Chapter 17
Maintaining Your Vehicle

17.1 Maintaining the Power Systems

17.2 Maintaining the Control Systems

17.3 Preventative Maintenance

17.4 Fuel Saving and Recycling Strategies

17.1
Maintaining the Power Systems

Power and Drive Systems

A vehicle's engine needs fuel to burn to create the power to move. The power generated from the **powerplant,** also known as the vehicle's engine or motor, is transmitted to a drive system that operates the front wheels, rear wheels, or all wheels in some vehicles. The powerplant is the source of energy that maintains a vehicle's movement.

New vehicles are powered by different types of internal combustion engines and a variety of electric motors or engine combinations. Selection of powerplant for a particular vehicle is based on its weight, usage, and government regulations.

Different drive-train systems are used for different vehicles. Some vehicles are rear-wheel drive, some front-wheel drive, and others all-wheel drive. The picture shows a front-wheel drive system.

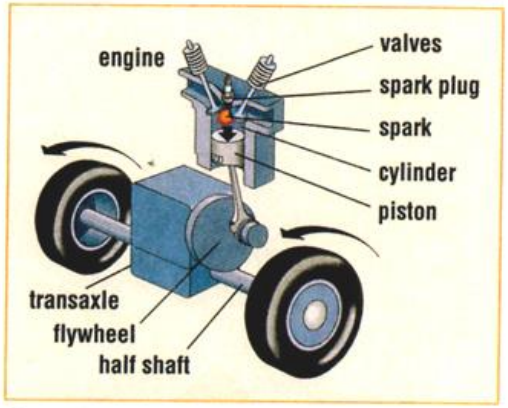
Depending on the type of vehicle, the drive train has different components including

- powerplant (engine or motor)
- transmission
- clutch (in a stickshift)
- drive shaft or half shafts
- differential
- transaxle
- drive axles
- universal, or constant velocity joints

A vehicle's **transmission** houses different gears. The gears of the transmission enable the engine to deliver power to the drive wheels. Lower gears are for power and let the engine turn faster. Higher gears are for greater speed and let the engine turn more slowly and efficiently.

The **drive shaft** is a long metal tube in rear-wheel drive vehicles. The drive shaft carries power from the transmission to the **differential** in the rear of the vehicle. The differential has gears that allow one wheel to turn more slowly than the other when turning a corner.

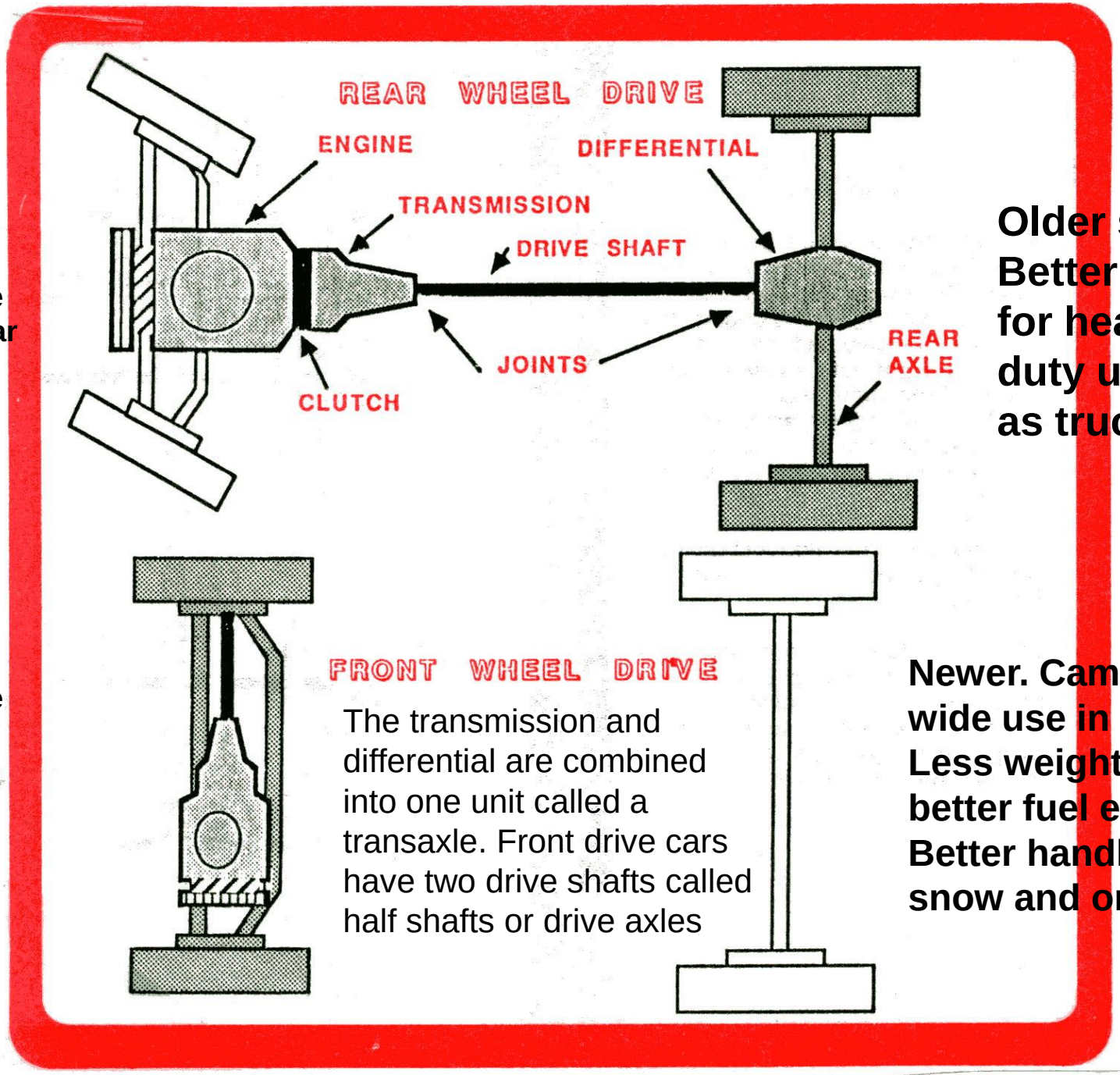
In front-wheel drive vehicles, power is carried to the front wheels by two half shafts. A **transaxle** is located between the two half shafts and replaces the transmission and differential.



Transmitting power in a front-wheel drive vehicle

Check your automatic transmission or transaxle fluid once a month. Jerky shifting, slipping in and out of gears while driving, or pauses before the vehicle starts to move are signs of a low transmission fluid level. Your owner's manual explains how to check the fluid level.

Rear wheel drive. Engine is front to rear



Older style. Better suited for heavy duty use such as trucks

Front wheel drive. Engine is transverse or sideways

Newer. Came into wide use in the 1980s Less weight thus better fuel economy. Better handling in snow and on ice

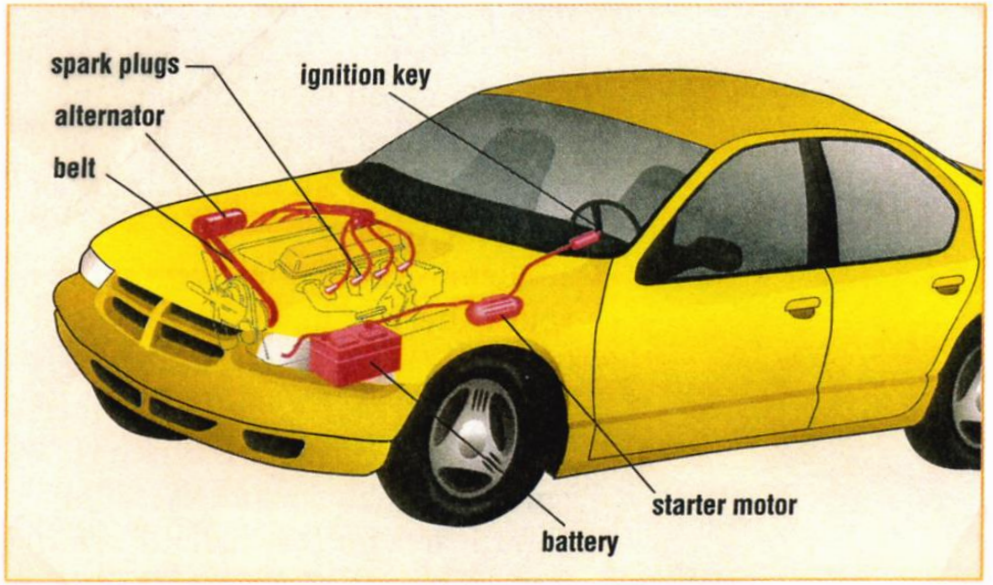
Ignition and Electrical Systems

The ignition system sets off combustion in your engine's cylinders. The electrical system is involved in the ignition process and also provides the electrical power needed to operate your vehicle's lights, controls, and accessories.

Alternator

When you turn your key in the ignition, an electrical current sent from the battery to the electric starter turns the engine. Once the engine is running, the **alternator** generates an electrical current that recharges the battery. A belt drives the alternator. Current from the battery continues to power the ignition system. This system delivers energy to each spark plug at the proper time to ignite the air–fuel mixture in each cylinder.

If the alternator light comes on while you are driving, or the battery gauge displays a strong discharge, the alternator is not working properly. It is not generating electricity. The problem could be as simple as a broken or loose belt, or as complicated as an internal electrical problem.



