

Offices and clinics of medical doctors .....	\$9.74
Hospitals .....	9.54
Hotels and motels .....	9.16
Personnel supply services .....	9.02
Miscellaneous business services .....	8.66

Median hourly earnings of telephone operators in 2000 were \$13.46. The middle 50 percent earned between \$9.40 and \$16.76. The lowest 10 percent earned less than \$7.23, and the highest 10 percent earned more than \$19.57.

Some telephone operators working at telephone companies are members of the Communications Workers of America (CWA) or the International Brotherhood of Electrical Workers (IBEW). For these operators, union contracts govern wage rates, wage increases, and the time required to advance from one pay step to the next. (It normally takes 4 years to rise from the lowest paying, nonsupervisory operator position to the highest.) Contracts also call for extra pay for work beyond the normal 6-1/2 to 7-1/2 hours a day or 5 days a week, for Sunday and holiday work, and for a pay differential for nightwork and split shifts. Many contracts provide for a 1-week vacation after 6 months of service; 2 weeks after 1 year; 3 weeks after 7 years; 4 weeks after 15 years; and 5 weeks after 25 years. Holidays range from 9 to 11 days a year.

### Related Occupations

Other workers who provide information to the general public include dispatchers; hotel, motel, and resort desk clerks; information and record clerks; and reservation and transportation ticket agents and travel clerks.

### Sources of Additional Information

For more details about employment opportunities, contact a telephone company, temporary-help agency, or write to:

- Communications Workers of America, 501 3rd St. NW., Washington, DC 20001. Internet: <http://www.cwa-union.org>
- International Brotherhood of Electrical Workers, Telecommunications Department, 1125 15th St. NW., Room 807, Washington, DC 20005.

## Computer Operators

(O\*NET 43-9011.00)

### Significant Points

- Employment is expected to decline sharply due to advances in technology.
- Opportunities will be best for operators who have formal computer-related education, are familiar with a variety of operating systems, and keep up-to-date with the latest technology.

### Nature of the Work

Computer operators oversee the operation of computer hardware systems, ensuring that these machines are used as efficiently as possible. They may work with mainframes, minicomputers, or networks of personal computers. Computer operators must anticipate problems and take preventive action, as well as solve problems that occur during operations.

The duties of computer operators vary with the size of the installation, the type of equipment used, and the policies of the employer. Generally, operators control the console of either a mainframe digital computer or a group of minicomputers. Working from operating instructions prepared by programmers, users, or operations



*Computer operators usually receive on-the-job training.*

managers, computer operators set controls on the computer and on peripheral devices required to run a particular job.

Computer operators load equipment with tapes, disks, and paper, as needed. While the computer is running—which may be 24 hours a day for large computers—computer operators monitor the control console and respond to operating and computer messages. Messages indicate the individual specifications of each job being run. If an error message occurs, operators must locate and solve the problem or terminate the program. Operators also maintain log-books or operating records, listing each job that is run and events, such as machine malfunctions, that occur during their shift. In addition, computer operators may help programmers and systems analysts test and debug new programs. (See the statements on computer programmers; and systems analysts, computer scientists, and database administrators elsewhere in the *Handbook*.)

As the trend toward networking computers accelerates, a growing number of computer operators are working on personal computers (PCs) and minicomputers. In many offices, factories, and other work settings, PCs and minicomputers are connected in networks, often referred to as local area networks (LANs) or multi-user systems. Whereas users in the area operate some of these computers, many require the services of full-time operators. The tasks performed on PCs and minicomputers are very similar to those performed on large computers.

As organizations continue to look for opportunities to increase productivity, automation is expanding into additional areas of computer operations. Sophisticated software, coupled with robotics, enables a computer to perform many routine tasks formerly done by computer operators. Scheduling, loading and downloading programs, mounting tapes, rerouting messages, and running periodic reports can be done without the intervention of an operator. Consequently, these improvements will change what computer operators do in the future. As technology advances, the responsibilities of many computer operators are shifting to areas such as network operations, user support, and database maintenance.

### Working Conditions

Computer operators generally work in well-lighted, well-ventilated, comfortable rooms. Because many organizations use their computers 24 hours a day, 7 days a week, computer operators may be required to work evening or night shifts and weekends. Shift assignments usually are made based on seniority. However, increasingly automated operations will lessen the need for shift work, because many companies let the computer take over operations during

less desirable working hours. In addition, advances in telecommuting technologies—such as faxes, modems, and e-mail—and data center automation, such as automated tape libraries, enable some operators to monitor batch processes, check systems performance, and record problems for the next shift.

