

中等职业教育计算机系列教材

计算机专业英语

李 飞 编著

电子科技大学出版社

图书在版编目 (CIP) 数据

计算机专业英语/李飞编著. —成都: 电子科技大学出版社, 2006.7
ISBN 7-81114-105-1

I. 计... II. 李... III. 电子计算机—英语—专业学校—教材 IV. H31

中国版本图书馆 CIP 数据核字 (2006) 第 036468 号

内 容 提 要

本书包括四个部分, 即计算机硬件知识、计算机软件知识、计算机应用知识、计算机网络及多媒体技术, 其侧重点是讲解计算机技术, 让学生了解计算机技术专业英语词汇和表达方式。每个单元都由课程讲解、参考译文以及阅读资料组成, 知识点难度适中, 强调知识的实用性。本书每部分后附有多种类型的练习题, 有助于读者复习、巩固所学知识。

本书作为中等职业教育教材, 也可作为各类计算机培训班的培训教材, 以及各类职业院校学生的教材或参考书。

计算机专业英语

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出 版: 电子科技大学出版社 (成都建设北路二段四号 邮编: 610054)

责任编辑: 陈建军

发 行: 新华书店经销

印 刷: 成都墨池教育印刷总厂

开 本: 787mm×1092mm 1/16 印张 10.75 字数 275 千字

版 次: 2006 年 7 月第一版

印 次: 2006 年 7 月第一次印刷

书 号: ISBN 7-81114-105-1/TP·25

定 价: 17.00 元

本书如有印刷、装订等质量问题, 请寄回印刷厂调换
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前 言

社会的发展离不开高素质的专业人才，随着我国现代化建设的深入进行，职业教育正逐步体现其在国民经济建设中的重要作用。按照《中共中央国务院关于深化教育改革全面推进素质教育的决定》精神，以及《面向 21 世纪教育振兴行动计划》中提出的职业教育课程改革和教材建设规划的要求，当前的职业教育要“以职业能力为本位”，“以就业为导向”，服务于培养高素质劳动者和技能人才这一目标，要围绕培养技术应用能力这条主线来设计学生的知识、能力、素质结构，加强对学生的基本实践能力、专业技术应用能力及综合实践能力的培养。在职业教育使用的教材中适当增加实验或案例所占的比重，在教学中多采用“项目教学法”和“案例教学法”，引导学生积极思考，主动参与，勤于实践。

为了使理论与实践更好地结合，培养学生分析问题和解决问题的能力，从整体上提升中等职业学校学生的计算机应用水平，促进教学改革，我们依据教育部制定的《中等职业学校计算机及应用专业教学指导方案》，以及教育部等六部委最新制定的《中等职业学校计算机应用与软件技术专业领域技能型紧缺人才培养培训指导方案》，组织一批职教专家和优秀教师，结合最新的教学改革研究成果，编写了这套中等职业教育计算机系列教材。

本书为本套中等职业教育计算机系列教材之一。计算机专业英语综合了计算机知识和英语运用能力，是计算机学科的一门重要工具课。本书旨在使学生掌握计算机专业英语术语，培养和提高学生阅读和笔译专业英语文献资料的能力。

本书包括四个部分，即计算机硬件知识、计算机软件知识、计算机应用知识、计算机网络及多媒体技术，其侧重点是讲解计算机技术，让学生了解计算机技术专业英语词汇和表达方式。每个单元都由课程讲解、参考译文以及阅读资料组成，知识点难度适中，强调知识的实用性。本书每部分后附有多种类型的练习题，有助于读者复习、巩固所学知识。

本书编者是长期从事计算机教学的一线教师，具有丰富的教学实践经验。

本书凝聚了编者多年来的教学经验和成果，编写上深入浅出，通俗易懂。

本书为中等职业教育教材，也可作为各类计算机培训班的培训教材，以及各类职业院校学生的教材或参考书。本教材相关学习资料及习题答案可登录 www.21pcedu.com 免费下载。

由于编者水平有限，书中难免存在不妥之处，敬请广大读者批评指正。

编 者

2006 年 6 月

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第一部分 计算机硬件知识

Unit 0 ne Fundam ental Com puter Know ledge

Lesson One The Structure of a Microcomputer

A computer is popularly known as an "electrical brain". In appearance, its primary hardware components are the main frame, the monitor, the keyboard, and many peripherals such as the hardwired to the main frame.

1. The main frame

The main frame is the heart of a microcomputer system. It contains the Central Processing Unit (CPU), a chip that controls the major operations of the computer, and the main memory.

