AAEE

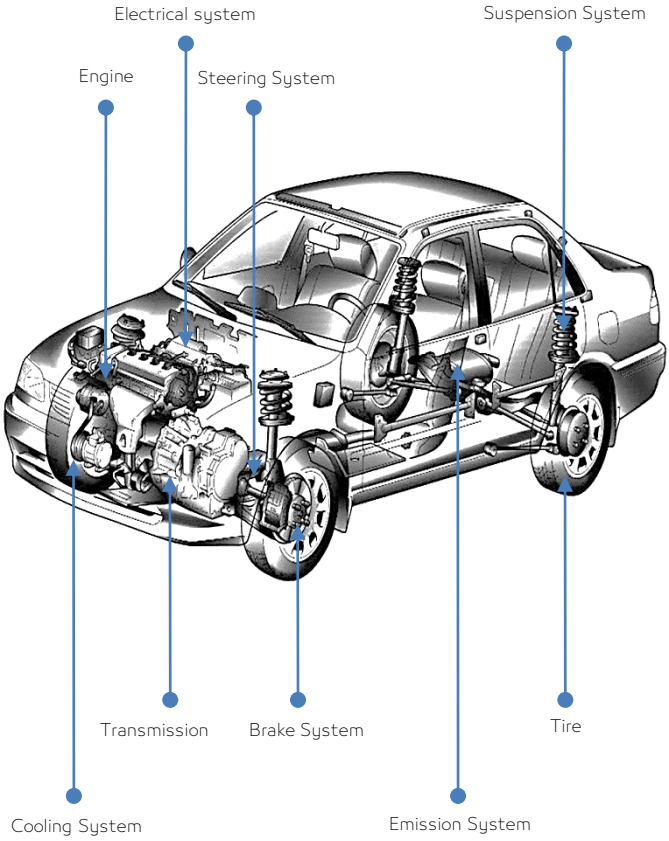
ADVANCED
AUTOMOTIVE
ENGINEERING
EDUCATION

BASIC AUTOMOTIVE SYSTEMS

Together for Road Safety

INDEX:

AUTOMOTIVE SYSTEMS



ENGINE ARCHITECTURE

The engine provides the power required for the running of the car, by converting the heat capacity resulting from the combustion of the gaseous mixture (air-fuel) into mechanical power.

Cylinder head

This Indented lower surface forms the combustion.

Piston

The piston moves up and down in the cylinder as a result of receiving the pressure created by the explosion of the air-fuel mixtures .

Cam Shaft

The camshaft is driven by timing belt. If opens and closes the intake and exhaust valves.

Crank Shaft

The crankshaft convents the up and down motion of the position into rotational motion via the connecting rods.

Intake valves

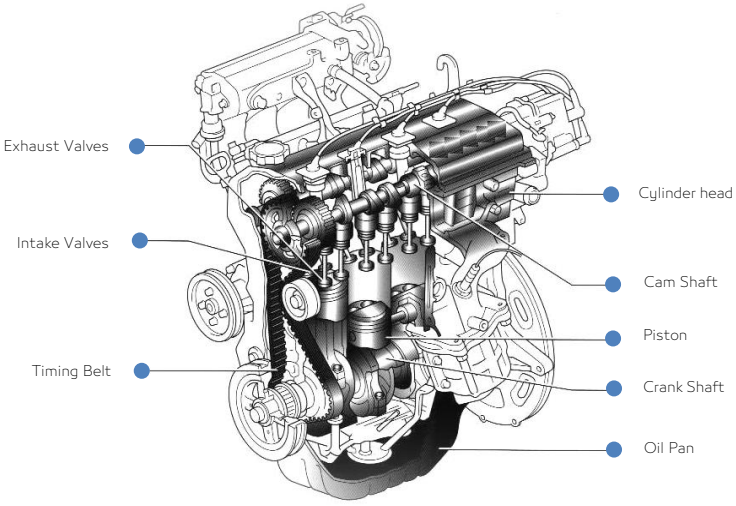
The Intake valves are valves that open to draw the air-fuel mixture into the cylinders.

Exhaust Valves

The exhaust valves are valves that open to discharge combustion gases from the cylinders.

