

# Replacing Your Windshield Wipers

Although we swear to ourselves not to wait until the next hurricane, rain storm, or blizzard to realize we need new wipers, we usually do. Inevitably, we're just trying to get home from a long day at the office when a sudden downpour starts; we fire up the wipers and they can't clear the water.

There we are squinting through the blurry windshield trying to make out the radar blip of distant taillights, cursing ourselves for not changing the wipers the last time we said we were going to.

If you get your oil changed regularly, you're probably in good shape. Service stations check the wipers for you.

But, if you're a do-it-yourselfer, then you just might let the wipers deteriorate to rubber bits until the day you need them.

To prevent this frustration, the next time you're at a gas station or auto parts store, pick up a couple of replacements to have on hand. Depending on what part of the county you are in, the rubber wiper portions generally only last six months to one year.

And just because you live in a region country where it barely drips rain, do not be misled into thinking your wipers are immortal. They aren't. The sun is bakes and cracks them into oblivion. Plus, if you use your wipers to constantly clear road gunk from the windshield, those bits of debris that are seeming tossed to the wayside slowly eat away at the wipers.

If you do have a pair of wipers handy, they are easy to change. You can opt to switch out only the rubber portion of the blade that squeegees the windshield, but in most cases you'll change the whole blade. The entire gadget consists of an arm and a blade. The blade directly attaches to the arm, and is comprised of a mount and the metal-covered-by-rubber slab.

Before you purchase refill blades or replacement rubber strips, either check the length with a tape measure or look in the manual for the proper size (usually they range from 16-21 inches). Also, your local auto parts store should have manuals that match up every car ever manufactured with a correct replacement.

## Signs You Need to Replace Your Wipers

- Windshield streaking
- Windshield smearing
- Wiper screeching
- Wiper is brittle with rubber flaking off at the touch

- Wiper is frayed

## Tools for the Change

- Screwdriver
- Tape measure
- Needle-nose pliers

## Three Types of Wiper-Arm Mounts

**Hook Slot Connector**—This type of blade is the easiest to change. Bring the arm to a right angle and search out the flap that attaches the wiper in the slot. Either push it in or unlatch it. One way or the other will release the blade and allow you to pull it out. If it poses any difficulty, tug it with pliers. Insert the new wiper and slide it along the slot until you feel or hear it snap into place.

**Pin Type Arm**— Basically uses the same concept of the hook-slot arm, except you will see a pin rather than a tab. Press on the pin from behind the blade or lift the pin out (most likely will entail the use of a screwdriver). Jiggle the blade until it fully releases. Lock the new blade into the pins.

**Straight-End Connector**—Changing this type can be a drag, because it tends to be more difficult. If there is a notch or tab that secures the blade, you only need to release it using your screwdriver. Pull the blade out and install the new one by sliding it in and locking it.

This is the simplified version. The other involves having to deal with screws the size of ants that hold the blade in. Take out the screws to remove the old blade and install the new one. Note that the screws are fragile so take it easy when securing them.

Now that your new wiper blades are in place, you should be able to have a clear view of the road ahead—regardless of the weather.

## Changing a Fuse

Fuses seem to break all the time, but they're designed to. Huh? When when one circuit has too much electricity flowing through it, the fuse blows to prevent serious damage and even fire.

Fuses are inexpensive and easy to replace. You can store extra fuses in your vehicle's fuse panel. If your fuse panel doesn't have a storage space, the second best place to keep such tiny parts is in your glove compartment or a special compartment in your toolbox.

## Step-by-Step: How to Change a Fuse

### Locate the Fuse Panel

Your owner's manual will tell you where your vehicle's fuse panel is. Most models situate the fuse panel on the driver's side of the dashboard and under the steering wheel, or in the engine compartment, but location varies from vehicle to vehicle. Other are found in the front dash door jambs or in the glove box.

Remove the fuse panel's cover; you'll see several different color-coded fuses plugged in. These colors, along with the numbers stamped on the fuses, indicate different amperage ratings. Now, turn the fuse panel cover over to see a helpful fuse diagram. This diagram shows you which fuse works with which electrical component.

### Remove the Blown Fuse

Before you can change a fuse, you must find the faulty one. It will have a broken filament (the thin strip of metal inside) or will be black inside. Some vehicles come with special "pullers" to remove fuses, but tweezers work just as well. You can also use your trusty fingers. Just make sure you *carefully* remove and replace the fuses until you find the culprit.

Note that the vehicle's electrical problems may need a mechanic's attention if none of the fuses look blown, or if the fuse immediately blows again.

### Replace the Fuse

Replace the blown fuse with a new fuse of the same amperage. Use your owner's manual, the fuse panel diagram, and the numbered, color-coded fuses themselves to help you determine the correct amperage. If you use the wrong amperage, you could cause much worse damage to your vehicle than just a blown fuse.

Once you have located a fuse of the right amperage, place it into the correct slot. Push it down with your finger to ensure it's completely installed, and then replace the fuse panel's cover.

Remember, if you don't have a spare fuse, you can always temporarily use the fuse of another less-used electrical component—as long as the amperage is correct. Consider using the fuse for your cigarette lighter, the radio, or the back window heater.

### Check the Circuit

Once the fuse is replaced and the panel is covered, turn your vehicle's ignition and check to see if the troubled circuit is working properly. If it's working correctly, chances are you just had a temporary overload of electricity that caused the fuse to blow. If this is the case, then you just solved the problem.

However, if the circuit doesn't work, or it does work but only briefly before it needs to be replaced again, your vehicle's electrical problems go beyond just a blown fuse. It's best to see a mechanic at this point.

# Replacing Brake Fluid

## Adding vs. Changing Brake Fluid

Adding brake fluid is usually not part of routine vehicle maintenance. Low brake fluid typically means that your brake pads are low and soon need to be changed. If you notice a sudden drop in the brake fluid level, it could indicate a problem with your brake system, or that you simply need to change your brakes.

Have a professional check your brakes if you are unsure. If you are sure that your brake pads are in serviceable condition and your brake fluid is below the add line, only then should you add fluid.

## Symptoms of Brake Problems

Some braking problems have to do with the brake fluid. If your brakes have developed a "mushy" feel, or if they need to be pumped, then, rarely, air may have entered the line. Check the brake fluid level; if the reservoir is empty, then bleeding the brake lines to remove the air may improve the condition. However, if the reservoir still holds brake fluid, have the brakes checked as soon as possible.

