TOYOTA Berbagi
Bersama Membangun Indonesia

TOYOTA INDONESIA
PT Toyota Motor Manufacturing Indonesia

Automotive Basic Knowledge

Ver 1.0 / Sept. 2017

Foreword

- **Why we have to learn this topics?**

  To understand vehicle structure and basic function, and how it works, to increase participants' interest in Automotive Technology.

Training Objective

- After finish this training, participants should be able to:
  - Can understand car categorization based on its body type
  - Can identify main function and structure of a car
  - Can understand basic principles of car Operations

AUTOMOTIVE BASIC KNOWLEDGE

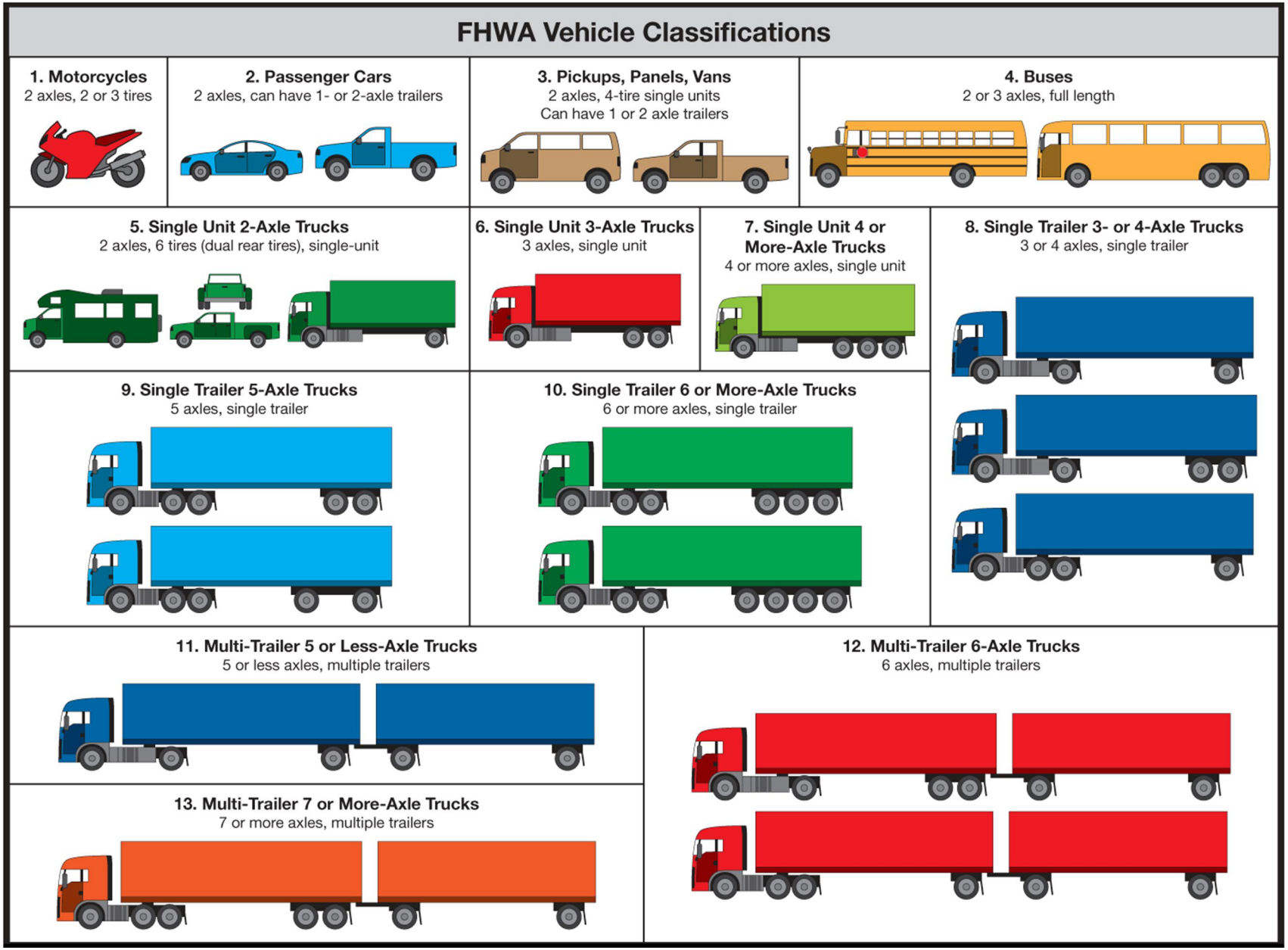
What is a Vehicle?

"A vehicle is thing used for transporting people or goods, especially on land."

What is a Car?

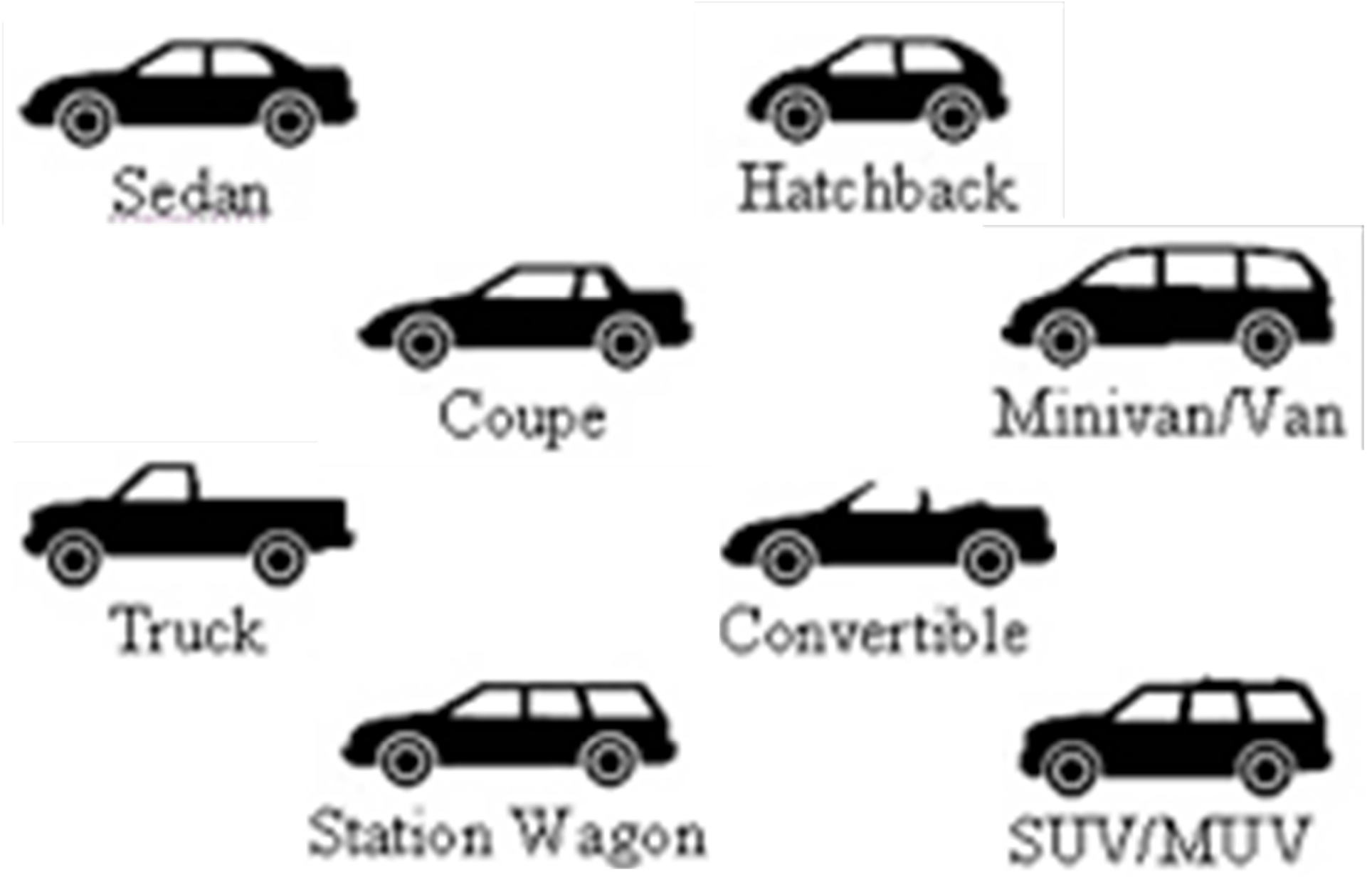
"A Car is wheeled motor vehicle, typically with four wheels, used for transportation"

