AUTOMOBILE HISTORY

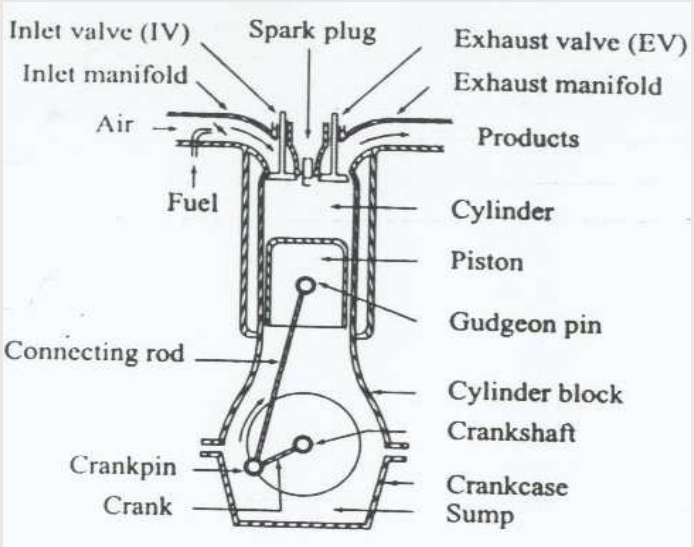
- First automobile developed in 1860's in Europe.
- By 1900 cars gaining some reliability.
- All cars are hand made costing $10,000.00
- **Henry Ford's better ideas:**
- ***Interchangeable parts***
- ***Mass production using an assembly line***

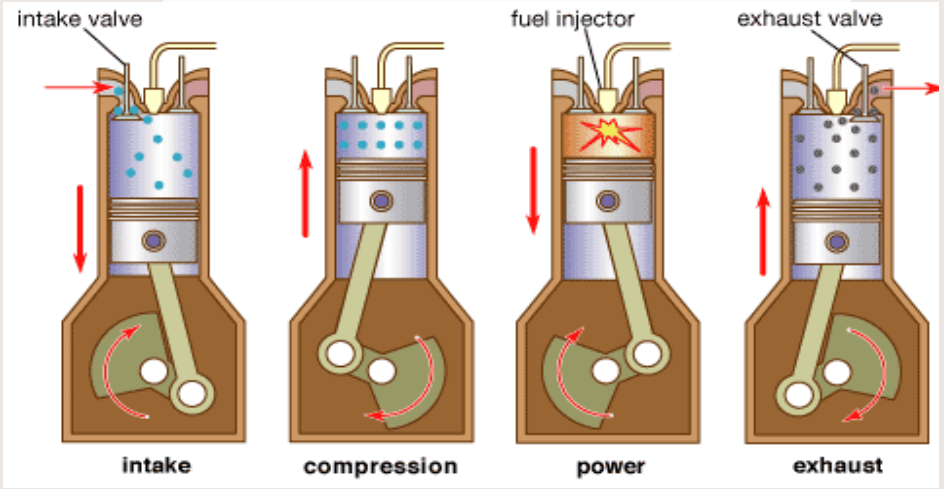
Four Basic Parts of Vehicles

- **Engine**
- **Braking and Steering**
- **Chassis or framework**
- **Drive Train**
- **Body**