Oil Pan

This receptacle for engine oil is located under the engine.



BASIC PRINCIPLE OF 4 STROKE FOR GASOLINE ENGINES

In order for a gasoline engine to run continuously, the motions required for combustion must repeated in a constant sequence.

Intake Stroke

This the stroke in which the air-fuel mixture is drawn into the cylinder. The intake valve is open while the exhaust valve is closed.

Compression Stroke

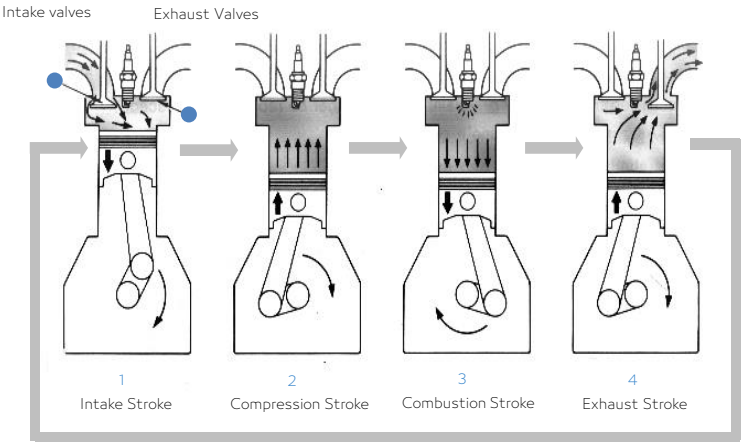
This the stroke which the are-fuel mixture is compressed. Both the intake and exhaust valves are closed.

Compassion Stroke

This is the stroke in which are engine generates motive power for the vehicle. The spark plug ignites the compressed air fuel mixture. The burning, high pressure gas force the piston downward. This force became the engine power.

Exhaust Stroke

This is the stroke in which the burnt gas is discharged from the cylinder. The exhaust valve is open and the piston moves upward forcing the burnt gas from the engine.



LUBRICATION SYSTEM

This system that ensures the quality of the movement of all metal parts inside the engine.

Oil Pump

This scoops up oil collected in the oil pan and pumps it under pressure to each part of the engine.

Oil Filter

Engine oil gradually become contaminated with metal chips etc, oil filter removes those undesired substances from the oil.

Oil Strainer

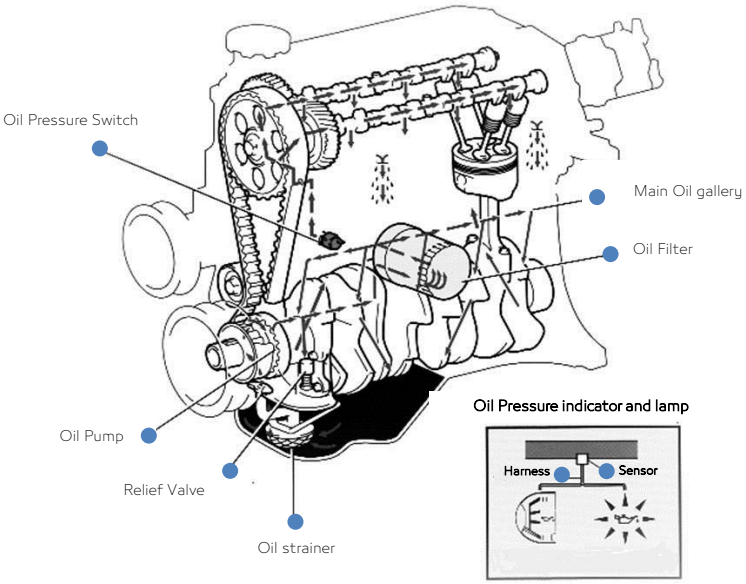
This is a metal strainer installed at the oil inlet port to remove large particles from the oil.

Relief Valve

When the oil pump applies excessive pressure, this valve relieves the pressure.

Oil Pressure Switch

Oil pressure is insufficient when the engine starts, this switch actirates the warning lamp.



COOLING SYSTEM

This system maintains the engine temperature.