## Brake Fluid Facts

Keep these facts in mind while handling brake fluid:

- Never use DOT 5 brake fluid in a vehicle designed for DOT 3 or DOT 4 fluids. It is ok to use DOT 4 fluid in a vehicle that requires DOT 3, but not vice-versa.
- NEVER substitute any other fluid for brake fluid.
- Wash your hands immediately after coming in contact with brake fluid. It eats paint, so imagine what it'll do to skin.
- Properly discard brake fluid that's been unsealed for more than one year. Check with your city for recycling days or centers.

## How to Check and Add Brake Fluid

- Determine the location of the brake fluid reservoir.

- Look inside the reservoir to determine the current fluid level. If it's at the "full" mark, close the reservoir and mark the date of the inspection in your maintenance log.
- If the fluid level is below the "add" line, have your disc brakes checked. As disc brakes wear down, the fluid is displaced into the brake calipers. Most brake fluid reservoirs are designed so you should not have to add or "top off" the fluid. If the fluid looks dark, it is time to have it changed.

## Bleeding the Brake Lines to Remove Air

Two people are required to bleed a brake line; one to depress the brake pedal and one to drain the fluid into a container. These directions are the basic procedure for bleeding a brake line. Consult your service manual before you begin to bleed your own lines; this WILL NOT work for newer cars.

### Have the following items handy:

- A section of plastic, vinyl or rubber tubing, 3/16" diameter, long enough to reach from the brake caliper to the clear plastic container.
- A wrench to open and close the bleeder valve.
- A clear plastic container containing at least one inch of clean brake fluid, or enough to submerge the plastic tubing. Clear plastic is important so you can see the air bubbles as they exit the brake line.

### Here are the basic instructions for the process:

- Open the reservoir and add brake fluid up to the full line.
- Replace the cap on the master cylinder reservoir before you begin bleeding the line. Never remove the reservoir cap while the brake pedal is depressed.
- Starting with the wheel rear wheels, locate the brake cylinder or caliper and find the bleed valve on the back side. It will look like a bolt with a nipple on it and may have a rubber cap that you will have to remove.
- Place one end of the clear tube into the clear container to which you have added approximately one inch of brake fluid. Be sure to do this step before you connect the other end of the tube to the bleed valve.
- With the tube end in the container of brake fluid, connect the other end of the tube to the bleed valve.
- Use a wrench to loosen the valve on the brake caliper just slightly. Do not allow the brake fluid to begin to flow; just loosen the valve enough to make it easy to release when you are ready to bleed the line.

- Now, have the person inside the vehicle pump the brake pedal a few times to build up pressure in the line, and then have them hold the brake pedal down firmly, without further pumping.
- While the brake pedal is held in place, loosen the bleed valve enough to allow a small amount of brake fluid to flow out of the brake line and into your container.
- Watch for the air bubbles to exit the tube placed in the clear plastic container with the brake fluid.
- The person inside the vehicle should only allow the pedal to travel about 2/3rds of the way to the floor. Allowing the pedal to reach the floor may damage a master cylinder. Once the pedal reaches this position, the person inside should signal you with an "OK" so you know to tighten the bleeder screw. After the screw is tightened, signal the person inside with an "OK" so he may release the pedal.
- Repeat this action of pumping the brakes and bleeding the fluid until there are no more bubbles remaining in the line. It is very important to remember to periodically check the fluid level in the reservoir, and always replace the cap before actuating the brake pedal.
- Repeat the process above for the three remaining brake lines. Be sure your helper pumps and holds the brake pedal each time.
- Once all four brake lines have been bled, fill the brake fluid reservoir to the "full" line, then close the cap,  
Thoroughly rinse any spilled brake fluid spilled in the engine compartment off with water.
- If you are in any doubt about the condition of your braking system, make an appointment for a brake inspection as soon as possible.

## Changing an Air Filter

Before you start heaving luggage out of your car's side windows or imposing passenger weight restrictions to improve your vehicle's mileage, check the air filter. A dirty or clogged air filter can alter your vehicle's gas mileage by up to 10%.

An air filter serves as an engine's protection device against grit and grime—your car's Achilles' heel. An air filter that is blocked with debris essentially chokes your vehicle and restricts air intake.

Fortunately, changing an air filter usually takes under five minutes.

### When to Change the Air Filter

An air filter should be replaced once a year, or every 15,000 miles. If you regularly travel on dirt roads, however, you will need to check your air filter every few months. You don't need a mechanic's eye to determine the air filter's condition. If you see dust build-up within the filter's accordion-like folds, change is needed. Or, for absolute certainty, shine a flashlight from the

inside out. If the beam cannot penetrate the folds, you need to spring into air-filter-maintenance mode.

## How to Change an Air Filter

To find your air filter, pop the hood and look for a black plastic casing—about the size of a bread loaf—fastened with clips or screws. If you're still unsure, consult your car's manual.

Open the clips. You can do this with your hands, or if you're intent on keeping the fingers grime-free, use a screwdriver.

If you drive an older car, you'll find the air filter above the engine, encased in a round black covering that looks like it could contain a pillbox hat. Unscrew the center wing nut to open.

Next, remove the filter and inspect it for dirt by bending back the paper ridges. If deemed filthy, go purchase a new one.

Insert the new filter and make sure the casing is tightly secured.

Not only is this fast, but cost efficient. Most quick lube shops charge up \$20 to change an air filter. For a few minute's time, you can save yourself half the cost by self-installing.

# Changing a Headlight

## Changing the Headlight in a Newer Model Vehicle

In the old days, replacing a headlight seemed to be as complicated as a root canal. The lamp had to be completely removed. Today, cars and trucks come with headlight bulbs that plug into the back of the headlight lens housing. If your headlight goes out, replacing the bulb is simple and takes very little time.

### What Type of Bulb?

First, find out what type of bulb you need. It may be listed in the owner's manual for your vehicle.

If you cannot locate the correct bulb information, ask the service clerk at the auto parts store. They have reference material and can find this information for you quickly.