CPU is abbreviation of "central processing unit", pronounced as separate letters. The CPU is the brains of the computer, sometimes referred to simply as the "processor" or "central processor". The CPU is where most calculations take place. CPU is the most important element of a computer system, such as Intel 8086, Intel 80286, Intel 80386, etc. Two typical components of a CPU are: the ALU (Arithmetic Logic Unit), which performs arithmetic and logical operations, the EU (Execute Unit), which extracts instructions from memory and decodes and executes them.

In common usage, the term "RAM" is synonymous with "main memory", this type of memory available to programs. For example, a computer with 8M RAM has approximately 8 million bytes of memory that programs can use. In contrast, "ROM" ("read-only memory") refers to special memory used to store programs that boot the computer and perform diagnostics. Most personal computers have a small amount of ROM (a few thousand bytes). In fact, both types of memory (ROM and RAM) allow random access. To be precise, therefore, RAM should be referred to as "read/write RAM" and ROM as "read-only RAM".

There are two basic types of RAM:

dynamic RAM(DRAM)

static RAM (SRAM)

These two types differ in the technology but both use to hold data, and dynamic RAM being the more common type. Dynamic RAM needs to be refreshed thousands of times per second. Static RAM needs to be refreshed less often, which makes it faster; but it is also more

expensive than dynamic RAM. Both types of RAM are "volatile", meaning that they lose their contents when the power is turned off.

2. Floppy and Hard Disks

The typical secondary storage medium of a microcomputer is the floppy and hard disks. A floppy disk, or diskette, is a thin circular piece of flexible polyester coated with a magnetic material. Most microcomputers use floppy diskettes of 5¼ inches and 3¼ inches in diameter. Hard disks, or fixed disks, can be either fixed in the mainframe as a part of the internal design of a microcomputer or separate, external units. Internal hard disks reside permanently within the microcomputer and are removed only for servicing or replacement. External hard disks can be purchased alone and then attached to the microcomputer with cables; they are used for backing up large amounts of data or for additional storage capacity. Hard disks provide tremendous storage capacities ranging from hundreds of megabytes to several gigabytes.

3. Keyboard and Mouse

A keyboard is a requisite hardware device of a computer. It is an input device most in use, and a dialogue tool between a man and a computer.

A typical keyboard includes a group of standard keys set in the center of the keyboard, many function keys and several additional keys. Function and additional keys have different roles in different software.

Another popular input device is mouse. The mouse is a small, hand-held object that is pushed around a desktop to move the cursor on the screen or to select choices from menus displayed on the screen. A mouse is essentially a pointing device that allows the user to do many operations more quickly than he could with the keyboard alone.

4. Monitor

The monitor is an essential output device of a microcomputer, also known as video display terminals (VDTs), resembles television screens, and may be either monochrome or color. A monochrome monitor displays only one color on the screen. It is possible white or more eyes pleasing green. While color monitors usually offer a wide selection of display colors.

5. Printer

The printer is the most commonly used output device after the monitor. Printers can create a permanent paper copy of results generated by the program being run on the computer. These printouts are sometimes referred to as hard copy. Printers can also generate listings of programs and graphic images. Three types of printers are available: wire printers, ink jet printers and laser printers.

6. Software

A computer system is composed of software and hardware in the light of its working mode. If we compare the hardware to a human body, then, the software would be the soul.

You can't control a computer without controlling techniques or the computer itself. The controlling techniques are called software, while computers themselves and related devices are called hardware.

The work of a computer is just making full use of various resources by a software set in the computer, and directing the hardware to realize marvelous omnipotent functions.

There are three different types of software that you will use on your new machine. They are the Operating System, application, and games or multimedia.

- Operating System

The operating system is an essential component of any new computer. The computer is useless without it.

Users of home PCs should stick with Microsoft's Windows 95 or Windows 98, which is the OS that comes, bundled with most new systems. But users considering doing graphic-intensive operations or running a computer primarily for business use should consider Windows NT Workstation.

Most home users should stay away from NT at this stage unless they have specific reason for wanting that OS. It will be possible to upgrade at a later date.

- Applications

These are the programs that run home accounts, word processing, spreadsheets, etc. The most popular applications suite (or group) is Microsoft's Office 97, which comes in Standard (home user) and Professional (business or corporate) versions. This package includes a spreadsheet, word processor, and presentation package (slides). A desktop database manager is included in the professional edition called Access.

