

Demand for qualified body repairers will increase, as the number of motor vehicles in operation continues to grow in line with the Nation's population. With an increase in the number of motor vehicles in use, the number of vehicles damaged in accidents also will grow. New automobile designs increasingly have body parts made of steel alloys, aluminum, and plastics—materials that are more difficult to work with than traditional steel body parts. In addition, new, lighter-weight automotive designs are prone to greater collision damage than older, heavier designs and, consequently, more time is consumed in repair. The need to replace experienced repairers who transfer to other occupations, retire, or stop working for other reasons will account for the majority of job openings.

Changes in body shop management have begun to increase some shops' productivity, profits, and customer satisfaction. Employing a team approach to repairs decreases repair time, improves customer relations, and allows shops to increase their volume of work. By more efficiently managing inventory, shops also may be able to replace the large portion of their space occupied by parts inventory with additional work bays to service vehicles, requiring additional body repairers.

The automotive repair business is not very sensitive to changes in economic conditions, and experienced body repairers are rarely laid off. However, although major body damage must be repaired if a vehicle is to be restored to safe operating condition, repair of minor dents and crumpled fenders can often be deferred during an economic slowdown. During slowdowns, most employers will hire few new workers, some unprofitable body shops may go out of business, and some dealerships might consolidate body shops.

**Earnings**

Median hourly earnings of automotive body and related repairers, including incentive pay, were \$15.00 in 2000. The middle 50 percent earned between \$11.12 and \$20.02 an hour. The lowest 10 percent earned less than \$8.49, and the highest 10 percent earned more than \$26.06 an hour. Median hourly earnings in the industries employing the largest number of automotive body and related repairers in 2000 were as follows:

New and used car dealers .....	\$15.76
Automotive repair shops .....	15.05

Median hourly earnings of automotive glass installers and repairers, including incentive pay, were \$12.46 in 2000. The middle 50 percent earned between \$9.65 and \$15.86 an hour. The lowest 10 percent earned less than \$8.03, and the highest 10 percent earned more than \$19.18 an hour. Median hourly earnings in 2000 in automotive repair shops, the industry employing the largest numbers of automotive glass installers and repairers, were \$12.51.

The majority of body repairers employed by automotive dealers and repair shops are paid on an incentive basis. Under this method, body repairers are paid a predetermined amount for various tasks, and earnings depend on the amount of work assigned to the repairer and how fast it is completed. Employers frequently guarantee workers a minimum weekly salary. Body repairers who work for trucking companies, bus lines, and other organizations that maintain their own vehicles usually receive an hourly wage.

Helpers and trainees usually earn from 30 to 60 percent of the earnings of skilled workers. Helpers and trainees usually receive an hourly rate, until they are skilled enough to be paid on an incentive basis.

Some automotive body repairers are members of unions, including the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the Sheet Metal Workers' International Association; and the International Brotherhood of

Teamsters. Most body repairers who are union members work for large automobile dealers, trucking companies, and bus lines.

**Related Occupations**

Repairing damaged motor vehicles often involves working on mechanical components, as well as vehicle bodies. Automotive body repairers often work closely with individuals in several related occupations, including automotive service technicians and mechanics, diesel service technicians and mechanics, auto damage insurance appraisers, and painting and coating workers, except construction and maintenance.

**Sources of Additional Information**

Additional details about work opportunities may be obtained from automotive body repair shops and motor vehicle dealers, locals of the unions previously mentioned, or local offices of your State employment service. State employment services also are a source of information about training programs.

For general information about automotive body repairer careers, write to:

- Automotive Service Association, Inc., 1901 Airport Freeway, Bedford, TX 76021-5732. Internet: <http://www.asashop.org>
- National Automobile Dealers Association, 8400 Westpark Dr., McLean, VA 22102. Internet: <http://www.nada.org>
- Inter-Industry Conference On Auto Collision Repair Education Foundation (I-CAR), 3701 Algonquin Rd., Suite 400, Rolling Meadow, IL 60008. Telephone (tollfree): 888-722-3787. Internet: <http://www.i-car.com>

For information on how to become a certified automotive body repairer, write to:

- ASE, 101 Blue Seal Dr. SE., Suite 101, Leesburg, VA 20175. Internet: <http://www.asecert.org>

