
Radio and Telecommunications Equipment Installers and Repairers

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Significant Points

- Little or no change in employment is projected.
- Job opportunities vary by specialty; good opportunities are expected for central office installers and repairers, but station installers and repairers can expect keen competition.
- Applicants with computer skills and postsecondary electronics training should have the best opportunities.
- Repairers may be on-call around the clock in case of emergencies—night, weekend, and holiday hours are common.

Nature of the Work

Telephones, computers, and radios depend on a variety of equipment to transmit communications signals and connect to the Internet. From electronic and optical switches that route telephone calls and packets of data to their destinations to radio transmitters and receivers that relay signals from radios in airplanes, boats, and emergency vehicles, complex equipment is needed to keep us communicating. The workers who set up and maintain this sophisticated equipment are called radio and telecommunications equipment installers and repairers.

Telecommunications equipment installers and repairers have a range of skills and abilities, which vary by the type of work they do and where it is performed. Most work indoors. (Equipment installers who work mainly outdoors are classified as telecommunications line installers and repairers—a separate occupation discussed elsewhere in the *Handbook*.)

Central office installers and repairers—telecommunications equipment installers and repairers who work at switching hubs called central offices—do some of the most complex work. Switching hubs contain the switches and routers that direct packets of information to their destinations. Installers and repairers set up those switches and routers as well as cables and other equipment.

Although most telephone lines connecting houses to central offices and switching stations are still copper, the lines connecting central hubs to each other are fiber optic. Fiber optic lines, along with newer packet switching equipment, have greatly increased the transmission capacity of each line, allowing an ever increasing amount of information to pass through the lines. Switches and routers are used to transmit, process, amplify, and direct a massive amount of information. Installing and maintaining this equipment requires a high level of special technical knowledge.

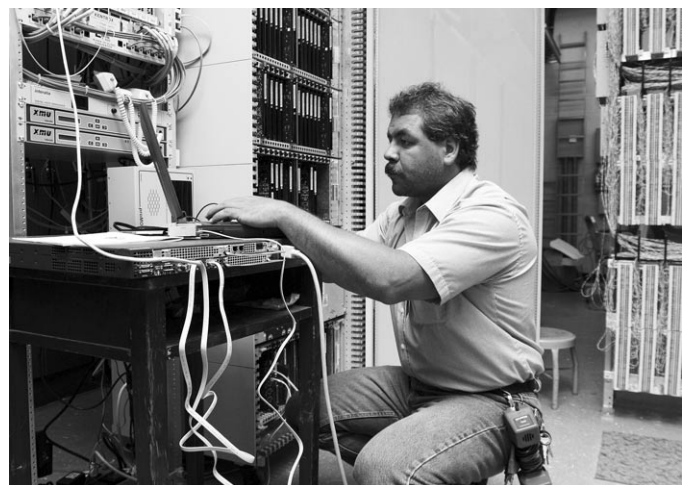
The increasing reliability of switches and routers has simplified maintenance, however. New self-monitoring telecommunications switches alert central office repairers to malfunctions. Some switches allow repairers to diagnose and correct problems from remote locations. When faced with a malfunction,

the repairer may refer to manufacturers' manuals that provide maintenance instructions.

As cable television and telecommunications technology converge, the equipment used in both technologies is becoming more similar. The distribution centers for cable television companies, which are similar to central offices in the telecommunications sector, are called *headends*. Headend technicians perform essentially the same work as central office technicians, but they work in the cable industry.

When problems with telecommunications equipment arise, telecommunications equipment repairers diagnose the source of the problem by testing each part of the equipment. This requires understanding how the software and hardware interact. Repairers often use spectrum analyzers, network analyzers, or both to locate the problem. A network analyzer sends a signal through the equipment to detect any distortion in the signal. The nature of the signal distortion often directs the repairer to the source of the problem. To fix the equipment, repairers may use small hand tools, including pliers and screwdrivers, to remove and replace defective components such as circuit boards or wiring. Newer equipment is easier to repair because whole boards and parts are designed to be quickly removed and replaced. Repairers also may install updated software or programs that maintain existing software.

