



**FIX-IT CAREERS:  
JOBS IN REPAIR**



**A**re you interested in how things work—and how to fix them when they don't? Then your career world is wide open. From auto mechanic to HVAC technicians, many occupations require repair skills.

For jobseekers with the right skills, there are many advantages to a repair career. Repair work provides millions of jobs throughout the United States. Wages are often higher than average. And in many occupations, the employment outlook is bright. Plus, most repair jobs don't require a 4-year college degree.

In today's job market, however, repairers need more than mechanical ability in their skills toolbox. Mathematics and writing are useful for workers in many of the fastest growing repair occupations. And those who understand and keep up with technology usually have an advantage.

Sound good? Keep reading to learn more about repair occupations and what it takes to get started in a career. The first section of the article talks about different types of repair work, highlighting those occupations that pay the best and are expected to have the best employment prospects. The second section looks at three occupations in which employment is expected to grow through 2018: automotive service technicians and mechanics; general maintenance and repair workers; and heating, ventilation, and air conditioning mechanics and installers. You'll also learn more about what these workers do, which tools they use, and where they work. The third section discusses skills, training, and other requirements for repair careers. You can find additional sources of information at the end of the article.

## Repair work

Almost any product, from motorboats to telecommunications lines, may need fixing, creating opportunities for repairers. All repairers help to restore machinery, equipment, or other products to working order. Many repairers also provide routine and general maintenance, and some install the products that they fix.

Sometimes these jobs are physically demanding and require heavy lifting or working in awkward positions. Injury rates for repair occupations are typically higher than those of other occupations.

In May 2009, more than 5 million workers were employed in installation, maintenance, and repair occupations, according to the U.S. Bureau of Labor Statistics (BLS). And the overall job outlook for repair workers is good, with more than 1.5 million job openings expected between 2008 and 2018. The table on page 28 shows selected repair occupations, ranked according to their projected job openings.

### Wages

Workers in repair occupations earned a median annual wage of \$39,600 in May 2009, compared with a median annual wage of \$33,190 for workers in all occupations. (A median wage means that half of all workers made more than that amount and half made less.) All of the repair occupations shown in the table had wages that were at or above the national median for all occupations.

Among the highest paying repair occupations in May 2009 were powerhouse, substation, and relay electrical and electronics repairers (\$62,270) and electrical power line installers and repairers (\$56,670). Working with electricity is dangerous and requires special training—a factor that often leads to higher pay. Repair workers who advance to become supervisors or managers also usually earn higher wages.

### Prospects

Although overall job prospects for repair occupations are good, BLS expects variability across these occupations over the 2008–18 decade. In the table, prospects are shown as total job openings, which is the number of jobs expected to become available in the 2008–2018 decade. Openings come from employment growth in an occupation or the need to replace workers who leave the occupation, or from a combination of the two. In general, more jobs usually means better opportunities. Moreover, even declining occupations

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Selected installation, maintenance, and repair workers by total job openings, projected 2008-18				
Occupation	Employment, May 2009	Total job openings due to growth and net replacement needs, projected 2008-18	Job growth, projected 2008-18	Median annual wages, May 2009
Maintenance and repair workers, general	1,268,930	357,500	About average growth	\$34,620
Automotive service technicians and mechanics	606,990	181,700	Slower than average growth	35,420
First-line supervisors/managers of mechanics, installers and repairers	427,560	136,500	Slower than average growth	58,610
Heating, air conditioning, and refrigeration mechanics and installers	244,410	136,200	Much faster than average growth	41,100
Bus and truck mechanics and diesel engine specialists	232,810	75,300	Slower than average growth	40,250
Industrial machinery mechanics	276,230	62,400	About average growth	44,470
Electrical power-line installers and repairers	108,980	45,500	Slower than average growth	56,670
Automotive body and related repairers	133,290	43,800	Little or no change	37,980
Aircraft mechanics and service technicians	112,130	31,400	Slower than average growth	52,810
Telecommunications line installers and repairers	162,400	27,900	Little or no change	49,110
Computer, automated teller, and office machine repairers	111,600	26,300	Moderate decline	37,620
Medical equipment repairers	34,550	23,200	Much faster than average growth	42,300
Electric motor, power tool, and related repairers	20,660	9,400	Slower than average growth	36,280
Home appliance repairers	34,670	8,700	Little or no change	34,200
Electrical and electronics repairers, powerhouse, substation, and relay	22,870	6,700	About average growth	62,270
Rail car repairers	20,910	5,900	About average growth	46,460
Motorboat mechanics	18,180	5,800	Slower than average growth	35,430
Camera and photographic equipment repairers	3,290	1,300	Rapid decline	35,420
Radio mechanics	5,690	1,000	Moderate decline	41,060
Watch repairers	2,350	900	Rapid decline	37,680



