

What each part does

YES Electric • a plain-language course for shop helpers and car buyers

First edition (October 2026). Prices and hours in this course are rough numbers for a 2008–2016 sedan and will change by car and by year. Treat them as a guide for deciding, not a quote.

Battery. A box of stored electricity. It gives the car its first jolt to wake up and runs the radio and lights when the engine is off. Like the battery in a flashlight, only big enough to crank an engine.

Starter. A small electric motor that spins the big engine for the first second or two until the engine catches and runs on its own. Like pulling the cord on a lawnmower, except a motor does the pulling.



A car starter motor off the engine. The big round can is the electric motor, the smaller can on top is the solenoid, and the small gear at the right end is the drive gear that pops out to spin the engine's flywheel.

Photo: File:Automobile starter.JPG by Willdre 00:20, 8 February 2007 (UTC), CC BY-SA 3.0.

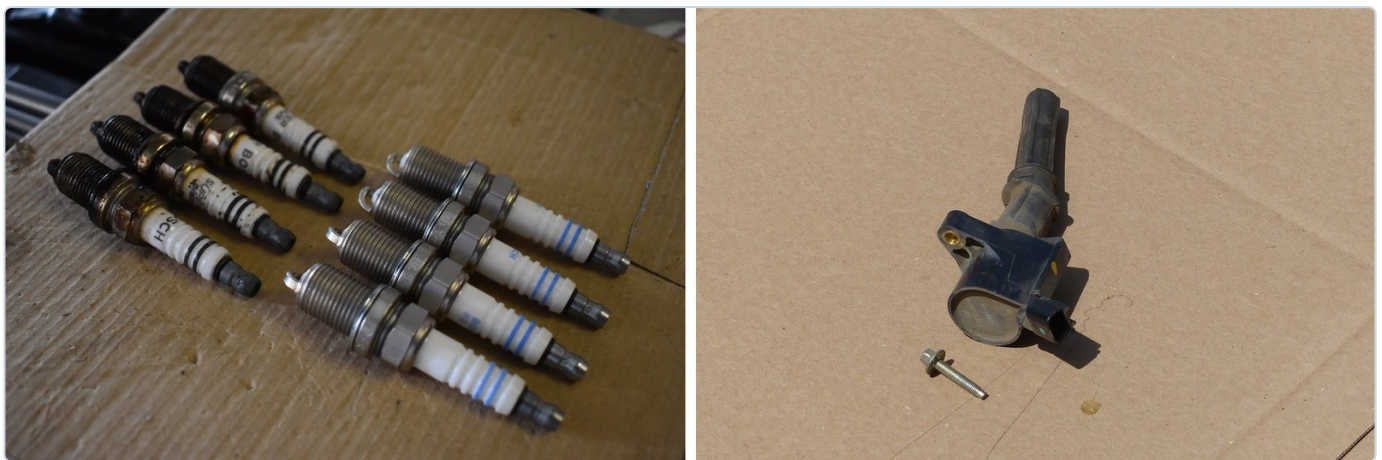
Alternator. A little generator spun by the engine. Once the car is running, it makes electricity to run everything and refills the battery. Like a bike light that gets brighter the faster you pedal. If it dies, the battery slowly drains and the car quits.



A car alternator sitting on a workbench, seen from the pulley end. The belt rides on the grooved pulley in the middle, and the slots in the housing let air through to cool the windings inside.

Photo: File:Car alternator on a workbench surrounded by various auto parts in a garage setting.jpg by Shixart1985, CC BY 2.0.

Spark plugs and coils. The engine burns gas in little explosions. The coil turns battery power into a big spark, and the spark plug is where that spark jumps, like a tiny lightning bolt that lights each explosion. A bad one means one cylinder misses its explosion, and the engine shakes.



Left: a set of old spark plugs next to new ones. The old plugs have dark, crusty tips and worn electrodes. Right: a coil-on-plug ignition coil, which sits directly on top of each spark plug and makes the high-voltage spark.

Photo: Peugeot: old & new spark plugs by denniselzinga, CC BY 2.0; Coil over plug (COP) by lw5315us, CC BY-SA 2.0.

Crank and cam sensors. The engine's computer has to know exactly where the pistons are so it fires the spark at the right instant. These two sensors are its eyes. If they go blind, the computer does not know when to spark, so the engine cranks but never starts.



A camshaft position sensor mounted on the engine, with its green wiring connector. The sensor reads a toothed wheel inside the engine and tells the computer where the camshaft is, so it knows when to fire the spark and injectors.

Photo: Camshaft Position Sensor Replacement by Teresa Trimm, CC BY-SA 2.0.

Fuel pump. Sits in the gas tank and pushes gas up to the engine, like a straw with a pump on it. No pump, no gas gets to the engine, and it cranks and cranks but never catches.