Ignition and electrical system

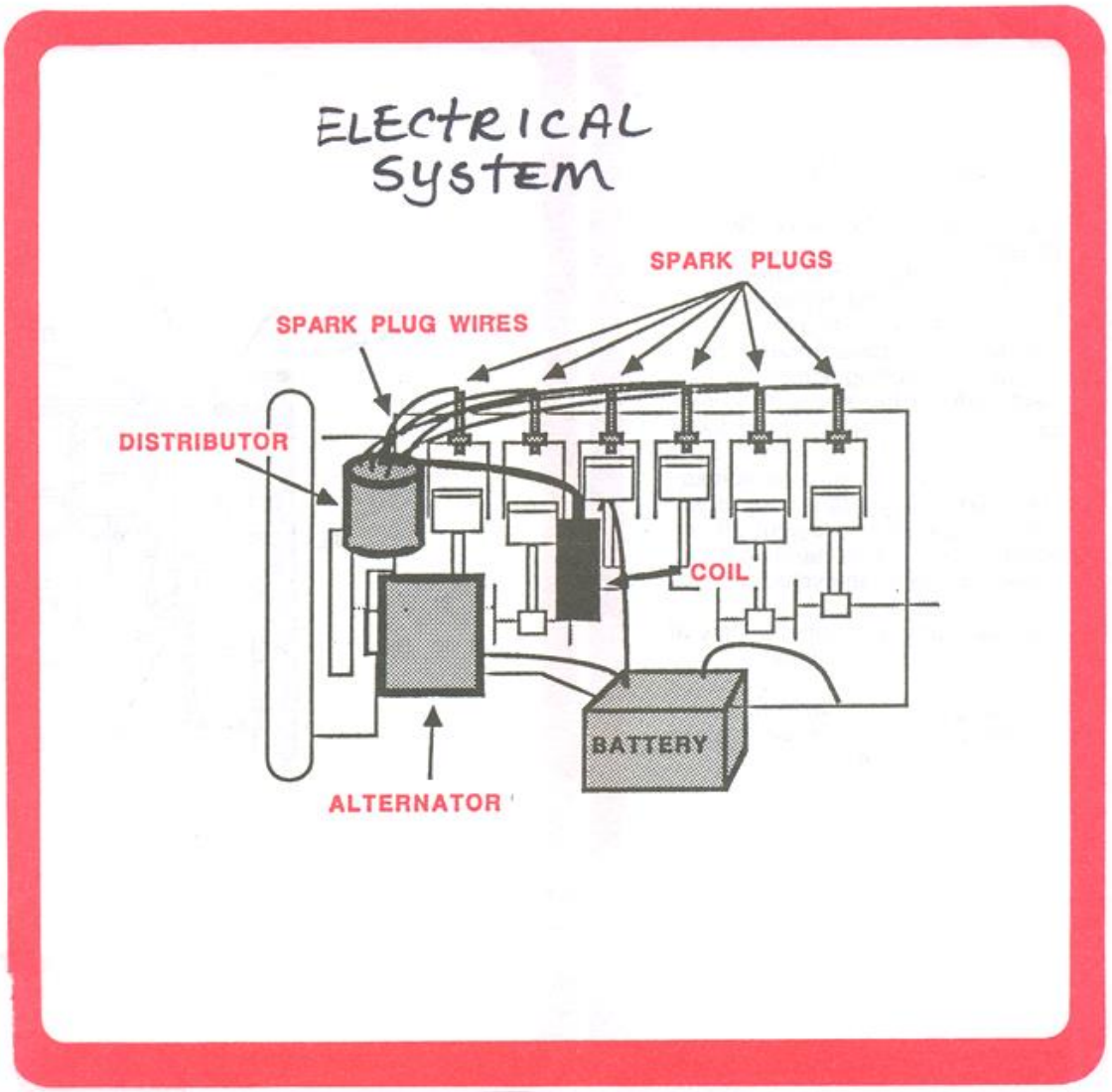
Battery

A vehicle's starter, lights, computer-assisted controls, and other electrical accessories depend on the electrical power stored in the battery.

Extreme cold or hot weather makes starting your vehicle difficult. A battery has less power when it is cold or overheated. Keep your battery charged to avoid failure. If the engine turns over very slowly when you try to start your vehicle, have the battery charged or replaced.

Keep battery cables tight and free of corrosion, especially where the terminals connect to the battery. Most batteries in today's vehicles are sealed and do not need to have their fluid levels checked. Read your owner's manual for maintenance information.

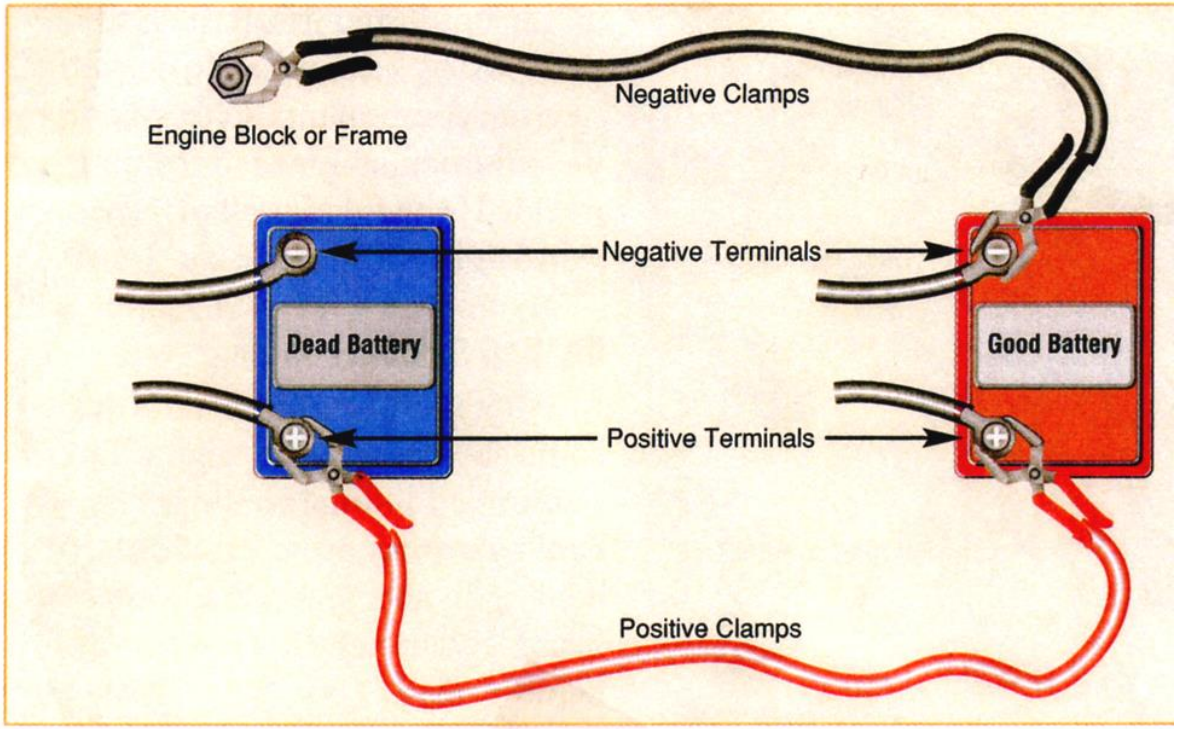
Always wear eye protection and gloves when working with, or around, a battery. A battery releases hydrogen gas, which is very explosive. Never expose a battery to an open flame or electrical spark. Never let battery fluid touch your eyes, skin, or clothing. The fluid is a strong acid that can cause severe injury.



Starting a Vehicle That Has a Dead Battery

If you turn the ignition key while in PARK or NEUTRAL and the starter makes no sound, it usually indicates a dead battery or bad battery connection. You may be able to jump-start your vehicle by using a jumper cable connected to another vehicle that has a good battery. Check both owner's manuals before you attempt to jump a dead battery. Follow the recommended procedures for your vehicle. *Note:* Both batteries must be the same voltage.

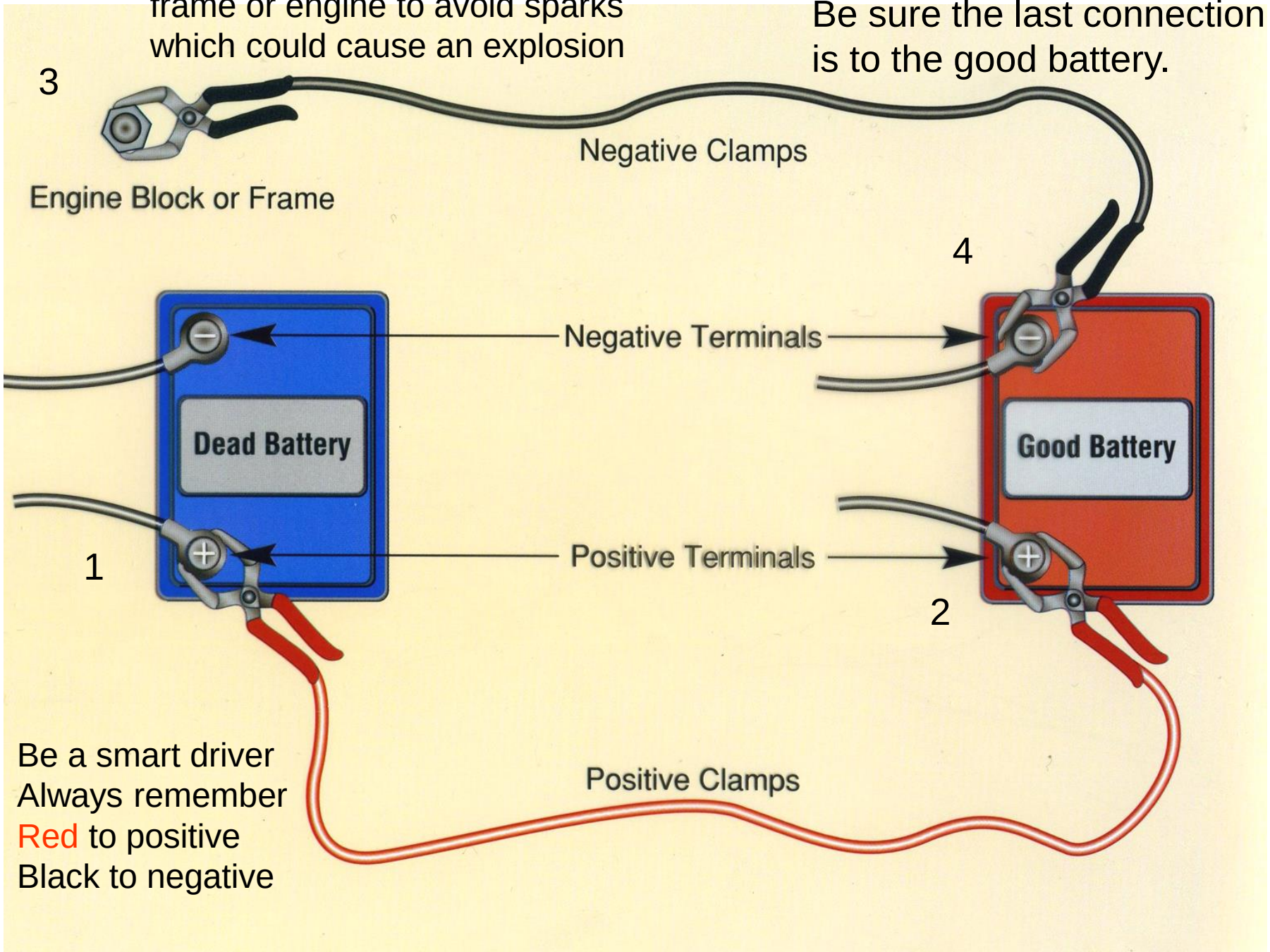
Remove any battery vent caps on your battery (if not a self-contained battery). *Do not jump a dead battery that has frozen cells; the battery might explode.* If the battery is frozen, remove the battery and place it in a warm area for several hours, away from direct heat, before trying to jump-start it.



Jumper cable connections for jump-starting a vehicle

Attach the jumper cable to the frame or engine to avoid sparks which could cause an explosion

Be sure the last connection is to the good battery.



Be a smart driver
Always remember
Red to positive
Black to negative

Lubrication and Cooling Systems

Lubrication is the use of oil, grease, or other substances to reduce damage to moving parts from heat caused by friction. *Cooling* is a process of reducing heat that builds up in a vehicle's engine or transmission. Excessive heat can destroy the engine and other moving parts of the vehicle. Proper lubrication and cooling keeps the systems operating efficiently.

Lubrication System

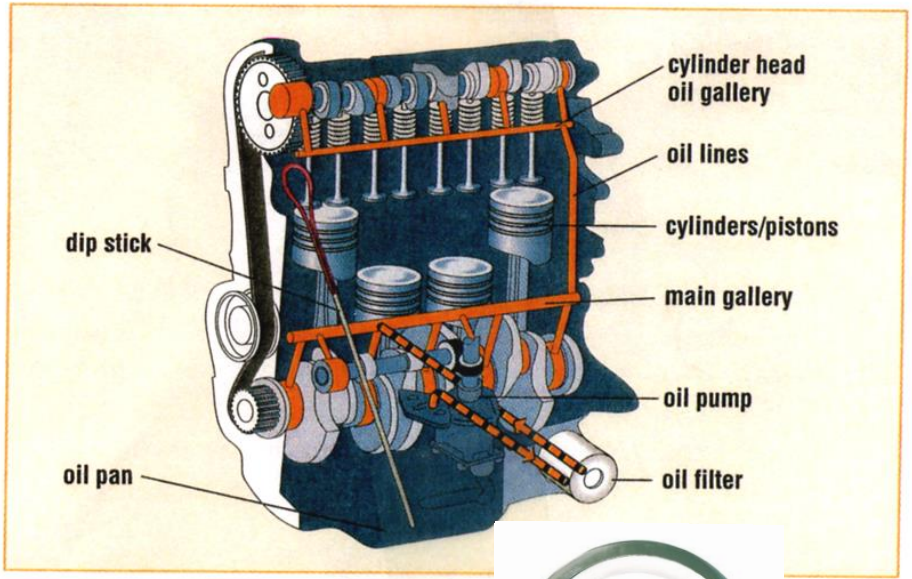
Lubricants, such as oil, help the engine operate efficiently by reducing friction, carrying away engine heat, and cleansing engine parts.