Because computer operators generally spend a lot of time in front of a computer monitor, as well as performing repetitive tasks such as loading and unloading printers, they may be susceptible to eye-strain, back discomfort, and hand and wrist problems.

### Employment

Computer operators held about 194,000 jobs in 2000. Most jobs are found in organizations such as wholesale trade establishments, manufacturing companies, business services firms, financial institutions, and government agencies that have data-processing needs requiring large computer installations. A large number of computer operators are employed by service firms in the computer and data-processing services industry, as more companies contract out the operation of their data-processing centers.

### Training, Other Qualifications, and Advancement

Computer operators usually receive on-the-job training in order to become acquainted with their employer's equipment and routines. The length of training varies with the job and the experience of the worker. However, previous work experience is the key to obtaining an operator job in many large establishments. Employers generally look for specific, hands-on experience with the type of equipment and related operating systems they use. Additionally, formal computer-related training, perhaps through a community college or technical school, is recommended. Related training also can be obtained through the Armed Forces and from some computer manufacturers. As computer technology changes and data processing centers become more automated, employers will increasingly require candidates to have formal training and experience for operator jobs. And although not required, a bachelor's degree in a computer-related field can be helpful when one is seeking employment as a computer operator.

Because computer technology changes so rapidly, operators must be adaptable and willing to learn. Analytical and technical expertise also are needed, particularly by operators who work in automated data centers, to deal with unique or high-level problems that a computer is not programmed to handle. Operators must be able to communicate well, and to work effectively with programmers, users, and other operators. Computer operators also must be able to work independently because they may have little or no direct supervision.

A few computer operators may advance to supervisory jobs, although most management positions within data-processing or computer-operations centers require advanced formal education, such as a bachelor's or higher degree. Through on-the-job experience and additional formal education, some computer operators may advance to jobs in areas such as network operations or support. As they gain experience in programming, some operators may advance to jobs as programmers or analysts. A move into these types of jobs is becoming much more difficult, as employers increasingly require candidates for more-skilled computer jobs to possess at least a bachelor's degree.

### Job Outlook

Employment of computer operators is expected to decline sharply through the year 2010. Experienced operators are expected to compete for the small number of openings that will arise each year to replace workers who transfer to other occupations or leave the labor force. Opportunities will be best for operators who have formal

computer-related education, are familiar with a variety of operating systems, and keep up-to-date with the latest technology.

Advances in technology have reduced both the size and cost of computer equipment, while increasing the capacity for data storage and processing automation. Sophisticated computer hardware and software are now used in practically every industry, in such areas as factory and office automation, telecommunications, medicine, education, and administration. The expanding use of software that automates computer operations gives companies the option of making systems user-friendly, greatly reducing the need for operators. Such improvements require operators to monitor a greater number of operations at the same time and be capable of solving a broader range of problems that may arise. The result is that fewer operators will be needed to perform more highly skilled work.

Computer operators who are displaced by automation may be reassigned to support staffs that maintain personal computer networks or assist other members of the organization. Operators who keep up with changing technology, by updating their skills and enhancing their training, should have the best prospects of moving into other areas such as network administration and technical support. Others may be retrained to perform different job duties, such as supervising an operations center, maintaining automation packages, or analyzing computer operations to recommend ways to increase productivity. In the future, operators who wish to work in the computer field will need to know more about programming, automation software, graphics interface, client/server environments, and open systems, in order to take advantage of changing opportunities.

### Earnings

Median annual earnings of computer operators were \$27,670 in 2000. The middle 50 percent earned between about \$21,280 and \$35,320 a year. The highest 10 percent earned more than \$43,950, and the lowest 10 percent earned less than \$17,350. Median annual earnings in the industries employing the largest numbers of computer operators in 2000 are shown below:

Computer and data processing services .....	\$28,530
Hospitals .....	26,550
Commercial banks .....	22,840
Personnel supply services .....	22,130
Miscellaneous business services .....	21,980

The average salary for computer operators employed by the Federal Government was \$37,574 in early 2001.

According to Robert Half International, the average starting salaries for console operators ranged from \$28,250 to \$40,500 in 2001. Salaries generally are higher in large organizations than in small ones.

### Related Occupations

Other occupations involving work with computers include computer software engineers; computer programmers; computer support specialists and systems administrators; and systems analysts, computer scientists, and database administrators. Other occupations in which workers operate electronic office equipment include data entry and information-processing workers, as well as secretaries and administrative assistants.

### Sources of Additional Information

For information about work opportunities in computer operations, contact establishments with large computer centers, such as banks, manufacturing and insurance firms, colleges and universities, and data processing service organizations. The local office of the State employment service can supply information about employment and training opportunities.