### Tools to Change a Newer Headlight Bulb

You'll need a few supplies in order to change a single or both headlights on your vehicle. Remember, if you are using a different type bulb for a burned-out headlight, you must place that same type bulb in the working headlight.

Here's what you need:

- The correct bulb for your vehicle's make, model and year.
- Service manual for your vehicle's make, model and year.
- Any tools required, as indicated in the service manual.

## **Changing the Newer Vehicle Headlight Bulb**

Follow these steps to change the headlight bulb on your vehicle:

1. Open the engine compartment hood.
2. Locate the back of the headlight to determine the lamp and bulb type.
3. Decide which bulb you need to replace.
4. Purchase the correct bulb for your headlamp.
5. Follow the directions in the service manual for the correct way to replace the bulb.

## **Changing the Headlight in an Older Model Vehicle**

Older models are a bit trickier. First find the part number, which can usually be found as a raised impression on the front of the glass covering the headlamp. If it's not there, check the service manual, the owner's manual, or with the auto parts shop to buy the correct headlight.

## **Tools to Change an Older Headlight**

To change out the whole headlight in an older vehicle:

- Correct lamp for the vehicle's make and model.
- Screwdriver to disconnect the frame holding the lamp in the bracket.

## **Changing the Older Vehicle Headlight**

Follow these steps to change the headlight bulb on an older vehicle:

1. Remove the screws that connect the headlamp frame to the bracket holding the headlamp. Make certain you turn only the screws that hold the lamp frame, not the adjusting screws.
2. Disconnect the electrical connector in the back of the lamp by pulling the socket away from the headlamp with your hand.
3. Remove the headlight from the bracelet area and discard it.
4. Replace with the new headlight, making sure that it is positioned right side up.
5. Plug the wire socket into the new headlight, which holding the headlight securely.
6. Replace the headlight into the frame.
7. Place the frame onto the headlight bracket.
8. Reattach the screws to hold the frame and bracket in place.



9. Do not adjust the setting screws for the direction the headlight shines.

If you suspect that the positioning of your new headlight may have been disturbed while you changed it, have it checked before you drive at night. Otherwise, you are ready to go.

## Replacing Fuel Hoses

Fuel hoses rarely need to be changed, but if yours leaks or was damaged while [changing a fuel filter](#), you'll need to make this repair.

NOTE: Because replacing a fuel hose can be quite dangerous, this is a fix better left to an experienced mechanic.

### Safety First

Since dealing with fuel lines could end in a giant fireball, follow all gasoline safety precautions. Don't smoke, make sure there's plenty of ventilation, and properly dispose of all gasoline-soaked rags, old parts, hoses, and any other items contaminated by gasoline. Keep a current and charged fire extinguisher handy, and do not forget to disconnect the vehicle's battery before you begin.

### What You'll Need

It's important to use the correct tools for the job. Using the wrong tool, or using the right in the wrong way, may cause sparking. So make sure you've got [correct tools](#) before you start.

- The service manual for your vehicle year, make, and model.
- A dozen or so clean, dry shop rags to catch excess fuel.
- Screwdriver or other tool as required to remove the hose clamps.
- Pair of regular pliers.
- Standard razor knife with blade-locking capability.
- Fuel filter for your vehicle's make and model.

Don't worry if you can't figure out the diameter of the fuel line, because the auto parts store can look it up.

You must always replace the [fuel filter](#) on your vehicle if you will be changing the fuel hose.

## Remove the Old Fuel Line

Once you have all your tools and new parts at the ready, you can begin the process of replacing your fuel hose.

1. Locate the fuse box and remove the fuel pump fuse.
2. Start the engine and run it until it stops.
3. Remove the fuel filter and trace the fuel line to the transfer unit.
4. Remove the air cleaner if you are changing the hose leading from the fuel filter to the carburetor.
5. Put rags under the end of the hose where the gasoline will come out.
6. Loosen the metal hose clamps just until the clamp slides back over the bump that is close to the end of the line.
7. Place a rag over the end of the hose as you remove it from the filter.
8. If the hose sticks and is difficult to remove, use the pliers to grip and turn the hose.
9. If the hose still does not come away easily, use the razor knife to split the hose along the direction of the line.
10. Have the shop rags ready, because the fuel in the line will begin to drain once the hose has been removed.
11. Remove the fuel line from the steel tube at the fuel block. Twist it a bit if it is stuck.
12. After you remove the hose, clean off any dirt, hardened rubber, fuel, or other contaminants from the steel tube.
13. Place the old hose on your work bench to measure the new hose, adding an extra two inches.

## Attach the New Fuel Hose

Now that you've got the old hose removed, here's the steps you'll need to take:

1. Place the still-loose clamps over the new fuel hose.
2. Be sure the clamp screws face the correct direction for easy tightening.
3. Check the new fuel filter to be sure it faces the correct fuel-flow direction.
4. Place the hose ends on the steel tube and at the new fuel filter.
5. Check the new fuel line for fit. If there are any kinks in the hose, remove the hose and trim a bit from the ends.
6. Replace the clamps in the correct position and tighten the screws to hold them firmly in place.
7. Reattach the hose to the new fuel filter, and then tighten the clamp.
8. Reattach the vehicle's battery cables.
9. Dispose of gasoline soaked rags, the old fuel line, and any contaminated items properly.

That's it! You've just replaced your fuel line. May you have excellent gas mileage, perfect performance, and a great ride!

# How To Check Tire Pressure

Back in the days of full-service gas stations, checking the tires was part of the deal. Today, as many motorists pump their own gas, and as even full-service does not include a tire pressure check, it is important for drivers themselves to be aware of their tire conditions and pressure.

Inflating and maintaining proper tire pressure ensures safer, more comfortable driving and better fuel efficiency. Particularly in times of high gas prices; in inclement driving conditions such as heavy rain, snow, or ice; and in vehicles of all sizes, tire pressure can make a major difference in driving, wherever you are.

Given the importance of the task, you might think it is complicated, but checking and maintaining your tire pressure is simple, provided you have a good tire air pressure gauge and source of air, both of which are available at many gas stations.

## Get a Gauge

A simple tire air pressure gauge, available at most auto parts stores, for a few dollars, is adequate for the job. You do not necessarily need a digital air pressure gauge. If it is worth the \$12 to \$15 to you, a digital pressure gauge is easy to read and accurate. However, you should consider whether it will require batteries, and whether this would prevent you from using it.

