Computer Hardware Engineers

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Nature of the Work
Computer hardware engineers research, design, develop, and test computer hardware and supervise its manufacture and installation. Hardware refers to computer chips, circuit boards, computer systems, and related equipment such as keyboards, modems, and printers. (Computer software engineers—often simply called computer engineers—design and develop the software systems that control computers. These workers are covered elsewhere in the *Handbook*.) The work of computer hardware engineers is very similar to that of electronics engineers, but, unlike electronics engineers, computer hardware engineers work exclusively with computers and computer-related equipment. (See electrical and electronics engineers elsewhere in the *Handbook*.) In addition to design and development duties, computer hardware engineers may supervise the manufacture and installation of computers and computer-related equipment. The rapid advances in computer technology are largely a result of the research, development, and design efforts of computer hardware engineers. To keep up with technological advances, these engineers must continually update their knowledge.

Employment
The number of computer hardware engineers is relatively small compared with the number of computer-related workers who work with software or computer applications. Computer hardware engineers held about 74,000 jobs in 2002. Almost 40 percent worked in computer and electronic product manufacturing. Almost one-quarter worked in professional, scientific, and technical services firms, many of which provided services to the computer industry. Many of the rest were employed in the telecommunications.

Job Outlook
Computer hardware engineers may face competition for jobs because the number of degrees granted in this field has increased rapidly and because employment is expected to grow more slowly than average. Although the use of information technology continues to expand rapidly, the manufacture of computer hardware is expected to be adversely affected by intense foreign competition. Also, this industry is expected to continue to experience very high levels of productivity growth, which will even affect computer hardware engineers. The utilization of foreign computer hardware engineering services also will serve to limit growth. In addition to job openings arising from employment growth, other vacancies will result from the need to replace workers who move into managerial positions, transfer to other occupations, or leave the labor force.

Earnings
Median annual earnings of computer hardware engineers were $72,150 in 2002. The middle 50 percent earned between $56,490 and $91,730. The lowest 10 percent earned less than $46,190, and the highest 10 percent earned more than $114,880. Median annual earnings in the industries employing the largest numbers of computer hardware engineers in 2002 were:

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Semiconductor and other electronic component manufacturing.	$76,600
Computer and peripheral equipment manufacturing	75,300
Computer systems designs and related services	74,320

According to the National Association of Colleges and Employers, starting salary offers in 2003 for bachelor's degree candidates in computer engineering averaged $51,343 a year; master's degree candidates averaged $64,200.

Sources of Additional Information
For further information on careers, education, certification, publications, and conferences related to computer hardware engineers, contact:
➤ IEEE Computer Society, 1730 Massachusetts Ave. NW., Washington, DC 20036-1992. Internet: **http://www.computer.org**

See the introduction to the section on engineers for information on working conditions, training requirements, and other sources of additional information.