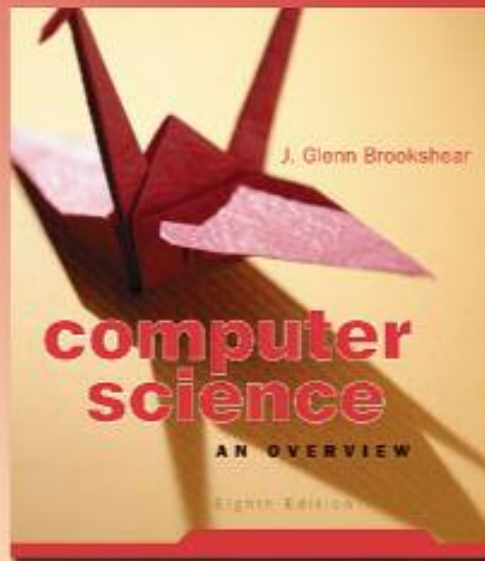


Chapter 2



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Chapter 2: Data Manipulation

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Computer Architecture

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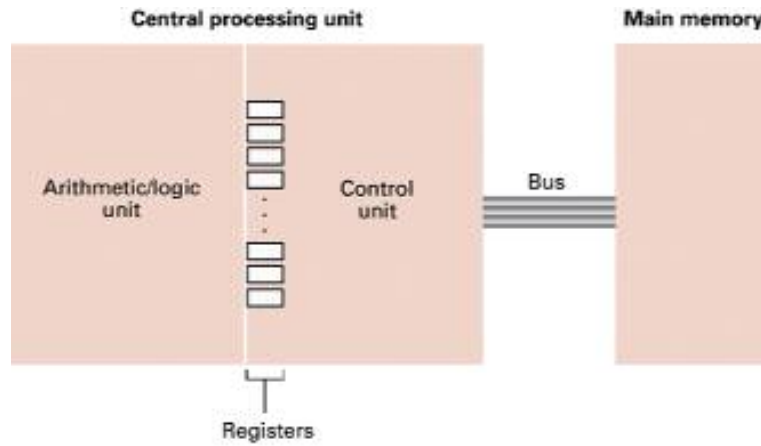


Stored program concept

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Figure 2.1 CPU and main memory connected via a bus



Machine language: definitions

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Machine language philosophies

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Machine instruction types

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Figure 2.2 Adding values stored in memory

- Step 1.** Get one of the values to be added from memory and place it in a register.
- Step 2.** Get the other value to be added from memory and place it in another register.
- Step 3.** Activate the addition circuitry with the registers used in Steps 1 and 2 as inputs and another register designated to hold the result.
- Step 4.** Store the result in memory.
- Step 5.** Stop.

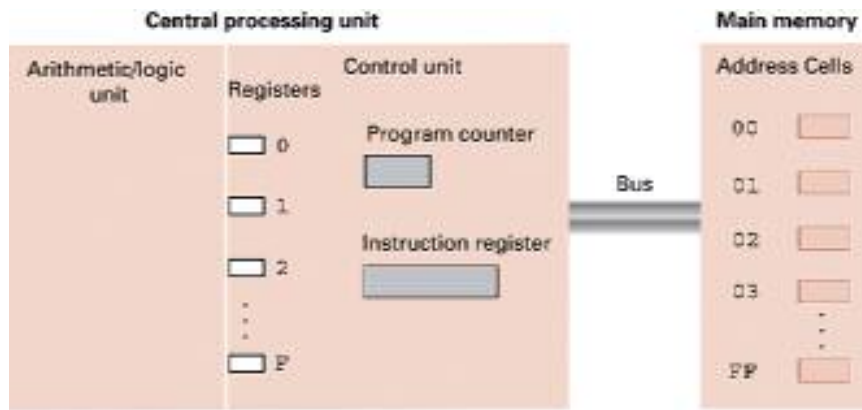


Figure 2.3 Dividing values stored in memory

- Step 1.** LOAD a register with a value from memory.
- Step 2.** LOAD another register with another value from memory.
- Step 3.** If this second value is zero, JUMP to Step 6.
- Step 4.** Divide the contents of the first register by the second register and leave the result in a third register.
- Step 5.** STORE the contents of the third register in memory.
- Step 6.** STOP.