Again, a standard pressure gauge that measures pounds per square inch (PSI) and fits easily in the glove box of your vehicle, is sufficient. Do avoid ultra-cheap models that may not give a proper reading.

As for a source of air, many gas and service stations have air available for 50 cents or so. Some of these air machines have gauges on them, and if you have no other means of measuring the pressure of your tires, these will work. However, they are typically beat and inaccurate, so have your own gauge to ensure the proper PSI for your tires and vehicle.

## Checking Pressure

PSI is measured by the notches on a tire air pressure gauge or with a number reading on digital gauges. To find out what PSI is right for your tires, look on the tires themselves. In the raised writing on the side of the tires, you should find "recommended PSI" or "PSI recommended at ..." or similar, with the proper figure for your tires. When buying new tires, or getting a rotation, it's a good idea to ask what the right pressure is.

Recommendations may vary, but you should never inflate the tires five PSI more or less than what is recommended on the tire. Under-inflating wears out the sides of the tire, and is actually a driving hazard. Over-inflated tires will wear more quickly, and are also dangerous because of the increased possibility of a blowout. If you are unsure about the PSI for your tires, or it is unclear or worn away on the side of your tires, ask your mechanic or someone who knows about vehicles what PSI you should have for your tires.

Smaller compact and mid-size sedans typically have PSI levels between 30 and 40 PSI. Larger vehicles with larger tires, including bigger sedans, usually have higher pressure, around 45 PSI. These are general PSI figures, and the most accurate PSI for your tires is the number listed on the side. Tires should all be inflated to the same PSI for safety, proper vehicle function, comfort, and fuel efficiency.

Also, check your vehicle's tire pressure when the tires are cold. This means the tires should not have been driven on for at least three hours. If you need to drive to get air, try to drive less than a mile. Or, slightly under-inflate the tires to compensate for the warmer air inside them, and then check the pressure again when you can get a cold reading.

To get a PSI reading on your tire, place the air pressure gauge onto the tire's valve stem, the pencil-width air nozzle on the side of the tire. Try to place the gauge evenly onto the valve stem. This will allow air to escape, but once you firmly press the gauge down on the valve stem, it will stop the flow of air and give your gauge a reading, either by blowing out the metered stick with a traditional gauge, or a reading with a digital model gauge.

## Adjusting Tire PSI

So you have a tire pressure gauge, and a source of air. It is best if you can park your car centered on the source of the air, which usually has a hose to reach the vehicle's tires. You may need to move the car to reach all of the tires, depending on the situation. Before you pay any money for air or start pumping up your tires, remove the caps on all the tire valve stems.

Next, you should check the pressure of all four tires, noting which ones need the most air. This will help you maintain uniform pressure in the tires, some of which may need less air. Hot weather, extreme temperatures and other conditions can cause the air in your tires to expand, and PSI can subsequently increase.

Once you know which tires need more air, you can deposit coins into the air machine, or get your air hose ready. Choose the first tire to fill, and fit the air hose nozzle onto the tire stem. When you start to place the air hose onto the tire stem, it will hit a pin inside the stem and start leaking air. You know when you have the air hose nozzle properly applied when the leaking air stops. It takes some force to get the hose locked on, but once it is in place, you will be ready to increase the tire pressure.

Some air hoses are automatic, and will release air in your tire once you have it on the tire's valve stem. Other air hoses have handles and require you to squeeze them to activate the air.

It is important to have your gauge as you fill the tire, taking the hose off somewhat frequently to check the pressure. It is extremely important not to over-inflate your tires. You can avoid this by using small bursts of air between your checks. As you increase the PSI and keep checking it, you will get a feel for how much air you are putting into the tire, and how much more you need. Once you get close to your recommended PSI, use less air, and keep going until you are at the right level.

Once you have the tires properly inflated, replace the stem caps by screwing them back on. Do not over-screw them, as they will break on the top. Tire stem caps are important to keep your tire valve stems clean and undamaged.

Tire pressure should be checked weekly, or every other week at least. Particularly with severe weather and temperature swings, tire pressure on the nicest tires with the nicest cars can still fluctuate, and must be monitored and maintained regularly for safe and fuel-efficient driving.

## How To Put On Tire Chains

Some motorists may not be familiar with them, but tire chains for snowy, icy, and steep mountainous roads are common in some states. In some cases, particularly in the steep mountain passes of the Rockies, the Sierra Nevadas, and the Cascades, tire chains are even required at certain points.

Even drivers who are familiar with snowy and icy driving conditions must have tire chains to maintain safe control on mountain roads and highways. The grade of mountain inclines and declines combined with snow and ice can leave the biggest four-wheel-drive or the most nimble front-wheel-drive vehicle with little road control.

Putting tire chains on your vehicle is not the most simple task, but it is sometimes required to keep you rolling, and once you have installed snow chains for a first time, you will be ready to chain up and keep on driving through the snowy mountains, every time.

When obtaining your tire chains, you must first make sure they will fit your tires. Most tire chain packaging has a guide that indicates which tires it fits. Stores and markets where chains are sold also have guides, or employees who can help you get the right size. Never try to attempt to use chains that are too large or too small for the tire, as this could result in dangerous driving and damage to your car.

### Dry Run

The same way it is a good idea to test the braking and steering on a snowy or slippery road, you should test putting on the tire chains before you reach the mountain roads where they may be required.

Pick an open stretch of street, or a vacant parking lot. Take the chains out of their packaging or case, and untangle all of the links so they are hanging free in a web shape. Place the two separated chains by the tires to which you will apply them. For a front-wheel-drive vehicle, the chains should go on the front two tires. For rear-wheel-drive vehicles, the chains should be applied to the rear two wheels. Some trucks and extreme conditions may call for tire chains on all four wheels, which is fine, but make sure you put the chains on the right tires when you only have two.

With the car parked, parking brake engaged, and car in gear, place the chain onto the tire, holding it from the top and ensuring that it is evenly placed over the wheel. Obviously, the bottom part of the chain cannot cover that portion of tire that is touching the road. Just fit the rest of the chain onto the wheel as best you can.

