

The Computer System

- The equipment associated with a computer system.

- The set of instructions that tell a computer what to do.

- Use the power of the computer for some purpose.

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Hardware = Physical Computer

Computers process and communicate using *Data*

People communicate using *Information*

- ❖ **Input** receives data (keyboard, mouse)
- ❖ **Processor** processes data (CPU, RAM Memory)
- ❖ **Output** produces information (Monitor, Printer)
- ❖ **Secondary storage** (Hard Drive, CD, USB Drive)

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Software = Computer Programs

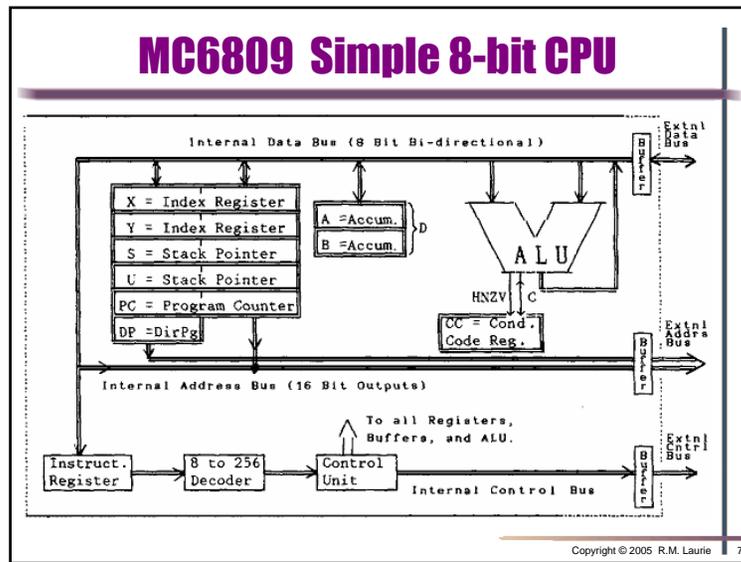
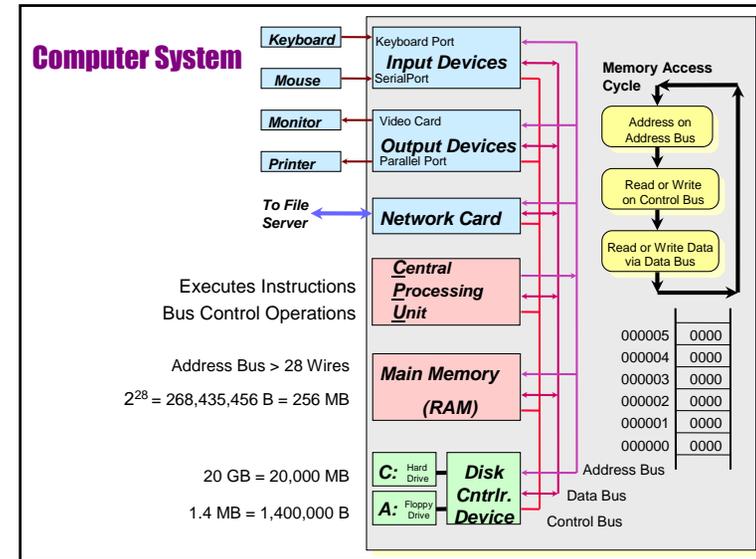
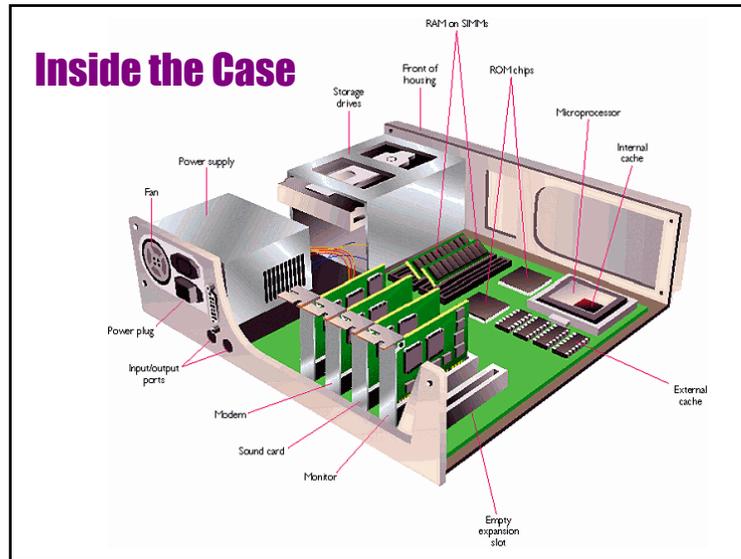
- ❖ **Program** - A set of step by step instructions that direct the computer to do a task that you want it to do and produce the results you want.
- ❖ **Programming Language** – A set of rules that instructs the computer what operations to perform.