Vehicle Category

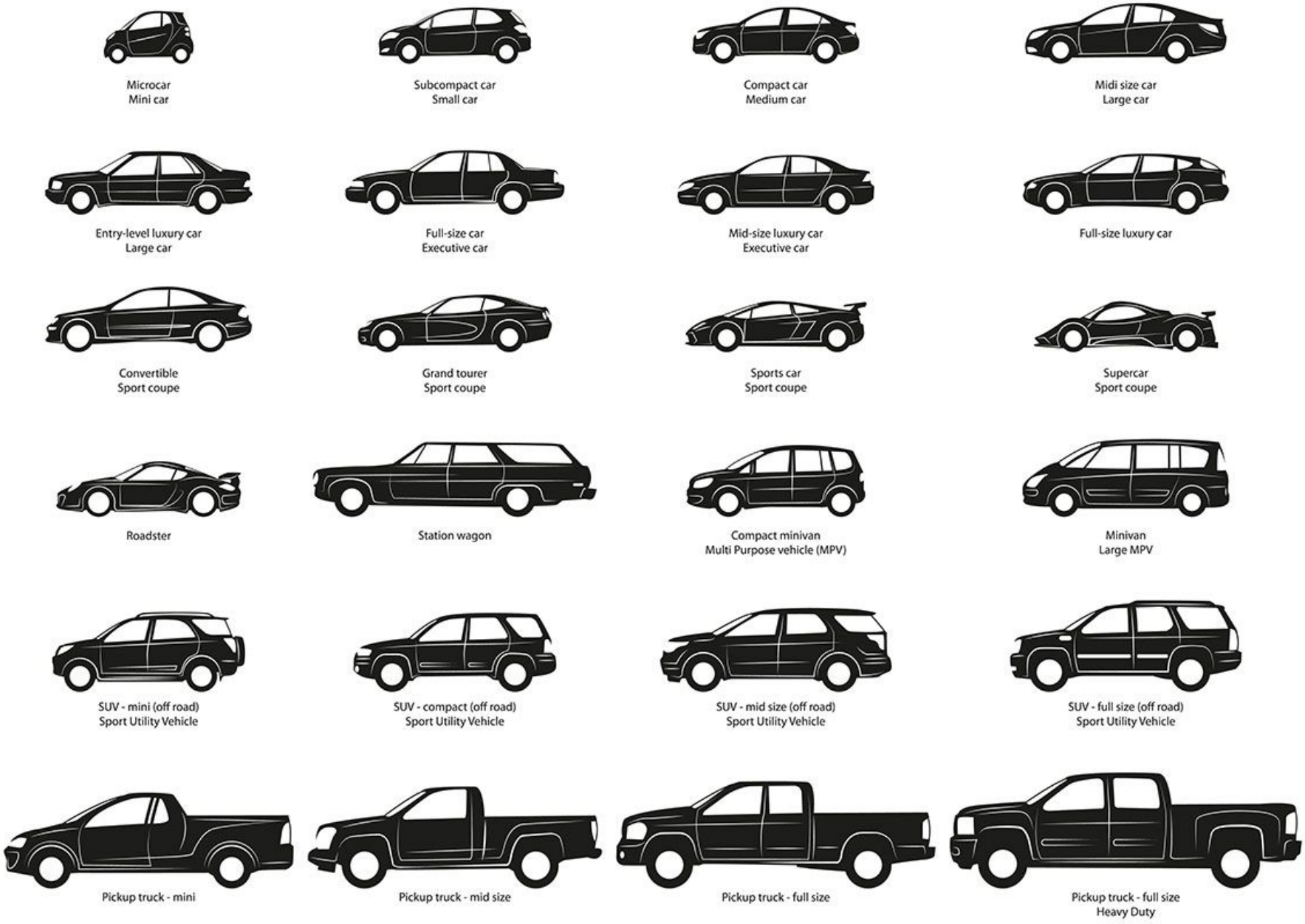


FHWA : Federal Highway Administration

Car Category (Body)



Car Category (Space)



TMMIN MODEL LINE-UP

TMMIN

TMMIN Line-Up Model

Kijang INNOVA

Category	Minivan *
Plant Production	Plant 1
Delivery Part	>1500 P/No.
Part Quantity	>3300 pcs
Local Sourcing	77%
Supplier	85 Companies

FORTUNER

Category	SUV
Plant Production	Plant 1
Delivery Part	>1700 P/No.
Part Quantity	>3800 pcs
Local Sourcing	75%
Supplier	82 Companies

TMMIN Line-Up Model

YARIS

Category	Hatchback
Plant Production	Plant 2
Delivery Part	>1400 P/No.
Part Quantity	>3100 pcs
Local Sourcing	69%
Supplier	83 Companies

VIOS

Category	Sedan
Plant Production	Plant 2
Delivery Part	>1400 P/No.
Part Quantity	>3200 pcs
Local Sourcing	70%
Supplier	83 Companies

SIENTA

Category	Minivan
Plant Production	Plant 2
Delivery Part	>1500 P/No.
Part Quantity	>3000 pcs
Local Sourcing	81%
Supplier	86 Companies

TMMIN Line-Up Model

	INNOVA	FORTUNER	YARIS	VIOS	SIENTA
Delivery Part	>1500	>1700	>1400	>1400	>1500
Part Quantity	>3300	>3800	>3100	>3200	>3000
Local Content	77%	75%	69%	70%	81%
Supplier	85	82	83	83	86

How to control all components?