- Multimedia

This segment includes games and educational software. Most dealers carry a wide range of this type software. If buying for children, try to get them to test it first.

【Key words and Expressions】

function key 功能键
dialogue tool 对话工具
flexible *a.* 柔性的
polyester *n.* 聚酯材料
magnetic *a.* 磁性的
track *n.* 磁道
subdivide *vt.* 再分, 细分
sector *n.* 扇区
write protect notch 写保护槽
microcomputer *n.* 微型计算机
primarily 首先, 起初, 主要地

label *n.* 标签
read/write opening 读写打开
gigabyte *n.* 千兆字节
random *a.* 随机的
touch *v.* 触及
common *a.* 常见的
approximate *a.* 近似的
boot *v.* 引导
mainframe *n.* 主机, 大型机
megabyte *n.* 兆字节

【相关专业词语英汉双解】

Application

Application is a program or group of programs designed for users. (应用程序是为用户设计开发的一个程序或一组程序。)

【参考译文】

第一课 微型计算机的结构

计算机俗称“电脑”。从外表上看,它的主要硬件成分是主机、监视器和键盘以及许多与主机通过电线连接相连的外围设备,如磁盘驱动器、硬盘、打印机、鼠标。

1. 主机

主机是微机系统的核心,它包括中央处理器单元(CPU)和主存,CPU 是一块控制计算机主要操作的芯片。

CPU 是 central processing unit (中央处理单元)的缩写,读作 C-P-U(即首字母名称)。CPU 是计算机的大脑,是进行大部分计算的地方,有时干脆就叫“处理器”(processor)或“中央处理器”(central processor)。从计算能力上讲,CPU 是计算机系统中最重要部件。如 Intel 8086, Intel 80286, Intel 80386 等。CPU 有两个典型的部件:

“算术逻辑部件 ALU”,执行算术和逻辑运算。

“执行部件 EU”,从存储器中提取指令,将其译码并执行。

在通常情况下,术语 RAM 就是“主存储器”(main memory)的同义词,即程序可用的存储器。例如,具有 8M RAM 的计算机有差不多 8 000 000 字节的存储器供程序使用。相反,ROM(只读存储器)是指存储计算机引导程序及诊断程序的特殊存储器。大多数个人计算机有一个小容量的 ROM(几千字节)。事实上,这两种存储器(ROM 和 RAM)都允许随机存取。因此,精确地说,RAM 应是“读-写 RAM”(read-write RAM)和“只读 RAM”(read-only RAM)。

RAM 有两种基本的类型:

动态 RAM

静态 RAM

这两种类型的存储器存放数据所用的技术不同,动态 RAM 更为常用。动态 RAM 需要每秒钟刷新数千次。静态 RAM 需要刷新的次数较少,从而速度较快,但比动态 RAM 贵。这两种 RAM 都是易失性的(Volatile),就是说,当断电时内容要丢失。

2. 软盘和硬盘

微型计算机的典型的辅助存储介质是软盘和硬盘。软盘是一个表面附有磁性材料的柔性的用聚酯材料做成的圆形的薄片。大多数的微机使用 5¹/₄ 和 3¹/₂ 英寸的软盘。硬盘,又称固定盘,它既可以固定在主机箱内成为微机内部设计的一部分,也可以是独立的外部单

元。内部硬盘永久性地安置在微机内，只有需要维修或更换时才取出。外部硬盘可以独立购买，通过电缆线与微机相连；它的用处是备份大量的数据或增加存储容量。硬盘的存储量从几百兆字节到数千兆字节不等。

3. 键盘和鼠标

键盘是计算机的一个必要的硬件设备，也是最常用的一种输入设备，是人与计算机的对话工具。我们可以通过键盘把数据、资料等需要计算机处理或保存的信息送入计算机。

一个典型的键盘包括一组位于键盘中间的标准键、许多功能键和一些附加键。功能键和附加键在不同的软件中有不同的作用。

另一种常用的输入设备是鼠标。鼠标是一个可以用手在桌面上推动的小东西，通过它可以在屏幕上移动光标或者选中菜单上的某项功能。鼠标是一个必要的外部设备，它可以使用户以比使用键盘快得多的速度完成许多操作。

4. 显示器

显示器是微机必需的输出设备，显示器类似于电视屏幕，也被称为视频显示终端（VDTs），显示器有单色显示器和彩色显示之分。单色显示器屏幕上仅显示一种颜色，它可能是白色或是一种更悦目的绿色。彩色显示器通常提呈供许多种可供选择的颜色。