Radiator

The radiator used the airflow from vehicle forward motion to reduce the temperature of the cooling circulating through the engine.

Cooling Fan

This speeds the flow of air through the radiator and improves the heat radiation effect.

Water Pump

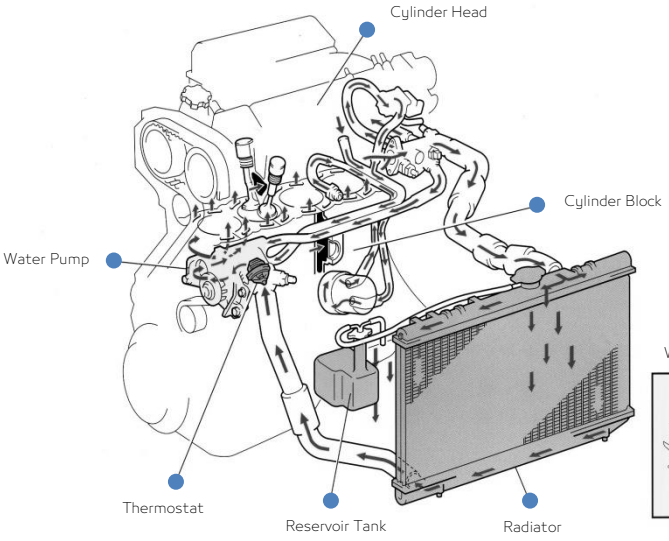
The water pump forces coolant to circulate through the coolant circulation passages.

Reservoir Tank

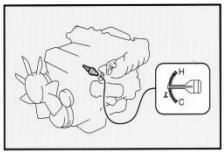
The reservoir tank is provided to store the overflow to keep waster coolant. And it sent to radiator.

Thermostat

The thermostat works automatically to keep the temperature of the coolant constant.



Water Temperature Gauge



EXHAUST SYSTEM

This system draws air into the engine and releases the gases that are produced during the combustion process.

Air Cleaner

The air cleaner removes dust and sand from the air so that clean air is sent to the cylinders.

Cooling Fan

The fan speeds up the flow of air passing through the radiator to improve the cooling performance of the radiator.

Water Pump

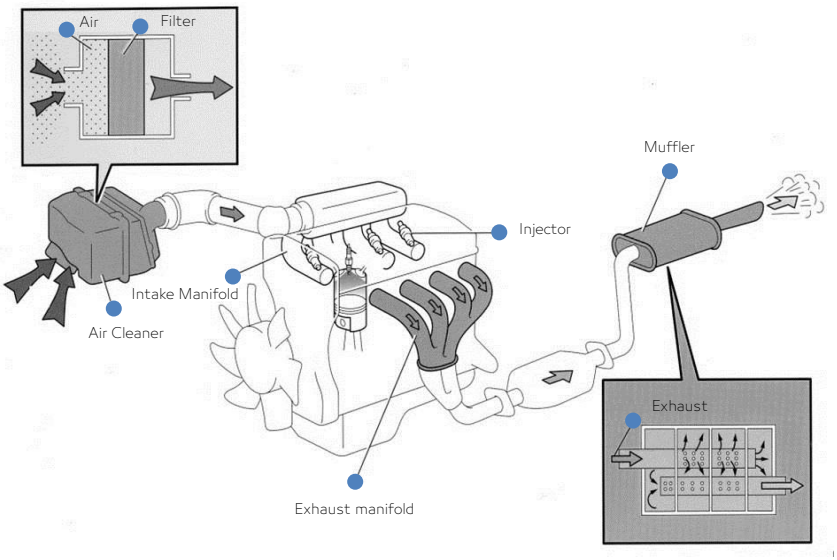
The water pump forces coolant to circulate through the coolant circulation passages.

