互之间的转换。
- 重点难点：模拟信号和数字信号的区别及其在电路中的形式。
- 推荐学时：6 学时。

How is the sound recorded in the computer? And how is the sound in the computer broadcasted? See Fig. 1 – 1.

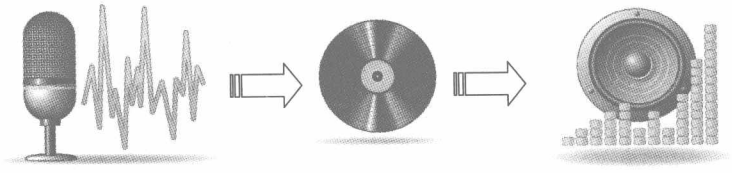

Fig. 1 – 1 Sound

As everyone knows, vibrating of the substance causes the sound. We often record the sound by computers, and hear the amplified sound from the radios, computers and other electric devices. Then, how does the sound go into the electric system? And how can the sound in the electric systems be transformed and be heard again?

1. What is an analog quantity—a temperature line

An analog quantity is one having continuous values. A digital quantity is one having a discrete set of values.

Most things that can be measured quantitatively occur in nature in analog form. For example, the air temperature changes over a continuous range of values. During a given day, the temperature does not go from, say, 70° to 71° instantaneously; it takes on all the infinite values in between. If you graphed the temperature on a typical summer day, you would have a smooth, continuous curve similar to the curve in Fig. 1 – 2.

Other examples of analog quantities are time, pressure, distance, and sound, as shown in Fig. 1 – 3.

Several kinds of analog signals, as shown in Fig. 1 – 4.

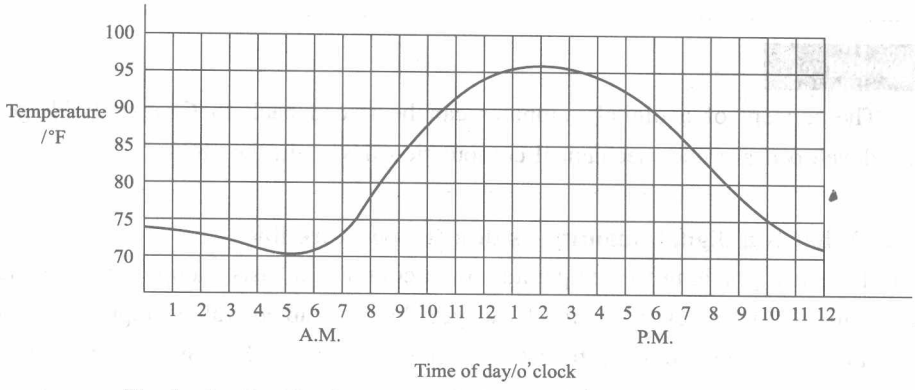

Fig. 1 – 2 Graph of an analog quantity (temperature versus time)

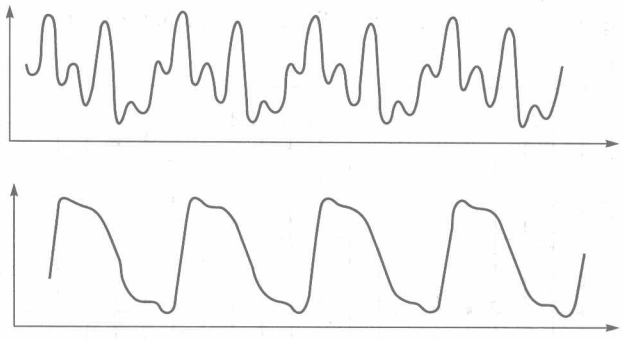

Fig. 1 – 3 The sound wave of violin and piano

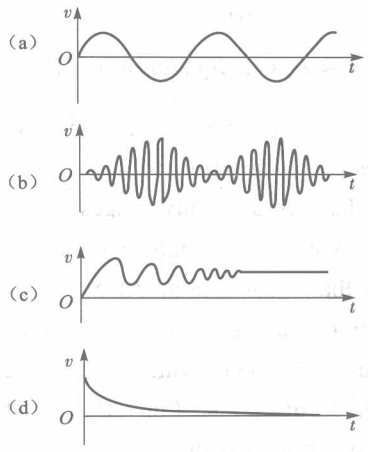

Fig. 1 – 4 Several kinds of analog signals

(a) Sine wave; (b) Modulated wave; (c) Damped oscillatory wave; (d) Exponential decay wave

Knowledge:

The concept of a digital computer can be traced back to Charles Babbage, who developed a crude mechanical computation device in the 1830s.