For a directory of certified automotive body repairer programs, contact:

- National Automotive Technician Education Foundation, 13505 Dulles Technology Dr., Herndon, VA 20171-3421. Internet: <http://www.natef.org>

For a directory of accredited private trade and technical schools that offer training programs in automotive body repair, contact:

- Accrediting Commission of Career Schools and Colleges of Technology, 2101 Wilson Blvd., Suite 302, Arlington, VA 22201. Internet: <http://www.accsct.org>

For a list of public automotive body repair training programs, contact:

- SkillsUSA-VICA, P. O. Box 3000, 1401 James Monroe Hwy., Leesburg, VA 22075. Internet: <http://www.skillsusa.org>

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## Automotive Service Technicians and Mechanics

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(O\*NET 49-3023.01, 49-3023.02)

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**Significant Points**

- Formal automotive technician training is the best preparation for these challenging technology-based jobs.
- Opportunities should be very good for automotive service technicians and mechanics with good diagnostic and problem-solving skills and knowledge of electronics and mathematics.
- Automotive service technicians and mechanics must continually adapt to changing technology and repair techniques as vehicle components and systems become increasingly sophisticated.

### Nature of the Work

Anyone whose car or light truck has broken down knows the importance of the jobs of automotive service technicians and mechanics. The ability to diagnose the source of a problem quickly and accurately—a most valuable skill—requires good reasoning ability and a thorough knowledge of automobiles. Many technicians consider diagnosing hard-to-find troubles one of their most challenging and satisfying duties.

The work of automotive service technicians and mechanics has evolved from simply mechanical to high technology. Today integrated electronic systems and complex computers run vehicles and measure their performance while on the road. Automotive service technicians have developed into diagnostic, high-tech problem solvers. Technicians must have an increasingly broad base of knowledge about how vehicles' complex components work and interact, as well as the ability to work with electronic diagnostic equipment and computer-based technical reference materials.

Automotive service technicians and mechanics use these high-tech skills to inspect, maintain, and repair automobiles and light trucks with gasoline engines. The increasing sophistication of automotive technology now relies on workers who can use computerized shop equipment and work with electronic components, while maintaining their skills with traditional handtools. Because of these changes in the occupation, workers are increasingly called "automotive service technicians," and the title "mechanic" is being used less and less frequently. (Service technicians and mechanics who work on diesel-powered trucks, buses, and equipment are discussed in the *Handbook* statement on diesel service technicians and mechanics. Motorcycle mechanics—who repair and service motorcycles, motor scooters, mopeds, and, occasionally, small all-terrain vehicles—are discussed in the *Handbook* statement on small engine mechanics.)

When mechanical or electrical troubles occur, technicians first get a description of the symptoms from the owner or, if they work in a large shop, the repair service estimator who wrote the repair order. To locate the problem, technicians use a diagnostic approach. First, they test to see if components and systems are proper and secure, and then isolate those components or systems that could not logically be the cause of the problem. For example, if an air conditioner malfunctions, the technician's diagnostic approach can pinpoint a problem as simple as a low coolant level or as complex as a bad drive-train connection that has shorted out the air conditioner. Technicians may have to test drive the vehicle or use a variety of testing equipment, such as onboard and hand-held diagnostic computers or compression gauges, to identify the source of the problem. These tests may indicate whether a component is salvageable or if a new one is required to get the vehicle back in working order.

During routine service inspections, technicians test and lubricate engines and other major components. In some cases, the technician may repair or replace worn parts before they cause breakdowns that could damage critical components of the vehicle. Technicians usually follow a checklist to ensure that they examine every critical part. Belts, hoses, plugs, brake and fuel systems, and other potentially troublesome items are among those closely watched.

Service technicians use a variety of tools in their work. They use power tools, such as pneumatic wrenches to remove bolts quickly, machine tools like lathes and grinding machines to rebuild brakes, welding and flame-cutting equipment to remove and repair exhaust systems, and jacks and hoists to lift cars and engines. They also use common handtools like screwdrivers, pliers, and wrenches to work on small parts and in hard-to-reach places.