5. 打印机

打印机是除显示器外最常用的输出设备。打印机可以将程序运行的结果打印出来，从而成为永久的纸拷贝。这种打印输出有时也被称为硬拷贝。打印机也可以打印程序列表和图形图片。打印机有三种类型：针打式打印机、喷墨打印机和激光打印机。

6. 软件

从计算机的工作过程看，计算机系统是由软件和硬件组成的。如果将硬件比做人的躯体，那么，软件就好比人的灵魂。

没有计算机或者没有控制计算机的技术，人就不能操纵计算机。这些控制计算机的技术被叫做软件，计算机及其各种设备本身被叫做硬件。

计算机的工作就是通过计算机的软件组，充分利用计算机的各种资源，并指挥硬件实现无所不能的奇妙用途。

你将会在你的新机器上使用到三种不同类型的软件。它们分别是：操作系统软件；应用软件以及游戏或多媒体软件。

● 操作系统软件

操作系统是任何一部新计算机的基本组成部分。如果缺少了它，计算机就无任何作用了。

个人计算机家庭用户应该坚持使用微软公司的 Windows 95 或 Windows 98，这个系统一般是与新的系统捆绑在一起的。但是，如果用户认为做图形处理操作或是主要用计算机从事商务业务处理，也可考虑使用 Windows NT 的工作站系统。

不过，大多数家庭用户在这个阶段应远离 NT 版本，除非他们特别需要这种 NT 操作系统版本。因为这种版本在日后升级比较困难。

- 应用软件

以下是运行家务账户的推荐程序：文字处理应用程序、电子表格应用程序等。最流行的应用软件是微软公司的 Office 97，这个软件有标准版（适合家庭用户）和专业版（适合商业或公司使用）两种版本。这个应用程序软件包包括了电子表格处理、文字处理以及幻灯演示程序。数据库系统包括在专业版中。

- 多媒体软件

这部分软件包括游戏软件和教育软件。大多数经销商经销较宽范围的这类软件。如果要为孩子们购买的话，先试运行一下再购买。

Lesson Two Classification of Computers

Computers can be divided into digital, analog and hybrid computers. A digital computer is a counting device that operates on discrete data. It operates by directly counting numbers (or digits) that represent numbers, letters, or other special symbols. In contrast to digital processors, however, there are also analog computers that do not compute directly with numbers. Rather, they deal with variables that are measured analog by a continuous scale and are recorded to some predetermined degree of accuracy. Desirable features of analog and digital machines are sometimes combined to create a hybrid computing system. Analog and hybrid processors obviously perform important specialized tasks. But the overwhelming majority of all computers used for business and scientific applications are digital devices.

For the purpose, computers can be classified into special and general computer. A special purpose computer is one that's designed to perform only one specific task. The program of instructions is wired into or permanently stored in such a machine. Although it lacks versatility, it does its single task quickly and efficiently. A general-purpose computer is one that can store different programs and can thus be used in countless applications. New programs can be written, and old programs can be changed or dropped. The versatility of a general-purpose system is limited only by human imagination.

Generally, computers can be placed into three general classes: mainframes, minicomputers and microcomputers. These classifications are usually based on three characteristics of computers: speed, main storage capacity and word size. Speed is expressed by how many millions of instructions can be executed per second, called MIPS. Main storage capacity is the number of characters a computer's memory can hold. Word size is the number of bits in an addressable main storage location. The amount of main storage that can be addressed is partly determined by a computer's word size.

1. Microcomputers

The development of the microcomputer began in 1971 with the introduction of the first computer processor based on microelectronics. Since that time, there have been a number of improvements in the microcomputer, and the microcomputer has had a tremendous impact on the

computer industry. Besides size, its primary advantage is low cost. Most microprocessors have either a 16-bit or 32-bit word size. Typical microcomputer's main storage capacities range from 16M to 128M characters. Generally, the MIPS of the microcomputer don't exceed 10.

2. Minicomputer

A typical minicomputer has a 32 to 64-bit word size. Its main storage capacity ranges from 128 megabytes to 16 Gigabytes. Clearly the characteristics of minicomputer systems vary widely. The characteristics of some minicomputers equal those of mainframes. The MIPS of minicomputer ranges from one to 2000. A minicomputer sometimes called server, can be used in MIS (Management Information System), OLTP (On-Line Transaction Processing) and DSS (Decision Support System). In physical size, minicomputers can vary from a desktop model to the size of a small file cabinet.