The **oil pump** forces oil from the oil pan at the bottom of the engine through the oil filter. From the filter, the oil flows through oil lines to the engine's moving parts. Oil is returned to the oil pan, and the cycle is repeated.

All vehicles need to have the oil changed, either after a specific number of miles or months. Oil filters are typically replaced at the same time. If you make a lot of short trips, you may need to have your oil and filter changed more often than recommended.

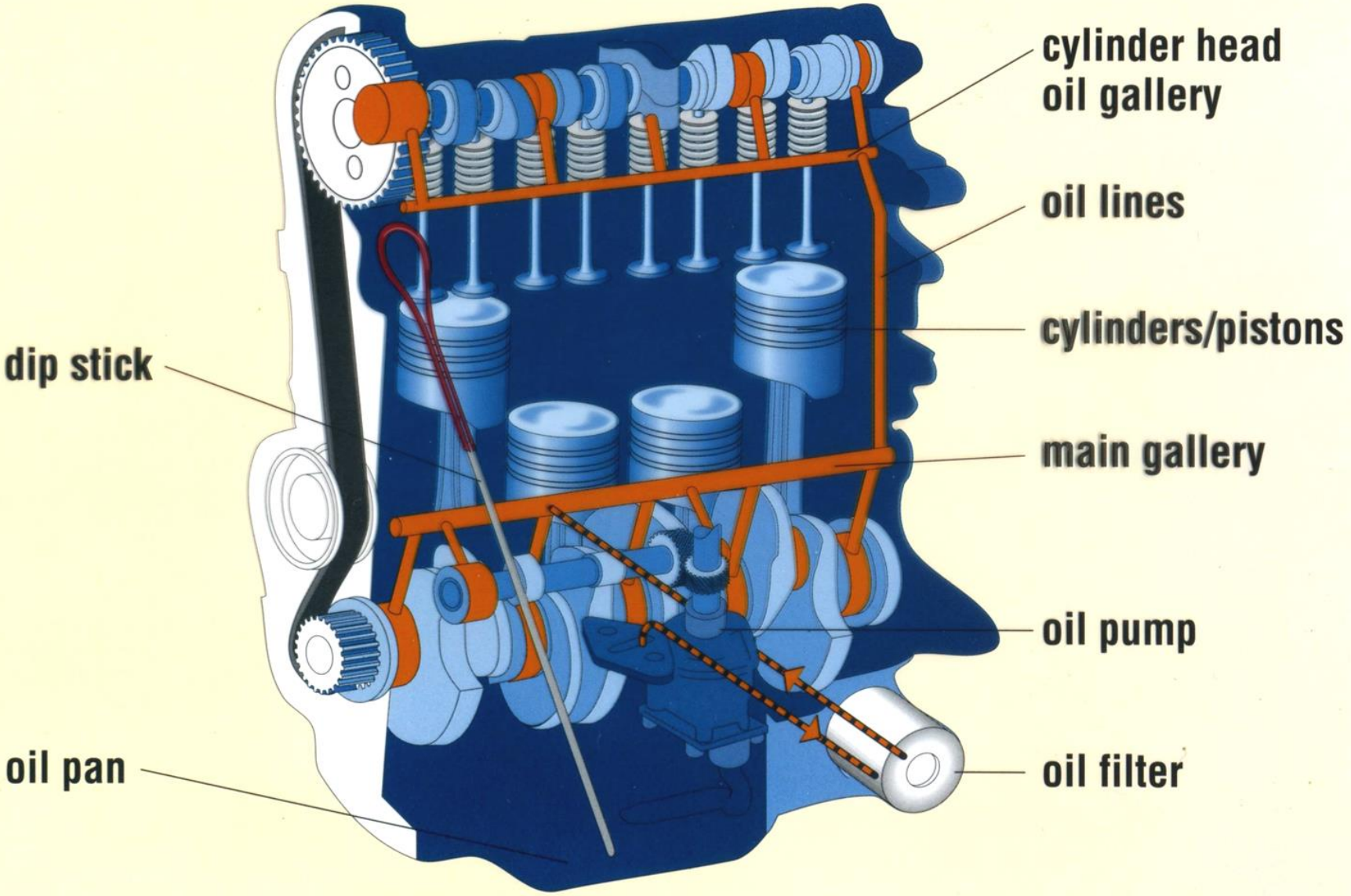
If the oil-pressure warning light comes on while you are driving, it indicates oil is not going through your engine quickly enough to lubricate it. Pull over to the side of the road when it is safe to do so. Turn off your engine and wait a while before checking the oil level. If your oil level is not the problem, your vehicle needs service right away. Low oil pressure can damage an engine very quickly.

Your vehicle also needs to be greased periodically. Grease is commonly used to lubricate such things as the axles, suspension parts, and steering components. Check your owner's manual for the recommended schedule for all of your vehicle's lubrication needs.



Lubrication system

Lubrication System



Cooling System

Although lubricating oil removes some engine heat, the engine requires additional cooling. The cooling system provides additional cooling. It also provides a source of heat for your vehicle's interior in cold weather.

The cooling system includes a fan, fan belt or electric motor, radiator, water pump, coolant recovery (or surge) tank, thermostat, and hoses that connect the radiator to the engine. The **radiator** holds and cools the coolant, a mixture of water and antifreeze. The owner's manual indicates the correct mixture to use in your vehicle.

The **water pump** draws coolant from the radiator and forces it through the engine's cooling passages. The fan draws air through the radiator and helps cool the coolant.

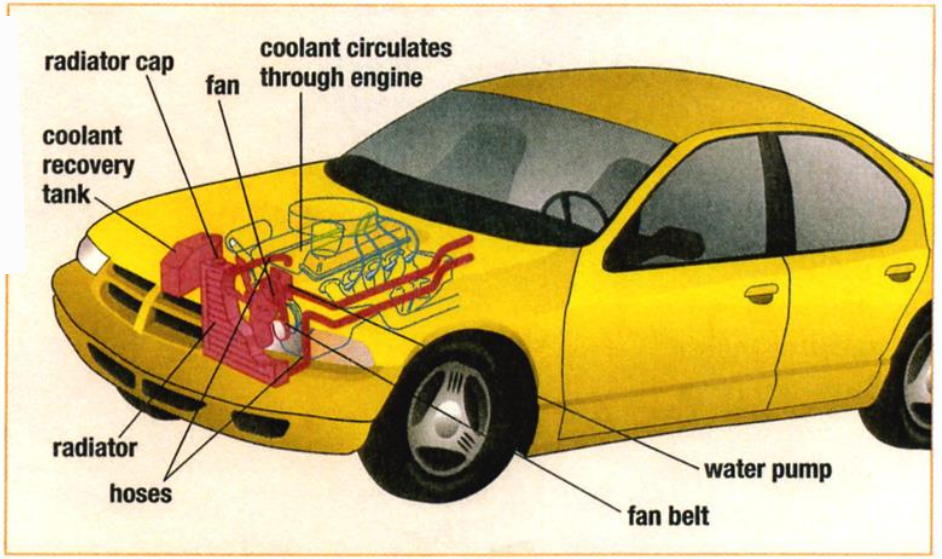
The **thermostat** opens and shuts to control the flow of coolant to the radiator. When the temperature in the system rises to the correct level, the thermostat opens to let coolant flow to the radiator and maintain a stable temperature.

Overheating can damage your engine as a result of a low coolant level, blocked radiator airflow, frozen coolant in the system, or a faulty thermostat. Check your coolant level at least once a month. Check the coolant surge tank before you start the engine. If the coolant level is low, pour a 50/50 mixture of water and coolant into the surge tank to the prescribed level.

Check your radiator hoses every time you change your oil. Look for cracks and squeeze the hoses to feel for spongy spots. Replace hoses that are cracked, leaking, or have a spongy feel to them.

Many vehicle manufacturers suggest the cooling system be flushed and replenished with fresh coolant at least once every two years. Check your owner's manual for recommended service intervals for your vehicle.

Overheating an aluminum engine just once can ruin it



Cooling system

Fuel and Emission Systems

The purpose of the fuel system is to provide fuel needed for the creation of power to move a vehicle. The fuel system includes a fuel tank, fuel line, fuel pump, air cleaner, fuel filter, and carburetor or fuel-injection system.

The emission (or exhaust) system takes the exhaust created by the burning of fuel, and forces it through the exhaust system to the outside of the vehicle. The system includes the positive crankcase ventilation system (PCV), the exhaust gas recirculation system (EGR), the heat control valve, the catalytic converter, exhaust pipe, muffler, and tailpipe.

Fuel System

The fuel pump draws fuel from the fuel tank through the fuel line. Fuel is then pumped to the **carburetor** or **fuel-injection system.** Air is drawn through the air filter and mixes with the fuel. The fuel–air mixture becomes a fine mist for combustion in the cylinders of the engine.

Most new vehicles have electronic fuel-injection systems rather than carburetor systems. Fuel-injection systems deliver the exact amount of fuel to each of the engine's cylinders at the proper time to give maximum power and fuel efficiency. Fuel-injection systems also reduce the amount of pollution-causing gases.

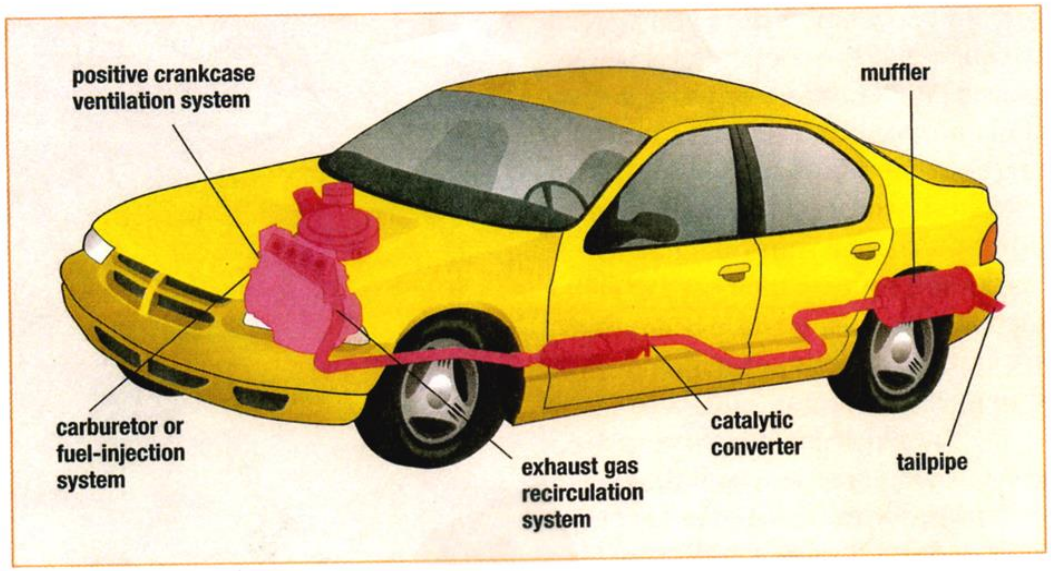
Emission System

The combustion process creates exhaust. The emission system takes the exhaust and recirculates unburned fuel back into the combustion process for greater efficiency. The **catalytic converter** then converts harmful gases into less harmful gases and water. It also cuts down levels of nitrogen oxides, which the sun heats into smog.