Reservoir Tank

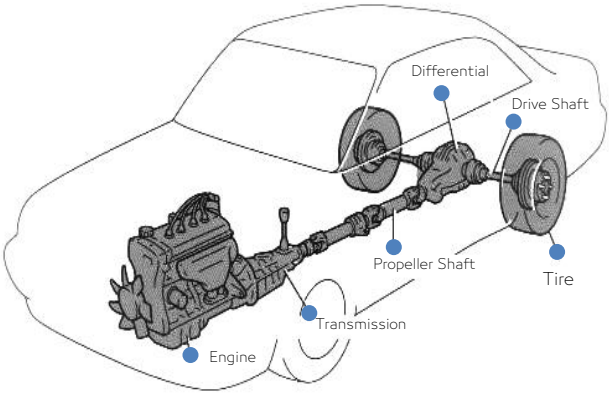
The reservoir tank is provided to store the overflow to keep waster coolant. And it sent to radiator.

Thermostat

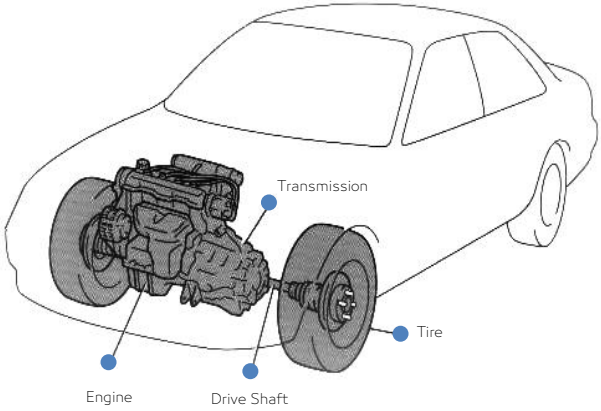
This device adjusts the temperature of the engine coolant.



REAR WHEEL DRIVE

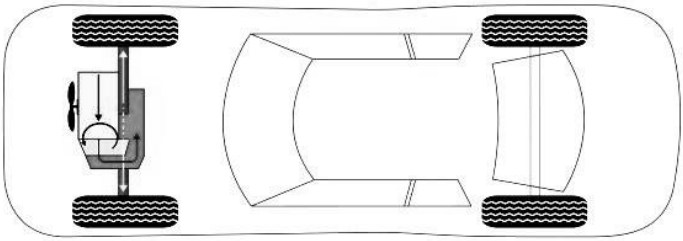


FONT WHEEL DRIVE

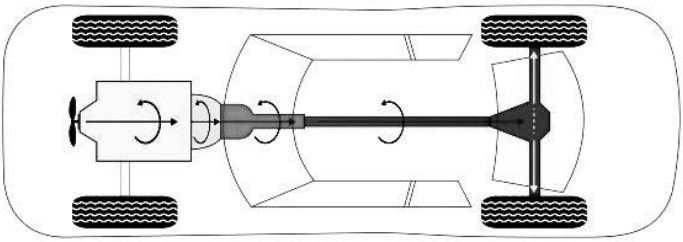


DRIVE TRAIN

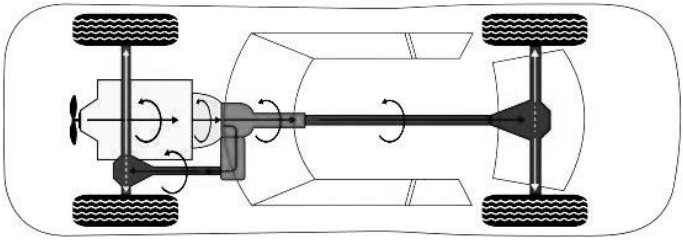
Front Wheel Drive



Rear Wheel Drive



Four Wheel Drive



DRIVE TRAIN

A Drive train is an integrated mechanism that transmits the power developed in the engine to the drive wheel of the vehicle.

Engine

The Engine transfers the transmission to the gearbox and operates other systems in the vehicle.

Clutch

The clutch is used for starting, stopping or for changing gear. It is transmits the power from the engine to the drive train.

Transmission

This transmits and changes the speed and power from the engine in response to the gear selected and transmits to the drive train.