3. Mainframes system

The term mainframe refers to computer systems provided by the major computer vendors, such as IBM. A whole series of mainframe models ranging in size from small to very large are generally lumped together under family designation by mainframe manufactures, so mainframes can be super computers, large computers or smaller computers.

The most powerful mainframes are called super computers. They can execute over ten billion of instructions per second, have up to a 128-bit word size and may have a main storage capacity of over 64G bytes. Super computers are used primarily in scientific applications requiring extensive calculations.

Large computer systems can execute 50 to 1500 million instructions pre second, commonly have a 64 or 128 bit word size, and have a main storage capacity of up to 8G characters. Like other mainframes, these machines can be expanded to provide additional processing capability.

If a mainframe is not a large computer, its characteristics are more difficult to distinguish. We shall group all such mainframes into the class of smaller computers. These smaller computers may execute 100 to 500 million instructions per second. Some have the same word size as large computers. Their main storage capacities range from 1 to 64 G bytes.

【Key words and Expressions】

extensive *a.* 广大的, 广阔的, 广泛的从
analog *n.* 模拟
hybrid *n.* 混合
discrete *adj.* 离散的, 不连续的
variable *n.* 变量
predetermine *v.* 预定
accuracy *n.* 精确性, 正确度
desirable *adj.* 值得要的, 合意的
special-purpose computer 专用计算机
versatility *n.* 多面性, 多功能性, 通用性

location *n.* 存储单元
MIPS 百万条指令/秒
vendor *n.* 卖主, 供应商
vary *vt.* 变化, 不同
kilomega *n.* 千兆
server *n.* 服务器
MIS (Management Information System)
管理信息系统
OLTP (On-Line Transaction Processing)
联机事物处理

general-purpose computer	通用计算机	DSS (Decision Support System)	
imagination	<i>n.</i> 想象, 想象的事物, 想象力	决策支持系统	
minicomputer	<i>n.</i> 小型机	cabinet	<i>n.</i> 文件柜
main storage capacity	主存容量	tremendous	<i>adj.</i> 惊人的, 极大的
bit	<i>n.</i> 位	distinguish	<i>vt.</i> 区别
addressable	<i>n.</i> 可寻址的		

【相关专业词语英汉双解】

1. 64-bit Microprocessor

A 64-bit microprocessor can handle eight bytes of data at the same time, and the fastest microprocessor ever mass-produced for personal computer use—much faster than 8, 16, 32 bit microprocessors.

(64 位微处理器是一个在相同时间内可以处理 8 个字节数据的微处理器。这种微处理器是为 PC 机而批量生产的, 是迄今速度最快的微处理器, 其速度远远高于 8 位、16 位、或 32 位微处理器。)

2. Pentium

The Pentium is 64-bit microprocessor whose 64-bit internal data bus connects to a 32-bit external data bus. The differences in bus width at the 64-bit level do not cause a significant performance decrease.

(Pentium 微处理器是一种 64 位的微处理器。其 64 位内部数据总线连接 32 位外部数据总线, 64 位总线宽度的差异不会导致明显的性能下降。)

3. Home Computer

Home computer is a personal computer specifically designed and marketed for home applications, such as educating children, playing games, balancing a checkbook, paying bills, and controlling lights or appliances.

(家用电脑是专门为家庭应用而设计和销售的个人计算机, 用于如教育儿童、游戏、结算支票、票据付款、控制照明或电器等。)

【参考译文】

第二课 计算机的分类

计算机可以分为数字、模拟和混和三种类型。数字计算机是对离散数据进行操作的计算机设备。它对表示数字、字母或其他专门用符号的数直接进行计算。和数字处理对应的是模拟计算机, 它不直接对数进行计算。模拟计算机处理的变量是在连续标度上测量出的模拟量, 并按预先设定的精度来记录。有时把模拟和数字计算机的显著优点结合起来形成一个混合计算机系统。模拟和混合处理器显然是用来执行重要的特殊任务。但绝大多数的商业和科学用的计算机都是数字设备。

根据不同的用途,计算机可以分为专用和通用计算机。一台专用计算机是为执行某个特殊任务而设计的。程序的指令是固化或永久存储在机器上的。虽然它缺少通用性,但在它执行单一任务时快速而高效。通用计算机是一种可存储不同的程序,因而可有多种用途的计算机。它可以编写新程序,也可以更新或淘汰旧程序,所以其通用性只受人们创造力的限制。