2. What is a digital quantity—still a temperature line

Rather than graphing the temperature on a continuous basis, suppose you just take a temperature reading every hour. Now you have sampled values representing the temperature at discrete points in time (every hour) over a 24-hour period, as indicated in Fig. 1 – 5. You have effectively converted an analog quantity to a form that can now be digitized by representing each sampled value by a digital code. It is important to realize that Fig. 1 – 5 itself is not the digital representation of the analog quantity.

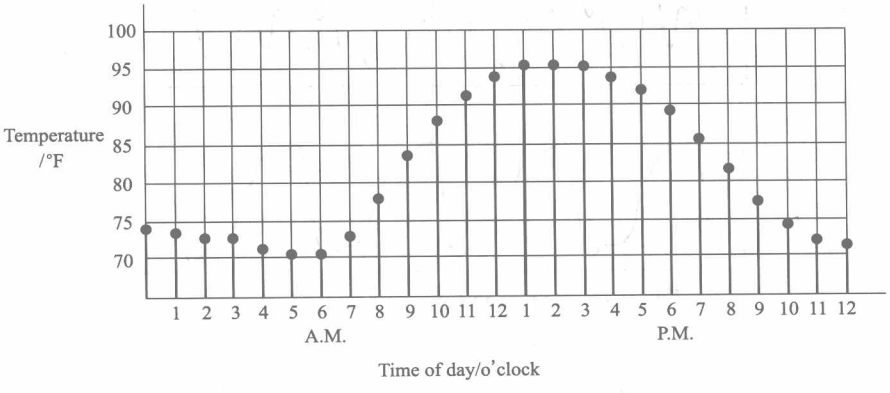

Fig. 1 – 5 Sampled-value representation (quantization) of the analog quantity in Fig. 1 – 2

Each value represented by a dot can be digitized by representing it as a digital code that consists of a series of 1 s and 0 s.

Digital representation has certain advantages over analog representation in electronics applications. For one thing, digital data can be processed and transmitted more efficiently and reliably than analog data. Also, digital data has a great advantage when storage is necessary. For example, music when converted to digital form can be stored more compactly and reproduced with greater accuracy and clarity than is possible when it is in analog form. Noise (unwanted voltage fluctuations) does not affect digital data nearly as much as it does analog signals.

Several kinds of digital signals, as shown in Fig. 1 – 6.