Thermostat and water pump. The engine makes a lot of heat, so there is water running through it to carry the heat away. The water pump is the heart that keeps that water moving. The thermostat is a little valve that stays shut while the engine is cold and opens when it gets hot, like a door that opens when the room gets too warm.



Left: two engine thermostats, one closed (left) and one pushed open (right) so you can see the spring and valve. The thermostat stays shut until the engine warms up, then opens to let coolant flow to the radiator. Right: a water pump with its cover off, showing the star-shaped impeller that pushes coolant through the engine.

Photo: File:Replacement Thermostat.jpg by Hoikka1, CC BY-SA 3.0; File:Automotive coolant pump 6C1Q-8K500-AF - opened-3868.jpg by Raimond Spekking, CC BY-SA 4.0.

Radiator and hoses. The radiator is the big grid of thin metal at the front of the car. Hot water from the engine flows through it, the wind blows across it, and the water cools off before it goes back. The hoses are the rubber pipes that carry the water back and forth.

Serpentine belt and tensioner. One long rubber belt that wraps around the front of the engine and spins the alternator, the air conditioner, and the power steering pump all at once. The tensioner is a spring-loaded wheel that keeps it tight. If the belt snaps, all three quit at the same time.

Timing belt or chain. Inside the engine, pistons go up and down while little doors called valves open and shut. The timing belt ties them together so the valves open only when the piston is out of the way. If it breaks, the piston smashes into open valves. That is why one broken rubber belt can ruin a whole engine.



A timing chain with the front cover removed, running over the two camshaft sprockets at the top of the engine. The chain keeps the camshafts turning in step with the crankshaft so the valves open at the right moment.

Photo: File:Timing Chain.jpg by Logansenf, CC BY-SA 4.0.

Head gasket. The engine is two big pieces of metal bolted together, and the head gasket is the thin seal sandwiched between them. It keeps the water, the oil, and the explosions each in their own lane. When it fails, water leaks into the oil and makes a milkshake, and white smoke comes out the tailpipe.



A failed head gasket laid flat after removal. Look at the thin metal strip between the two left cylinder openings: it is burned and broken through, which let hot gases and coolant cross between cylinders.

Photo: File:Damaged head gasket.jpg by Lewis Collard (Collard), CC BY-SA 3.0.

Engine. The thing that turns gas into motion. Gas and air go in, explode, and shove pistons down, and that pushing spins a shaft. Everything else in the car exists to feed the engine or to use what it puts out.

Transmission. The engine spins fast, but the wheels need to spin slow with lots of push when you start and fast with less push on the highway. The transmission is a box of gears between them, like the gears on a bike. A CVT is the kind that slides smoothly instead of clicking between gears, and the cheap ones wear out.

Clutch. Only on stick-shift cars. It is a plate that lets you unhook the engine from the gears for a second so you can change gears, then hooks them back up. It wears like a brake pad.

CV axles. The two bars that carry the spinning from the transmission out to each front wheel. They have a flexible joint at each end so the wheel can bounce and turn while still spinning. When the rubber boot splits, grit gets in and the joint clicks every time you turn.

Wheel bearing. A ring of steel balls inside the hub that lets the wheel spin smoothly, like the bearings in a skateboard wheel. When it wears, it hums, and the hum gets louder the faster you go.



A tapered roller wheel bearing pulled out of a hub, lying on a shop rag. The ring of small steel rollers is what the wheel spins on. When the rollers wear or pit, the wheel starts to hum or growl.

Photo: Greasy wheel bearing by mathrock, CC BY-SA 2.0.

Brake pads and rotors. The rotor is a metal disc that spins with the wheel. The pads are blocks that squeeze the disc from both sides to slow it down, like grabbing a spinning bike tire with your hand. The pads wear down and the disc gets grooved.

Brake calipers. The clamp that holds the pads and squeezes them when you push the pedal. Brake fluid pushes a piston inside it. When it sticks, that wheel keeps braking a little all the time and gets hot.



Left: a disc brake on a car with the wheel off. The shiny round plate is the rotor and the black clamp over its edge is the caliper, which squeezes the pads against the rotor to stop the car. Right: a worn brake pad (top) next to a new one (bottom). The friction material on the old pad is almost gone.

Photo: File:Bremsscheibe + Bremssattel HA 1.jpg by PCI-Support-Bernhard, CC BY-SA 4.0; Comparing my old and new brake pads by londoncyclist, CC BY-SA 2.0.

Struts and shocks. The springs hold the car up, and the struts and shocks are the dampers that stop it from bouncing like a pogo stick after every bump.



A complete MacPherson strut taken off a car, lying on the floor. The big coil spring and the shock absorber inside it are one unit, and the steering knuckle with the brake rotor is still bolted to the bottom.

Photo: File:Federbein.JPG by Bukk, Public domain.