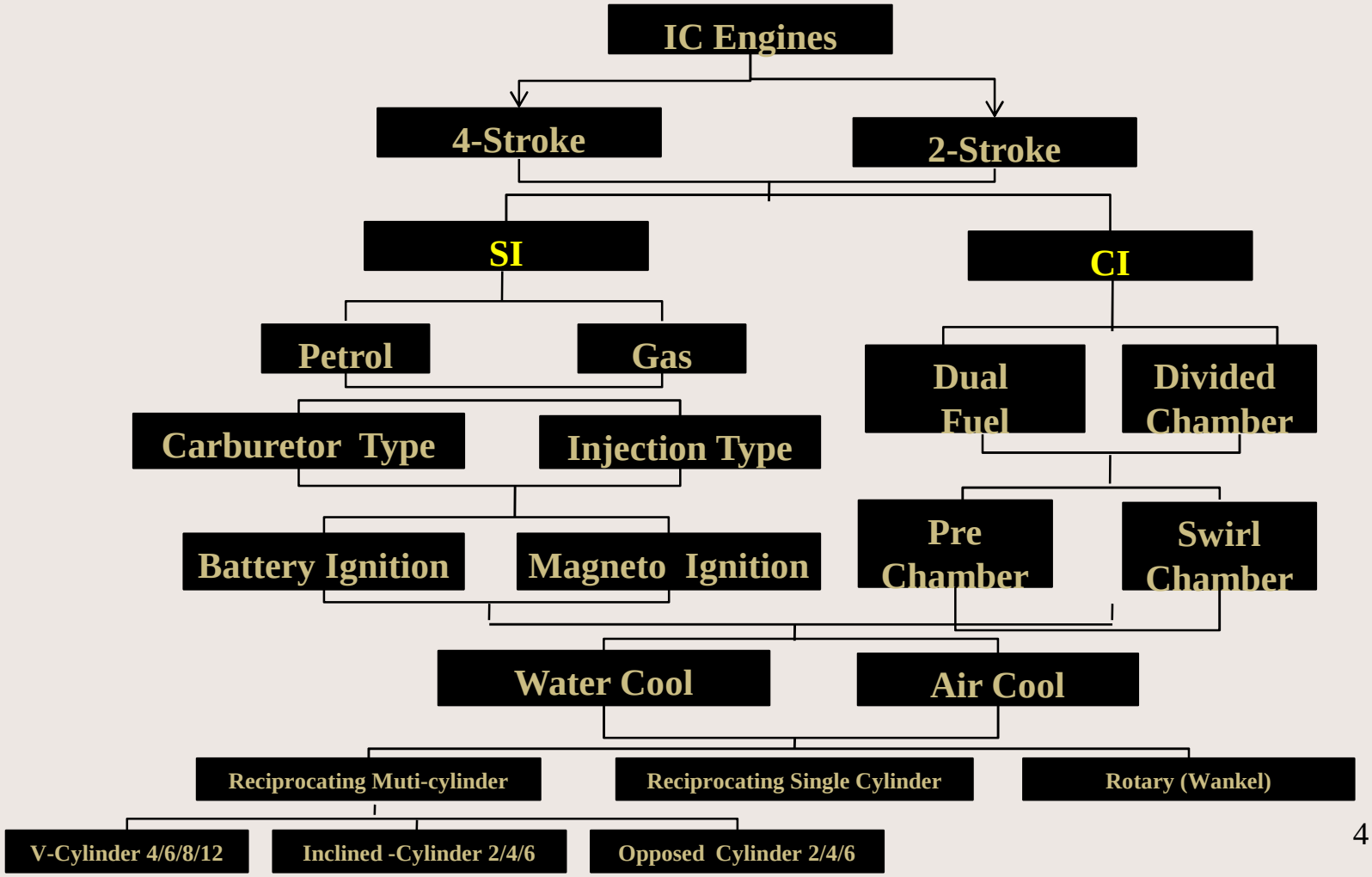
Engine Systems

- Compression system
- Valve train
- Fuel system
- Ignition system
- Lubricating system
- Cooling system
- Starting system
- Charging system
- Emission controls
- Exhaust system



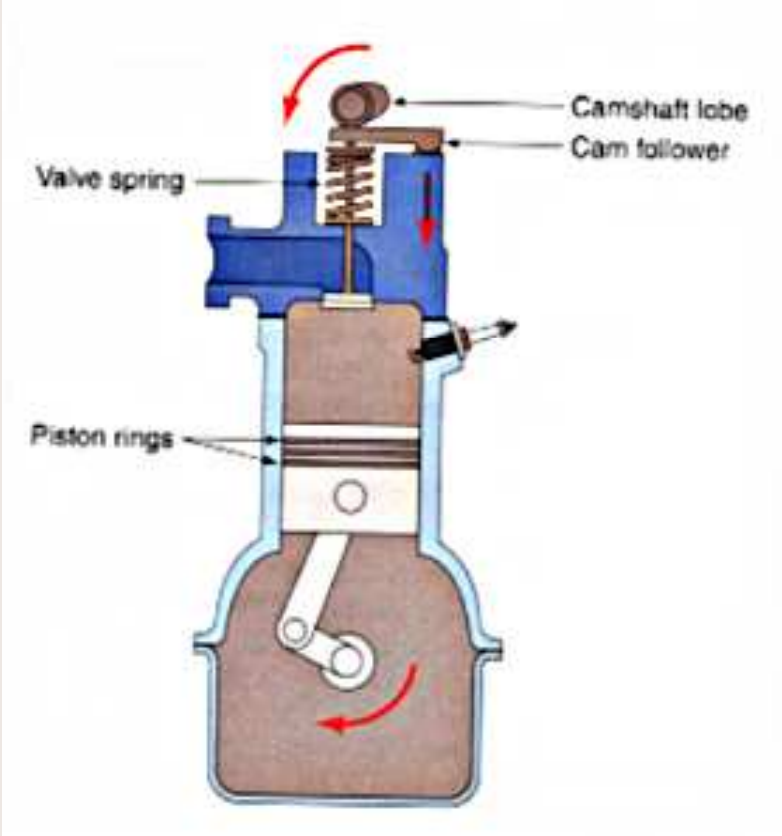


Classification of IC engines

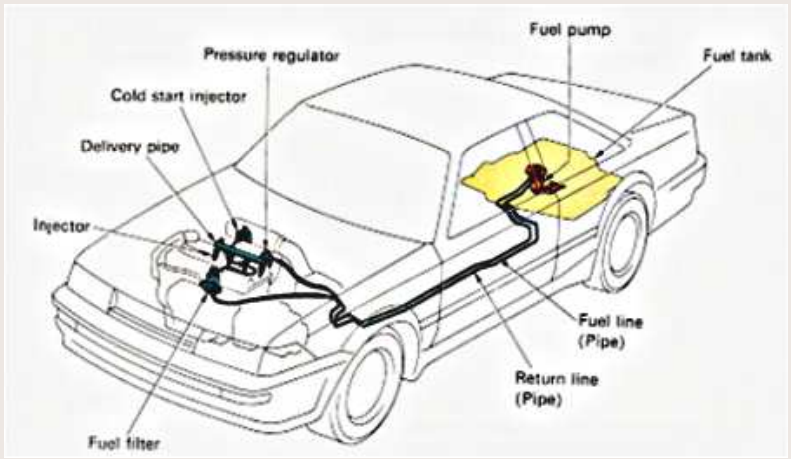


Engine Block & Head(s)

- Compression system lower end
- Harnesses the power of burning gasoline
- Valve train top end
- Lets in and out the fuel charges to be burned