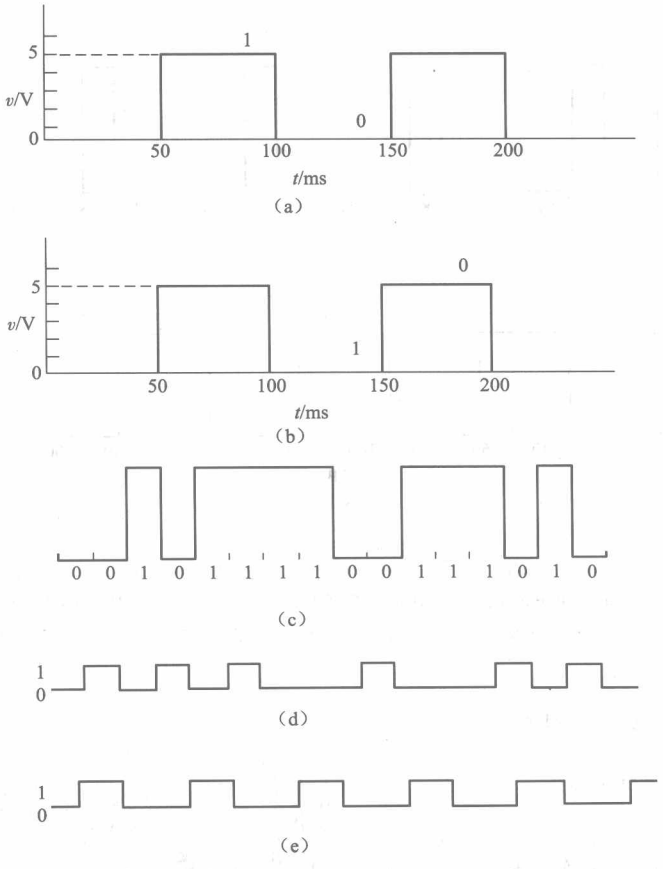

Fig. 1 – 6 Several kinds of digital signals

(a) Positive logic; (b) Negative logic; (c) 16 bit diagram; (d) Nonperiodic digital signal; (e) Periodic digital signal

Two periodic digital signals, as shown in Fig. 1 – 7.

3. An example of analog system—a speaker

A public address system, used to amplify sound so that it can be heard by a large audience, is one simple example of an application of analog electronics. The basic diagram in Fig. 1 – 8 illustrates that sound waves, which are analog in nature, are picked up by a microphone and converted to a small analog voltage called the audio signal. This voltage varies continuously as the volume and frequency of the sound changes and is applied to the input of a linear amplifier. The output of the amplifier, which is an increased reproduction of input voltage, goes to the speaker(s). The speaker changes the amplified audio signal back to sound waves that have a much greater volume than the original sound waves picked up by the microphone.

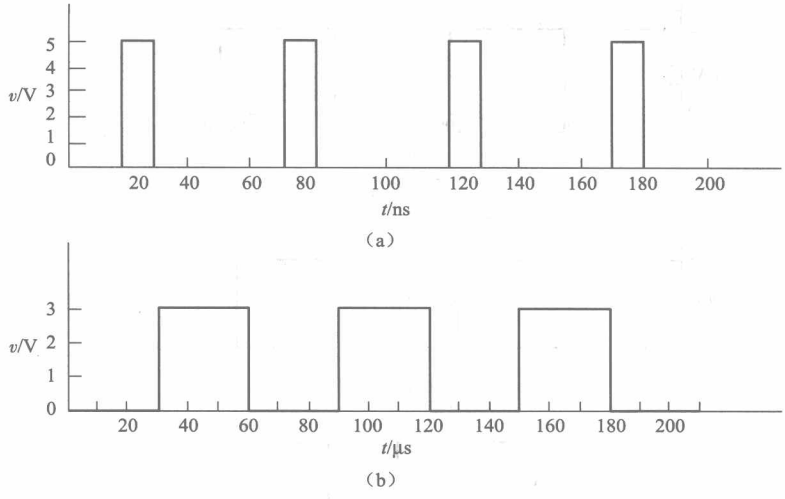

Fig. 1 – 7 Two periodic digital signals

(a) Amplitude 5 V, $tw = 10$ ns, $T = 50$ ns, $q = 20\%$, $f = \text{PRR} = 20$ MHz;

(b) Amplitude 5 V, $tw = 30$ ns, $T = 60$ ns, $q = 50\%$, $f = \text{PRR} = 16.67$ MHz

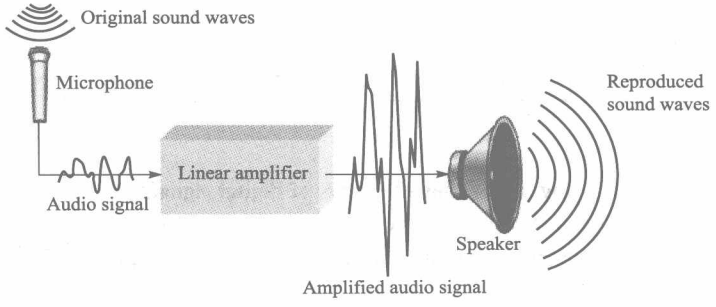

Fig. 1 – 8 A basic audio public address system

4. An example of analog and digital system—also a speaker

The basic block diagram in Fig. 1 – 9 illustrates a system using digital and analog methods.