Ball joints, control arms, tie rods. The arms and joints that hold each wheel onto the car while still letting it bounce up and down and steer left and right. A ball joint is like your hip joint. A tie rod is the stick that connects the steering to the wheel. When they wear loose, the car clunks and wanders.

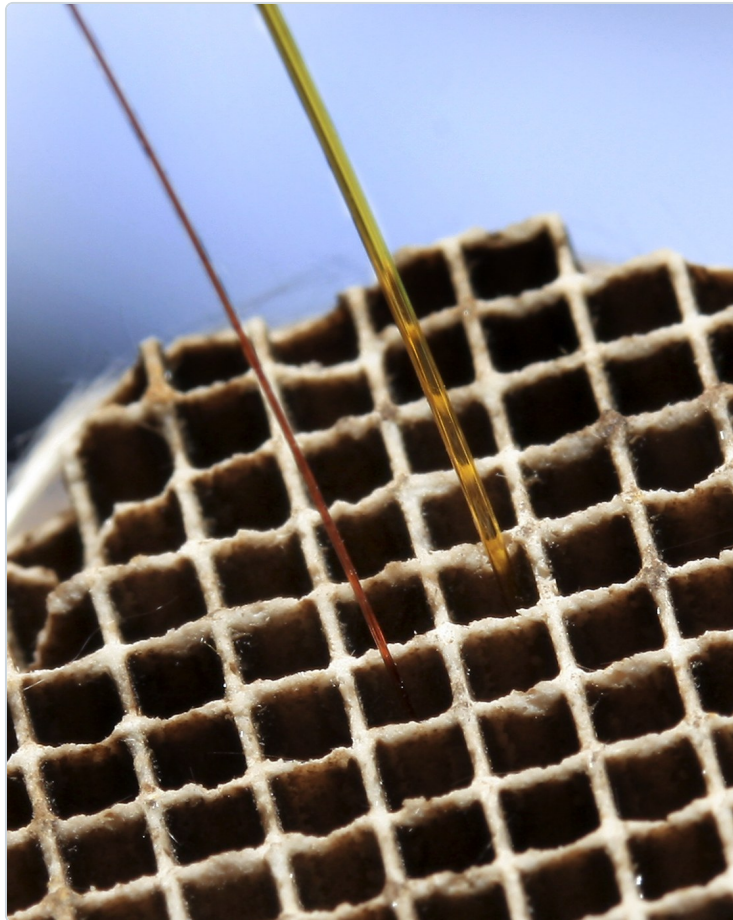


Left: an old and a new lower control arm. The ball joint is the round knob with the threaded stud at the end of each arm; it lets the wheel steer and move up and down. Right: a tie rod end on a car. It is a smaller ball joint that connects the steering rack to the wheel.

Photo: Old vs. New VW Golf Control Arms - Bushings and ball joint were completely shot by mathrock, CC BY-SA 2.0; File:Tie rod end.jpeg by Craig Howell, CC BY 2.0.

Power steering pump or rack. The rack is the long bar that turns the wheels when you turn the steering wheel. The pump pushes fluid that helps you so you are not wrestling the car. When it quits, you can still steer, but it feels like turning a truck with no help.

Catalytic converter. A metal can in the exhaust pipe packed with a honeycomb coated in precious metal. Hot exhaust passes through and the honeycomb burns off the nasty stuff. It gets clogged like a stopped-up drain, and thieves saw them off because the metal inside is worth money.



A close look at the inside of a catalytic converter. The ceramic block is made of hundreds of tiny square channels, like a honeycomb, coated with precious metals. Exhaust gas flows through these channels and is cleaned on the way out.

Photo: File:Catalytic converter (4292886769).jpg by Oak Ridge National Laboratory, CC BY 2.0.

O2 sensors. Little probes screwed into the exhaust pipe that sniff the exhaust and tell the computer whether the engine is getting too much gas or too little, so it can fix the mix. Like a smoke detector for the exhaust.

A/C compressor. The pump for the air conditioner. It squeezes the refrigerant, which is what makes it get cold, the same way a refrigerator does. The engine belt spins it.

Window motors, door locks, blower motor. Small electric motors. One rolls the window up and down, one locks the door, one blows the air out of the vents. They are cheap but each one is a separate job.

Key and immobilizer. Modern keys have a tiny chip inside. The car checks for that chip every time you turn the key, and if it does not see the right one, it refuses to start even if everything else works. A car at auction with no key cannot be started until a locksmith makes a chip key that matches.



A modern car key taken apart: the plastic shell, the small circuit board, the coin battery, and the hidden metal emergency key blade. The transponder chip that the car's immobilizer checks lives on that little board. Without it, a cut key will turn the lock but the engine will not start.

Photo: File:2020 Ford key fob inside look.jpg by Benbur121, CC BY-SA 4.0.

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