- Good Management
- Good Communication
- Good Team Work

VEHICLE
BASIC COMPONENT

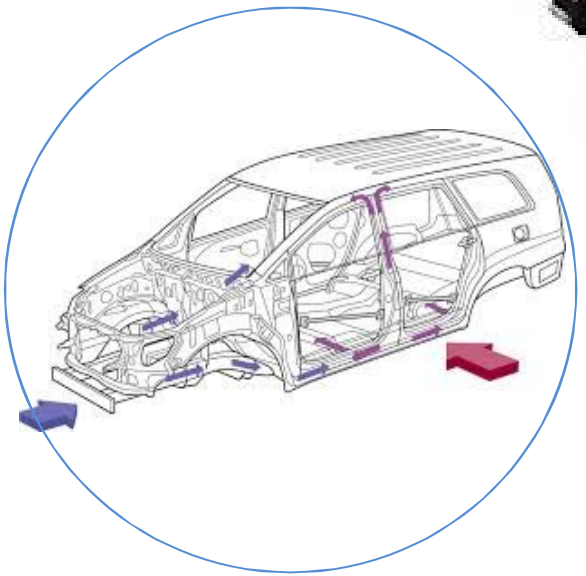
TMMIN

Vehicle Basic Component

CHASSIS & FRAME

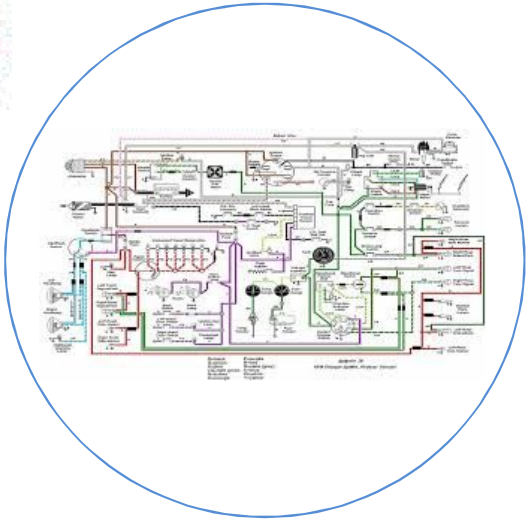
POWER TRAIN (E/G)

DRIVE TRAIN



BODY & EXTERIOR

INTERIOR



ELECTRICAL & WIRE HARNESS

Vehicle Basic Component

VEHICLE

CHASSIS FRAME

- Frame
- Suspension
- Steering
- Brake
- Wheel
- Etc.

POWER TRAIN

- Engine Unit
- Engine Compartment (Encopa)
- Drive Train *)
- Etc.

DRIVE TRAIN

- Transmission
- Clutch
- Drive Shaft
- Differential
- Etc.

BODY EXTERIOR

- Body Shell
- Exterior
- Body Function
- Etc.

INTERIOR

- Instrument Panel
- Seat
- Lining/Trim
- Etc.

ELECTRICAL WIRE HARNESS

- Battery
- ECU
- Wire Harness
- A/C, etc.

VEHICLE
BASIC FUNCTION

走る(RUNNING)

- Power Train, Drive Train, Body

曲がる(TURNING)

- Chassis (Steering & Suspension)

止まる(STOPPING)

- Chassis (Braking, Wheel)

つながる(CONNECTING)

- Electrical, Interior

走る(RUNNING)

- **Power Train, Drive Train, Body**

POWER TRAIN (E/G)

TRANSMISSION

BODY & EXTERIOR

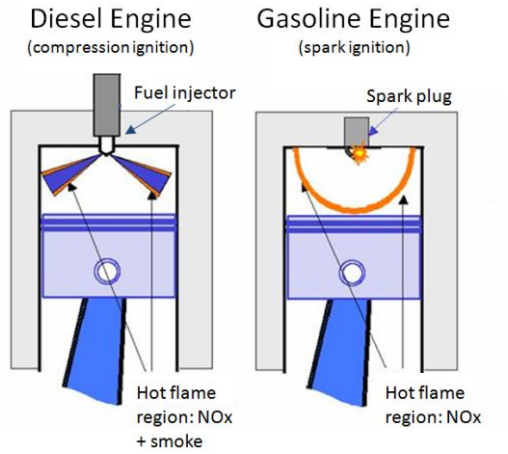
Power Train (Engine)

Function

- To run the vehicle/car by converting energy into mechanical.
- To define car/vehicle power characteristic.