In modern repair shops, service technicians compare the readouts from diagnostic testing devices to the benchmarked standards

given by the manufacturer of the components being tested. Deviations outside of acceptable levels are an indication to the technician that further attention to an area is necessary. The testing devices diagnose problems and make precision adjustments with precise calculations downloaded from large computerized databases. The computerized systems provide automatic updates to technical manuals and unlimited access to manufacturers' service information, technical service bulletins, and other information databases, which allow technicians to keep current on trouble spots and to learn new procedures.

Automotive service technicians in large shops have increasingly become specialized. For example, *transmission technicians and rebuilders* work on gear trains, couplings, hydraulic pumps, and other parts of transmissions. Extensive knowledge of computer controls, diagnosis of electrical and hydraulic problems, and other specialized skills are needed to work on these complex components, which employ some of the most sophisticated technology used in vehicles. *Tune-up technicians* adjust the ignition timing and valves, and adjust or replace spark plugs and other parts to ensure efficient engine performance. They often use electronic test equipment to isolate and adjust malfunctions in fuel, ignition, and emissions control systems.

*Automotive air-conditioning repairers* install and repair air conditioners and service components, such as compressors, condensers, and controls. These workers require special training in Federal and State regulations governing the handling and disposal of



*Automotive service technicians frequently work with dirty and greasy parts.*

refrigerants. *Front-end mechanics* align and balance wheels and repair steering mechanisms and suspension systems. They frequently use special alignment equipment and wheel-balancing machines. *Brake repairers* adjust brakes, replace brake linings and pads, and make other repairs on brake systems. Some technicians and mechanics specialize in both brake and front-end work.

### Working Conditions

Almost half of automotive service technicians work a standard 40-hour week, but over 30 percent work more than 40 hours a week. Many of those working extended hours are self-employed technicians. To satisfy customer service needs, some service shops offer evening and weekend service. Generally, service technicians work indoors in well-ventilated and lighted repair shops. However, some shops are drafty and noisy. Although they fix some problems with simple computerized adjustments, technicians frequently work with dirty and greasy parts, and in awkward positions. They often lift heavy parts and tools. Minor cuts, burns, and bruises are common, but technicians usually avoid serious accidents when the shop is kept clean and orderly and safety practices are observed.

### Employment

Automotive service technicians and mechanics held about 840,000 jobs in 2000. The majority worked for retail and wholesale automotive dealers, independent automotive repair shops, or automotive service facilities at department, automotive, and home supply stores. Others found employment in gasoline service stations; taxicab and automobile leasing companies; Federal, State, and local governments; and other organizations. About 18 percent of service technicians were self-employed.

### Training, Other Qualifications, and Advancement

Automotive technology is rapidly increasing in sophistication, and most training authorities strongly recommend that persons seeking automotive service technician and mechanic jobs complete a formal training program in high school or in a postsecondary vocational school. However, some service technicians still learn the trade solely by assisting and learning from experienced workers.

Many high schools, community colleges, and public and private vocational and technical schools offer automotive service technician training programs. The traditional postsecondary programs usually provide a thorough career preparation that expands upon the student's high school repair experience.

Postsecondary automotive technician training programs vary greatly in format, but normally provide intensive career preparation through a combination of classroom instruction and hands-on practice. Some trade and technical school programs provide concentrated training for 6 months to a year, depending on how many hours the student attends each week. Community college programs normally spread the training over 2 years; supplement the automotive training with instruction in English, basic mathematics, computers, and other subjects; and award an associate degree or certificate. Some students earn repair certificates and opt to leave the program to begin their career before graduation. Recently, some programs have added to their curriculums training on employability skills such as customer service and stress management. Employers find that these skills help technicians handle the additional responsibilities of dealing with the customers and parts vendors.

High school programs, while an asset, vary greatly in quality. The better programs, such as the Automotive Youth Education Service (AYES), with 150 participating schools and more than 300 participating dealers, conclude with the students receiving their technician's certification and high school diploma. Other programs offer only an introduction to automotive technology and service for

the future consumer or hobbyist. Still others aim to equip graduates with enough skills to get a job as a mechanic's helper or trainee mechanic.