Some chains have rings that go on the inside of the wheel, and help guide the chains into place. For these ring-type chains, be sure the open connection is on the bottom of the wheel. Once you place the chains on and the ring is going around the inside of the wheel, you can connect the bottom of the ring. This usually requires you to get right down under the car by the tire. You may need to change position to get the best angle on the connection.

Once the chain is evenly and securely on the three-quarters of the wheel that is not touching the road, repeat the process on the other side. When both chains are on, check to make sure the front of the car is clear, and drive forward a few feet. You only need to drive far enough to expose the rest of the wheels that were previously touching the ground. Put the car in gear or in park, engage the parking brake, and get out of the vehicle again. Now you can secure the chains squarely on the remaining wheel surfaces.

Next, tighten the chains by using a closer link on the chains. Now you are ready to drive, but only for a little bit. After you have driven 50 to 100 feet, you must get out and re-tighten the chains, which will likely have some slack from evening out across the tires.

Don't be alarmed by the bumpy ride. After all, you are driving with chains on your tires. For your practice run with the tire chains, you will likely be on a dry road, so limit the driving, but this is a good chance to get to know how they feel and how the car rides with the chains on.

Taking the chains off is much easier, once you have disconnected the inside rings or chains. This once again requires you to get right down to the lower inside of the wheel. However, once the inside ring or chain is disconnected, you can't simply pull the chains off. The chains will not disconnect on the bottom, where the tire is resting on the ground.

Simply lay the chains to the side of the tires as flat as possible, making sure that they are not still around the wheel or axle of the vehicle. Then you will drive forward a few feet, enough to get the car's tires clear from the chains. When putting the chains back in a bag or packaging, try to make sure they are not tangled together, and make sure they are dry.

## Mountain Driving

The reason it is often good to have practice putting on chains and knowing what you are doing is the adverse conditions in which you may have to repeat the task. Chains are required on snowy, icy, or possibly slick mountain roads and passes, where rain, snow, sleet, and wind can be formidable. This highlights the need for good gear to put your chains on.

Don't depend on your ski wear or other clothing you plan on wearing much, unless you don't mind if it's wet, dirty, or both. The best gear for putting on tire chains is heavy, waterproof wear, such as rain gear. Waterproof pants are important because you will have to kneel down to install and take off the chains.

Another good thing to have is gloves, but they should not be bulky ski gloves, and mittens won't do you any good under your car's wheel well. Garden gloves work well because they provide

some protection from the cold elements and chains, yet still afford dexterity and the use of your fingers.

Repeat the same procedures as described above in "Dry Run" to get your chains installed. Make sure you have enough space to work on all sides of the vehicle safely. Mountain passes typically have chain-up turnouts with signs to let you know when to put your chains on, and then take them off again. Follow the posted signs and requirements, and don't get caught without chains, as there can be fines in addition to the difficult driving you might face.

For more details and some helpful diagrams, check out the National Association of Chain Manufacturers' informative document, [Tire Chain Specifications](#).

## Replacing A Fuel Filter

### Is My Fuel Filter Clogged?

Is your car hemming and hawing more than a politician in the Iowa primaries? Does it hesitate, stall, or lag when you put the pedal to the metal? If these symptoms are new, a clogged fuel filter is the likely culprit.

Fuel filters become obstructed due to dirt or rust in the fuel tank, and by debris from the normal deterioration of the fuel line. The fuel filter keeps contaminants out of your vehicle's engine.

All fuel filters need occasional changing. Some cars tell you how often, but most don't. It needs to be replaced yearly, especially if your car's got a lot of miles; if you use cheap gas or gas with alcohol in it; drive on a lot of gravel; or do anything else that might help clog things up.

Nobody gets off easy. Even if you have a new car with a "lifetime" filter, it'll still need to be replaced once in a while, at least every 30,000 miles. Further, you can't tell from looking that a filter's clogged. Blow through it; if that's hard to do, then it needs to be replaced.

### Safety Disclaimer

This article provides a basic description of the process of changing a fuel filter. It doesn't cover every kind of car or situation, so check out your vehicle's service manual.

First, fuel is flammable. Repeat: fuel is flammable. Take these precautions to prevent turning everybody into human charcoal:

- Turn off the car before you work on the fuel system AND remove the fuel pump fuse or relay.
- Smoking's extra life-threatening while working with fuel, so don't do it.
- If you are working in an enclosed garage, make sure there is adequate ventilation.

- Gasoline is a serious skin irritant; wear petroleum-resistant gloves, like nitrile, while handling fuel or fuel lines.
- Automotive fuel is also a known carcinogen, so avoid breathing fumes or prolonged exposure.
- Clean up any spills immediately and dispose of any gasoline or fuel-soaked rags and the old fuel filter properly. Be sure to handle the old fuel filter carefully, as it will still contain a small amount of fuel.

## Locating the Fuel Filter

Look at your manual to find your fuel filter, then get these things ready:

- Several clean, dry shop rags.
- Tools to change your specific fuel filter.
- Extra hose if your filter is of the type that utilizes standard rubber hose and screw clamps
- Correct fuel filter for your make and model vehicle.
- Petroleum-resistant gloves.
- Proper eye protection.

## Changing the Fuel Filter

The first steps in replacing your fuel filter depend on the type of fuel pump. Determine whether your vehicle has an electric or non-electric fuel pump, then follow the directions below

### Electric Fuel Pump

- Remove the fuel pump fuse or relay in the main fuse box.
- Start the engine and allow the motor to run until it stops by itself.
- Turn off the ignition and remove the key from the starter.

This drains the fuel in the line and relieves the higher fuel pressure in an electric fuel system. If the line is not drained, the pressurized fuel will spray into the engine compartment, creating a potential hazard.

### Non-Electric Fuel Pump

For a non-electric fuel pump system, you will not be able to run out the fuel; however, the pressure in the fuel line will be much lower than that of an electric fuel pump system. Because



you will not be able to run out the fuel, there will be a larger quantity of fuel spilled but, because it is not under as much pressure, it will be easier to contain. Just be sure to have your shop rags handy.

## **Out with the Old, In with the New**

If the filter is underneath the vehicle, be sure to take proper precautions before going under the vehicle. Either use ramps approved for the weight of your vehicle, or use floor jacks and stands.

Always set the parking brake and use wheel chocks. Never get under a vehicle which is supported by jacks alone. Always use jack stands to support the vehicle.