The **muffler** reduces the noise from combustion sounds in the engine. Over time, holes develop in mufflers due to rust. If you notice that your vehicle's engine sounds louder and louder over time, it is likely you have a hole in your muffler.

After passing through the muffler, the exhaust leaves the exhaust system through the tailpipe at the rear of the vehicle.

Have your emission system checked periodically to ensure there are no leaks in the system. By doing this, you reduce your risk of carbon monoxide poisoning while driving.



Vehicle emission system

The last year a vehicle with a carburetor was sold in the USA was about 1990

Steering System

The steering system includes the steering wheel, steering column, steering gear, and the connections to the front wheels. The steering column transmits your steering input to move the front wheels of your vehicle in the direction you choose.

Most vehicles today have **power steering,** a system that uses a hydraulic pump and fluid to make steering easier for you. Avoid turning the steering wheel when the vehicle is not moving. This causes wear on the steering system.

Steering problems often develop gradually rather than suddenly. This may make them difficult to recognize. Any steering problem is serious and should be repaired immediately. Common indications of problems include

- "play" or excess movement in the steering wheel
- steering difficulty, even though the tires are properly inflated
- shimmying or wobbling, or shaking or pulling to one side under normal driving conditions
- squealing sounds when you make turns

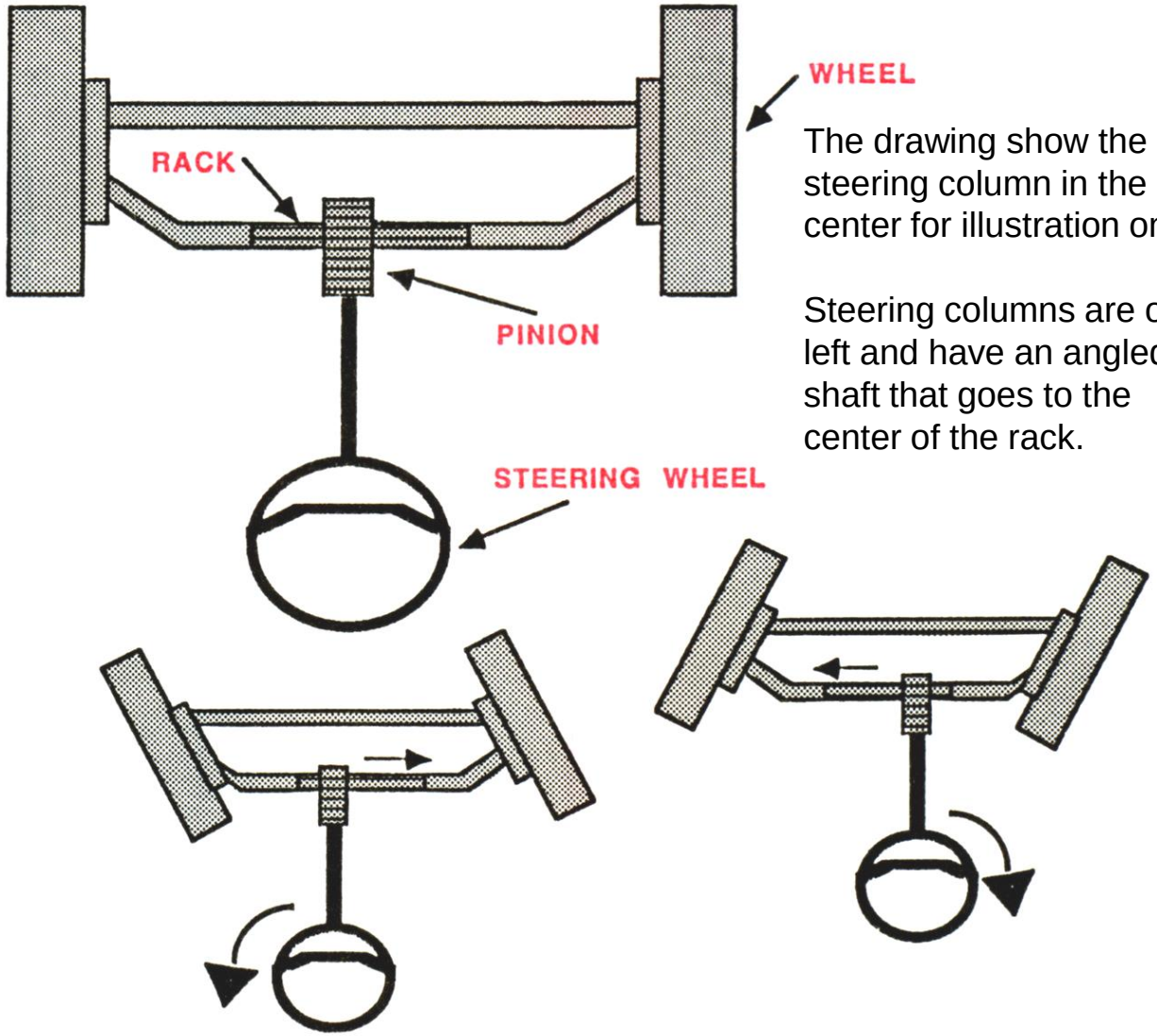
Suspension System

The suspension system includes a series of rods, bars, springs, and other components. This system keeps the wheels and tires pointed in the direction you are steering. The springs in the suspension system support the vehicle to allow a gentle up-and-down motion while driving. A shock absorber or strut assembly unit is located at each wheel to control hard bouncing and to keep the tires on the roadway.

If you notice your vehicle bouncing more than usual, or you find uneven tire wear, there may be a problem with its suspension. Check your owner's manual for the recommended intervals for servicing or replacing your vehicle's shocks, struts, and joints.

Clunking sounds when driving over bumps is a sign of possible loose or worn suspension parts

RACK-AND-PINION STEERING



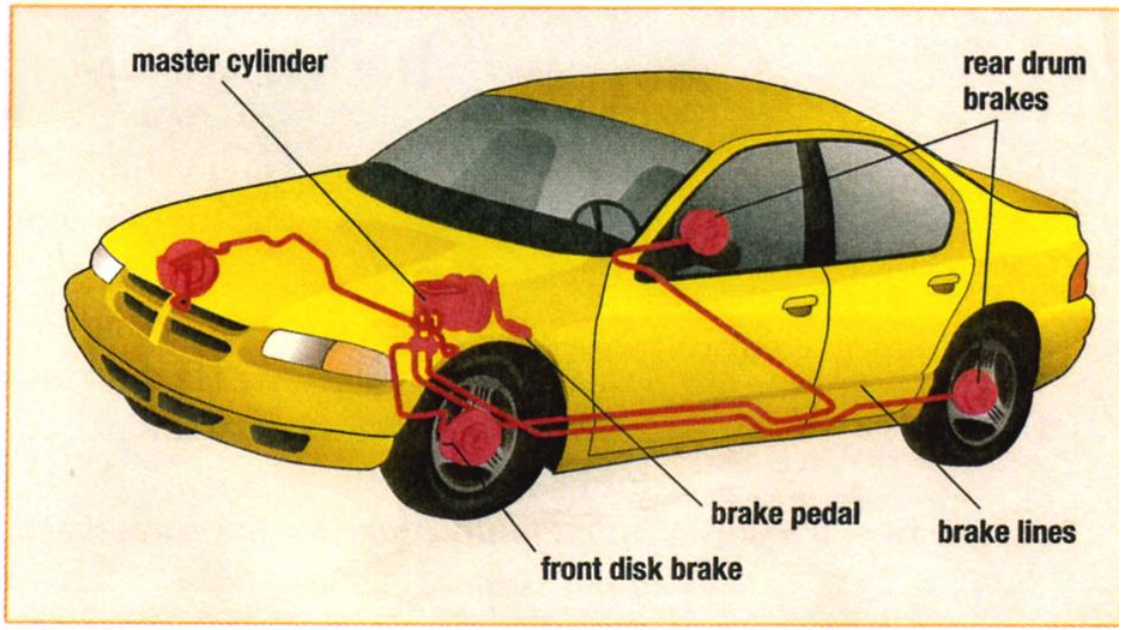
The drawing show the steering column in the center for illustration only.

Steering columns are on left and have an angled shaft that goes to the center of the rack.

Brake System

Good brakes are essential for the safe operation of a vehicle. The life expectancy and performance of your brakes depend on how you use and maintain them. A vehicle's brake system is composed of four individual brakes (one on each wheel), brake lines, brake fluid, wheel cylinders, and a master cylinder.

The brake system's **master cylinder** contains two parts. Each part controls two wheels. When a driver applies pressure on the brake pedal, brake fluid is forced from the master cylinder through the brake lines to each wheel's brake cylinder. The cylinder at each wheel forces the brake shoes or brake pads against a brake drum or disk. The pressure causes friction, which slows or stops the wheel.



Brake system

This drawing shows disc/drum brakes which are the most common. Four wheel disc brakes are an option on many vehicles and standard on some.

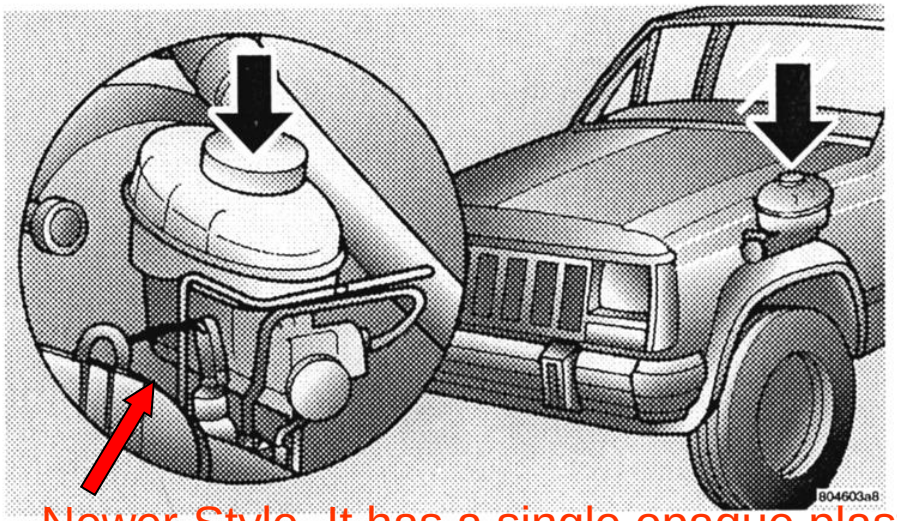
Front disc brakes have been a federal requirement since about 1975.

Disc brakes are superior in that they apply pressure equally, do not need to be adjusted and dissipate heat faster than drum brakes.

Brake System

Checking Fluid Level

The Brake Fluid reservoir is located behind the air cleaner.



Clean the cap and reservoir exterior before removing the cap. Fill the reservoir to the full mark on the side of the reservoir. Do not overfill.

