

First Generation Computers

AP Computer Science

Unit 09

First Generation Computers

Atanasoff-Berry Computer 1938

The Atanasoff-Berry computer (ABC), invented by John Atanasoff and Clifford Berry at Iowa State University in 1938, is now recognized as the first electronic digital computer. It was a special-purpose computer that used binary arithmetic to solve simultaneous equations.

The ABC was about the size of a desk, weighed over seven hundred pounds, contained approximately one mile of wire, and used two hundred and eighty vacuum tubes.



Atanasoff-Berry Computer
Public Domain

The use of vacuum tubes marked the ABC as the first computer to use electronic switching as opposed to mechanical switching, however its inability to store a program distinguishes it from “modern” digital computers.

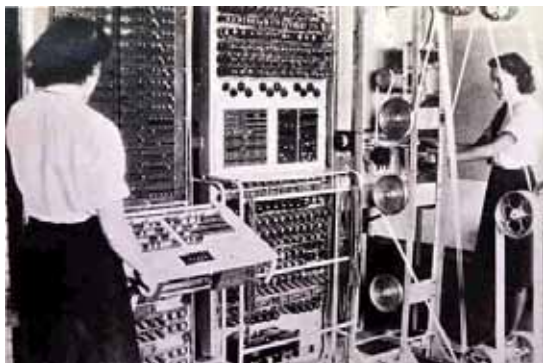
The controversy over who designed the first digital computer was resolved by a patent lawsuit in 1973, which declared that the ABC, not the ENIAC, was the first electronic digital computer.

First Generation Computers

Colossus 1944

Colossus was a special-purpose binary electronic digital computer developed to decode secret messages encrypted by Enigma, the famous code machine used by Germany during WWII. Colossus was programmed by re-wiring the circuits.

The Mark I used 1,500 vacuum tubes and could read paper tape-coded instructions at the rate of 30 mph.



Colossus
Public Domain

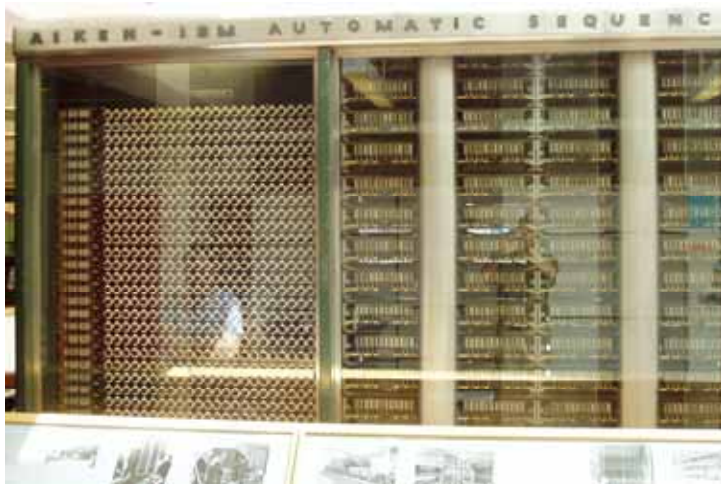
Alan Turing, who laid much of the foundation for computer science, was one of the lead cryptographers who worked on breaking the Enigma code.

First Generation Computers

Harvard Mark I 1944

Howard Aiken of Harvard University conceived the Automatic Sequence Controlled Calculator (ASCC), but it was built by IBM. More commonly known as the Harvard Mark I, it was a large scale automatic electromechanical computer/calculator that did not need any human intervention once it began processing.

The Mark I was 8 feet tall, 51 feet long, 2 feet wide, and weighed around 10,000 pounds. It consisted of 765,000 components, 500 hundred of miles of wire connecting switches, relays, rotating shafts, and clutches. A five-horsepower motor drove a 50 foot shaft that manually synchronized the calculating units.



Although not based on the binary number system, the Mark I could store 72 numbers, each 23 decimal digits long.

One of the first programmers was Grace Murray Hopper.