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*Repairers provide routine and general maintenance to keep equipment in working order.*

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can have job openings because of the need to replace workers.

What affects job prospects for those interested in repair careers? As with all occupations, many factors—such as shifting consumer tastes, demographic changes, and technological advances—can alter demand for repair workers. Demand for repair occupations is influenced by the likelihood that someone will pay to have a product fixed. Many items are increasingly being replaced rather than repaired. Watches, for example, have become relatively inexpensive and, therefore, more affordable to replace. As a result, watch repairers are not in high demand. Medical equipment, on the other hand, is more costly to replace. And with the rise in baby boomers seeking healthcare services, more medical machinery is needed, which should lead to a greater demand for medical equipment repairers.

So what's a would-be watch repairer to do? Options do exist for aspiring repairers. For one thing, there will be a need to replace workers who retire or leave the labor force. For another, just because many inexpensive watches are being replaced doesn't mean that expensive watches won't need to be repaired. Most importantly, though, many of the skills used to repair one type of item, like watches, can be applied to other repair occupations that are in greater demand.

## Three occupations, more than 2 million jobs

For a career with favorable prospects, consider one of the repair careers described below. Collectively, 2.1 million people were employed in May 2009 as automotive service technicians and mechanics; general maintenance and repair workers; and heating, air conditioning, and refrigeration mechanics and installers, according to BLS. And they are expected have more than 675,000 job openings between 2008 and 2018.

Workers in these occupations have similar skills and use some of the same tools, but each occupation involves very different tasks.

### **Automotive service technicians and mechanics**

A car owner brings the vehicle into a garage for a routine service check but mentions noticing that the antilock brake system warning light is on. The automotive service technician begins the inspection by using a computer to look up the required maintenance for that car's make and model. She uses a checklist to ensure that all the necessary work is performed for the service inspection, including changing the oil, checking the car's fluid levels, and examining major components. Using diagnostic equipment, she checks the car's antilock brake system and discovers that the warning light has been triggered by the pump motor, which might need to be replaced.

She then makes a note of this and all other possible issues so that she can inform the car's owner and recommend additional work.

This is a familiar routine for automotive service technicians, who inspect, maintain, and repair cars and light trucks. They provide safety inspections to ensure that vehicles are in good working order and don't pose a hazard on the road. They also perform regular maintenance on vehicles. To complete these tasks, workers might inspect vehicle components, including engines, steering and suspension systems, drive belts, hoses, and batteries.

Some automotive service technicians specialize. For example, front end technicians focus on steering and suspension systems; transmission technicians work on the various parts of automatic and manual transmission systems. Others specialize in vehicles that use fuels other than gasoline, such as diesel or "green" fuels such as electricity and ethanol.

For many technicians, determining the source of a problem is one of the most interesting parts of the job. When identifying a problem, workers get a description from the vehicle's owner and, using their knowledge of how a car works and what might go wrong, they start checking each possibility. A technician might test drive the vehicle to try to reproduce the problem—a noise under the hood, perhaps. Because many parts of modern automobiles are controlled by computers or electronic components, workers often use special high-tech devices to help them identify and fix problems.