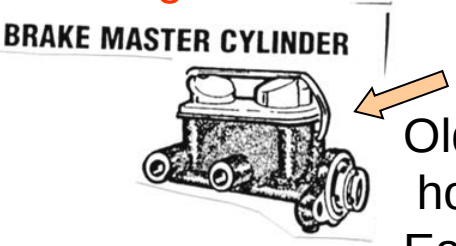
WARNING!

Do not overfill. The fill level is marked on the side of the reservoir. Too much fluid will create excessive pressure and leak fluid around cap of reservoir. Your brakes may not work properly and you could have an accident.

Recommended Fluid

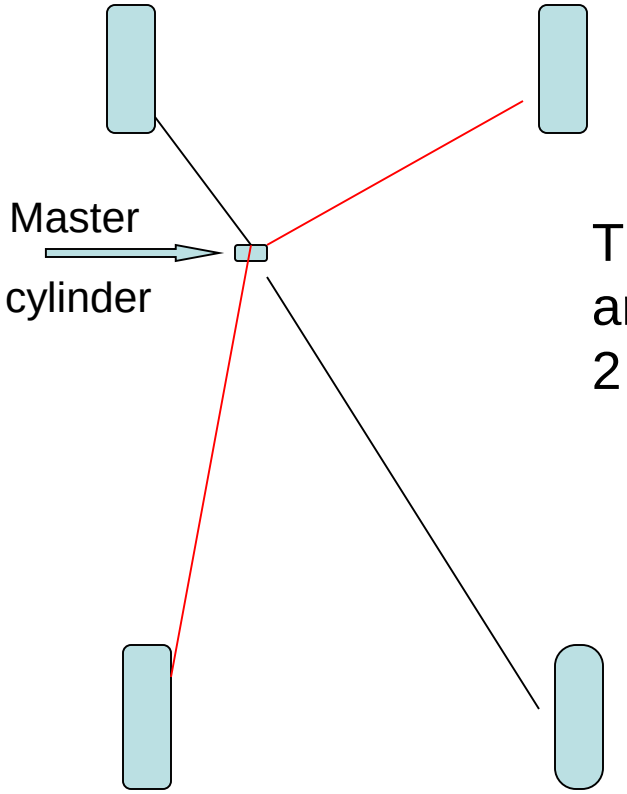
Mopar Brake Fluid or equivalent meeting SAE J1703 and DOT 3.

Newer Style. It has a single opaque plastic reservoir and a single cap but it still has two brake lines coming out. Checking is done visually. It has min-max lines



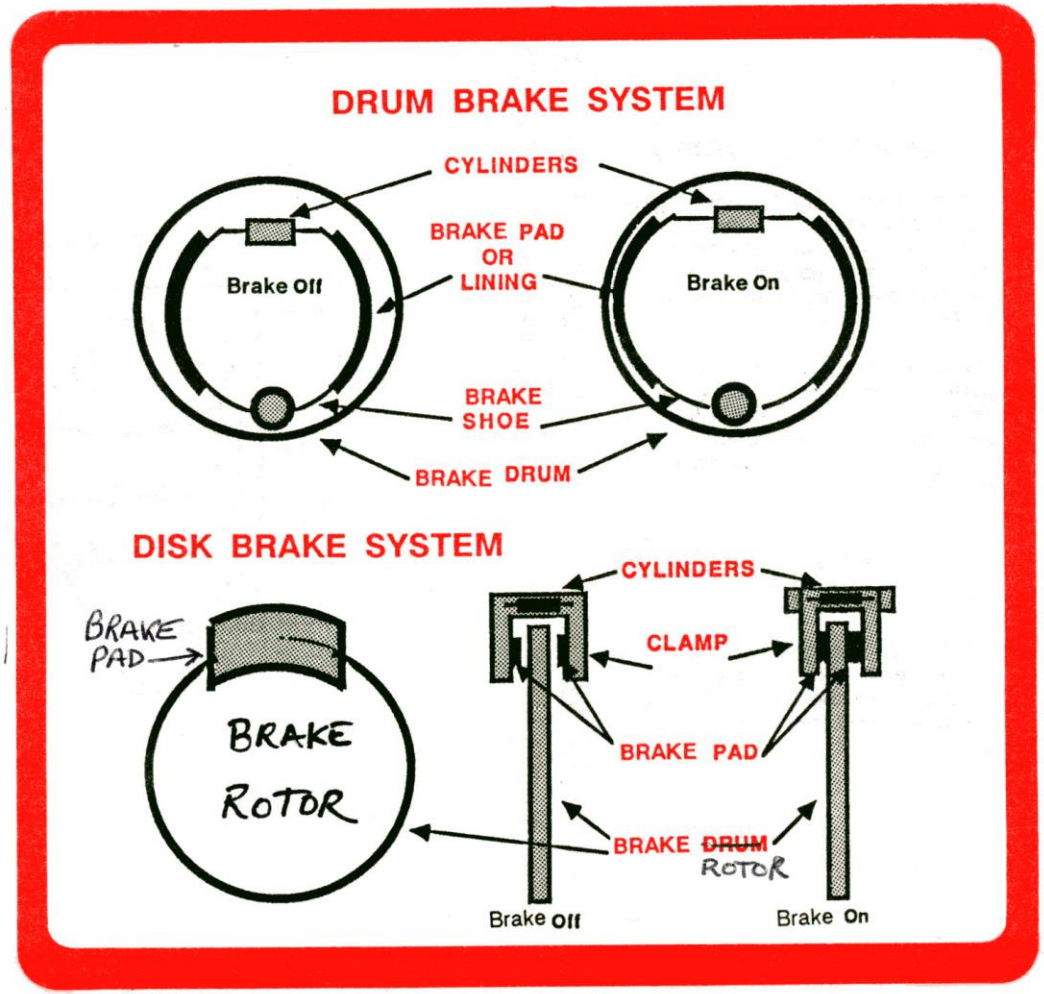
Older style master cylinder. It has a wire bale over the top that holds the cap in place. This style has two separate chambers. Each chamber has a port for brake lines that go to one front wheel and one back wheel on the opposite side of the vehicle (diagonally). This is called a Dual Diagonal Brake System

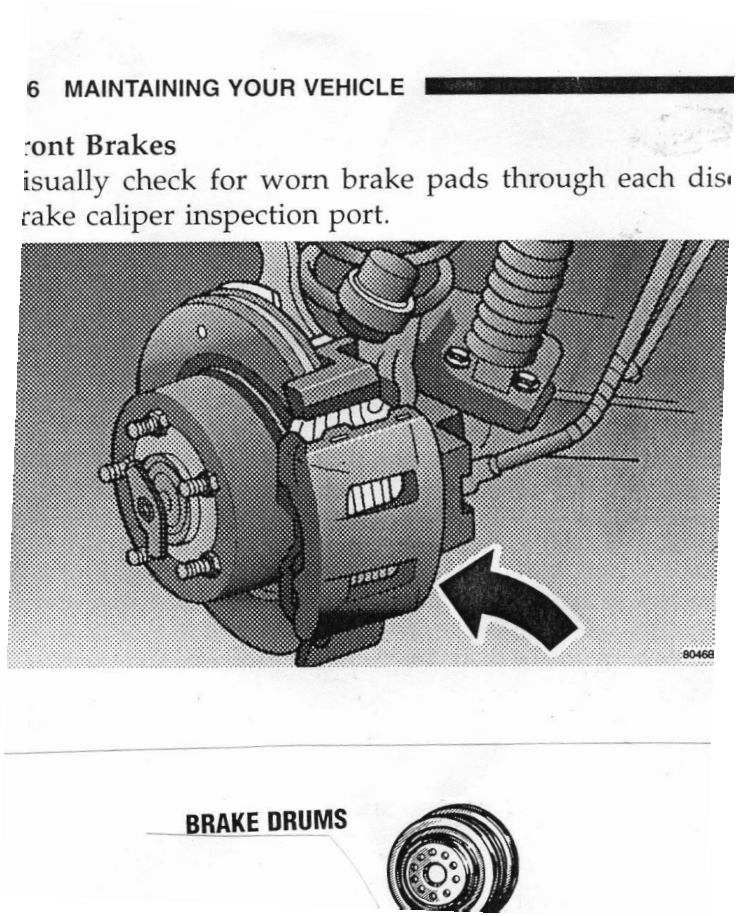
Example of a dual diagonal braking system



The 2 red brake lines are separate from the 2 black brake lines

If any part of the brake system fails or is damaged, only one half of the system loses it's hydraulic fluid. The vehicle still has part of it's braking system available thereby avoiding total brake failure.





You can inspect the brake pad linings by removing a front wheel and looking through the opening on the back side of the caliper as shown by the arrow.

Most vehicles' brake systems are designed with fail-safe systems. If a leak develops in the brake system, the brake warning light on the instrument panel will likely come on. Because of the dual master cylinder, however, fluid under pressure should still reach one pair of the wheels. Stopping distance will increase and handling may be erratic. The braking system must be checked and repaired immediately. *Never drive a vehicle with a faulty brake system, regardless of the distance.*

A vehicle's disk and drum brakes self-adjust when braking in reverse. If you notice that the brake pedal goes closer than two inches to the floor when you press the brake pedal hard, adjust the brakes. To adjust the brakes, stop, back up, and brake firmly. Repeat this procedure several times. If the problem persists, have your brake system inspected.

If the brake or antilock brake warning light stays on after starting your vehicle or comes on while driving, these are indicators of possible brake problems. Some other indications of potential problems include

- "spongy" feel in the brake pedal
- pulling to one side when stopping with dry brakes
- grabbing or uneven brake action
- squealing or chattering noises in the brakes
- a need to push the brake harder than usual to stop the vehicle

The parking brake is a separate brake system. A steel cable connects the parking brake pedal or lever to a separate brake assembly on the rear wheels only. When properly adjusted and engaged, the parking brake should hold a vehicle on a hill. If the parking brake doesn't hold, have it repaired.

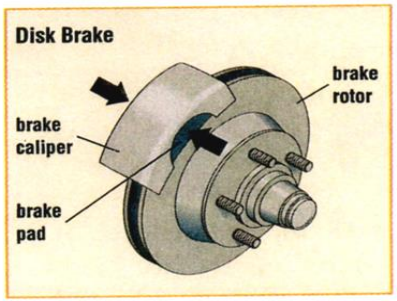
Keep the brake fluid in the master cylinder at the proper level. Use the brake fluid specified for your vehicle. Have your brakes checked on an annual basis, or as soon as you notice potential problems. Proper maintenance of your vehicle's brakes may not only save you money, but could save your life.

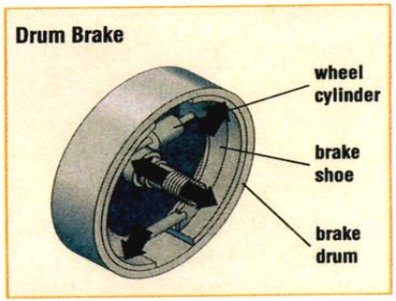
The book is incorrect. Only drum brakes need to be adjusted and self adjust when backing up and braking

DRIVE RIGHT

DID YOU KNOW?