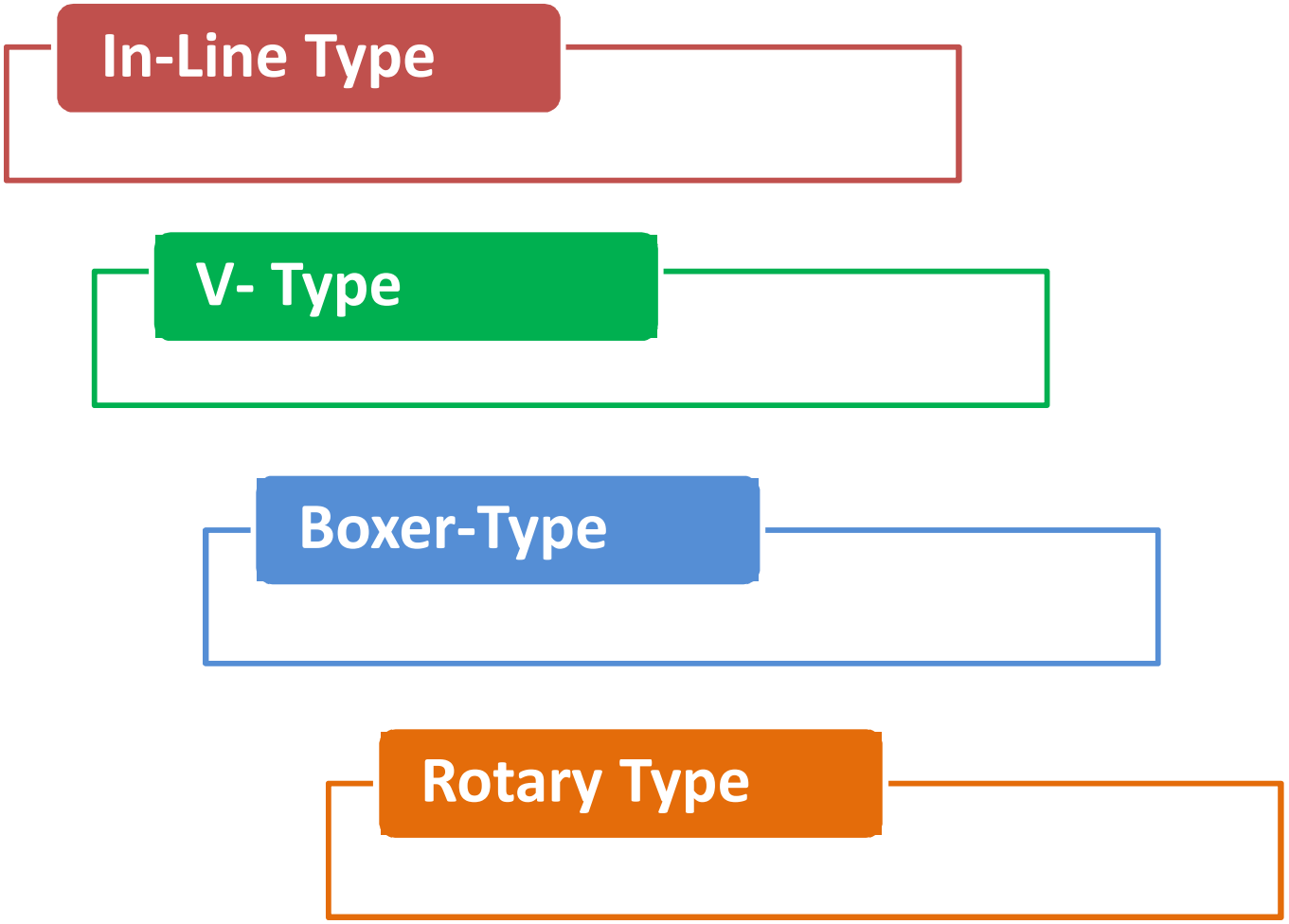
Engine Type

- Gasoline Engine
- Diesel Engine
- Etc



Power Train

- Engine Configuration Types



Power Train

- Engine Configuration Types ➢ In-Line Type

Definition

- Engine with all Cylinder in one row and having no offset

Advantage

- Simple design, easy to build
- Low cost, easy for service
- Can be mounted in any direction
- Etc

Dis-advantage

- Lack of balance & rough
- Etc

Power Train

- Engine Configuration Types ➢ V – Type

Definition

- An engine with cylinder and pistons are aligned in two separate planes, the angle between each other forming a V configuration.

Advantage

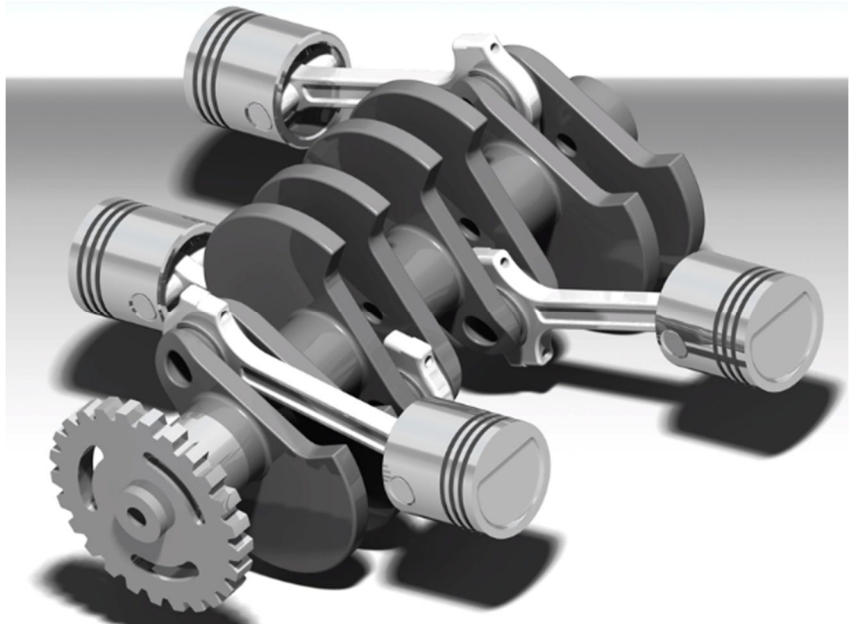
- Allow for greater displacement
- More torque and good power
- Etc

Dis-advantage

- More components
- more expensive
- Etc

Power Train

- Engine Configuration Types ➢ Boxer Type



Definition

- An engine with horizontally-opposed cylinders

Advantage

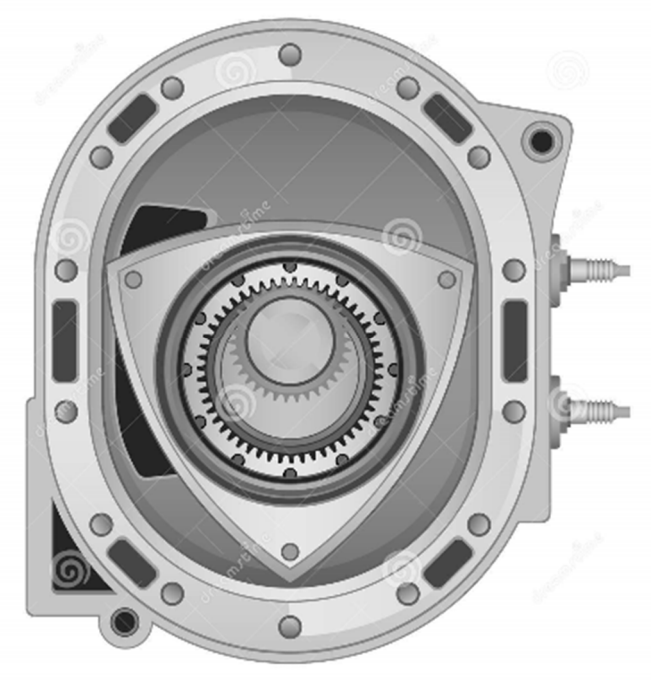
- Good engine balances
- Smooth engine
- Less power lost in rotational inertia
- Etc

Dis-advantage

- Very wide engine
- Complexity of part
- Etc

Power Train

- Engine Configuration Types ➢ Rotary Type



Definition

- An engine with an eccentric rotary design to convert pressure into rotating motion

Advantage

- High power to weight ratio
- Smoothness, compactness
- Etc

Dis-advantage

- Bad Fuel Economy & emission
- Complexity of part
- Etc

This engine type is used in previous Mazda engine

Drive Train (Transmission)

Function
- To transmit the engine power
- To change the speed and torque as driver needed.

Transmission Type
- Manual Transmission
- Automatic Transmission
- CVT

Manual Shifting lever – Automatic Shifting Lever

CVT

Vs.