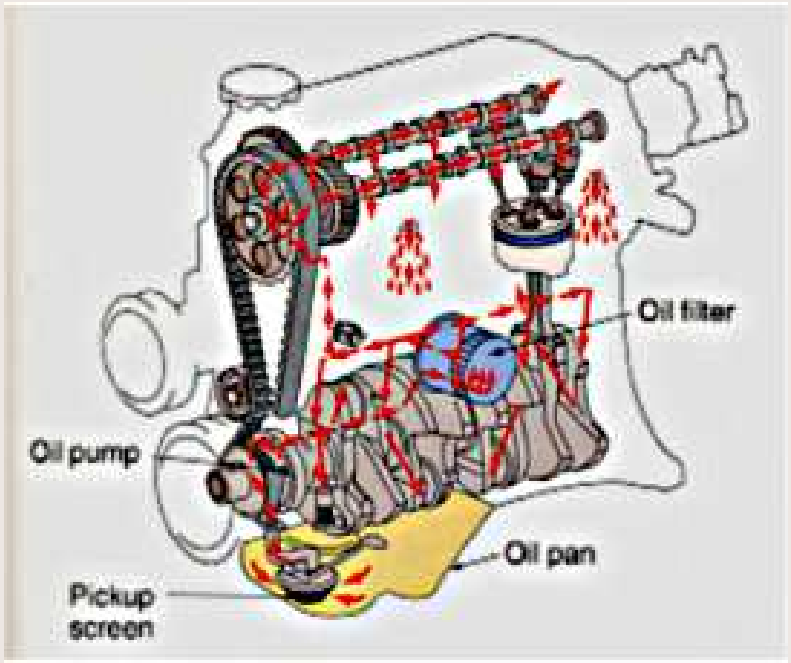


Fuel System



- Old cars used a carbureted system.
- Cars now use fuel injection.
- The purpose of the fuel system is to store, move and deliver the fuel and air in the proper proportion to the engine.

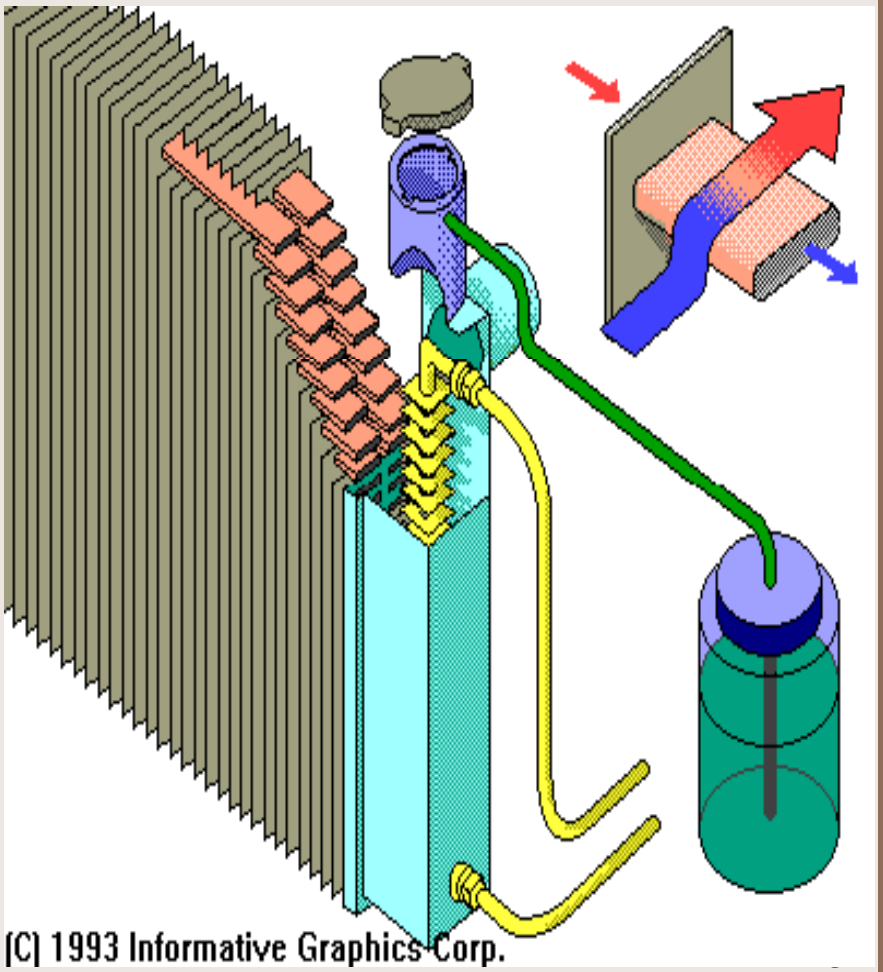
Lubrication System



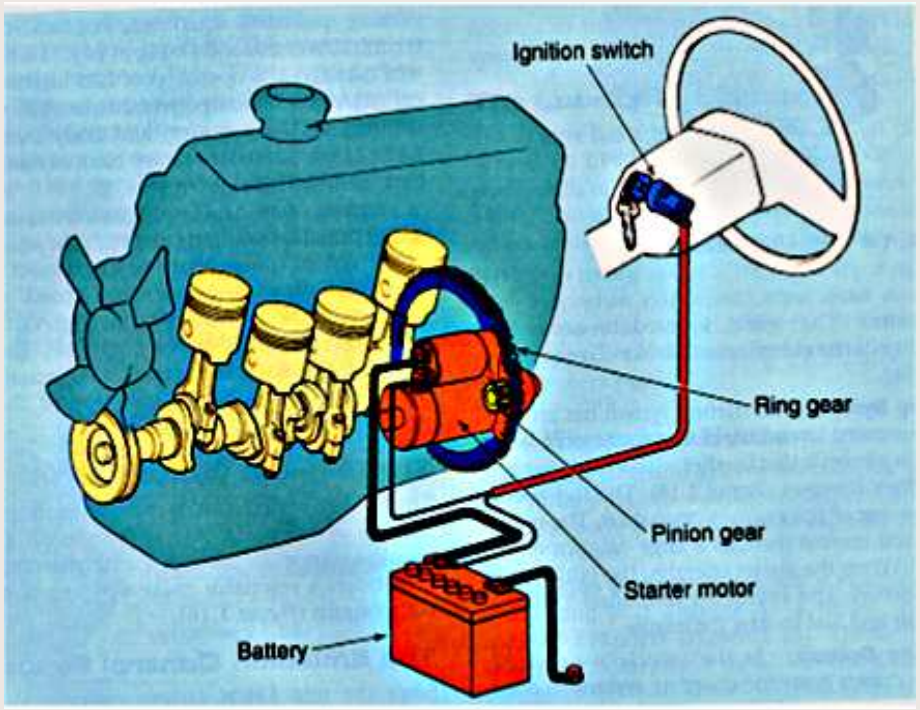
- Force feed or pressure fed system
- Via an oil pump
- Provides lubrication and protection for all the metal parts inside the engine
- Oil pump/
- pan
- galleries