The various automobile manufacturers and their participating dealers sponsor 2-year associate degree programs at postsecondary schools across the Nation. The Accrediting Commission of Career Schools and Colleges of Technology (ACCSC) currently certifies a number of automotive and diesel technology schools. Schools update their curriculums frequently to reflect changing technology and equipment. Students in these programs typically spend alternate 6- to 12-week periods attending classes full time and working full time in the service departments of sponsoring dealers. At these dealerships, students get practical experience while assigned to an experienced worker who provides hands-on instruction and time-saving tips.

The National Automotive Technicians Education Foundation (NATEF), an affiliate of the National Institute for Automotive Service Excellence (ASE), establishes the standards by which training facilities become certified. Once the training facility achieves these minimal standards, NATEF recommends the facility to ASE for certification. The ASE certification is a nationally recognized standard for programs offered by high schools, postsecondary trade schools, technical institutes, and community colleges that train automobile service technicians, collision repair and refinish technicians, engine machinists, and medium/heavy truck technicians. Automotive manufacturers provide ASE certified instruction, service equipment, and current model cars on which students practice new skills and learn the latest automotive technology. While ASE certification is voluntary, it does signify that the program meets uniform standards for instructional facilities, equipment, staff credentials, and curriculum. To ensure that programs keep up with ever-changing technology, repair techniques, and ASE standards, the certified programs are subjected to periodic compliance reviews and mandatory recertification. NATEF program experts also review and update program standards to match the level of training and skill-level achievement necessary for success in the occupation. In mid-2000, 1,491 high school and postsecondary automotive service technician training programs had been certified by ASE, of which 1,200 trained automobile service technicians, 224 instructed collision specialists, and 62 trained diesel and medium/heavy truck specialists.

For trainee automotive service technician jobs, employers look for people with strong communication and analytical skills. Technicians need good reading, mathematics, and computer skills to study technical manuals and to keep abreast of new technology and learn new service and repair procedures and specifications. Trainees also must possess mechanical aptitude and knowledge of how automobiles work. Most employers regard the successful completion of a vocational training program in automotive service technology as the best preparation for trainee positions. Experience working on motor vehicles in the Armed Forces or as a hobby also is valuable. Because of the complexity of new vehicles, a growing number of employers require completion of high school and additional postsecondary training. Courses in automotive repair, electronics, physics, chemistry, English, computers, and mathematics provide a good educational background for a career as a service technician.

There are more computers aboard a car today than aboard the first spacecraft. A new car has from 10 to 15 onboard computers, operating everything from the engine to the radio. Some of the more advanced vehicles have global positioning systems, Internet access, and other high-tech features integrated into the functions of the vehicle. Therefore, knowledge of electronics and computers has grown increasingly important for service technicians. Engine

controls and dashboard instruments were among the first components to use electronics, but now, everything from brakes to transmissions and air-conditioning systems to steering systems is run primarily by computers and electronic components. In the past, a specialist usually handled any problems involving electrical systems or electronics. Now that electronics are so common, it is essential for service technicians to be familiar with at least the basic principles of electronics. Electrical components or a series of related components account for nearly all malfunctions in modern vehicles.

In addition to electronics and computers, automotive service technicians will have to learn and understand the science behind the alternate fuel vehicles that have begun to enter the market. The fuel for these vehicles will come from the dehydrogenization of water, electric fuel cells, natural gas, solar power, and other nonpetroleum-based sources. Some vehicles will even capture the energy from brakes and use it as fuel. As vehicles with these new technologies become more common, technicians will need additional training to learn the science and engineering that makes them possible.

Beginners usually start as trainee technicians, mechanics' helpers, lubrication workers, or gasoline service station attendants, and gradually acquire and practice their skills by working with experienced mechanics and technicians. With a few months' experience, beginners perform many routine service tasks and make simple repairs. It usually takes 2 to 5 years of experience to become a journey-level service technician, who is expected to quickly perform the more difficult types of routine service and repairs. However, some graduates of postsecondary automotive training programs are often able to earn promotion to the journey level after only a few months on the job. An additional 1- to 2- years' experience familiarizes mechanics and technicians with all types of repairs. Difficult specialties, such as transmission repair, require another year or two of training and experience. In contrast, brake specialists may learn their jobs in considerably less time because they do not need a complete knowledge of automotive repair.