Automatic

Drivetrain layout categories

FWD

- Front Wheel Drive

RWD

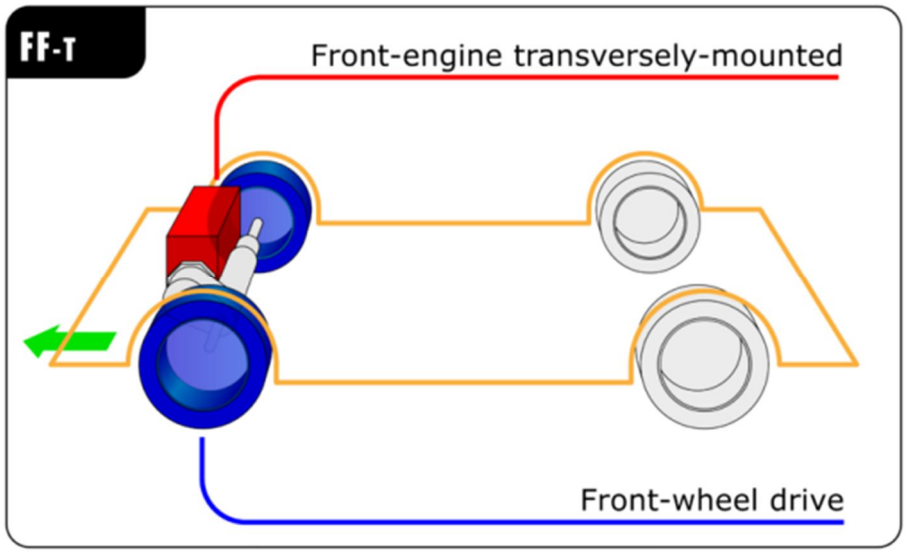
- Rear Wheel Drive

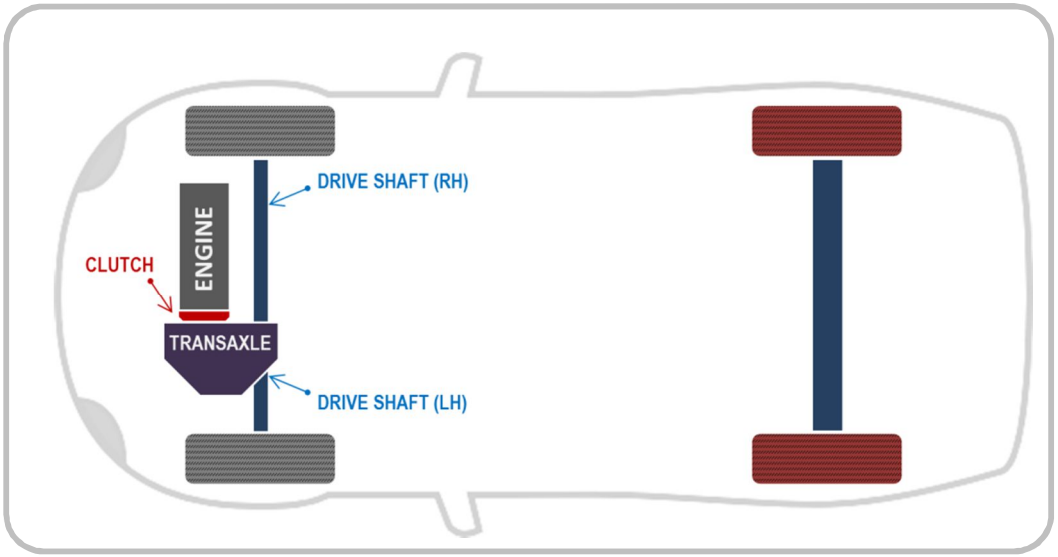
AWD

- All Wheel Drive

Drivetrain layout categories

- Front Wheel Drive (FWD)
  - FF → Front Engine – Front Drive





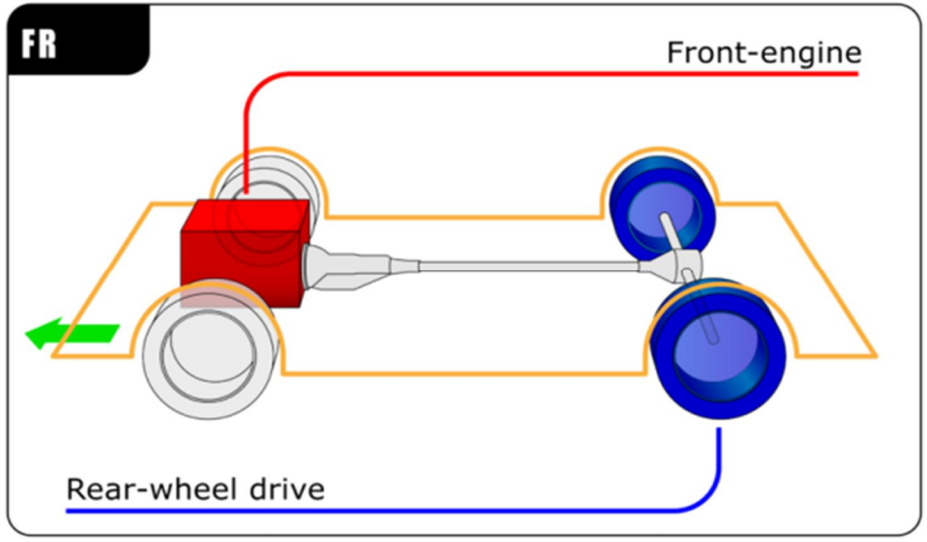
Advantage
- Light weight
- More cabin space
- Stable on straight

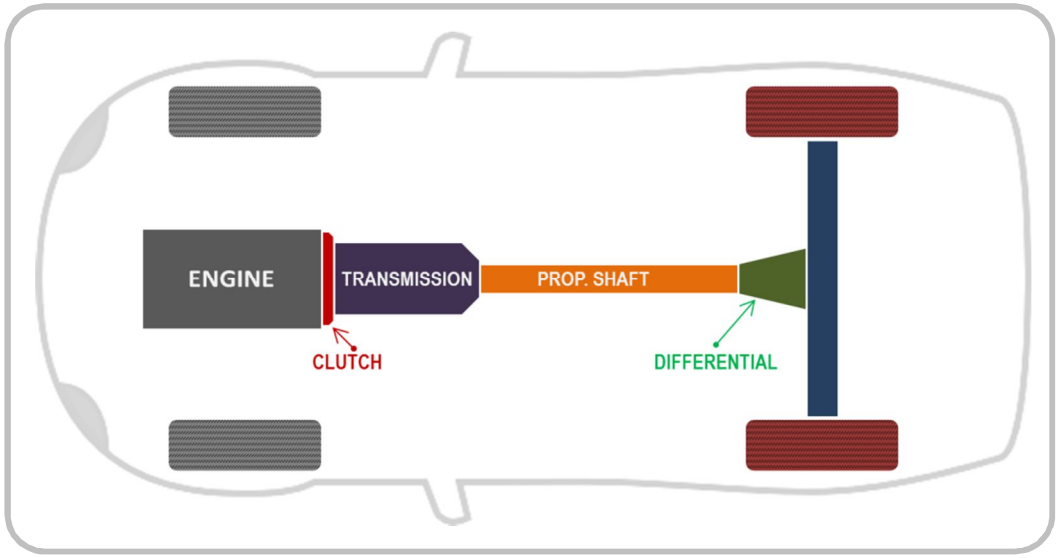
Dis-advantage
- Lack handling on turning

Usually used for compact and medium size family car.
- Toyota : Corolla, Vios, Yaris, Sienta
- Daihatsu : Ayla, Sirion
- Etc