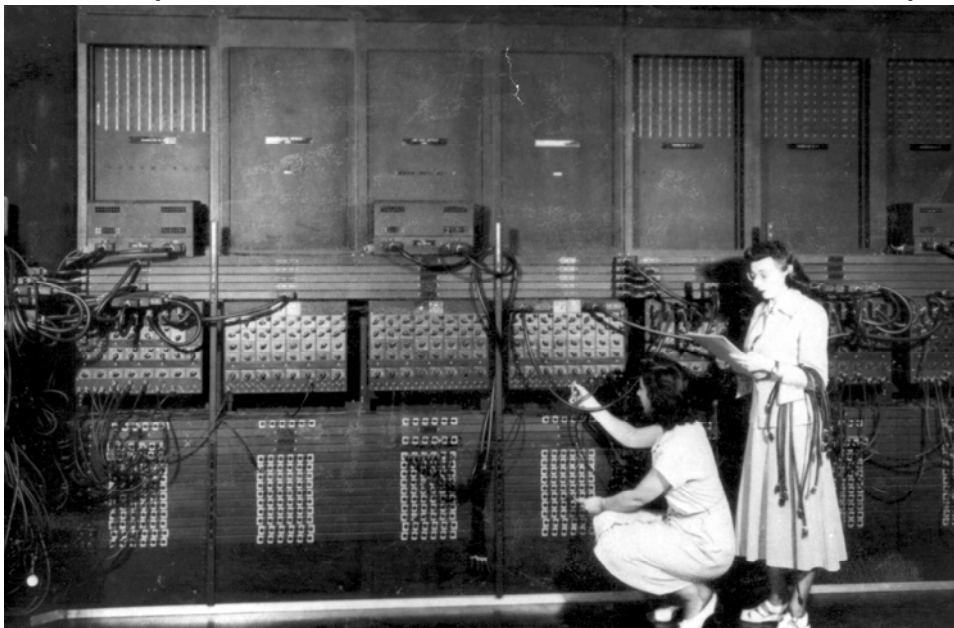
Several Panels of the Mark I
[Image GNU Free Documentation License](#)

First Generation Computers – Mainframe Era

ENIAC 1943

Short for **Electronic Numerical Integrator And Computer**, the ENIAC was the first large scale, general-purpose, re-programmable, electronic, digital computer. The ENIAC was designed by John Mauchly and Presper Eckert of the University of Pennsylvania. Unlike computers of today, it was based on the decimal number system. It was designed to calculate artillery firing tables and was also used in the design of the first hydrogen bomb.

The ENIAC was a massive: 100 feet long, 8 feet tall, and 3 feet wide. It weighed 30 tons and contained 17,468 vacuum tubes, and approximately 5 million hand-soldered connections. An IBM card reader was used for input, and an IBM card punch machine was used for output. It could perform 5,000 additions or subtractions per second.



Programming the ENIAC
©2007 Public Domain

In 1973, Mauchly and Eckert lost a patent battle with Atanasoff and Berry, for recognition of ENIAC as the first computer.



Presper Eckert and John Mauchly
©2007 Public Domain

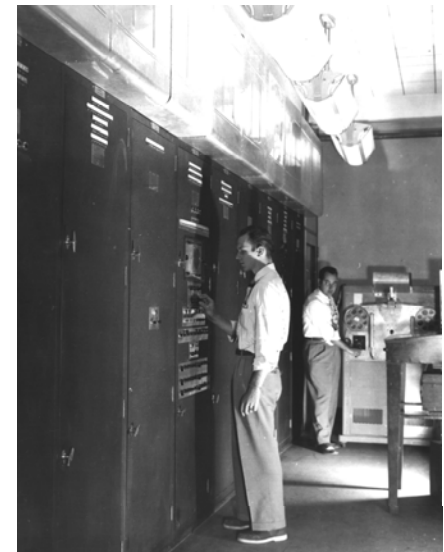
[ENIAC Simulator](#)

First Generation Computers – Mainframe Era

EDVAC

Mauchly and Eckert quickly realized the limitations of the ENIAC and set about designing a new computer, the EDVAC (Electronic Discrete Variable Automatic Calculator). They were joined in the effort by John von Neumann designed a way for the computer to store a program in memory and set the stage for computers as we know them today.

Unlike its predecessor, the EDVAC was based on the binary number system. It covered 490 ft², contained 6,000 vacuum tubes and took 30 people to operate. One of the first operators was computer pioneer Grace Murray Hopper.



EDVAC

First Generation Computers – Mainframe Era

UNIVAC - 1951

The UNIVAC I (Universal Automatic Computer I) was the first general-purpose electronic digital computer designed for business and administrative use. It was referred to as a mainframe computer weighing in at 14 tons and occupying more than 350² feet of floor space, about the size of a one car garage.

The UNIVAC contained 5,200 vacuum tubes and at a clock speed of 2.25 MHz could perform about 1,905 operations per second. So much heat was generated by the vacuum tubes that air conditioning was required to cool the system.

Grace Murray Hopper helped develop the Cobol programming language used by the UNIVAC.

The first UNIVAC mainframe was delivered to the U.S. Census Bureau in 1951, approximately 60 years after Herman Hollerith invented the data processing industry with his Tabulating Machine first used in the 1890 census.



UNIVAC I
Public Domain

First Generation Computers – Mainframe Era

IBM 704 1954

International Business Machines (IBM) dominated the early computer market with a series of highly successful mainframe computers, selling 123 IBM 704s from 1955 to 1960.

The IBM 704 was capable of 40,000 instructions per second. The FORTRAN and Lisp programming languages were first developed for the IBM 704.

An interesting anecdote occurred in 1962, when a Bell Labs scientist created a speech synthesizer with the IBM 704. The synthesizer was programmed to sing “Daisy Bell” with musical accompaniment. Arthur C. Clarke was visiting Bell Labs that day and was so impressed that he had the Hal 9000 rogue computer sing the same song in the novel and movie 2001: A Space Odyssey.



IBM 704 Mainframe Computer