In the past, many persons became automotive service technicians through 3- or 4-year formal apprenticeship programs. However, apprenticeships have become rare, as formal vocational training programs in automotive service technology have become more common.

At work, the most important possessions of technicians and mechanics are their handtools. Technicians and mechanics usually provide their own tools, and many experienced workers have thousands of dollars invested in them. Employers typically furnish expensive power tools, engine analyzers, and other diagnostic equipment, but technicians accumulate handtools with experience. Some formal training programs have alliances with tool manufacturers that help entry-level technicians accumulate tools during their training period.

Employers increasingly send experienced automotive service technicians to manufacturer training centers to learn to repair new models or to receive special training in the repair of components, such as electronic fuel injection or air-conditioners. Motor vehicle dealers also may send promising beginners to manufacturer-sponsored mechanic training programs. Employers typically furnish this additional training to maintain or upgrade employee skills and increase their value to the dealership. Factory representatives also visit many shops to conduct short training sessions.

Voluntary certification by Automotive Service Excellence (ASE) has become a standard credential for automotive service technicians. Certification is available in 1 or more of 8 different service areas, such as electrical systems, engine repair, brake systems, suspension and steering, and heating and air conditioning. For certification in each area, technicians must have at least 2 years of experience and

pass a written examination. Completion of an automotive training program in high school, vocational or trade school, or community or junior college may be substituted for 1 year of experience. In some cases, graduates of ASE-certified programs achieve certification in up to three specialties. For certification as a master automotive mechanic, technicians must be certified in all eight areas. Mechanics and technicians must retake each examination at least every 5 years to maintain their certifications.

Experienced technicians who have leadership ability sometimes advance to shop supervisor or service manager. Those who work well with customers may become automotive repair service estimators. Some with sufficient funds open independent repair shops.

### Job Outlook

Job opportunities in this occupation are expected to be very good for persons who complete automotive training programs in high school, vocational and technical schools, or community colleges. Persons with good diagnostic and problem-solving skills, and whose training includes basic electronics skills, should have the best opportunities. For well-prepared people with a technical background, automotive service technician careers offer an excellent opportunity for good pay and the satisfaction of highly skilled work with vehicles incorporating the latest in high technology. However, persons without formal automotive training are likely to face competition for entry-level jobs.

Employment of automotive service technicians and mechanics is expected to increase about as fast as the average through the year 2010. The growing complexity of automotive technology necessitates service by skilled workers, contributing to the growth in demand for highly trained mechanics and technicians. Employment growth will continue to be concentrated in motor vehicle dealerships and independent automotive repair shops. Many new jobs will also be created in small retail operations that offer after-warranty repairs, such as oil changes, brake repair, air conditioner service, and other minor repairs generally taking less than 4 hours to complete. Fewer national department store chains will provide auto repair services in large shops. Employment of automotive service technicians and mechanics in gasoline service stations will continue to decline, as fewer stations offer repair services.

In addition to job openings due to growth, a substantial number of openings will be created by the need to replace experienced technicians who transfer to other occupations, retire, or stop working for other reasons. Most persons who enter the occupation can expect steady work, because changes in general economic conditions and developments in other industries have little effect on the automotive repair business.

### Earnings

Median hourly earnings of automotive service technicians and mechanics, including commission, were \$13.70 in 2000. The middle 50 percent earned between \$9.86 and \$18.67 an hour. The lowest 10 percent earned less than \$7.59, and the highest 10 percent earned more than \$23.67 an hour. Median annual earnings in the industries employing the largest numbers of service technicians in 2000 were as follows:

Local government .....	\$16.90
New and used car dealers .....	16.87
Auto and home supply stores .....	12.35
Automotive repair shops .....	12.15
Gasoline service stations .....	11.86

Many experienced technicians employed by automotive dealers and independent repair shops receive a commission related to the labor cost charged to the customer. Under this method, weekly

earnings depend on the amount of work completed. Employers frequently guarantee commissioned mechanics and technicians a minimum weekly salary. Many master technicians earn from \$70,000 to \$100,000 annually.

Some automotive service technicians are members of labor unions such as the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the Sheet Metal Workers' International Association; and the International Brotherhood of Teamsters.