Here are the steps to remove the old fuel filter and replace it with the new fuel filter:

- Place a shop rag under the existing fuel filter and disconnect the filter using the proper tools. Your filter may utilize a "quick connect" system. If you are unsure of the operation of this system, you should find out the proper way to remove the filter and if there are any special tools necessary.
- Remove the existing fuel filter as shown in the vehicle's service manual. Check the filter to make sure it is facing the right direction.
- If the existing fuel line hose is cracked, frayed, or if it is damaged when you remove the filter, replace it at this time using the extra hose you purchased with the filter.
- Once the new filter has been installed, replace and tighten the clamps, if present.
- If you have an electric fuel pump, re-install the pump fuse.
- Dispose of the old filter and rags appropriately. Do not leave the old filter or any gasoline-soaked rags out once you have reconnected the battery.
- Attempt to start the engine. It may take more than one try as the filter fills up with fuel.

Congratulations, you've just changed your fuel filter! Your vehicle's performance should increase substantially. However, if you continue to experience problems with acceleration, contact a professional mechanic.

## **How To Change Your Oil**

In this fast-paced world of endless work and little play, the last thing most people think about is crawling under the car and changing their vehicle's oil. After all, there are Grease Monkeys and Jiffy Lubes on just about every corner, not to mention all the garages and big-box chains who can do the job for you.

But if you're the do-it-yourself type, you'll find the process takes only about 30 minutes and will only set you back around \$10 or \$15, if you have all of the right tools. Of course, you may get grimy, so if you have an aversion to getting your hands dirty, head out to a garage. If you're ready to get under the car and take care of business, then read on.

## When to Change the Oil

Check your vehicle owner's manual and see what the manufacturer recommends. Most will tell you to make the change once every 3,000 to 7,500 miles, so this is a pretty good leeway. Your dad may tell you something completely different. Then there is the opinion of the mechanic at the local garage, who will also throw out a number and then offer to change it for you each time. The general rule of thumb, especially if you want to keep your vehicle in tip-top condition, is to change the oil every 3,000 miles.

## Tools for the Job

- It's a dirty job, so dress in old clothes that you don't mind getting grubby.
- Eye protection (safety glasses/goggles) and latex gloves.
- Oil filter wrench for the size of your vehicles filter and a box end wrench for the size of your vehicles drain plug.
- Rags.
- A drain pan that holds up to six quarts.
- Oil. Check your vehicle owner's manual for the engine oil capacity (with filter) and the proper viscosity. Follow any specifications for an API (American Petroleum Institute) certified symbol.
- An automotive grade funnel.
- If you have a low-riding vehicle or just prefer more space to maneuver, then you need a jack and jack stands, or drive-on ramps. However, most vehicles have enough of a gap to easily reach the oil pan. Some oil filters are accessed via the underside of the vehicle. In these cases, propping the vehicle may be a better option.

## Changing the Oil

1. Make sure your vehicle is parked on a flat surface and not at an angle.
2. Run the engine for several minutes to heat the oil before draining. Shut off the engine before proceeding.

3. If using ramps, drive the vehicle onto the ramps. If using a jack and jack stands, raise the vehicle with the jack and lower it onto the stands. Never go under a vehicle unless it is supported by quality jack stands or drive-on ramps. Never go under a vehicle supported by drive-on ramps unless both of the non-ramped wheels (the ones which remain on the ground) are chocked. Blocks of wood of sufficient size suffice for this purpose; simply place them behind the tires. When using a jack, take care to lift the vehicle from a proper lifting point. If you're unsure where to place the jack, consider having just one more oil change done by a mechanic. When the vehicle is on the service hoist, ask if the mechanic would point out the proper lifting points on your vehicle.
  
4. Always wear appropriate eye protection when working under the vehicle. Components under the vehicle will be hot. Use caution, especially when working near the exhaust system. The engine oil pan should be easy to identify. It's large and sags down a bit from the engine area. There will be a drain plug on the bottom edge.
  
5. Once you find the engine oil pan and locate the drain plug, slip the drain pan below.
  
6. Unscrew the drain plug with the proper size box end wrench. (counter clockwise to loosen). The oil rushing from the drain most likely will drive the drain plug into the drain pan. Remember, the oil will be hot, so it is best to just let the bolt fall into the drain pan rather than try to yank it away once it comes free. This will save your hands from getting burned and gooey.
  
7. It will take several minutes for the oil to drain., Retrieve the drain plug from the drain pan and inspect the drain plug washer. A metal drain plug washer that is no longer flat should be replaced. A rubber drain plug washer that is damaged or deteriorated should be replaced. Reinstall the drain plug into the oil pan. Do not over tighten.
  
8. Find the oil filter. Adjust the drain pan to catch the oil that will fall from the filter once it's removed from the engine. Attach the filter wrench tightly around the filter and rotate counter clockwise to remove. You may find yourself in a battle trying to remove the filter and even crush the body. Simply make sure the wrench grip is solid and try for that first release. Once you achieve that, the filter should twist right off. The filter gasket should come off with the filter. If it didn't, remove the filter gasket from the filter mounting area. Wipe the filter mounting area with a clean rag.

9. Set the old filter off to the side and swab the housing area with the rag until it's free of old oil.
  
10. You're now ready to install the new filter. Coat the filter gasket with clean oil. Screw it in, taking caution not to go to the extreme when tightening. The tightening instructions will be printed on most filters. If not, a good rule to use is to rotate until gasket contacts mounting surface, then tighten an additional ½ turn.
  
11. At this point, the hard part is over. Now locate the lubricant depository, usually marked by a cap noted appropriately: oil. Open it and pour in the required amount of oil. Replace the cap upon completion and wipe up any excess oil.
12. Start the vehicle and do a quick check on all of the components to seek out any leaks. With the engine running, verify there is no engine oil leaking from the filter or from the drain plug. Shut off the engine and check engine oil level.
  
13. Now you're ready to clean up. Used motor oil is classified as hazardous waste and must be disposed of in accordance with all applicable laws. Using a funnel, carefully pour the used oil from the drain pan into a leak proof container. Take the old oil to your local garage or auto parts store for disposal.