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*Like most repairers, automotive service technicians use pliers, wrenches, and other hand and power tools.*

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**Tools of the trade.** Automotive service technicians, like most repairers, work with basic hand tools, including pliers, wrenches, and screwdrivers. They use jacks and hoists to lift up a vehicle so that they can work underneath it. They might use power tools, machine tools, or welding and flame-cutting equipment when installing or repairing parts or systems. They also use computerized diagnostic equipment, including handheld diagnostic computers and diagnostic computers that have been built into the vehicle, to help locate the source of a problem.

**Places of employment.** In May 2009, according to BLS, 37 percent of automotive service technicians and mechanics worked in automotive repair and maintenance shops. About 31 percent worked for automotive dealers. An additional 16 percent worked for automotive parts, accessories, and tire stores; gasoline stations; and local governments. Some workers are self-employed.

**More information.** For more information about automotive service technicians and mechanics, see the occupation's profile in the *Occupational Outlook Handbook (OOH)* online at [www.bls.gov/ooh/ocos181.htm](http://www.bls.gov/ooh/ocos181.htm).

## General maintenance and repair workers

It's been a busy week at the local schools. In one auditorium, an upgraded sound system must be installed to replace outdated equipment. At another school, asphalt under the outdoor basketball hoop is cracking and needs to be repaired. Several buildings have loose door hinges that should be tightened. Some of these tasks require simple adjustments; others are more complex. And it's the job of the general maintenance and repair worker to fix them all.

General maintenance and repair workers are jacks-of-all-trades. They help to fix almost any problem inside and outside of a building. For example, they might work on plumbing, electrical, or construction-related tasks. They also maintain and repair machinery and other equipment. And they perform routine preventive maintenance for a building's physical structure and systems.

When maintaining equipment, structures, or systems, workers often follow schedules or checklists to ensure that preventive

maintenance is done thoroughly and regularly. Common types of maintenance include replacing filters and checking fluid levels. Workers also inspect systems for safety. Often, they are required to document their work.

Like other repairers, these workers diagnose and correct problems using their mechanical ability and knowledge of how things work. For more extensive problems, they might plan out a repair project, order or purchase parts and supplies, and consult repair manuals. In some cases, they refer work to others who specialize in a particular type of repair.

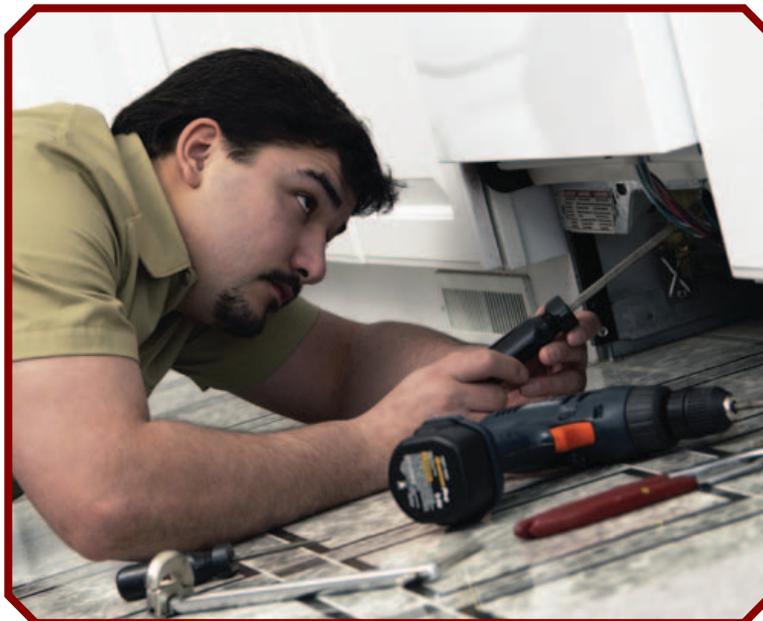
**Tools of the trade.** Because these workers perform such varied tasks, they must be comfortable working with many different tools. They might use hammers, electric drills, and screwdrivers when putting up shelves, walls, or partitions. Or they might use special testing devices to diagnose electrical or electronic malfunctions.