Figure 2.4 The architecture of the machine described in Appendix C

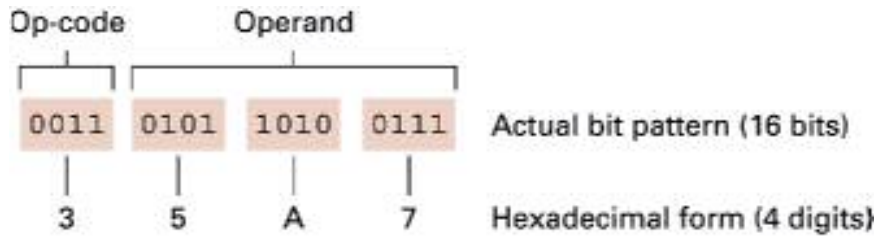


Parts of a machine instruction

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Figure 2.5 The composition of an instruction for the machine in Appendix C



Program execution

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Figure 2.8 The machine cycle

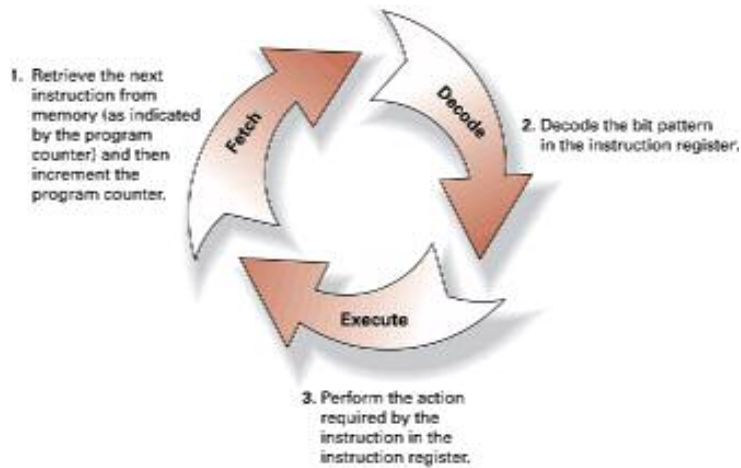


Figure 2.10 The program from Figure 2.7 stored in main memory ready for execution

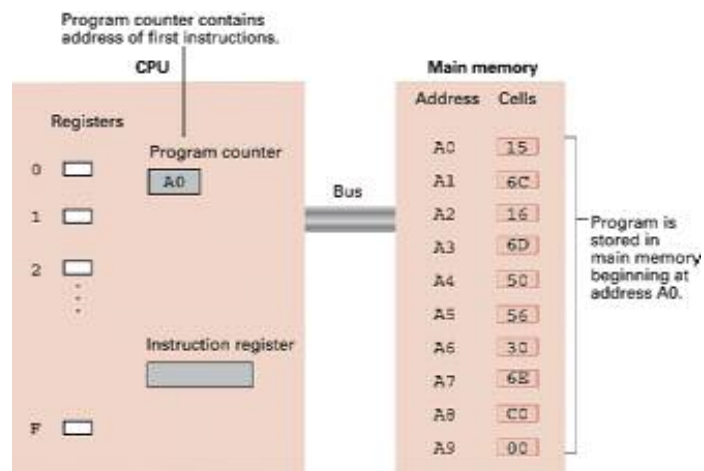
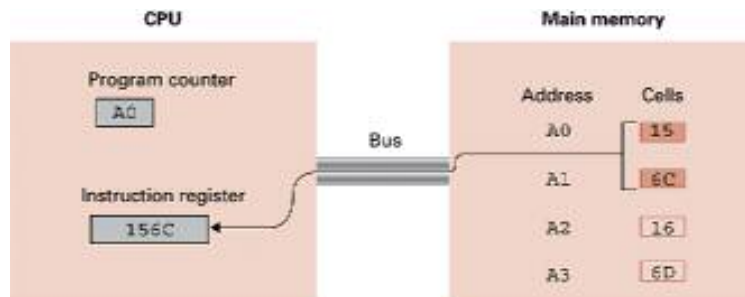




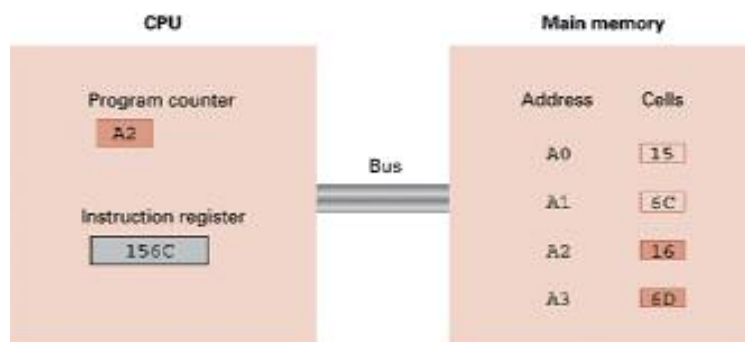
Figure 2.11 Performing the fetch step of the machine cycle



a. At the beginning of the fetch step the instruction starting at address A0 is retrieved from memory and placed in the instruction register.



Figure 2.11 Performing the fetch step of the machine cycle (cont'd)



b. Then the program counter is incremented so that it points to the next instruction.



Arithmetic/Logic operations

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Figure 2.12 Rotating the bit pattern A3 one bit to the right