Cooling System

- Liquid cooled system
- Provides protection from the excessive heat which builds up inside the cylinder
- Radiator, water jacket, hoses, thermostat, heater core, fan



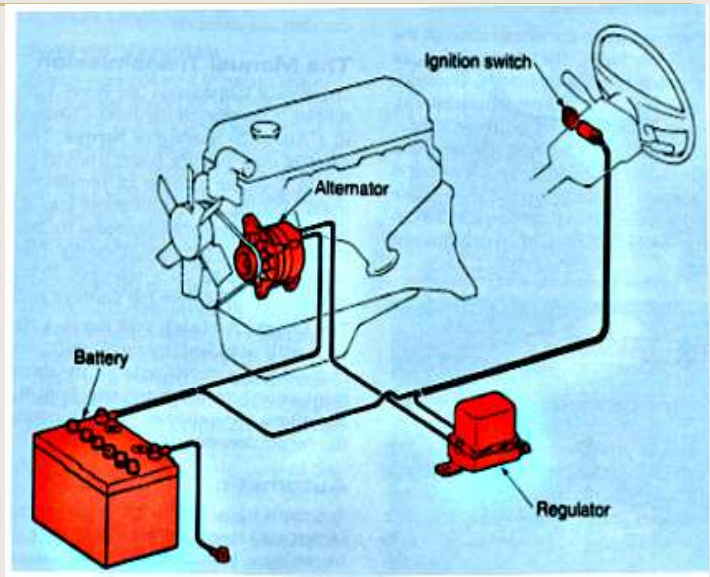
Starting System



- Uses a battery and electric starting motor *(cranking motor)* to crank over the engine for starting
- Battery
- Cranking motor
- Solenoid
- Key switch
- Wires

Charging System

- The charging system has two functions:
- 1 – To recharge the battery after starting.
- 2 – To provide all the electricity for the vehicle while the engine is running.
- The battery provides power while the engine is not running
- Battery/alternator/voltage regulator



Exhaust System

- Removes gases from engine
- Quiets vehicle
- Provides back pressure
- Exhaust manifold
- Crossover
- Tail pipe
- Muffler
- Resonator

Emission Controls

- To clean up the air pollution caused by the automobile.
- Capture any vapor which might escape the the fuel tank and engines crankcase.
- Clean up exhaust for any un burnt fuel, carbon monoxide, or oxides of nitrogen.
- Many types of devices are employed.
- PCV/Catalytic convertor/gas cap/EGR

Catalytic Converter

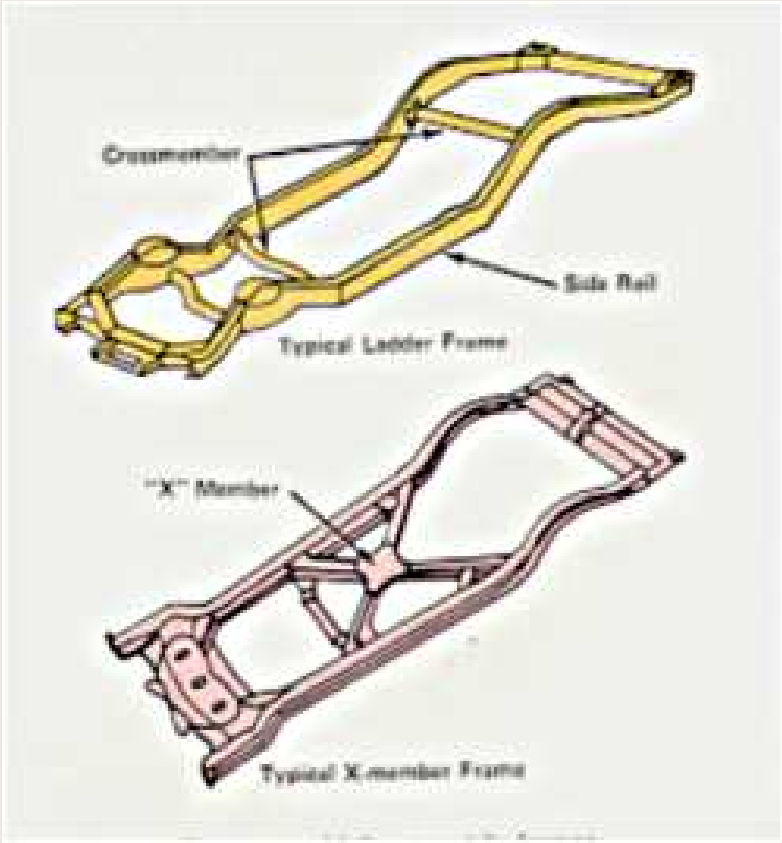
- One of the most important *<u>emission controls</u>* on the car.
- Literally burns up pollution in the exhaust system.