# Replacing an Alternator

## Is Your Alternator Out?

Perhaps you've noticed your headlights dimming while driving, or maybe you have an ongoing problem with a perfectly good battery that keeps running out of power, even after you've had it recharged a time or two. Or your battery light flickers on at low RPMs, or is on all of the time. These are all signs that your alternator is busted.

## Beginners Beware

Changing an alternator at home should only be undertaken by someone with mechanical skills. If you've never worked on a vehicle before, this might not be the best ["first job"](#) for you. Read all the steps and decide whether you are comfortable with this repair before you undertake it.

## What You'll Need to Get Started

- The correct service manual for your vehicle's make and model.
- Tools and equipment as outlined in your vehicle's service manual.

- Proper replacement alternator (see below).
- New alternator belt.
- Any other hoses or belts that will require removal in the process of replacing the alternator.
- A memory saver. This device plugs into your cigarette lighter and saves all your computerized PINs and codes, (including your engine settings as well as your stereo presets) so you don't have to reenter any information. It only costs about \$13, so it's worth picking one up.

The alternator is not a "stock" type of part on a vehicle. The location, parts, tools, and skills needed to change it differ from vehicle to vehicle. Be sure you're using the right tools for your case, to prevent injury to yourself or to your car.

Although it seems unnecessary to get new hoses and belts just because you've removed them to get to the alternator, you should. When you take these off, the hose and belt are likely to become stretched or damaged in ways you can't see. It's a safety measure, and doing so will cut down on damage or premature belt and hose wear.

## Removing the Old Alternator

If you have another way to get to the auto parts store, remove the old alternator from your vehicle first. Follow these steps to accomplish this removal:

1. Plug in your memory saver, if you have one.
2. Remove the vehicle's negative battery cable.
3. Remove the serpentine belt, or alternator belt. This is many times the most difficult part of the task.
4. Remove any necessary parts to reach the alternator.
5. Discard all belts or hoses removed in this process.
6. Disconnect all of the electrical connections (wires) from the alternator.
7. Disconnect and discard the alternator belt.
8. Remove any mounting bolts that hold the alternator in place.
9. Remove the alternator from the engine compartment.

## What About the New Alternator?

Now, take the old alternator to the auto parts shop and purchase the new alternator. It will be less expensive if you take the worn alternator and trade it in on the new one. If you do not provide the old part, most auto parts stores will add an additional fee to the listed price of a part such as an alternator.

This is legal, and is known as a "core charge" in the industry. However, the core charge is refundable with your old alternator and receipt.

## Installing the New Alternator

1. Set the alternator back in place in the engine compartment.
2. Reattach any mounting bolts to hold the alternator in place.
3. Reattach all electrical wires to their proper connections.
4. Place the new alternator belt over the pulleys or or replace the serpentine belt.
5. Replace all hoses and belts that required removal.
6. Replace and reattach all engine components that were removed.
7. Reattach the negative battery cable.
8. Remove the memory saver, if used.

## A Few Helpful Tips

- Never overtighten the alternator belt, as this will cause premature wear on the bearings.
- To reduce back strain, raise the front of the vehicle with jack stands placed in the correct spots for your vehicle. The wheels need not be elevated off the floor, but be sure your stands are in the right place for your particular vehicle to avoid damage.
- Reconditioned parts are great, and they're major money-savers for do-it-yourselfers. However, if you do plan to use a reconditioned part, do some research beforehand either on the Internet or by asking other home mechanics. While they are usually a great bargain, it's best to know which line has the best reputation; reconditioned auto parts vary greatly in quality.
- Be sure to properly dispose of any oily rags.
- Make sure you know the proper disposal procedure for the hoses, belts, and any other parts you have replaced. These regulations are different depending on where you live. If you are unsure, ask the auto parts store for this information.

# Replacing a Water Pump

## Engines and Overheating

Because it has moving parts and is burning fuel, an engine heats up to a very high temperature. This is normal; in fact, engines run better at a fairly high temperature than cold.

However, it can also get too hot. This results in damage ranging from something as minor as the need for fresh engine coolant, to complete destruction of the vehicle's engine, including fire. So the car also has a cooling system to keep things at just the right temperature.

The system can (and will) break down, though. Overheating can be caused by many different problems within the system. If you suspect a water pump is the culprit in your cooling system failure, this article is for you.

## Before You Replace a Water Pump

A water pump replacement is a repair that may be undertaken by an experienced home mechanic. If you are confident in your mechanical skills, this is a task you can complete in a few hours; however, if you're not comfortable you should definitely [take it to the shop](#).

Before you get started, here are a few things to consider.

### Disposal of Coolant Water

Since the water in a vehicle's cooling system contains antifreeze, don't wash it down the drain. Antifreeze is hazardous waste and must be disposed of properly. Determine the proper method for disposing of antifreeze-contaminated water in your community, including and necessary containers for disposal, before you begin draining the vehicle's cooling system.

### Read the Service Manual

A service manual is an instruction book for the various repairs that may be necessary on a specific make and model vehicle. These repair instructions will outline the parts required, the necessary tools, and the steps to take in order to accomplish the task. In many cases, there are helpful tips and hints included in order to make the job a bit easier to complete. But a manual isn't a shop class.

Determine if this is indeed something that you can undertake. If one of the steps is "Remove the timing belt", and you do not have the ability to properly reinstall the timing belt, then now is the time to abort your mission. Have a professional accomplish this task for you. If you improperly reinstall a timing belt, you may cause severe internal engine damage.

### Replacing Hoses and Belts

When replacing the water pump, professional mechanics suggest replacing the hoses and belts for the cooling system. It may seem like an effort to get you to part with more money than is necessary, but it's a very good idea. Belts and hoses are actually somewhat fragile, and can easily be damaged during removal or while putting them back on the engine. While they're off, they must not come in contact with grease, antifreeze, oil, or gasoline; not always easy in a repair situation.

New hoses and belts are not expensive, and it's always better to spend a little more and replace them, just to be on the safe side.

## Get Your Tools Ready

- Container large enough to catch the water and antifreeze as it drains from the system.
- Correct water pump for your vehicle.

- Tools as listed in your vehicle's Service Manual.
- Supply of shop rags to clean up spills.
- Any other belts or hoses you wish to replace at this time.
- Additional parts as called for by the vehicle's Service Manual.
- Replacement antifreeze. Check the Service Manual for the correct type of fluid.
- Gloves to wear while draining the system.