通常计算机可分三类:大型机、小型机和微机。这种分类通常是基于计算机的三个特性:速度、主存容量和字长。速度是指每秒能执行多少百万条指令,即 MIPS。主存容量是一台计算机的内存所能容纳的字符数量。字长是可寻址的主存单元的地址位数。可被寻址的主存总容量在一定程度上是由字长决定的。

1. 微机

随着第一台基于微电子技术的计算机处理器的产生,微机在 1971 年开始发展。从那时起,微机经历了各种各样的改进,同时它也对计算机工业产生了巨大的影响。除了体积小等优点外,其主要的优点是廉价。大多数微处理器有 16 位或 32 位的字长,典型的微机主存容量从 16 兆到 128 兆字节不等。通常微机的 MIPS 值不超过 10。

2. 小型机

一台典型的小型机有 32 到 64 位的字长,其主存容量从 128 兆到 16 千兆字节。小型机的特点差异很大,有的小型机的特点与大型机相同。小型机的 MIPS 值的变化可以从 1 到 2000。小型机有时也叫服务器,可以用于 MIS (管理信息系统)、OLTP (联机事务处理) 和 DSS (决策支持系统)。从尺寸上讲,小型机的体积小可为台式,大可为一个小型文件柜。

3. 大型机系统

“大型机”这个术语指的是由像 IBM 等主要计算机供应商提供的计算机系统。大型计算机厂家将它们的大型机设计成系列产品,包括从规模小的小型机到非常大的超级计算机。因此大型机可以是超级计算机、巨型机或更小型的计算机。

最强有力的大型机是超级计算机。它们每秒能执行上百亿条指令,有多达 128 位的字长,有大约超过 64G 的主存容量。超级计算机主要用于需要进行大量运算的科学应用领域。

巨型机系统每秒可执行 5 千万到 15 亿条指令,通常有 64 位或 128 位字长,有 8G 字节的主存容量。像其他大型机主机一样,这些机器能够被扩展以提供更多的处理能力。

如果一台大型机不是一台巨型机,则其特征就更难以区分了。我们将这些大型机归类到更小型的计算机中。这些小型机每秒可执行 1~5 千万条指令,有些有与巨型机一样的字长。它们的主存容量从 1G 字节到 64G 字节不等。

Lesson Three Evolution of Computer System

With the development of the ENIAC, the computer became a useful scientific and business tool. The ENIAC could operate without human intervention, depending only upon stored instructions. This development marked the beginning of the modern computer era. Since then,

many refinements in computer's speed, performance, and cost have been made. The much advancement in computer technology is divided into four time periods called generations.

1. First Generation Computers

The first generation of computers lasted from 1946 until 1958. They were large, costly to buy, expensive to power, and often unreliable. Their internal operations were controlled through the use of vacuum tubes. These tubes were fairly large, and they generated so much heat that special air conditioning had to be installed to handle it.

It was during this period that symbolic languages were developed. Symbolic languages use symbols made up of letters and numbers to stand for the 0s and 1s of machine language. For example, ADD may stand for addition. Computer instructions written in symbolic languages were easier for people to use than machine language. But symbolic language had to be translated into machine code before the computer could follow the instructions. The machine code was stored on the outer surface of magnetic drum

2. Second Generation Computers

The second generation of computers spanned the years from 1959 through 1964. It was during this time that the technology race really began.

The most notable change was that transistors replaced vacuum tubes. As a result, computers become much smaller, faster, and more reliable. They also became more efficient. Also at this time, magnetic cores replaced magnetic drums as storage media.

Next, second generation computers were given auxiliary storage, sometimes called external or secondary storage. Data was stored outside the computer on either magnetic tapes or magnetic disks. The use of auxiliary storage ended the limitation on how much data the computer could store and reduced the use of punched cards. Using magnetic tapes for input and output operations increased the speed of the computer.

Finally, improvements were made in the symbolic programming languages. New languages were more like English than the earlier ones, making programming the computer much easier.

3. Third Generation Computers

The third generation of computers lasted from 1965 to 1970. During this time, technology continued to improve and computers became even smaller, while their memory capacities became larger.

The third generation is marked chiefly by the development of integrated circuits, which replaced transistors. With integrated circuits, hundreds of electronic components could be included on one silicon-chip less than one eighth-inch square.

A number of other developments characterized this period. For example, minicomputers were introduced. These machines had many of the same capabilities as large computers; but they were much smaller, had less storage space, and cost less. Another development was the use of remote terminals, input/output devices that are electronically linked to a main computer but located at some distance from it. A popular innovation was the introduction of families of