Another type of telecommunications installer and repairer, *PBX installers and repairers* set up private branch exchange (PBX) switchboards, which relay incoming, outgoing, and interoffice telephone calls within a single location or organization. To install switches and switchboards, installers first connect the equipment to power lines and communications cables and install frames and supports. They test the connections to ensure that adequate power is available and that the communication links work properly. They also install equipment such as power systems, alarms, and telephone sets. New switches and switchboards are computerized and workers often need to install software or program the equipment to provide specific features. Finally, the installer performs tests to verify that the newly installed equipment functions properly. If a problem arises, PBX repairers determine whether it is located within the PBX system or whether it originates in the telephone lines maintained by the local telephone company. Newer installations use voice-over Internet protocol (VoIP) systems. VoIP systems operate like a PBX system, but they use a company's



Telecommunications equipment installers make adjustments in central offices.

computer wiring to run Internet access, network applications, and telephone communications.

Station installers and repairers, telephone—commonly known as *home installers and repairers* or *telecommunications service technicians*—install and repair telecommunications wiring and equipment in customers' home or business premises. They install telephone, VoIP, Internet, and other communications services by installing wiring inside the home or connecting existing wiring to outside service lines. Depending upon the service required, they may setup television capability or connect modems and install software on a customer's computer. To complete the connection to an outside service line, the installer may need to climb telephone poles or ladders and test the line. Later on, if a maintenance problem occurs, station repairers test the customer's lines to determine if the problem is located in the customer's premises or in the outside service lines and attempt to fix the problem if it is inside. If the problem is with the outside service lines, telecommunications line repairers are usually called to fix it.

Radio mechanics install and maintain radio transmitting and receiving equipment, excluding cellular communications systems. This includes stationary equipment mounted on transmission towers or tall buildings and mobile equipment, such as two-way radio communications systems in taxis, airplanes, ships, and emergency vehicles. Aviation and marine radio mechanics also may work on other electronic equipment, in addition to radios. Newer radio equipment is self-monitoring and may alert mechanics to potential malfunctions. When malfunctions occur, these mechanics examine equipment for damaged components and either fix them, replace the part, or make a software modification. They may use electrical measuring instruments to monitor signal strength, transmission capacity, interference, and signal delay, as well as hand tools to replace defective components and parts and to adjust equipment so that it performs within required specifications.

Work environment. Radio and telecommunications equipment installers and repairers generally work in clean, well-lit, air-conditioned surroundings, such as a telecommunications company's central office, a customer's location, or an electronic repair shop or service center. Traveling to the site of the installation or repair is common among station installers and repairers, PBX and VoIP installers and repairers, and radio mechanics. The installation may require access to rooftops, ladders, and telephone poles to complete the repair. Radio mechanics may need to work on transmissions towers, which may be located on top of tall buildings or mountains, as well as aboard airplanes and ships. These workers are subject to a variety of weather conditions while working outdoors.

The work of most repairers involves lifting, reaching, stooping, crouching, and crawling. Adherence to safety precautions is important in order to guard against work hazards. These hazards include falls, minor burns, electrical shock, and contact with hazardous materials.

Nearly all radio and telecommunications equipment installers and repairers work full time. Many work regular business hours to meet the demand for repair services during the workday. Schedules are more irregular at employers that provide repair services 24 hours a day, such as for police radio com-

munications operations or where installation and maintenance must take place after normal business hours. At these locations, mechanics work a variety of shifts, including weekend and holiday hours. Repairers may be on call around the clock, in case of emergencies, and may have to work overtime.

Training, Other Qualifications, and Advancement

Postsecondary education in electronics and computer technology is increasingly required for radio and telecommunications equipment installers and repairer jobs, and a few employers even prefer people with a bachelor's degree for some of the most complex types of work. About half of all radio and telecommunications equipment installers and repairers have completed some college courses or an associate degree.