**Places of employment.** General maintenance and repair workers are employed in many places. BLS data show that in May 2009, about 17 percent worked for firms that lease office buildings and apartments or perform other activities related to real estate. About 8 percent worked for local government. Five percent worked in traveler accommodation, including hotels and motels. And about 4 percent worked in elementary and secondary schools.

**For more information.** To learn more about general maintenance and repair workers, see the *OOH* profile at [www.bls.gov/ooh/ocos194.htm](http://www.bls.gov/ooh/ocos194.htm).

## Heating, air conditioning, and refrigeration mechanics and installers

A heating, air conditioning, and refrigeration repairer arrives at the first of his residential stops for the day. The gas furnace is having trouble starting up. He knows from his training and the description of the problem that the first thing to do is check the flame sensor. It's dirty, so he cleans it and then asks the customer to turn up the heat while he examines what happens. It looks like a new sensor is needed. But if that isn't it, the job might require something more complicated, such as a new control board. After explaining this to



the homeowner and telling her the cost of a new sensor, he goes out to his truck to get the specific part that's needed for the customer's heating unit. He then takes out the old sensor, installs the new one, and enters the details of the job and the customer's payment method into a portable computer.

A number of things can go wrong with the systems that heat or cool commercial and residential buildings. Heating, air conditioning, and refrigeration mechanics and installers troubleshoot and identify the cause of these problems and then properly maintain the systems to avoid future malfunctions. These workers—who are also called heating, ventilation, and air conditioning (HVAC) repairers—also install these systems, usually following blueprints and manuals.

When performing routine inspections, these workers might replace filters, clean ducts, or adjust burners and blowers. They might also test the heating or cooling unit to be sure that it is operating correctly. When locating the source of a problem, workers apply their knowledge of how systems work to figure out which parts need replacement or repair. They might, for example, repair or replace nonfunctioning components or wiring.

Some of these workers focus on heating units; others focus on air conditioning and refrigeration equipment. Workers can also specialize in a particular type of unit, such as oil-burning or gas-burning furnaces.

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*General maintenance and repair workers diagnose problems using their mechanical ability and knowledge of how things work.*

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Training, licensure, and certification are important for many careers in repair.



**Tools of the trade.** Workers use common hand tools, such as wrenches or pliers, to perform tasks such as adjusting system controls or installing thermostats. Other tools that are used when working with air ducts or refrigerant lines include pipe cutters and benders, hammers, and acetylene torches. Special testing devices verify that burners, electrical circuits, and other parts of the system are safe and working properly.

**Places of employment.** Plumbing, heating, and air-conditioning contractors employed 65 percent of all heating, air conditioning, and refrigeration mechanics and installers in May 2009, according to BLS. Other employers accounted for smaller percentages of total employment. For example, about 5 percent of workers were employed by direct selling establishments, such as those companies that deliver home heating fuel. And about 3 percent worked for merchant wholesalers of hardware, plumbing, and heating equipment

and supplies. Some workers are also self-employed.

**For more information.** See the *OOH* profile for heating, air conditioning, and refrigeration mechanics and installers online at [www.bls.gov/ooh/ocos192.htm](http://www.bls.gov/ooh/ocos192.htm).

## Getting your career up and running

Most repair jobs don't require a 4-year college degree, but they do have some specific requirements. Skills, training, and licensure and certification can be important for many repair careers.