The compact disk (CD) player is an example of a system in which both digital and analog circuits are used. The simplified block diagram in Fig. 1 – 9 illustrates the basic principle. Music in digital form is stored on the compact disk. A laser diode optical system picks up the digital data from the rotating disk and transfers it to the **digital-to-analog converter (DAC).**

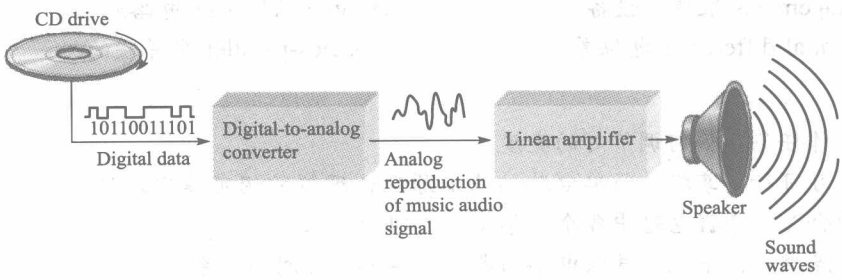

Fig. 1 – 9 Basic block diagram of a CD player (Only one channel is shown)

The DAC changes the digital data into an analog signal that is an electrical reproduction of the original music. This signal is amplified and sent to the speaker for you to enjoy. When the music was originally recorded on the CD, a process, essentially the reverse of the one described here, using an analog-to-digital converter (ADC) was used.

Questions

1. What is an analog signal?
2. What is the character of a digital signal?
3. How is the sound signal saved in the digital circuit?

Lesson 2 Application of Ohm's Law

Key words

- circuit 电路，线路
- series 串联
- parallel 并联
- path 通道
- current 电流
- divides 分流，分开
- point 点，节点
- resistances 电阻
- splits 分流，分开
- branches 分支，支路（电路）
- arrow 箭头
- generator 发电机，发生器
- conductor（电）导体
- apparatus 仪器
- voltage drop 电压降
- terminal 终点，末端
- termed 称为（=call）
- no-load 空载（无负载）
- apparent 显然的，明显的
- internal 内部

- arrangements 装置，设备
- potential difference 电位差
- circuit element 电路元件
- series-parallel 串并联的

- 工作任务：如何调节灯的亮度？
- 学习目标：掌握最简单电路的基本原理，理解欧姆定律中元件串联、并联的含义，掌握电路中各个电学参量之间的关系。
- 重点难点：串联、并联电路的各个电学参量之间的关系。
- 推荐学时：6 学时。

How to monitor the brightness of a light in a circuit?

Which segment decides the brightness of the light in the circuit, as shown in Fig. 2 – 1? We can see the brightness adjustable light anywhere in the market or in our home. Rotate the knob, the light will turn brilliant or turn dark. So when you rotate the knob, what has changed in the circuit?

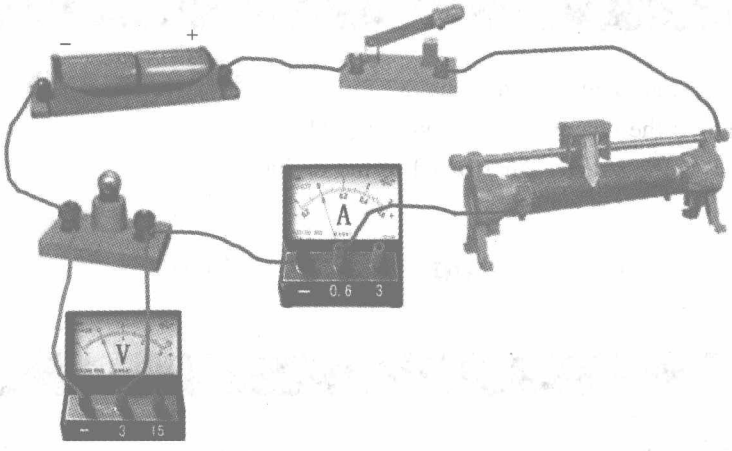

Fig. 2 – 1 How to monitor the brightness of a light in a circuit

■

All electrical circuits fall into one of three classes: series circuits, parallel circuits, and series-parallel circuits.

A series circuit is one in which the current flows in a single continous path and is of the same value at every point in circuit (Fig. 2 – 2).

In a parallel circuit there are two or more current paths between two points in the circuit, as shown in Fig. 2 – 3. Here the current divides at A, one part going through R_1, and the other part through R_2, and combines at B to return to the battery.