Drivetrain layout categories

- Rear Wheel Drive (RWD)
  - FR → Front Engine – Rear Drive





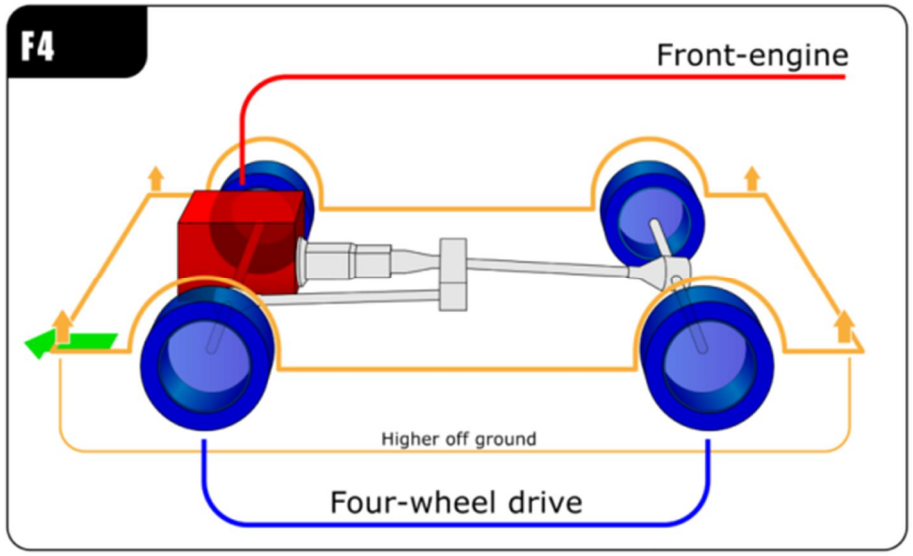
Advantage
- Good handling on turning

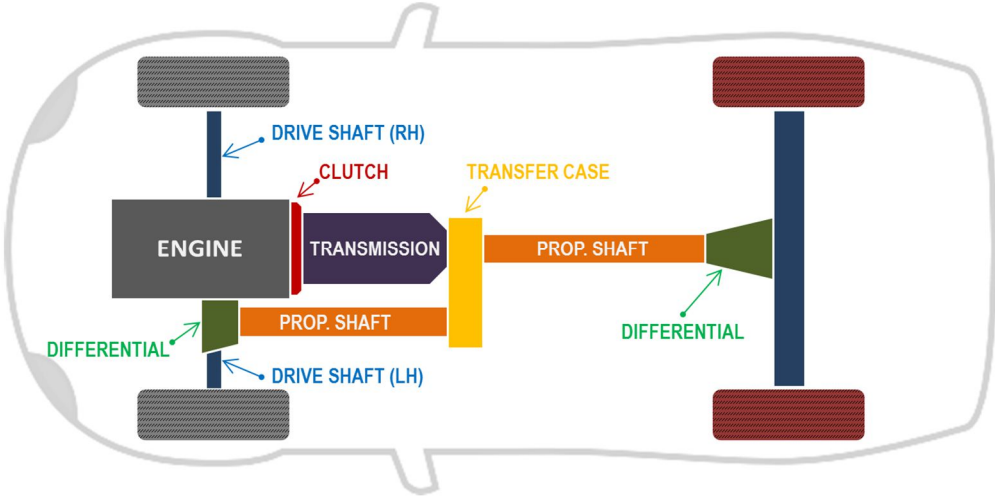
Dis-advantage
- Less cabin space
- Worse fuel cons. Than FF

Usually used for medium/high size family, sport car, commercial car.
- Toyota : Innova, Fortuner, Dyna
- Daihatsu : Avanza, Luxio
- Etc

Drivetrain layout categories

- Four Wheel Drive (4WD)





Advantage

- Good traction, good handling
- Good performance in rough road

Dis-advantage

- Heavier, complexity of part, expensive
- Worse fuel consumption

Usually used for SUV, Sport car.

- SUV : Landcruiser, Fortuner, Pajero
- Sport car : Audi, Ferrari, Lamborgini

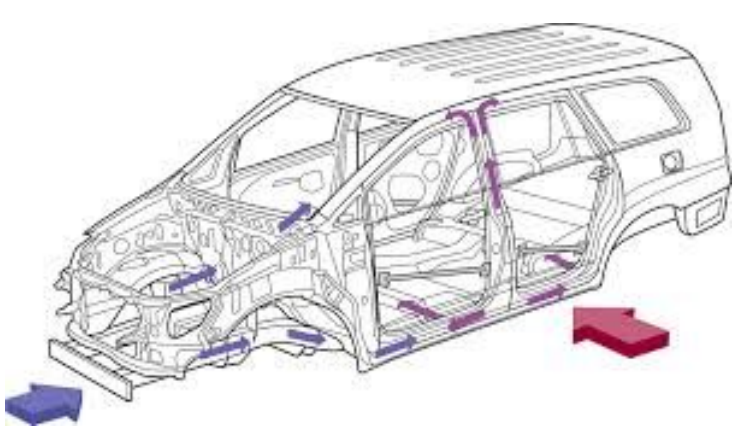
Body & Exterior

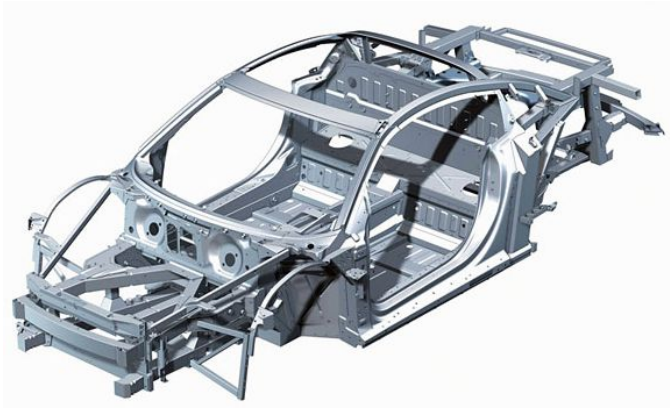
Function

- To protect the passengers from direct impact.
- Aerodynamic
- To have good looking (appearance).
- To attach other components (engine, electrical systems, seat , etc).

Body type

- Body on Frame
- Monocoque

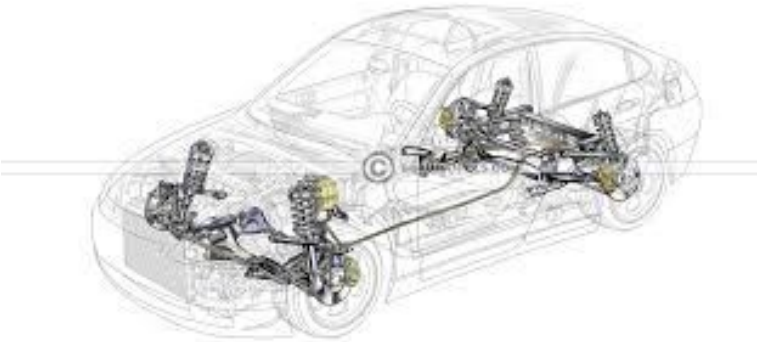




曲がる(TURNING)

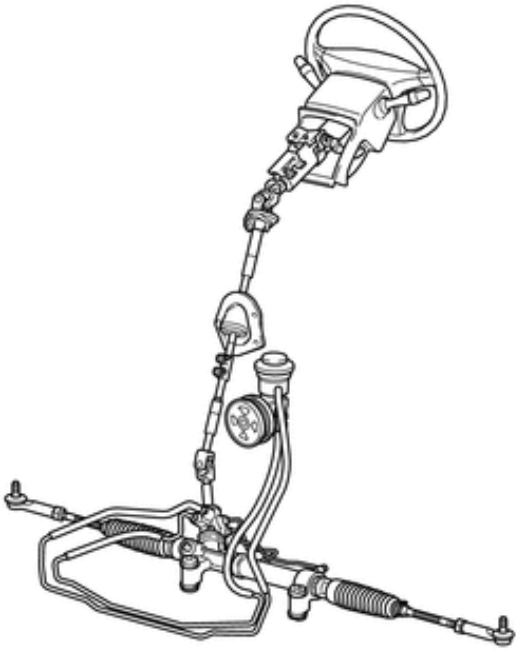
- **Chassis (Steering & Suspension System)**