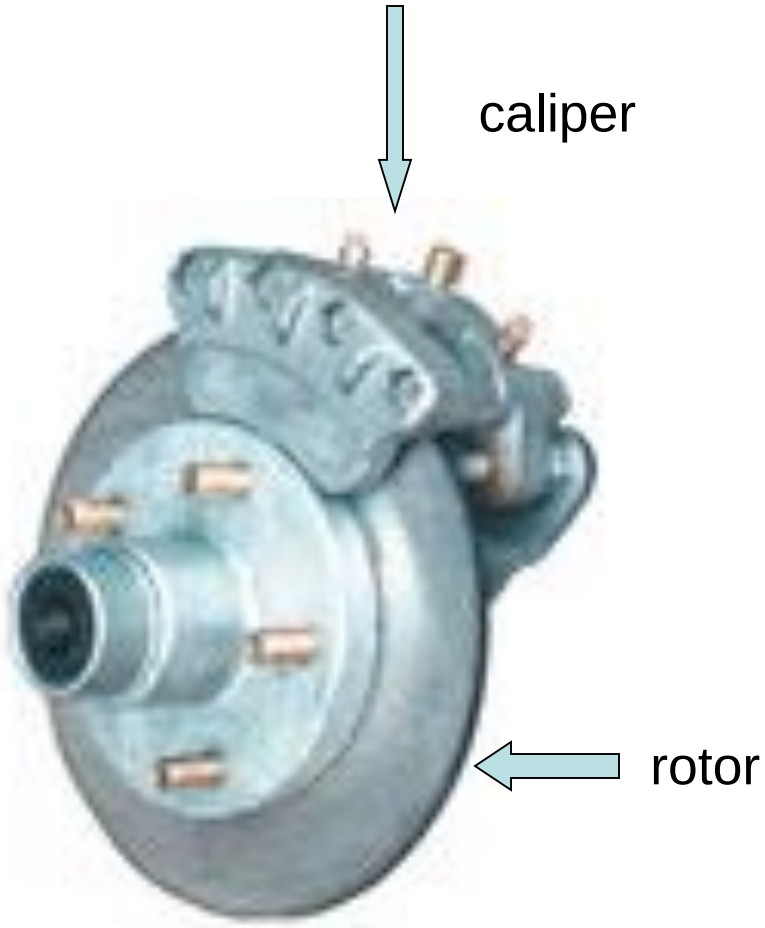
DISK BRAKES AND DRUM BRAKES Many vehicles have a disk brake on each front wheel and a drum brake on each rear wheel. Some vehicles have disk brakes on all four wheels. A disk brake works as fluid pressure presses the pads against the sides of the rotating disk inside the wheel. A drum brake works as fluid pressure forces the brake shoes against the hollow cylinder drum inside the wheel. Each type of brake causes friction that slows or stops the turning wheels.





What it looks like behind the brake drum

Brake drum



Another example of a disc brake

Tires: A Traction Control System

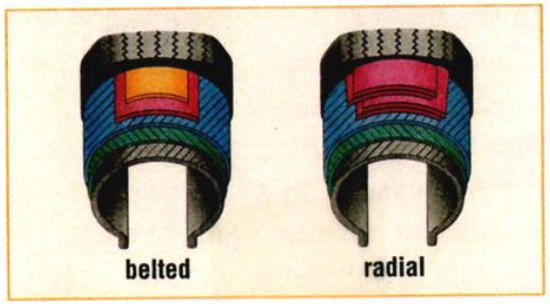
Your tires are your vehicle's lifelines to the roadway. It is important to understand your vehicle's tires and to ensure that your vehicle is equipped with tires that best meet your driving needs.

Tire Construction

A tire is made of rubber reinforced with layers of material under the tread. Each layer, called a *ply*, strengthens the tire and gives it shape.

A **belted tire** has special layers added to a bias-ply tire for improved strength, performance, and mileage. A **radial tire** has plies that run straight across under the tread, and strengthening belts of steel or other materials that circle the tire. Radial tires give improved tread mileage, traction, and fuel economy, compared to other tires.

Information about the tire's construction, size, recommended inflation levels, and carrying capacity is clearly marked on the sidewall of the tire. New tires usually have a paper label attached with additional information.



Tire construction

This is referred to as "bleeding" a tire. Never do it

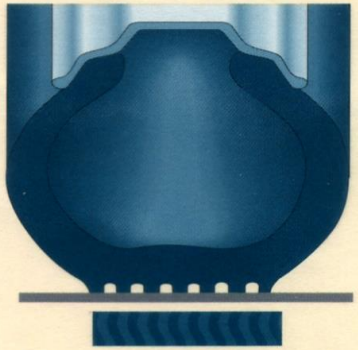
Inflation and Tread

Maintain the manufacturer's recommended air pressure in the tires at all times. Keep a reliable tire gauge in your vehicle and use it regularly. Maintaining the proper air pressure in the tire will yield maximum fuel efficiency and tire mileage. Too little air in one of your tires can make handling the vehicle more difficult.

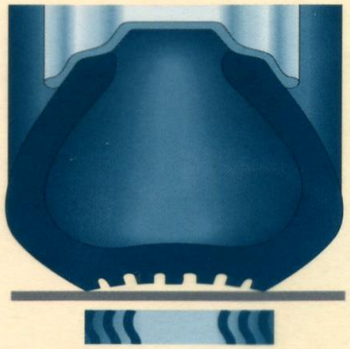
Air pressure in a tire rises in warmer weather and falls in cooler weather. Air pressure increases whenever the vehicle is driven, regardless of the distance of the trip. Don't let air out of a warm tire in an attempt to reduce the air pressure to the recommended level. The tire will be underinflated when it cools. Overall, cool tires will provide the most accurate and stable readings.

Be a smart driver. Buy a tire gauge, keep it in the glove box and use it. Radial tires have "radial bulge" which makes it hard to tell if a tire is low.

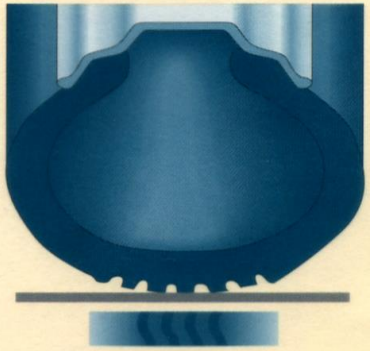
Proper Inflation for Better Grip on Road



Proper Inflation



Underinflation



Overinflation

TIRE TIPS

- **Check tire pressure once a month**
- **Don’t forget to check the spare**
- **The owners manual and/or the tire label will have proper inflation pressures.**
- **Be sure you know the size of the tire when looking at the owners manual or tire label. Some vehicles come with different size tires as options and the inflation pressure could vary by tire size.**
- **All tires lose air gradually. In cold weather tires will lose air more rapidly. Always adjust tire pressure in the fall after the weather turns cold.**
- **Always check air pressure when the tires are cold. Check them before driving the car.**
- **Never “bleed” a ‘hot’ tire, ie: a tire that is warm or hot from recently being driven**

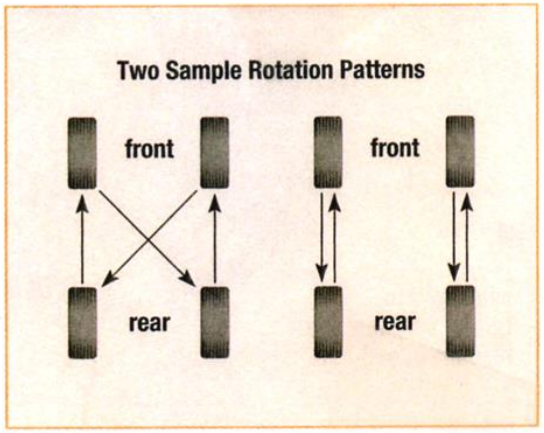
MORE TIPS

- **Rotate tires every 6,000 to 7,500 miles or every other oil change.**
- **By rotating tires regularly and keeping the inflation pressure up, you can get 50,000 or more miles out of a set of tires.**
- **Consider buying a small, 12 volt cigarette lighter operated air compressor so that you can maintain tire pressure yourself**
- **Keep a small spiral notebook in the glove box. Note mileage, date and pattern of rotation so you can go back and refer to it when the next rotation is needed.**
- **Use the same spiral notebook to jot down the date and mileage of all repairs, oil changes, other services and work done.**
- **A spiral note book will keep all of your automotive information in one handy place.**
- **Even with a spiral notebook, you should still save your receipts especially if your car is under warranty or extended warranty**

Rotation and Alignment

Rotate your tires regularly to promote longer tire life. Different rotation patterns are recommended for different vehicles and tires. See your owner's manual for the recommended pattern and schedule you should follow for your vehicle. The illustration shows different rotation patterns for different vehicles and tires.

In addition to rotating your tires, have them balanced periodically to promote even wear. Whenever you have your tires balanced, it is also a good idea to have your wheels aligned. Alignment is especially important on front-wheel drive vehicles. Proper wheel alignment also increases the life of the tires and reduces excessive and uneven wear.



Tire rotation patterns

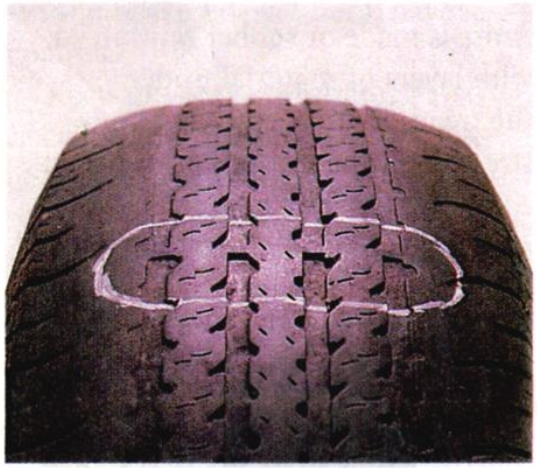
Rotate tires front to back on same side. The next time, rotate them in an X pattern.

By alternating the rotation pattern from front to back and then to an X pattern, the tires will get to all four corners of the vehicle and wear will be distributed evenly.

Replacing Tires

Most tires have wear bars built into them. A smooth bar will appear across your tire when the tread has worn down. A worn tire has poor traction on wet roads and is more likely to fail. When you can see one or more wear bars on any tire, it is time to replace that tire.

Replacement tires should be the same size and type as the tires they are replacing. Never use radial tires with any other type of tire on the vehicle. Radial tires do not react the same as belted tires.



Notice the wear bar!

Tire Quality and Grading

All tires sold in the United States are rated on the Uniform Tire Quality Grading System, as seen in the chart.