### Skills

Basic repair skills are essential for fix-it workers. These skills include good mechanical ability and being adept at working with your hands and with a variety of tools and technologies. Troubleshooting skills are also important because workers must be able to quickly and efficiently diagnose the source of a problem. Analytical skills, reasoning ability, and creativity also help in determining what needs to be fixed and how best to fix it. Moreover, repairers need excellent communication skills to be able to explain problems and possible solutions to customers and employers.

### Training

Most repairers benefit from having at least a high school education or its equivalent, such as a GED. Some go on to complete other educational programs.

**High school.** In high school, repairers learn many subjects that they can later apply to their careers. For example, they might use basic math, such as addition or multiplication, when determining the cost of repairs. Or they might use geometry and algebra to calculate the sizes and positioning of ductwork when installing a heating or air conditioning system.

Reading and writing abilities are needed to understand repair manuals, keep current on the latest technologies and repair techniques, and document work that has been done.

Sciences, such as physics, can be helpful for understanding electrical circuits or hydraulics in automobiles, for example. And working knowledge of computers, such as being able to navigate through Web pages and locate information on a computer, is also helpful.

Other, more specialized, high school courses that are helpful for repairers include mechanical drawing, blueprint reading, electrical or electronics training, and automotive classes. High schools might also offer vocational-technical programs to help prepare students for a career in repair. For example, some high schools have programs in automotive repair that are run in conjunction with the Automotive Youth Education Service, a program linking schools with car dealers and manufacturers.

#### **Formal training beyond high school.**

After high school, many repairers earn an associate degree or complete postsecondary vocational training. And many employers prefer to hire workers with formal training. These programs, offered at junior or community colleges and trade or technical schools, usually combine classroom learning with hands-on experience.

Sometimes, product manufacturers or dealers have specialized training programs, such as those offered by automobile manufacturers. The U.S. Armed Forces may also provide training opportunities for repairers, such as in machine operator and production occupations that train personnel to operate equipment, machinery, and tools for repair.

**On-the-job learning.** In addition to formal training, repair workers learn much of what they do on the job. General maintenance and repair workers, for example, often start out as helpers to other more experienced workers, slowly increasing the complexity of their tasks as they learn specific repair techniques. Sometimes, this experience takes the place of education. Other times, education and experience are combined.

Apprenticeships are common in some fields. Heating, air conditioning, and refrigeration mechanics and installers, for example, often learn their jobs in this way. Registered

apprenticeship programs are frequently conducted through partnerships with unions or trade associations, such as the United Association Union of Plumbers, Fitters, Welders, and HVAC Service Technicians. Such programs can last between 3 to 5 years and involve both technical instruction and paid on-the-job training. (For more information about registered apprenticeships, see the Grab Bag item on page 24 in this issue of the *Quarterly*.)

Workers also must learn proper safety procedures to avoid injuries, especially when working around heavy equipment, power tools, or electricity.

**Licensure and certification.** Some repairers, such as general maintenance and repair workers who perform electrical or plumbing work, might require licensure, depending on their employer or the State or locality in which they work. Other repairers benefit from optional certification, which shows an added level of expertise. Automotive service technicians and mechanics, for example, often choose to become certified in one or more specialty areas. Certification offered through the National Automotive Technicians Education Foundation involves passing an exam and having 2 or more years of experience.

## For more information

In addition to occupation-specific information cited for the three repair careers described in this article, general information is also available. For information on repair careers, visit your local library or One-Stop Career Center. Locate a career center near you by going to [www.servicelocator.org](http://www.servicelocator.org). The *OOH*, available online at [www.bls.gov/ooh](http://www.bls.gov/ooh), is also in print in many public libraries and career centers.

Detailed, up-to-date employment and wage data for installation, maintenance, and repair occupations are available on the Occupational Employment Statistics program's Web site at [www.bls.gov/oes/current/oes490000.htm](http://www.bls.gov/oes/current/oes490000.htm).

And for a look at the repair and maintenance industry by the numbers, visit [www.bls.gov/iag/tgs/iag811.htm](http://www.bls.gov/iag/tgs/iag811.htm). 