STEERING SYSTEM



SUSPENSION SYSTEM

Steering System



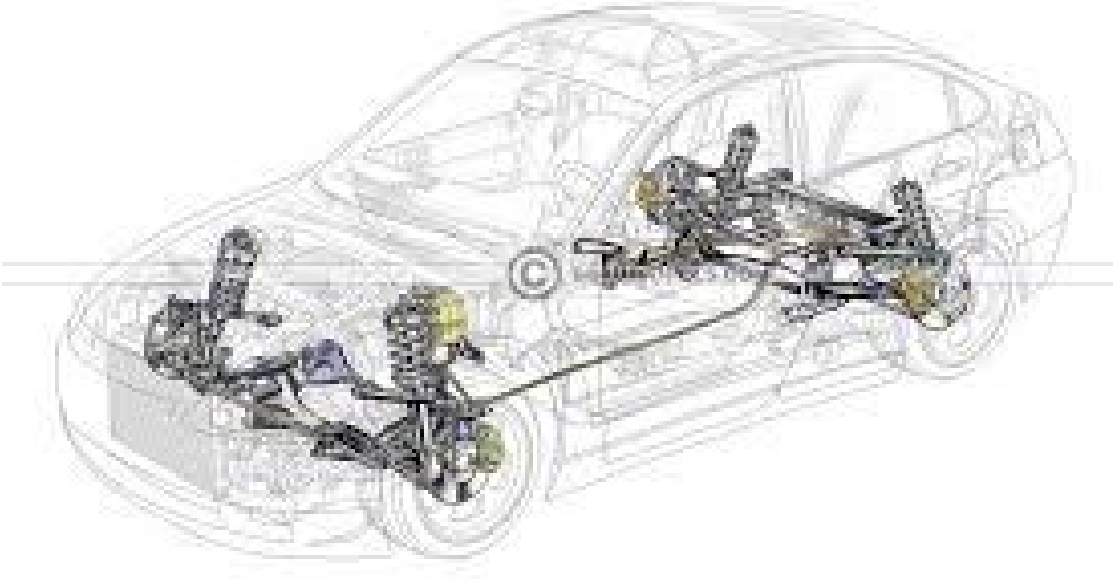
Function

- To transfer steering wheel movement into wheel movement.
- To allow the driver guide the vehicle.

Steering Type

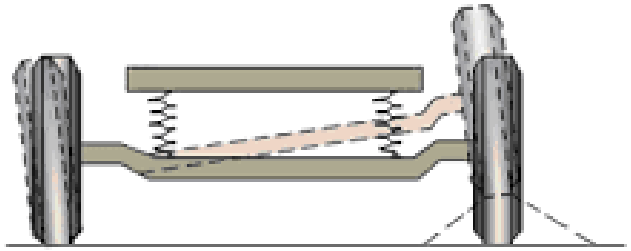
- Manual Steering
- Electric Power Steering
- Hydraulic Power Steering

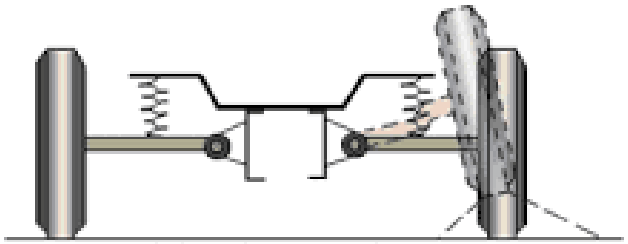
Suspension System

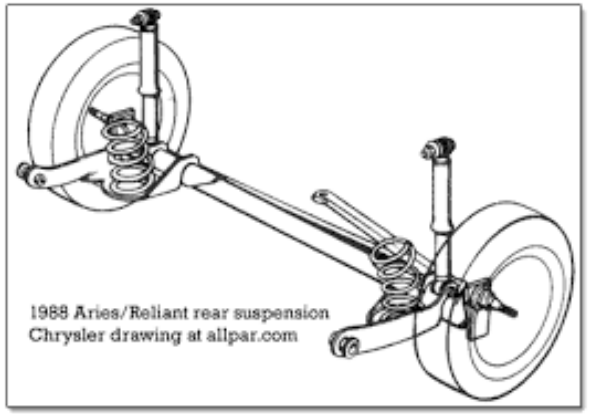


Function
- To maintain correct vehicle ride height
- To reduce the effect of shock force
- To provide steering stability and good handling
- To support vehicle weight/load

Types of Suspension System
- Dependent Suspension (Rigid)
- Independent Suspension
- Semi-Independent Suspension


non-independent suspension


independent suspension

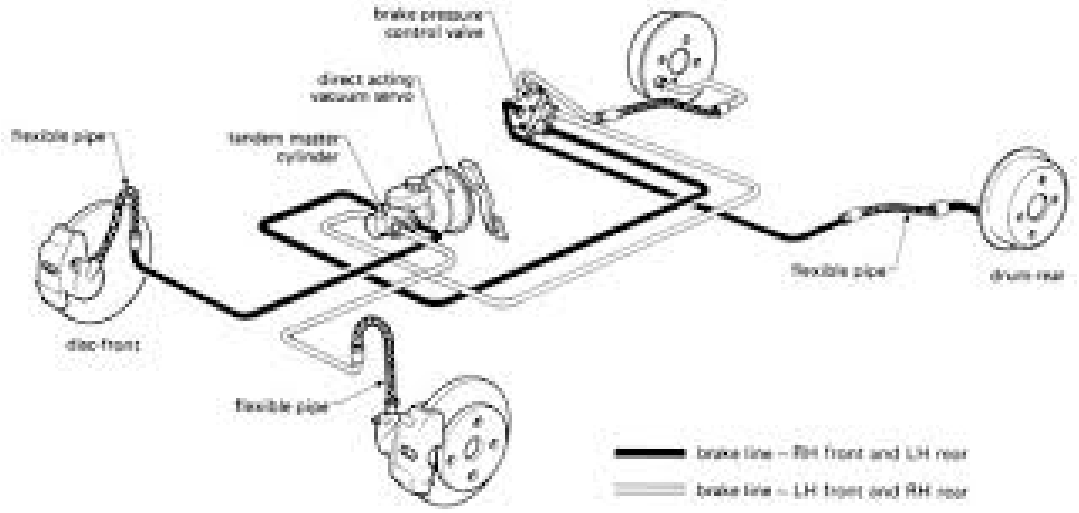


HOW SUSPENSION WORKS?