Chassis or Frame

- Under lying structure of all vehicles
- Three types of frame:
- 1 – **Full frame**
- 2 – Unitized frame called **unibody**
- 3 – **Space frame**

Full Frame Chassis

- Uses welded steel alloy metal
- C-channel or box frame construction
- Note engine cradle in front and rear axle hump in rear
- Used on large cars and most all trucks
- Body made in separate unit and bolted to chassis

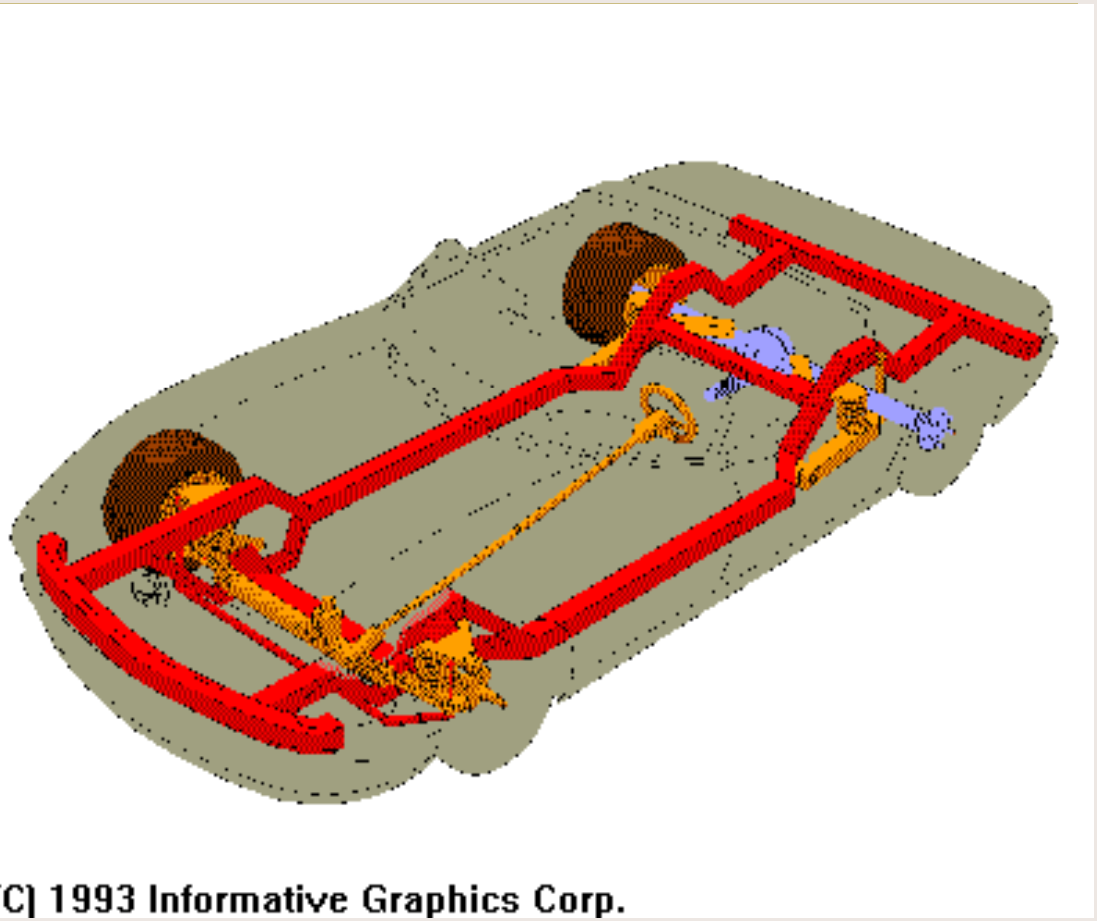


Unitized Body Construction

- Called Unibody
- All body and frame parts welded together
- Light weight but strong structurally
- Most cars use this construction