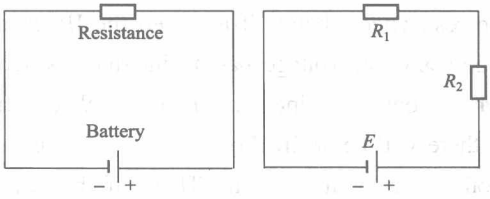

Fig. 2 – 2 Series circuits

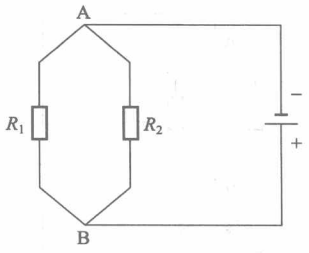

Fig. 2 – 3 A parallel circuit

Knowledge:

John Atanasoff was the first to apply electronic processing to digital computing in 1939. In 1946, an electronic digital computer called ENIAC was implemented with vacuum-tube circuits. Even though it took up an entire room, ENIAC didn't have the computing power of your handheld calculator.

Fig. 2 – 4 shows series-parallel circuits. There are two paths between points A and B as in the parallel circuit, and in addition there are two resistances in series in each branch of the parallel combination. The other example of series-parallel arrangements appears in Fig. 2 – 5. The way in which the current splits to flow through the parallel branches is shown by the arrows.

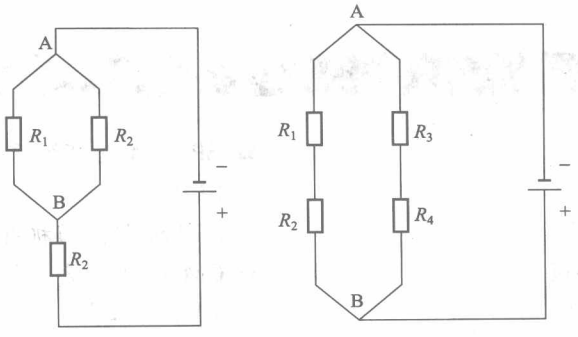

Fig. 2 – 4 Series-parallel circuits

In every circuit, each of the parts has some resistance: the batteries or generator, the connecting conductors, and the apparatus itself, thus, if each part has some resistance, no matter how little, and a current is flowing through it, there will be a voltage drop across it. In other words, there will be a potential difference between the

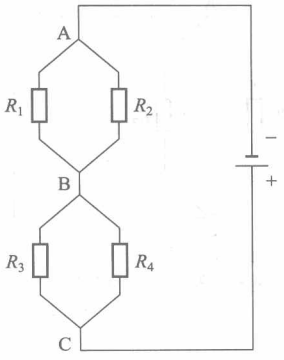

Fig. 2 – 5 Series-parallel circuit

two ends of the circuit element in question. The drop in voltage is equal to the product of the current and the resistance, hence it is called the IR drop.

The source of voltage has an internal resistance, and when connected into a circuit so that current flows, there will be an IR drop in the source just as in every other part of the circuit. Thus, if the terminal voltage of the source could be measured in a way that would cause no current to flow, it would be found to be more than the voltage measured when a current flows by the amount of the IR drop in the source. The voltage measured with no current flowing is termed the no-load voltage. It is apparent that a voltage source having a low internal resistance is more desirable.

Questions

1. What is a series circuit?
2. What is the characteristic of a parallel circuit?
3. How to calculate the current in these three kinds of circuits?

Lesson 3 The NAND Gate

Key words

- retract 缩进
- extended 展开
- inverter 反相器
- complement 补码
- AND gate 与门
- enable 使能
- OR gate 或门
- NAND gate 与非门
- NOR gate 或非门
- exclusive-OR gate 异或门
- exclusive-NOR gate 同或门
- EPROM 电可编程只读存储器
- EEPROM 电可擦除只读存储器
- SRAM 静态随机存储器
- CMOS 互补金属氧化物半导体
- TTL 晶体管—晶体管逻辑电路
- fan-out 输出端，扇出
- unit load 单位负载
- timing diagram 时序图
- boolean algebra 布尔代数
- truth table 真值表