Propeller shaft

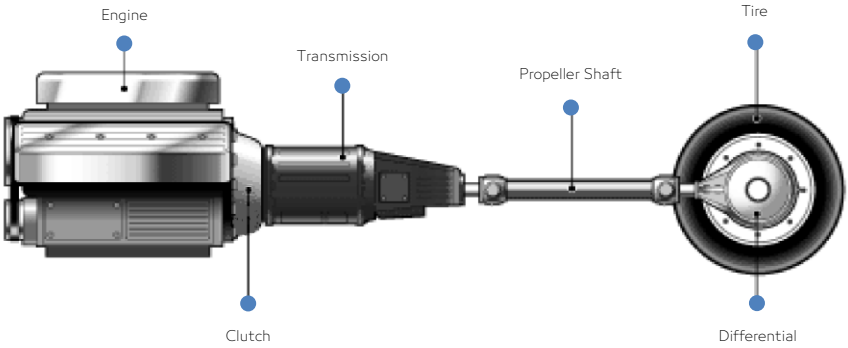
The propeller shaft transmits power from the front transmission to the rear differential.

Differential

This part changes the direction of the driving force to the wheels.

Tire

Converting and transmitting speed and braking forces to the road surface.



MANUAL TRANSMISSION

This system works by manual changing when switching from one speed to another.

In put Shaft

The in put shaft transmits the power from the engine to the transmission via the clutch.

Clutch disk

It transmits power from the engine to the transmission.

Clutch Cover

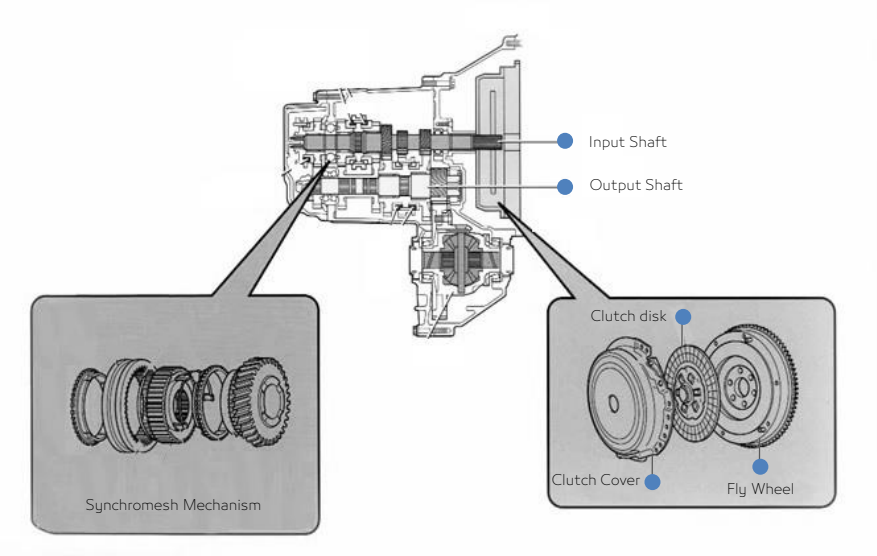
Clutch cover force the clutch disk against the flywheel to transmit power from the engine to the transmission.

Propeller shaft

The propeller shaft transmits power from the front transmission to the rear differential.

Fly Wheel

A fly wheel is used to add the inertia provided by its own weight, there thereby making the crank-shaft rotate more every and the engine run move smoothly.



AUTOMATIC TRANSMISSION

The Automatic Transmission is a transmission in which gear selecting is accomplished automatically, making staring and acceleration smooth.

Planetary Gear Unit

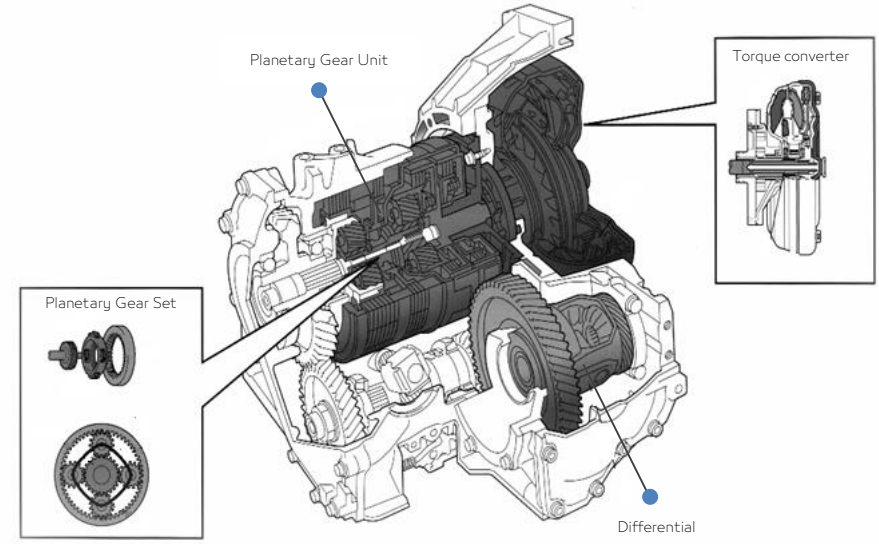
This group changes speeds.