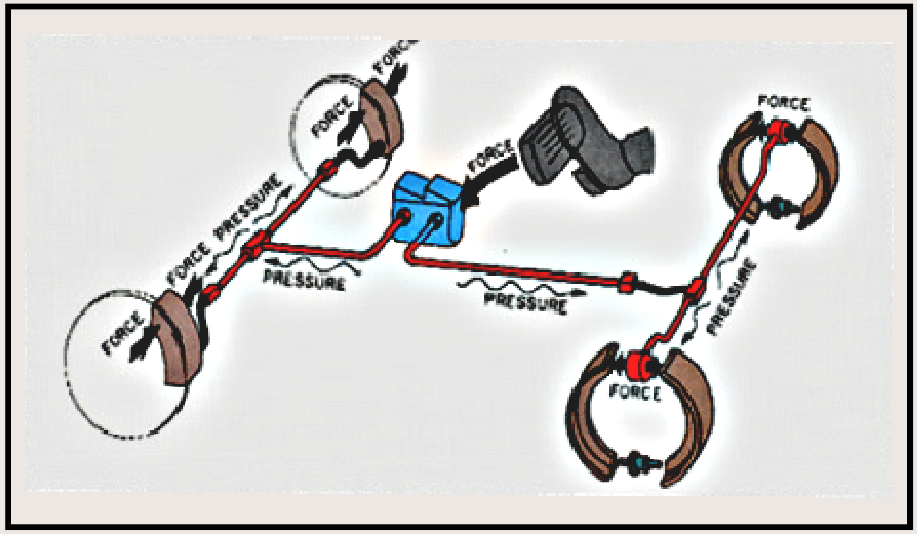
Chassis Related Systems

- Braking system
- Suspension system
- Steering system

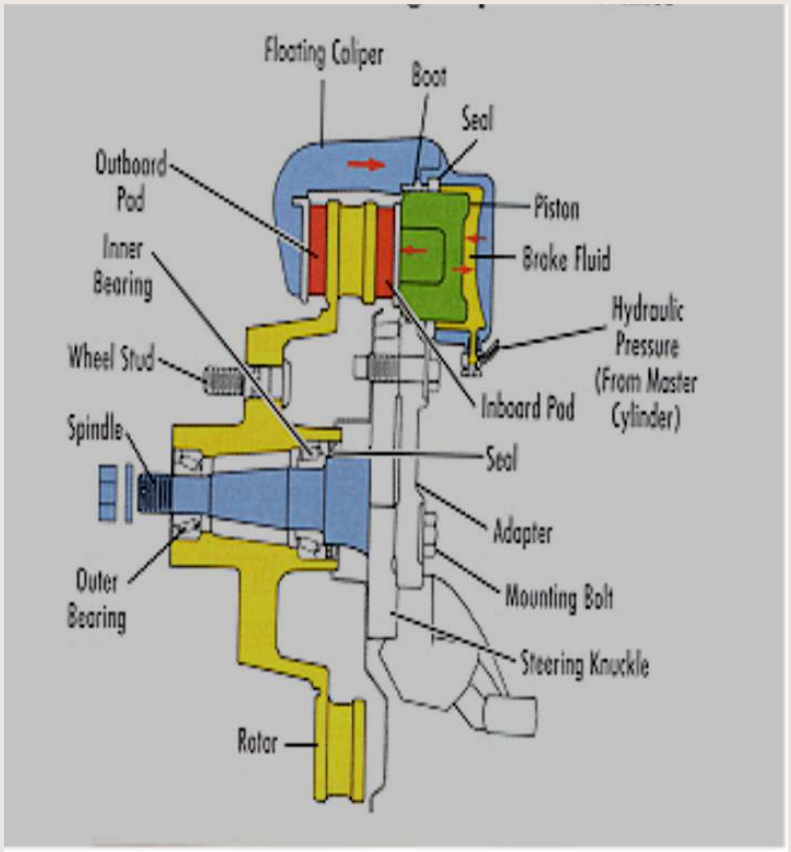


Braking System

- The purpose of the braking system is of course, to stop the car.
- Brakes are used on all wheels and is hydraulically operated.
- Two common types of brake assemblies are used.
- ***Disc Brakes***
- ***Drum Brakes***



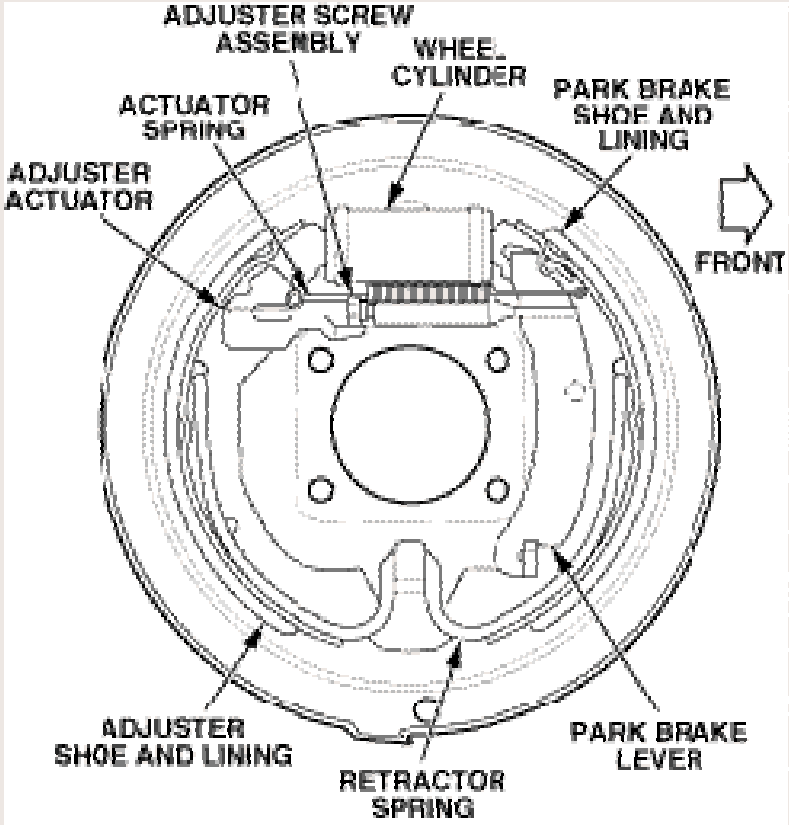
Disc Brakes



- Uses a rotor that spins with the wheel and a stationary caliper to press friction material against the spinning rotor.
- Used on most all front brakes and some rear brakes.

Drum Brakes

- Uses a drum which spins with the wheel. Stationary brake shoes are pressed out from the inside to cause friction.
- Used on rear brakes of many cars.