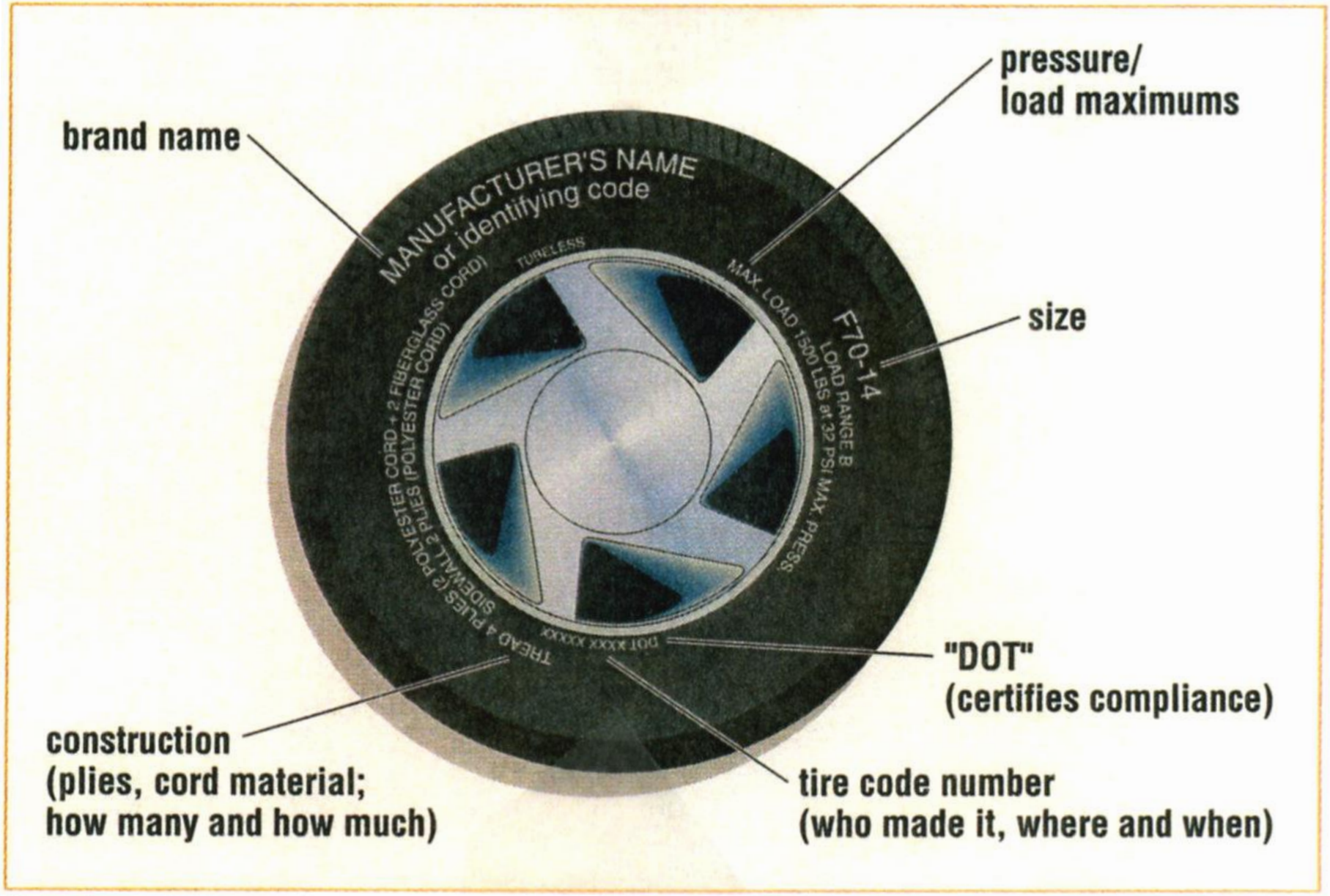
A tire's performance is measured under ideal controlled conditions on specific test surfaces and over a special test route. They are rated by traction, temperature, and treadwear performance.

Keep safety in mind when you are in need of new tires. Compare and decide which type of tire offers the best value for the kind of driving you do. Check your owner's manual for recommendations on tires for your vehicle.

Grades of Tires

Tire Grading	Traction	Temperature	Treadwear
Highest	A	A	200 190 180 170 160
	B	B	150 140 130 120 110 100
Lowest	C	C	90 80 70 60 50

- A tire's traction is measured by its ability to stop a car in straight-ahead motion on a wet surface. An A-graded tire has the best traction performance.
- Temperature resistance indicates a tire's ability to withstand heat. A tire graded A is the most heat-resistant, and is the least likely to suffer a blowout under the same conditions as tires with grades of B or C.
- The higher the treadwear rating, the greater the mileage. A tire with a treadwear rating of 150 is expected to last 50 percent longer than one graded at 100.



Information on the sidewall

A good rule to follow is: Do not pay for any more octane than you need

Engines have a detonation or knock sensor built in to detect pinging. The computer adjusts the timing as you drive.

However if your owner's manual recommends premium fuel, do not skimp; use premium

At a Fuel Stop

Most drivers fill their own vehicle's fuel tanks at self-service stations. Turn off your engine before you begin refueling. Follow posted instructions for refueling. Smoking is *always prohibited* near fuel pumps.

Almost every gas station offers a selection of types and grades of fuel. Check your owner's manual for your vehicle's recommended octane rating.

Alternative fuels are becoming more common. One type of alternative fuel is gasohol. Gasohol is a blend of gasoline and either methyl or ethyl alcohol.

Whenever you stop for fuel, it's a good time to perform routine checks and service. Here are some examples:

- Check your oil level. Add oil if needed.
- Check the windshield washer fluid level. Add additional fluid to the reservoir, if needed.
- Clean your windshield, windows and headlights.
- Check your windshield wipers for cracks. Replace damaged blades.
- Check your tires. Do they look low? Is the tire pressure correct? Are there any visible cracks in the tire? Take care of crucial problems before you leave the gas station.

While refueling, clean your windows and check wiper blades for any damage or excessive wear.

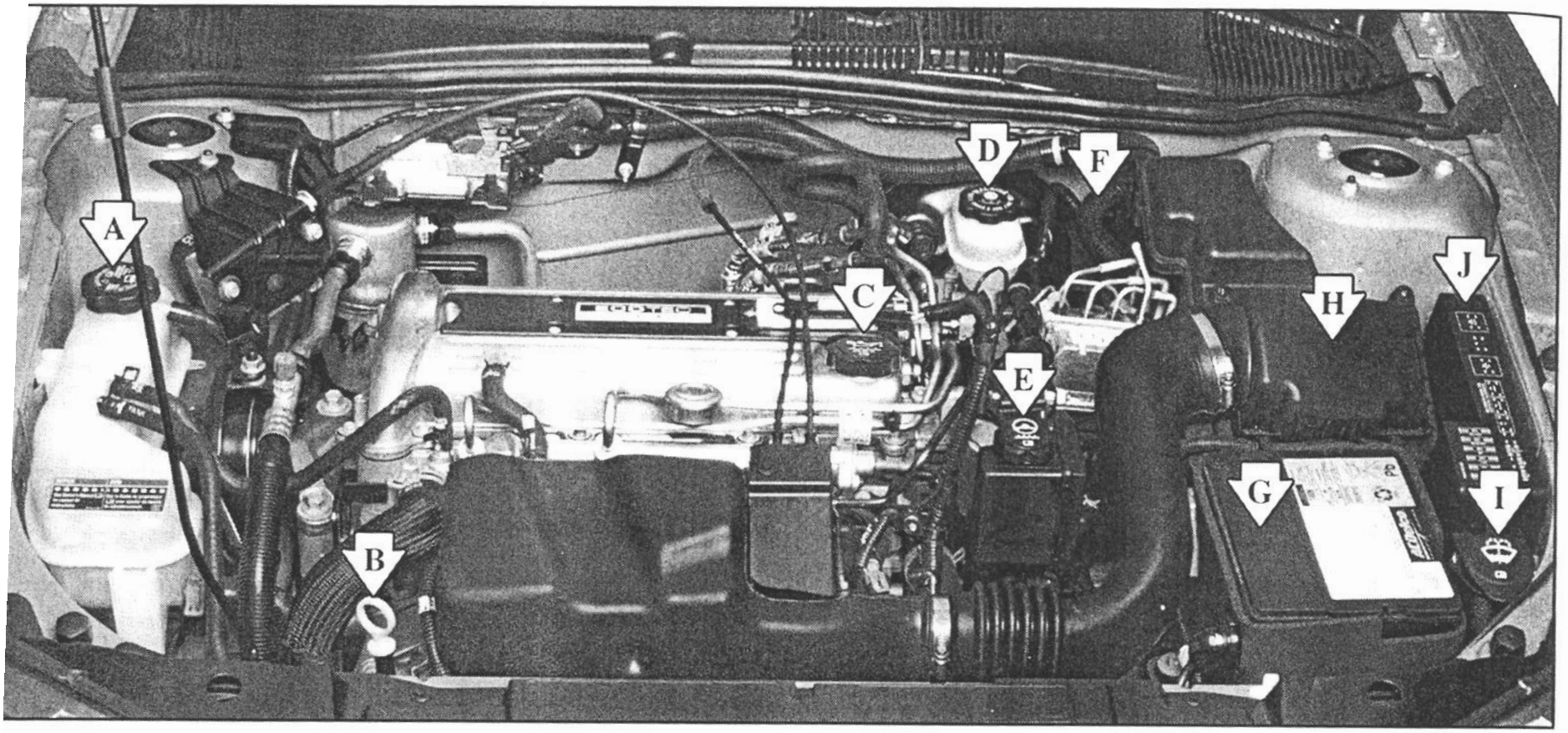
Scheduled Service

Vehicles need periodic service. Your owner's manual shows the recommended maintenance intervals for you to follow. Save all of your service receipts. Keep a comprehensive maintenance history of your vehicle, especially for warranty-related repairs.

Be a smart Driver. Learn what maintenance procedures are needed and their intervals. have them done. Like the oil filter commercial said: "Pay me now or pay me later."

Service Station Under Hood Checks

hen you open the hood on the engine, you'll see the following:

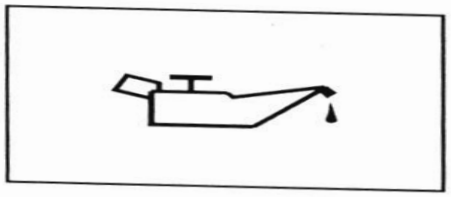


The engine oil dipstick is arrow B. The handle of the dipstick is usually yellow

Arrow A is the coolant recovery bottle Arrow C is where to add engine oil

Arrow I is where to add windshield washer fluid

Engine Oil



If the oil pressure light appears on the instrument cluster, it means you need to check your engine oil level right away.

For more information, see *Oil Pressure Light on page 3-32*.

You should check your engine oil level regularly; this is an added reminder.

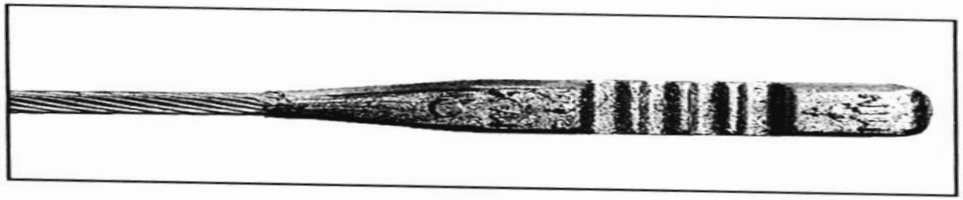
Checking Engine Oil

It is a good idea to check your engine oil every time you get fuel. In order to get an accurate reading, the oil must be warm and the vehicle must be on level ground.

The engine oil dipstick handle is a yellow loop. See *Engine Compartment Overview on page 5-12* for the location of the engine oil dipstick.

Turn off the engine and give the oil several minutes to drain back into the oil pan. If you don't, the oil dipstick might not show the actual level.

Pull out the dipstick and clean it with a paper towel or cloth, then push it back in all the way. Remove it again, keeping the tip down, and check the level.



When to Add Engine Oil

If the oil is at or below the MIN mark, then you will need to add at least one quart of oil. But you must use the right kind. This section explains what kind of oil to use. For engine oil crankcase capacity, see *Capacities and Specifications on page 5-85*.

Notice: **Do not add too much oil. If your engine has so much oil that the oil level gets above the upper mark that shows the proper operating range, your engine could be damaged.**

Steps for checking oil

1. Engine at normal operating temperature
2. Vehicle must be on a level surface
3. Turn engine off. Wait for 2 minutes before checking
4. Pull dipstick, wipe off with clean cloth or paper towel.
5. Reinsert dipstick, pull out again, keep tip down, read oil level

Okay, the oil level of your engine is down to the add mark. What kind of oil do you add?