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People = End Users & Programmers

- ❖ **End User's**
 - ◆ Utilize computer resources
 - ◆ Utilize software applications
- ❖ **Programmers**
 - ◆ **Analyze** a problem and create a solution algorithm
 - ◆ **Code** the solution algorithm into a specific programming language
 - ◆ **Verify** program works using known test data

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- ### Programming Language Generations
- ❖ 1st = Machine Language
 - ◆ Actual bits that CPU processes
 - ❖ 2nd = Assembly Language
 - ◆ Each assembly instruction corresponds to one machine code instruction
 - ◆ Requires an **assembler** to convert assembly source code to machine code
 - ❖ 3rd = High-level Language
 - ◆ Uses human words for keywords
 - ◆ Abstract and general purpose
 - ◆ Requires a **compiler** or **interpreter** to run
 - ◆ Compiles for different CPU's
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First Generation: Machine Language

- ❖ Lowest level programming language because it represents data and program instructions as binary 0/1. Generally, hexadecimal is used for human interaction.
- ❖ All programming languages are eventually converted into machine language.
- ❖ Will be run on only one type of CPU

0000	
...	
D000	86
D001	12
D002	8B
D003	0C
D004	B7
D005	D1
D006	00
D007	BB
D008	D1
D009	10
D00A	B7
D00B	D1
D00C	01
...	
FFFF	

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Second Generation: Assembly Language

Address	Instructions	Data	Assembly Language
D000	86	12	LDA #\$12
D002	8B	0C	ADDA #\$0C
D004	B7	D100	STA \$D100
D007	BB	D110	ADDA \$D110
D00A	B7	D101	STA \$D101
D00D	8B	1E	ADDA #\$1E
D00F	B7	D01B	BCC \$D019
D012	86	00	LDA #\$00
D014	B7	D110	STA \$D110
D017	23	D007	BRA \$D007
D01A	3F		SWI

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Third Generation: High-Level Language

```
int main(void)
{
    int nEntry = 1, nHour, nMinute;
    char cAM = 'a';
    cout << "Enter the the 2400 hour time \n>";
    cin >> nEntry;
    nMinute = nEntry % 100;
    nHour = nEntry / 100;
    if(nHour > 12)
    {
        nHour = nHour - 12;
        cAM = 'p';
    }
    cout << nHour << ':';
    if(nMinute < 10) cout << '0';
    cout << nMinute << ' ' << cAM << ".m.\n\n";
    return 0;
}
```

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High-Level Languages to Machine Code

- ❖ **Compiler**
 - ◆ Converts *HLL Source Code* into *Machine Code* file
 - ◆ Compiler targets only one type CPU
 - ◆ Intel: x86, 386, 486, Pentium 1-4
 - ◆ Motorola: 68k, Power PC, 68HC11
 - ◆ Compiler targets only one type OS
 - ◆ Microsoft: DOS, Windows
 - ◆ Unix, Linux, Solaris OS, Apple Macintosh, CPM
- ❖ **Interpreter**
 - ◆ Executes *HLL Source Code* line by line directly
 - ◆ **Scripting Languages** utilize an interpreter to execute programs
 - ◆ Excellent *portability*

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Historical Development of HLL

- ❖ **FORTAN**: 1957, Compiled language, Developed for engineering and science applications.
- ❖ **COBOL**: 1959, Compiled language, Developed for business applications.
- ❖ **BASIC**: 1965, Interpreted language, Easy to program, Personal non-production applications; Resurrected by Microsoft in DOS and Visual Basic.
- ❖ **Pascal**: 1971, Compiled language, Developed at ETH Switzerland and used by higher education to teach **Structured Programming** methodologies.
- ❖ **ADA**: 1980, Compiled language, Developed as common HLL for Military applications; First to support **Multitasking** = Concurrent execution.

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Historical Development of HLL

- ❖ **C**: 1975, Compiled language, **Procedural Oriented** (verbs). Highly efficient, fast, structured programs. Eliminated need for most assembly language programs.
- ❖ **C++**: 1985, Compiled language, Added keywords to C so that could be used as an **Object Oriented Programming** language. **OOP** focuses on object (nouns) rather than tasks (verbs).
- ❖ **Java**: 1993, Pseudo-Compiled language generates **bytecode** that runs on any **Java Virtual Machine** to achieve **OS** and **CPU Independence**. Developed as a simplified **OOP** language that supports **Networks**, **Security**, and **Multithreaded** for multitasking.
- ❖ **JavaScript**: 1995, Interpreted language that utilizes interpreter in web browser; **Object-based**; Similar syntax to Java, C/C++; Very secure: Available for both **Client** and **Server Scripting**. JavaScript is usually embedded in an html document.

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Compiler Choice

- ❖ Borland C++ command line compiler
- ❖ Borland C++ Help Files
- ❖ Text Editor = www.textpad.com
 1. Download and save the file Config.zip
 2. Extract all three files (bcc32.cfg, ilink32.cfg, and BCC55.bat) to the folder described by the path C:\Borland\BCC55\Bin.
 3. Run TextPad.
 4. Choose Configure, Preferences and click Tools.
 5. Click the Add button and choose Program.
 6. Browse to C:\Borland\BCC55\Bin\bcc55.bat
 7. Click Apply, not OK.

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Assignment 2: First C++ Program

```

1.  /******
2.  * PROGRAM 1: THE FIRST PROGRAM          *
3.  ******
4.  * This Welcome program also displays the *
5.  * programmers name.                    *
6.  *                                       *
7.  * Programmer: Robert Laurie            *
8.  * Northern Marianas College: CS225     *
9.  * Date: September 7, 2005             *
10. ******/
11. #include <iostream> // Required for I/O functions
12. using namespace std; // Required 1998 Standard C++
13. int main() // Required int before main()
14. {
15.     cout << "Welcome Robert Laurie "
16.         << "to C++ Programming" << endl << endl;
17.     return 0;
18. }
```

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