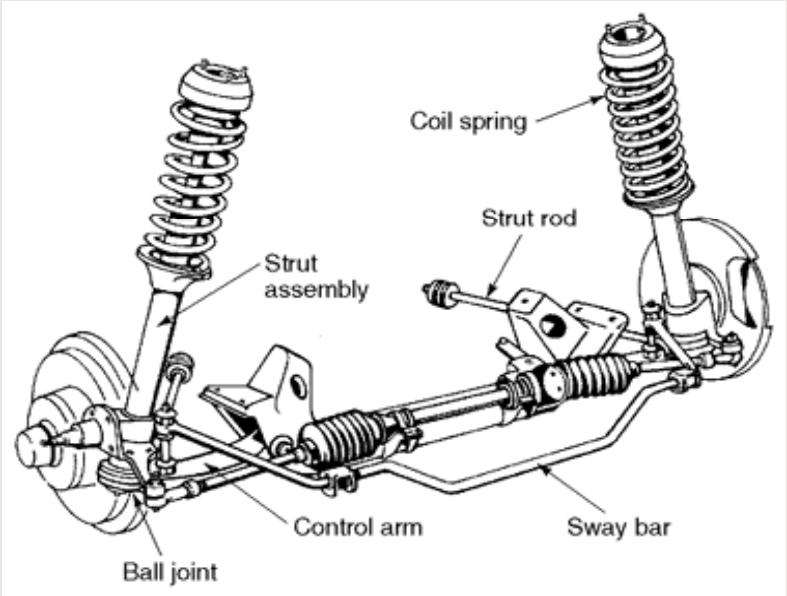


ABS Anti-Lock Braking System

- Helps driver stop under control
- Keeps brakes from locking up
- Pulses brakes
- Enables car to be turned

- **<u>*Does not replace hydraulic brakes</u>**
- Does not make vehicle stop faster
- Does not work if brake petal is pumped

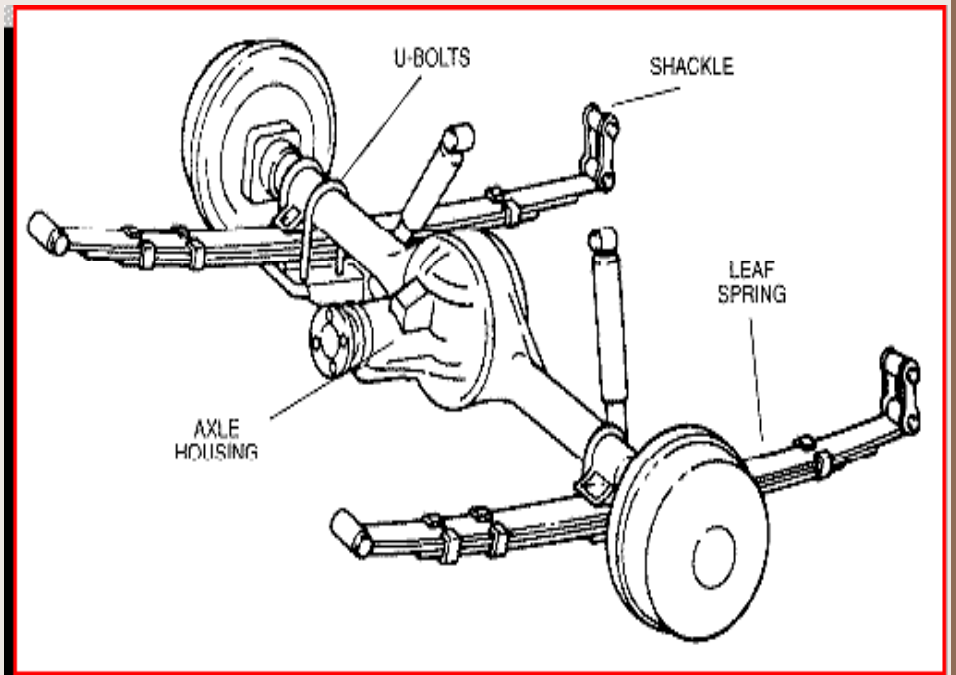
Suspension System



- Uses springs and shock absorbers to provide a good ride and improved handling.
- Coil & leaf springs, torsion bars and air suspension are all used.
- Most shock absorbers are hydraulic or gas operated.
  - **<u>Stop bouncing action</u>**
- Struts

Straight Axle

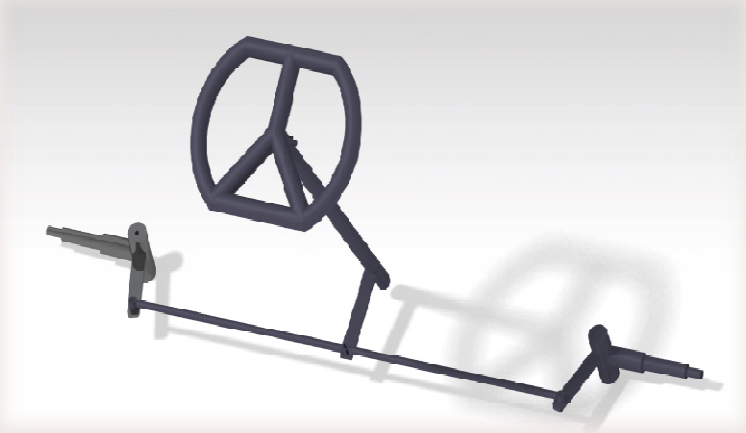
- Wheels are held together on a common axle.
- Very rugged but poor on handling.
- Used mostly on the rear wheels.