Education and training. As telecommunications technology becomes more complex, the education required for radio and telecommunications equipment installers and repairer jobs has increased. Most employers prefer applicants with postsecondary training in electronics and familiarity with computers. The education needed for these jobs may vary from a certification to work on certain equipment to a 2- or 4-year degree in electronics or a related subject. Sources of training include 2- and 4-year college programs in electronics or communications technology, military experience in radios and electronics, trade schools, and programs offered by equipment and software manufacturers. Educational requirements are higher for central office installers and repairers and for those working in nonresidential settings.

Many in the telecommunications industry work their way up into this occupation by gaining experience at less difficult jobs. Experience as a telecommunications line installer or station installer is helpful before moving up to the job of central office installer and other more complex jobs, for example. Military experience with communications equipment is also valued by many employers in both telecommunications and radio repair.

Newly hired repairers usually receive some training from their employers. This may include formal classroom training in electronics, communications systems, or software and informal hands-on training assisting an experienced repairer. Large companies may send repairers to outside training sessions to learn about new equipment and service procedures. As networks have become more sophisticated—often including equipment from a variety of companies—the knowledge needed for installation and maintenance also has increased.

Licensure. Aviation and marine radio mechanics are required to have a license from the Federal Communications Commission before they can work on these types of radios. This requires passing several exams on radio law, electronics fundamentals, and maintenance practices.

Other qualifications. Familiarity with computers, being mechanically inclined, and being able to solve problems are traits that are highly regarded by employers. Repairers must also be able to distinguish colors, because wires are color-coded. For positions that require climbing poles and towers, workers must be in good physical shape and not afraid of heights. Repairers who handle assignments alone at a customer's site must be able to work without close supervision. For

workers who frequently contact customers, a pleasant personality, neat appearance, and good communications skills also are important.

Certification and advancement. This is an occupation where the technology is changing rapidly. Workers must keep abreast of the latest equipment available and know how to repair it. Telecommunications equipment installers and repairers often need to be certified to perform certain tasks or to work on specific equipment. Certification often requires taking classes. Some of certifications are needed before entering an occupation; others are meant to improve one's current abilities or to advance in the occupation.

The Society of Cable and Telecommunications Engineers and the Telecommunications Industry Association offer voluntary certifications to workers in this field. Telecommunications equipment manufacturers also provide training on specific equipment.

Experienced repairers with advanced training may become specialists or troubleshooters who help other repairers diagnose difficult problems, or may work with engineers in designing equipment and developing maintenance procedures. Home installers may advance to wiring computer networks or working as a central office installer and repairer. Because of their familiarity with equipment, repairers are particularly well qualified to become manufacturers' sales workers. Workers with leadership ability also may become maintenance supervisors or service managers. Some experienced workers open their own repair services or shops, or become wholesalers or retailers of electronic equipment.

Employment

Radio and telecommunications equipment installers and repairers held about 205,000 jobs in 2006. About 198,000 were telecommunications equipment installers and repairers, except line installers. The remaining 6,500 were radio mechanics.

Telecommunications equipment installers and repairers work mostly in the telecommunications industry. Increasingly, however, they can be found in the construction industry working as contractors to the telecommunications industry.

Radio mechanics work in the electronic and precision equipment repair and maintenance industry, the telecommunications industry, electronics and appliance stores, government, and other industries.

Job Outlook

Little or no change in employment of radio and telecommunications equipment installers and repairers is projected. Job opportunities vary by specialty. Job prospects are best

for those with computer skills and postsecondary training in electronics.

Employment change. Employment of radio and telecommunications equipment installers and repairers is expected to increase 2 percent, reflecting little or no change, during the 2006-16 period. Over the next decade, telecommunications companies will provide faster Internet connections, provide video-on-demand, add hundreds of television stations, and many services that haven't even been invented yet. Although building the new networks required to provide these services will create jobs, these gains will be offset by a decline in maintenance work. The new equipment requires much less maintenance work because it is newer, more reliable, easier to repair, and more resistant to damage from the elements.

The increased reliability of radio equipment and the use of self-monitoring systems also will continue to lessen the need for radio mechanics. However, technological changes are also creating new wireless applications that create jobs for radio mechanics.