### Related Occupations

Other workers who repair and service motor vehicles include automotive body and related repairers, diesel service technicians and mechanics, and small engine mechanics.

### Sources of Additional Information

For more details about work opportunities, contact local automotive dealers and repair shops or local offices of the State employment service. The State employment service also may have information about training programs.

A list of certified automotive technician training programs can be obtained from:

► National Automotive Technicians Education Foundation, 13505 Dulles Technology Dr., Herndon, VA 20171-3421. Internet: <http://www.natef.org>

For a directory of accredited private trade and technical schools that offer programs in automotive technician training, contact:

► Accrediting Commission of Career Schools and Colleges of Technology, 2101 Wilson Blvd., Suite 302, Arlington, VA 22201 Internet: <http://www.accset.org>

For a list of public automotive technician training programs, contact:

► SkillsUSA-VICA, P.O. Box 3000, 1401 James Monroe Hwy., Leesburg, VA 22075. Internet: <http://www.skillsusa.org>

Information on automobile manufacturer-sponsored programs in automotive service technology can be obtained from:

► Automotive Youth Educational Systems (AYES), 2701 Troy Center Dr., Suite 450, Troy, MI 48084. Internet: <http://www.ayes.org>

Information on how to become a certified automotive service technician is available from:

► ASE, 101 Blue Seal Dr. SE., Suite 101, Leesburg, VA 20175. Internet: <http://www.asecert.org>

For general information about the work of automotive service technicians and mechanics, contact:

► National Automobile Dealers Association, 8400 Westpark Dr., McLean, VA 22102. Internet: <http://www.nada.org>

## Diesel Service Technicians and Mechanics

(O\*NET 49-3031.00)

### Significant Points

- A career as a diesel service technician or mechanic offers relatively high wages and the challenge of skilled repair work.
- Opportunities are expected to be good for persons who complete formal training programs.
- National certification is the recognized standard of achievement for diesel service technicians and mechanics.

### Nature of the Work

The diesel engine is the workhorse powering the Nation's trucks and buses, because it delivers more power and is more durable than its gasoline-burning counterpart. Diesel-powered engines also are becoming more prevalent in light vehicles, including pickups and other work trucks.

Diesel service technicians and mechanics, also known as *bus and truck mechanics and diesel engine specialists*, repair and maintain the diesel engines that power transportation equipment such as heavy trucks, buses, and locomotives. Some diesel technicians and mechanics also work on heavy vehicles and mobile equipment such as bulldozers, cranes, road graders, farm tractors, and combines. A small number of technicians repair diesel-powered passenger automobiles, light trucks, or boats. (For information on technicians and mechanics working primarily on automobiles, heavy vehicles, mobile equipment, or boats, see the *Handbook* statements on automotive, heavy vehicle and mobile equipment, and small engine service technicians and mechanics.)

Technicians who work for organizations that maintain their own vehicles spend most of their time doing preventive maintenance, to ensure that equipment will operate safely. These workers also eliminate unnecessary wear on and damage to parts that could result in costly breakdowns. During a routine maintenance check on a vehicle, technicians follow a checklist that includes inspection of brake systems, steering mechanisms, wheel bearings, and other important parts. Following inspection, technicians repair or adjust parts that do not work properly or remove and replace parts that cannot be fixed.

Increasingly, technicians must be flexible, in order to adapt to customer needs and new technologies. It is common for technicians to handle all kinds of repairs, from working on a vehicle's electrical system one day, to doing major engine repairs the next. Diesel maintenance is becoming increasingly complex, as more electronic components are used to control engine operation. For example, microprocessors regulate and manage fuel timing, increasing engine efficiency. In modern shops, diesel service technicians use hand-held computers to diagnose problems and adjust engine functions. Technicians must continually learn about new techniques and advanced materials.

Diesel service technicians use a variety of tools in their work, including power tools, such as pneumatic wrenches, to remove bolts quickly; machine tools, such as lathes and grinding machines, to rebuild brakes; welding and flame-cutting equipment to remove and repair exhaust systems; and jacks and hoists to lift and move large parts. Common handtools—screwdrivers, pliers, and wrenches—



A diesel service technician works on a bus engine.