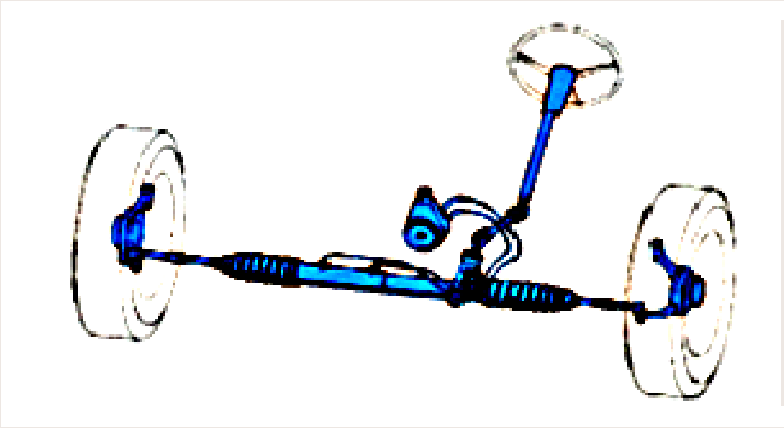


Solid Axle, Leaf Spring Suspension

Steering System

- **Akerman's principle based four bar steering**
- **Rack and pinion steering used on most cars.**
- **Conventional on trucks, SUV, BIG VEHICLES**





Drive train

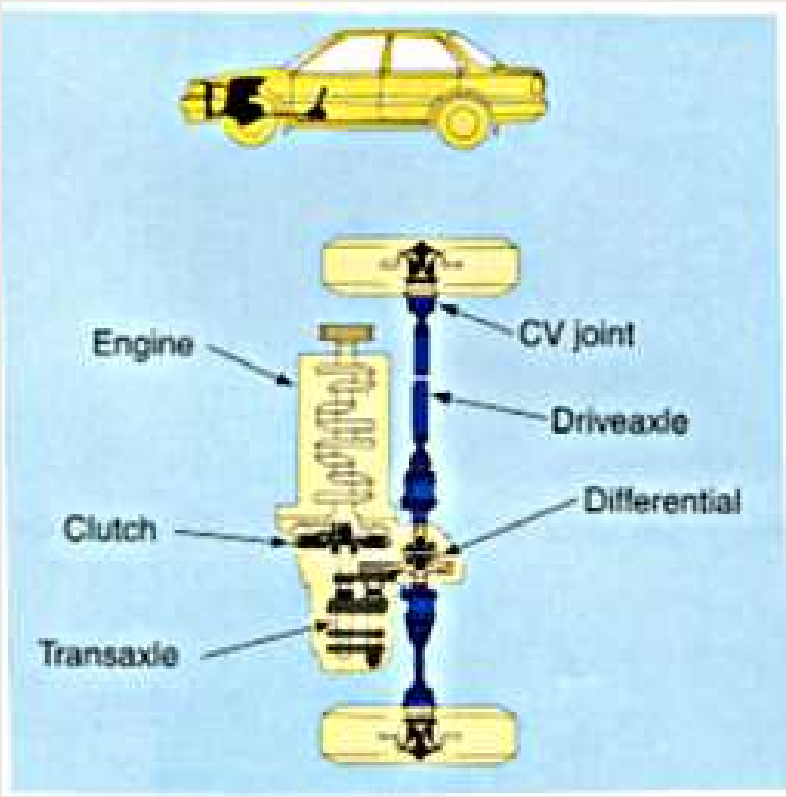
- Takes the engines torque and sends to the drive wheels.
- Major types are: front wheel drive, rear wheel drive, four wheel drive and all wheel drive.
- Major components of all drive trains: clutch, transmission, differential, and drive shaft(s).

Drive Train Components

- Basic purpose is to get the engines torque to the wheels.
- *Clutches* used with manual transmissions a *torque converter* used with automatics.
  - Disconnects engine from transmission
- *Transmission/transaxle*
- *Drive shafts* and *drive axles*.
- *Differentials*

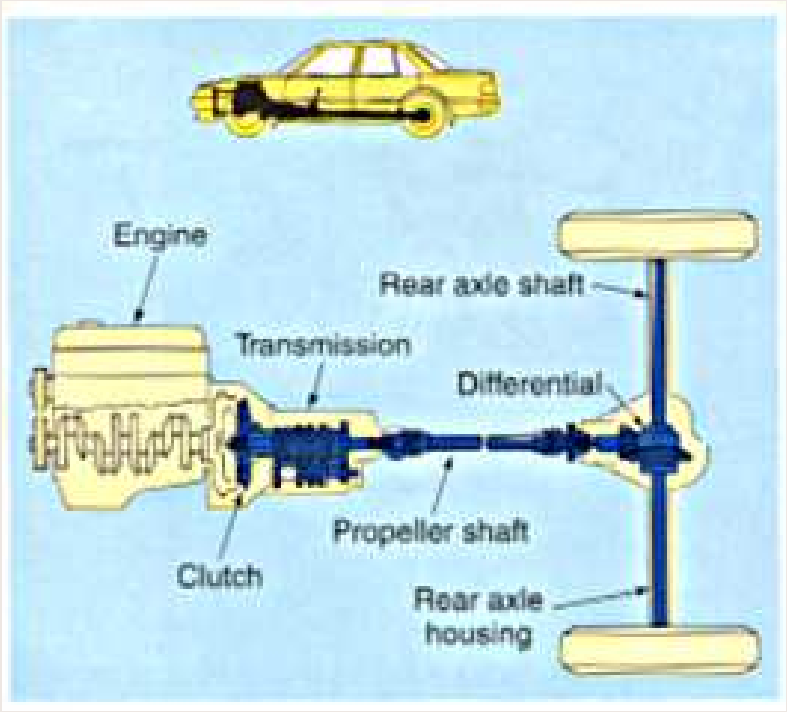
Front Wheel Drive

- All drive train components under the hood (transaxle)
- Reduces weight and size of vehicle
- Good traction in rain and snow



Front Wheel Drive

Rear Wheel Drive



- Components spread from front to rear
  - Transmission
- Heavier than FWD cars
- Poor handling in rain and snow
- Better traction for performance purposes

Four Wheel Drive 4X4

- Used primarily on trucks
- Drive all four wheel when engaged
- Heavy, poor fuel economy
- Excellent traction on rain, snow or off road conditions