Job prospects. Applicants with computer skills and postsecondary training in electronics should have the best opportunities for radio and telecommunications equipment installer and repairer jobs, but opportunities will vary by specialty. Good opportunities should be available for central office and PBX installers and repairers experienced in current technology, as the growing popularity of VoIP, expanded multimedia offerings such as video on demand, and other telecommunications services continue to place additional demand on telecommunications networks. These new services require high data transfer rates, which can be achieved only by installing new optical switching and routing equipment. Extending high-speed communications from central offices to customers also will require telecommunications equipment installers to put in place more advanced switching and routing equipment, but opportunities for repairers will be limited by the increased reliability and automation of the new switching equipment.

Station installers and repairers can expect keen competition. Prewired buildings and the increasing reliability of telephone equipment will reduce the need for installation and maintenance of customers' telephones, as will the declining number of pay telephones in operation as use of cellular telephones grows. However, some of these losses should be offset by the need to upgrade internal lines in businesses and the wiring of new homes and businesses with fiber optic lines.

Radio mechanics should find good opportunities if they have a strong background in electronics and an ability to work independently. Increasing competition from cellular services is limiting the growth of radio services, but employers report

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2006	Projected employment, 2016	Change, 2006-16	
				Number	Percent
Radio and telecommunications equipment installers and repairers..	49-2020	205,000	209,000	4,800	2
Radio mechanics	49-2021	6,500	6,300	-300	-4
Telecommunications equipment installers and repairers, except line installers	49-2022	198,000	203,000	5,000	3

NOTE: Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook*.

difficulty finding adequate numbers of qualified radio mechanics to perform repair work.

Earnings

In May 2006, median hourly earnings of telecommunications equipment installers and repairers, except line installers were \$25.21. The middle 50 percent earned between \$20.43 and \$28.66. The bottom 10 percent earned less than \$14.96, whereas the top 10 percent earned more than \$32.84. The median hourly earnings of these workers in the wired telecommunications carriers industry were \$26.25 in May 2006.

Median hourly earnings of radio mechanics in May 2006 were \$18.12. The middle 50 percent earned between 14.04 and \$23.02. The bottom 10 percent earned less than \$10.94, whereas the top 10 percent earned more than \$28.54.

About 4 percent of radio and telecommunications equipment installers and repairers were self-employed. About 26 percent of radio and telecommunication equipment installers and repairers are members of unions, such as the Communications Workers of America (CWA) and the International Brotherhood of Electrical Workers (IBEW.)

Telecommunications equipment installers and repairers employed by large telecommunications companies who also belong to unions often have very good benefits, including health, dental, vision, and life insurance. They also usually have good retirement and leave policies. Those working for small independent companies and contractors may get fewer benefits.

Radio mechanics tend to work for small electronics firms or government. Benefits vary widely depending upon the type of work and size of firm. Government jobs usually have good benefits.

Related Occupations

Related occupations that involve work with electronic equipment include broadcast and sound engineering technicians and radio operators; computer, automated teller, and office machine repairers; and electrical and electronics installers and repairers. Line installers and repairers also set up and install telecommunications equipment. Engineering technicians also may repair electronic equipment as part of their duties.

Sources of Additional Information

For information on career and training opportunities, contact:

➤ International Brotherhood of Electrical Workers, Telecommunications Department, 900 7th St.NW., Washington, DC 20001.

➤ Communications Workers of America, 501 3rd St.NW., Washington, DC 20001.

Internet: <http://www.cwa-union.org/jobs>

For information on training and professional certifications for those already employed by cable telecommunications firms, contact:

➤ Society of Cable Telecommunications Engineers, Certification Department, 140 Phillips Rd., Exton, PA 19341-1318. Internet: <http://www.scte.org>

For information on training and licensing for aviation and marine radio mechanics, contact:

➤ The Federal Communications Commission (FCC), 445 12th St.SW., Washington, DC 20554.

Internet: <http://wireless.fcc.gov/commoperators>

For more information on employers, education, and training in marine electronics and radios, contact:

➤ National Marine Electronics Association, 7 Riggs Ave., Severna Park, MD 21164. Internet: <http://www.nmea.org>