Keep in mind: the additive used in the cooling system is very slippery. If it is spilled, clean up as soon as possible.

## Accessing the Water Pump

Many of today's vehicles require the removal of the alternator, and in some cases various other parts, in order for you to access the water pump.

Before you begin, make a list of any parts that will require removal, then check the service manual for instructions on how to remove them. Again, be sure you have all the required tools and that you understand the process for the removal of these before you begin.

In addition, be sure to disconnect the negative battery cable before you start as a precaution. This is a good safety measure for any automotive repair, whether you are working with the electrical system or not. Install a memory saver if you have one, and disconnect the under-lamp so as not to drain the memory saver battery.

## Replacing the Water Pump

While many motor vehicle engine repairs can be spelled out in a simple step-by-step format, a water pump replacement is not one of them. This is because there is so much variety in the placement of and access to water pumps between vehicles, no one simple set of directions may be applied to all vehicles. So you'll have to follow your particular manual here.

## Finishing Up

Once you have replaced the water pump, belts, hoses, and any other components, replace the antifreeze and water in the system according to the directions in the manual and on the antifreeze container. Be certain to dilute antifreeze to one part antifreeze, one part water. More is not better when it comes to antifreeze. Store any unused antifreeze out of the reach of children.

If you have pets, be aware that animals are very attracted to the scent and taste of coolant/antifreeze; however, it is highly toxic if ingested. If you have transferred the old water and fluid into closed containers such as gallon-size plastic water bottles, seal the bottles with a



strip of strong material such a duct tape and keep them out of reach until you can dispose of them properly.

# Preventing Rust from Road Salt

## Why Salt Is Used on Roads

Human beings can't live without salt. It's a necessary nutrient, it's used to seed rain clouds, soften household tap water, make chemicals and, most important, to make ice cream.

In those parts of the country with freezing winter temperatures, drivers know that warming the cars up in the morning isn't the only inconvenience. Icy roads are, too. The same chemical reaction between ice and salt that creates creamy, delicious ice cream also keeps our roads and sidewalks free of dangerous ice during the cold winter months.

A salt and sand mixture is frequently spread over roads before or after a snow or ice storm. Salt lowers water's freezing point, causing any ice already formed to melt even though the air temperature remains well below freezing. The sand helps keep the salt in place, plus it adds a bit of traction to wet and often slushy roads.

While road salting helps people travel safely, it has drawbacks. It can cause major body and undercarriage damage to your vehicles unless you take extra care and precaution.

If you're one of the many who must travel the saline streets in the land of the ice and snow, we have some great tips to help protect your vehicle from the ravages of road salt.

## Plan Ahead

The best time to prevent salt damage to your vehicle is before the first snowflake falls.

- In late autumn, thoroughly wash every inch of your vehicle, including the underside.
- Apply a meticulous coat of wax, followed by a wax sealant to help keep the wax adhered to the vehicle's paint.
- Seal the undercarriage, paying closest attention to the brake and fuel lines, as these are the most susceptible items for rust and corrosion and make your vehicle unsafe if they fail. You can buy a product to do this, or you can have it done professionally.

## Keep a Clean Machine

Keeping your vehicle as clean as possible during the winter will go a long way to cut down the damage done by salt and sand.

- Take your vehicle to the car wash as often as possible. Many car washes in the "snow belt" offer steam cleaning and undercarriage cleaning as well as traditional car washing.
- Have your car re-waxed and sealed when you have it washed.
- Check out a mobile automobile detailer who can come to your workplace and do several vehicles at once.

## At-Home Car Washing Tips

If you can't get to any of the above, you'll need to brave washing your car at home. Try these tips.

- Wear a pair of waterproof gloves.
- Begin by spraying down your vehicle using a garden hose equipped with a high-pressure nozzle, moving from top to bottom.
- Be sure to get as much mud and muck from beneath the wheel wells, under the bumpers, behind the fenders and in any other areas prone to salty slush splashes.
- Follow with a warm, bubbly scrub down, using soap made especially for car washing. Dish soap strips your car's wax. Use a wash mitt or a sponge, never a shop rag, which may have metal bits in it.
- If the vehicle is really salty, add a couple of tablespoons of baking soda to the wash water to help remove and neutralize the salt.
- Don't neglect to scrub all the rubber, trim, outside door seals, tires, and the wheel covers.
- Rinse thoroughly, making sure to remove all traces of soap.

## Dry as a Bone

Don't stop now! Take the time to finish the job now, and you'll have less chance of discovering hidden damage after it's too late. Here are the next steps in the process:

- Carefully dry the edges of the doors inside and out, including the undersides of door handles, all hinges, plus the hood and trunk edges. This helps keep them from freezing shut.
- Use a good quality spray protectant on all exterior rubber or vinyl surfaces. It may be best to spray the applicator you are using instead of spraying the product directly onto the surface. This will avoid any overspray onto the paint.

- After a winter washing, apply an additional coat of wax to all exposed metal, using a hand-held hairdryer to warm the metal surface a bit before applying the wax. Warm your buffing rag, too, to help the wax better adhere to the cold metal.

## Beach Buggies Beware

If you live near the ocean—even if it has never, ever snowed in your area—your vehicles may still be under a slower attack by salt. The overspray and salt in the air near the beaches can and do cause their own rust and corrosion problems.

While not nearly as concentrated as the salt used on winter roads, it is important to keep your seaside sedan washed, waxed and inspected regularly for signs of salt damage. The biggest damage areas on beach-dwelling vehicles tend to be the hood, top, and rear deck of the car. Spray settles and dries, leaving a salt coating. Vinyl tops are especially susceptible to deterioration from exposure to salt and sun. Once the vinyl begins to break down, salt spray can accumulate underneath, and may go undetected until it has caused serious damage.

Give your beach mobile a good washing at least once a month, adding a couple of tablespoons of baking soda to the wash water. An alternative, if you are unable to do a full wash that often, is to attach an unused spray attachment (meant to dilute weed killer or fertilizer) filled with water to which a couple of tablespoons of baking soda have been added, to your garden hose. Spray over the susceptible areas with this dilution, followed by a clear water rinse. This will help keep your vehicle sparkling.