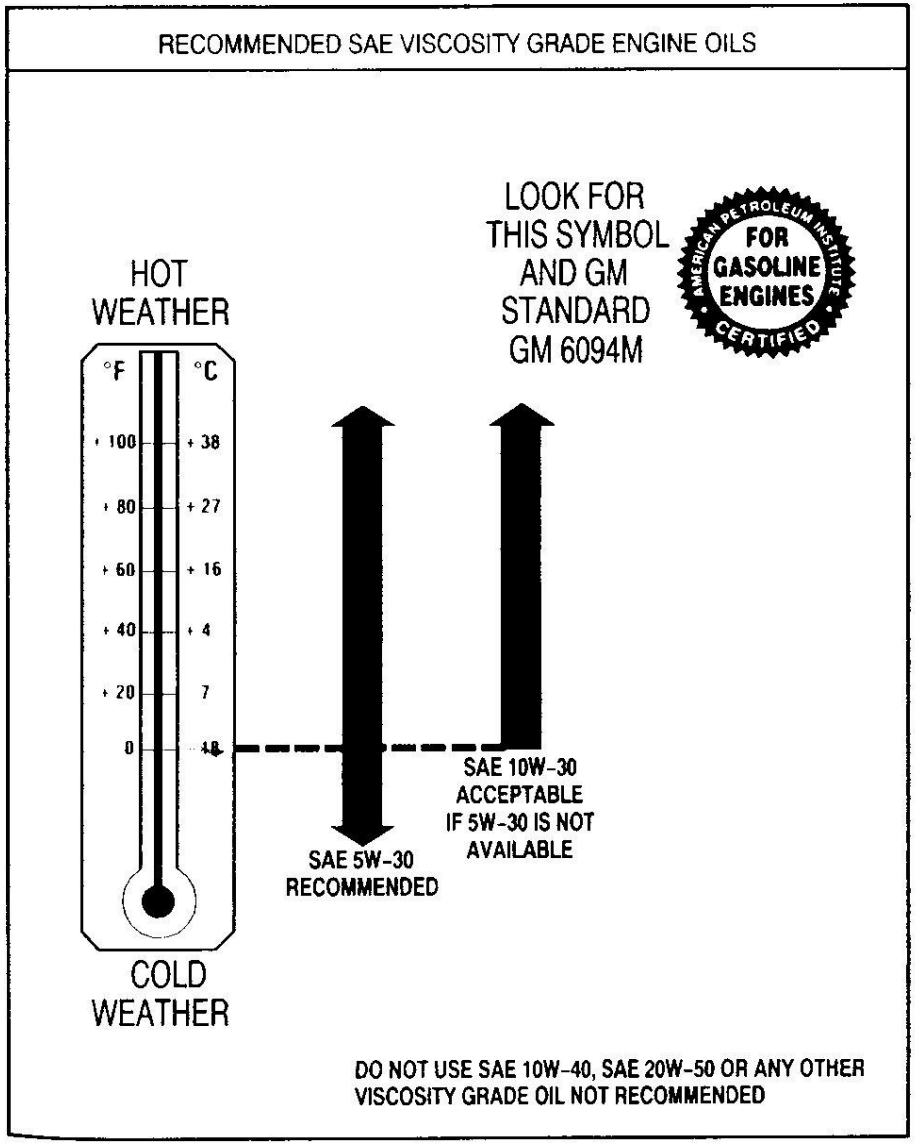
All modern engines use a year-round, all season oil. All-season oils are designated by a series of numbers with a “W” included (winter). For example 5W-30, 10W-30, 10W-40, 20W-50, etc. The number on the left before the “W” indicates the cold viscosity (thickness) of the oil, the number on the right indicates the hot viscosity of the oil.

Generally, the colder it gets where you live, the thinner the oil (designated by the smaller number on the left) you will need to allow your engine turn over and start in cold weather. 5 is about as low as oil cold weather designations go. Because modern engines are built to very close tolerances, the heavier oils such as 10W-40 or 20W-50 are not needed. In fact, most, if not all, auto makers recommend against using a heavier oil because it is not needed AND it’s usage reduces fuel economy.

So, what kind of oil do you need???

READ YOUR OWNER'S MANUAL

You must know what type of oil to use/add to your engine. This information is available in your owners manual as shown below:



- SAE 5W-30

  As shown in the viscosity chart, SAE 5W-30 is best for your vehicle. However, if it is going to be 0°F (–18°C) or above and SAE 5W-30 is not available, you may use SAE 10W-30.

  These numbers on an oil container show its viscosity, or thickness. Do not use other viscosity oils such as SAE 20W-50.

Oils meeting these requirements should also have the starburst symbol on the container. This symbol indicates that the oil has been certified by the American Petroleum Institute (API).

You should look for this information on the oil container, and use *only* those oils that are identified as meeting GM Standard GM6094M and have the starburst symbol on the front of the oil container.

17.4
Fuel-Saving and Recycling Strategies

Advancements in design and technology have changed the ways our vehicles look and perform. Today's vehicles are designed and built for greater fuel efficiency. The way you drive can also improve fuel efficiency.

Facts About Fuel Efficiency

Even though vehicle designs and changes in the types of materials used in today's vehicles save fuel, drivers need to follow certain practices to help conserve resources.

Control Your Speed

Many newer vehicles have very fuel-efficient engines that achieve maximum fuel economy at speeds between 50–55 mph. However, strong winds can reduce an engine's fuel efficiency. While driving at speeds of more than 45 mph, keep your windows closed to cut wind resistance.

Higher speeds result in more fuel being used. For every 5 mph increase in speed above 55 mph, most cars get 1.5 fewer miles per gallon.

While driving in the city, coast to a stop when possible, and moderately accelerate to your desired speed. Very fast or very slow starts waste fuel.

Care for Your Engine

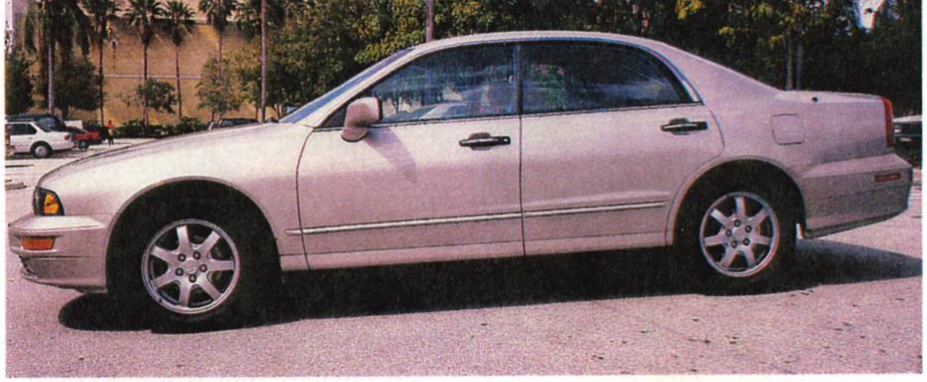
Use a vehicle with a warm engine, if you can. A warm engine is more fuel-efficient than a cold engine. The greatest fuel consumption is within the first few minutes after starting a cold engine. The most efficient way to warm up a cold engine is to drive it at moderate speeds for the first few miles. Avoid excessive idling to avoid wasting fuel and possibly damaging the engine.

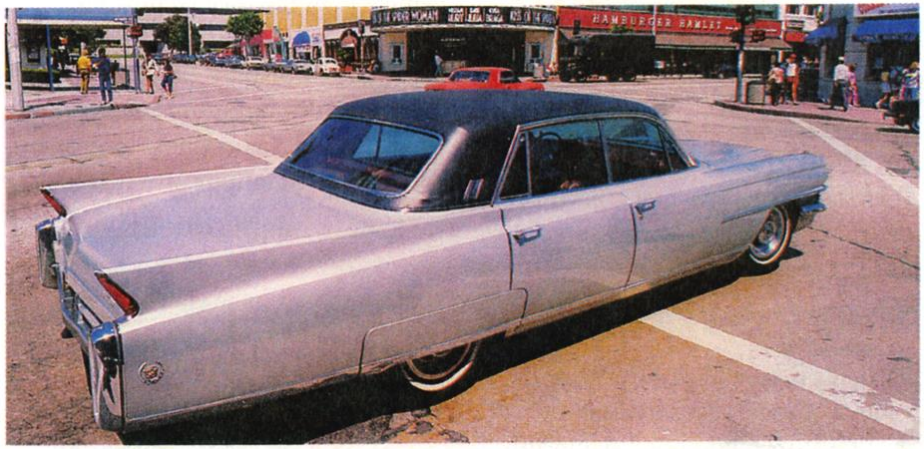
You must record your beginning odometer reading when you fill your tank. If you do not, you cannot determine the number of miles you have driven. In other words: Fill the tank and note the mileage or set the odometer trip to zero.

Calculating Miles Per Gallon

Most drivers want to get the most miles from each gallon of fuel. Checking your fuel economy can warn you of potential mechanical problems. Follow these simple steps to calculate miles per gallon.

1. Fill the fuel tank. Record the odometer reading, or set the trip odometer at zero.
2. Drive normally until you have about a half tank of fuel.
3. Refill the tank. Record the number of gallons it took to refill the tank. Next, record the odometer or trip odometer reading.
4. Subtract the first odometer reading from the second. Then, divide the number of miles driven by the number of gallons of fuel it took to refill the tank. The result is the number of miles per gallon (mpg).





Notice how the newer vehicle is more aerodynamic.

Engine Improvements

Because of the types of materials used in manufacturing today's vehicles, smaller engines are common. Smaller engines are designed to provide adequate power for smaller and lighter vehicles. Smaller engines also provide better fuel efficiency.

Electronic ignitions and computerized **engine management systems** help vehicles' engines operate and use fuel efficiently.

Vehicle Design

The designs of many vehicles have been streamlined to reduce wind resistance and help increase performance and fuel efficiency. Changes in the body shapes, wheel covers, bumpers, and headlights all have contributed to more fuel-efficient vehicles.

How to Save Fuel

Use good driving habits.

Turn off engine. If you are waiting in line for more than one minute, shut off the engine.

Carry less weight. Clean out your trunk and interior. Overloaded cars use more fuel.

Keep engine cool. Keep radiator filled with coolant. Excess heat increases engine wear and reduces gas mileage.

Close windows. At high speeds, use air conditioner. At lower speeds, turn off air conditioner and open windows.

Slow down. You use less fuel if you drive at 50 mph instead of 60 mph.

WHAT ARE SOME WAYS YOU CAN CONSERVE FUEL?

- **BUY A SMALL, FUEL EFFICIENT VEHICLE**
- **AVOID “JACK RABBIT” STARTS**
- **REMOVE ITEMS FROM THE TRUNK THAT ARE NOT NEEDED**
- **DRIVE SLOWER (55 MPH USES LESS FUEL THAN 75 MPH)**
- **MAINTAIN A STEADY SPEED – USE CRUISE CONTROL WHENEVER YOU CAN**
- **MAINTAIN RECOMMENDED TIRE PRESSURE**
- **FOLLOW A REGULAR MAINTENANCE SCHEDULE**
- **DO NOT ALLOW YOUR VEHICLE TO WARM UP EXCESSIVELY IN COLD WEATHER**
- **COMBINE YOUR TRIPS**
- **AVOID SHORT TRIPS AND STOP AND GO DRIVING AS MUCH AS POSSIBLE**