Torque converter

This part works to transfer force from the engine to the gearbox.

Differential

This part changes the direction of the driving force to the wheels.



BRAKE SYSTEM

The Brake System which reduces speed and stops the vehicle while it is being driven and keeps it from moving while it is parked.

Brake Booster

This mechanism greatly increases the force applied to the brake master cylinder in response to the drivers pressure on the brake pedal.

Master Cylinder

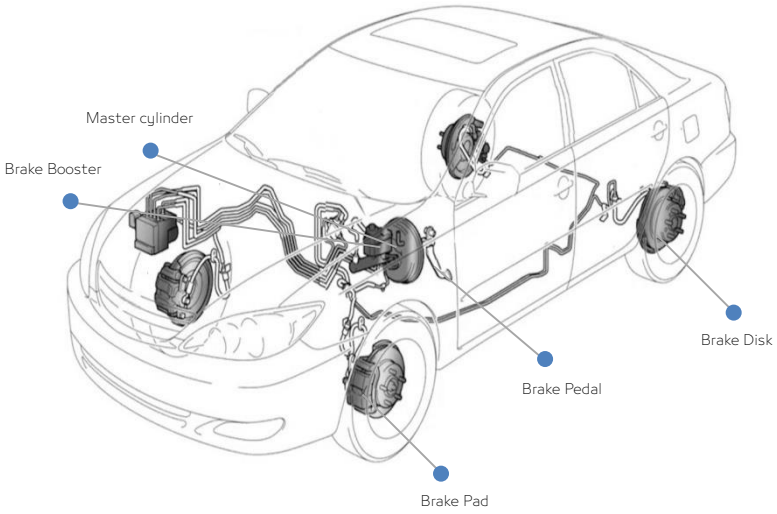
This is a mechanism which changes the force applied to the brake pedal into hydraulic force.

Brake Disk

Brake disk is a circular part rotating together with the wheel. When the brake pedal is depressed , rotation of rotor with wheel era stopped immediately.

Brake Pads

Brake pads consist of high friction material pressed against the rotating disk rotor.



SUSPENSION SYSTEM

The suspension has more function such as improve riding comfort and to provide steering stability.

Shock absorbers

The shock absorbers work to suppress the bouncing motion of the springs.

Spring

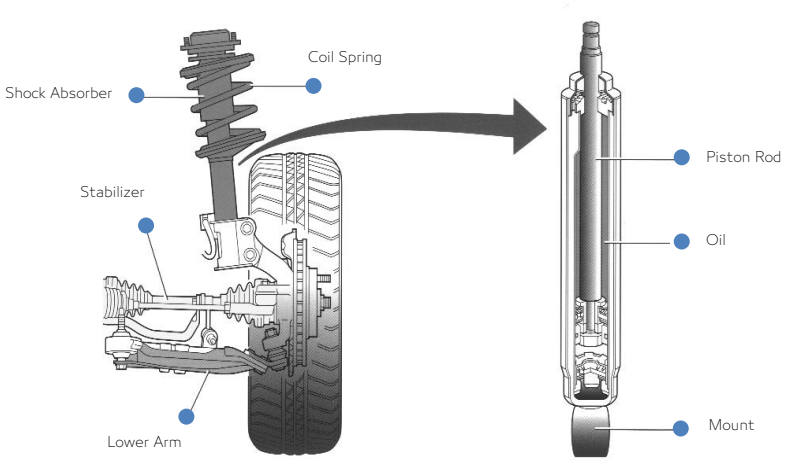
The spring dampen vibrations and impacts from the road surface to prevent them from being transmitted directly to the body.

Piston Rod

This is a mechanism which changes the force applied to the brake pedal into hydraulic force.

Oil

The oil produces a stabilizing damping effect.



STEERNING SYSTEM

The purpose of the steering system is to allow the driver to control the direction of the vehicle by turning the front wheels.

Steering Gear Box

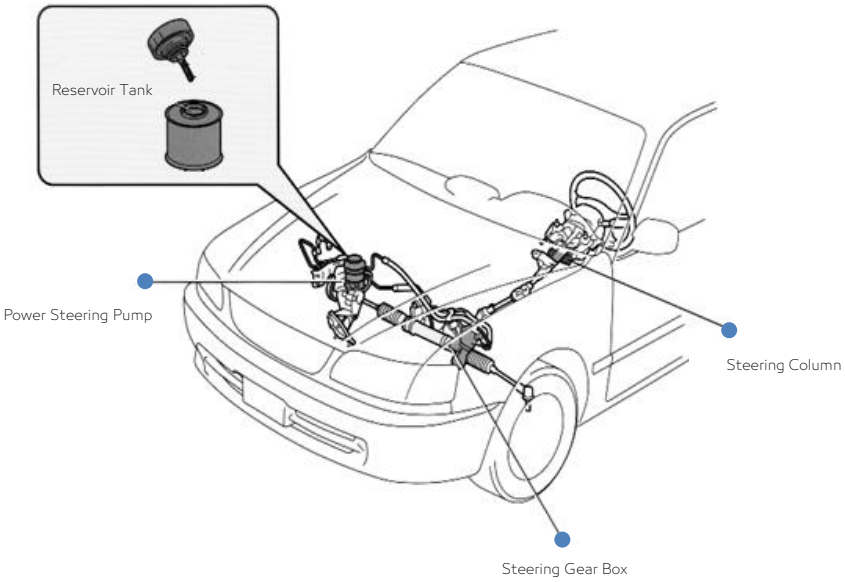
The rotation of the steering wheel is converted into left and right lateral movement by the steering gear.

Power Steering pump and reservoir

Hydraulic pressure is generated by power steering pump.

Steering column

It works to transfer the movement from the steering wheel to the steering gear box.



IGNITION SYSTEM

This system turns the engine at start-up and supplies electrical current to the vehicle's parts.

Battery

The battery is rechargeable and is the source of electrical power when the engine is stopped.

Distributor

The distributed supply the voltage to the spark plugs at the appropriate timing.

Spark Plug

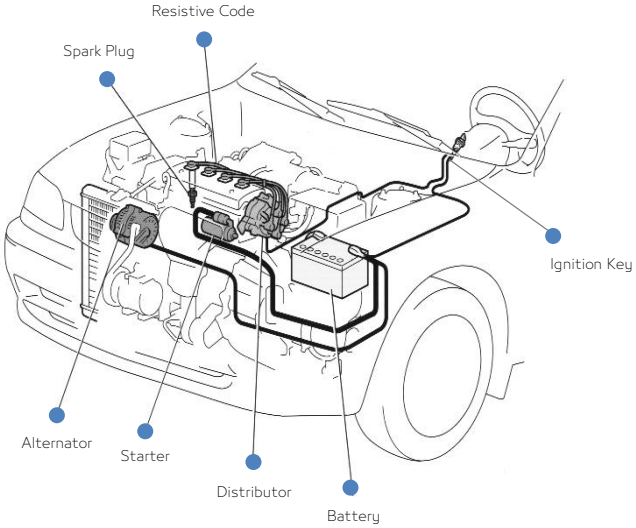
The spark ignites the fuel and air inside the cylinder.

Alternator

The alternator charges the battery while the engine is operating.

Starter

The starter is the motor which starts the engine.



AIR CONDITION SYSTEM

The Air condition system combines a cooler and a heater to adjust the temperature and humidity of the air inside the vehicle and keep the interior comfortable at all time.

Compressor

The engine is driven by the crankcase via a pulley and belt. It compresses the refrigerant, making it under a high pressure.

Condenser

The high temperature pressure refrigerant from the compressor is passed through the condenser, where it is cooled and liquefied.

Cooling Unit

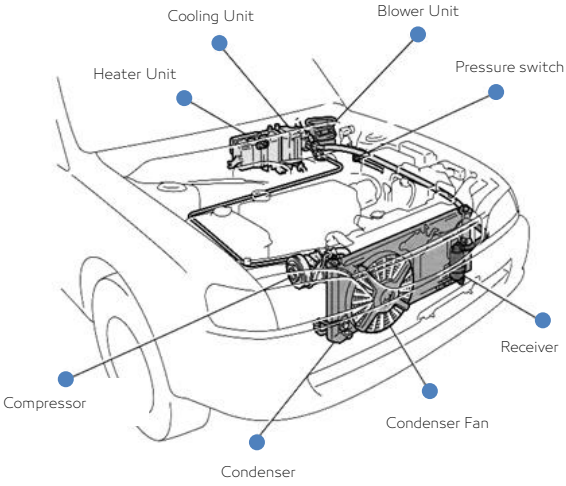
The cooling unit includes the expansion valve, thermostat, blower motor and fan.

Heater

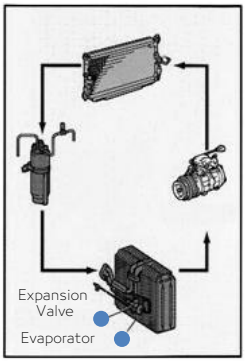
The heat of the coolant heater up by the engine is used to warm up the air from the blower fan.

Condenser Fan

This fan cools the condenser.



Air Condition Gas Cycle



TIRE

Vehicles ride on pneumatic tires filed with pressurized air. Tires are the only vehicle constituents that come into direct contact with the road surface.

Attribution of vehicle weight

The tires support the overall weight of the vehicle.

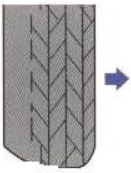
Tire friction and rolling

The tires directed contact the road surface and transmit the vehicles driving and braking force to the road, thus controlling starting, acceleration, deceleration, stopping and turning.

Air

The tires attenuate shock caused by irregularities in the road surface.

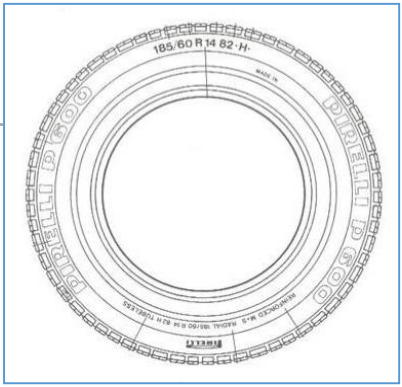
Tires wear abnormally worn

Both edges wear	Center wear	Feather edge wear	One side edge wear	Toe and heel wear
				
Air pressure too low	Air pressure too high	Toe-In problem	Camber problem	Arbitrary wear normal

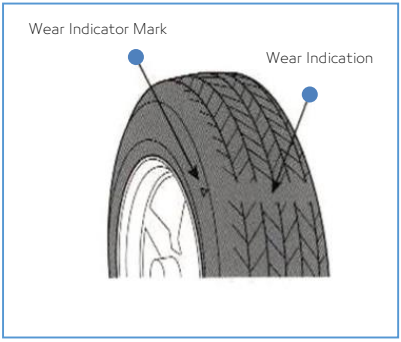
TIRE SIDEWALL INFORMATION

185 / 60 R 14 82 H

1 2 3 4 5 6



1. Tire width (mm)
2. Flat rate
3. Radial tire
4. Rim diameter (Inch)
5. Road Index
6. Speed Mark



Speed Rating and Load Index

Speed Rating	Q	R	S	T	H	V	W	Y	Z
Max. Speed (km/h)	160	170	180	190	210	240	270	300	<240

Load Index	62	70	76	80	84	90	96	100	104
Load in kg	265	335	400	450	500	600	710	800	900