止まる(STOPPING)

- Chassis (Braking System, Wheel)

Brake System

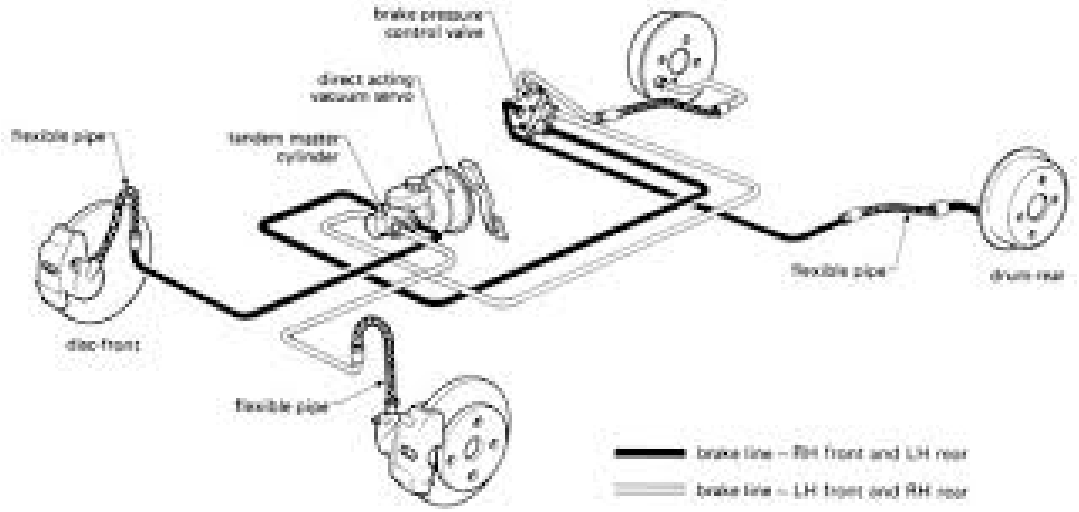


WHAT IS THE FUNCTION OF BRAKE?

VIDEO 1

VIDEO 2

Brake System

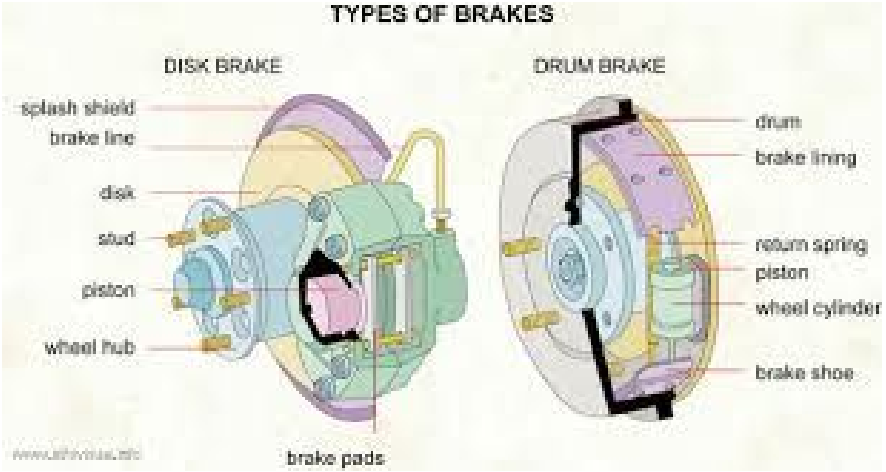


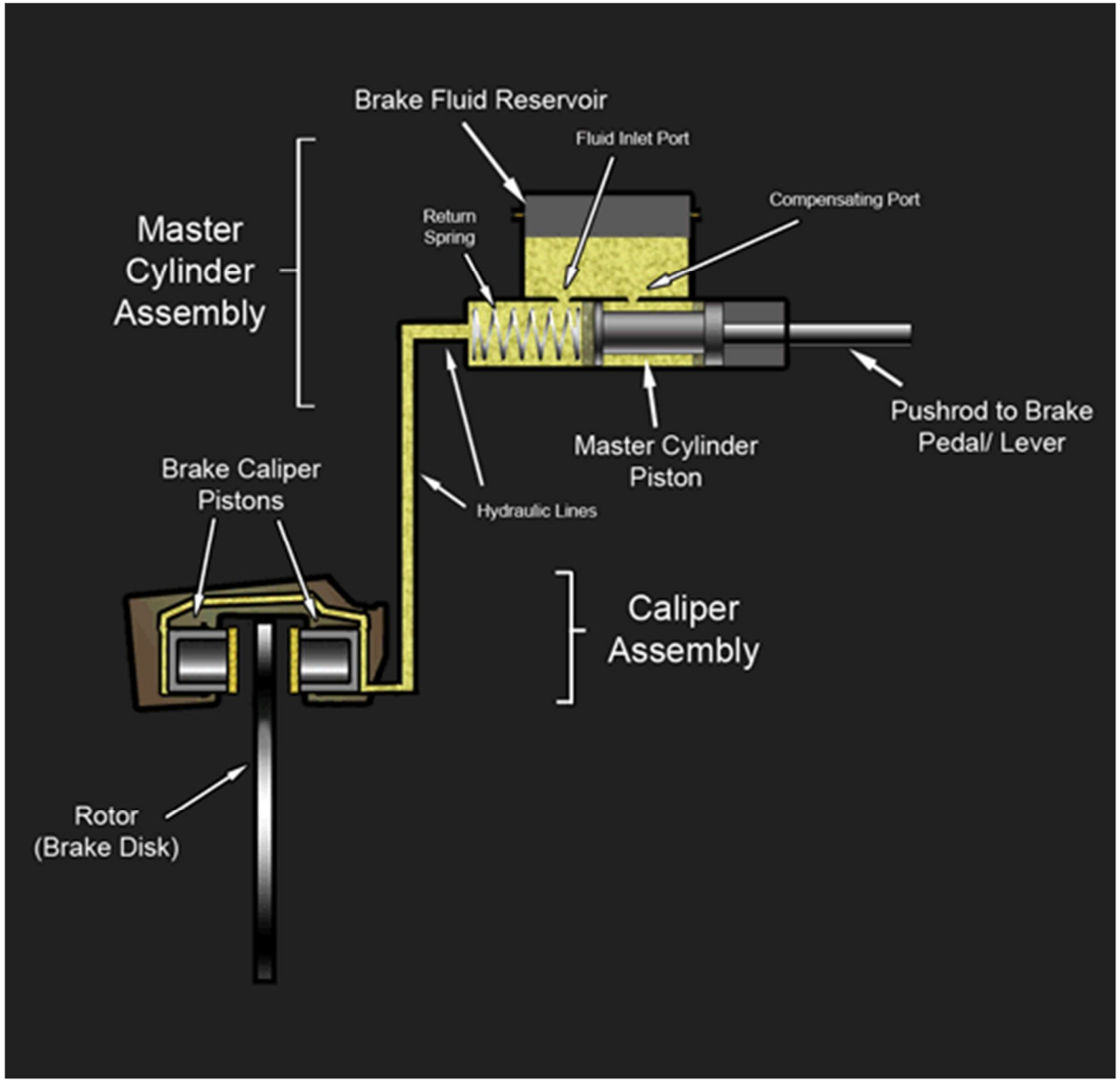
Function

- To stop the wheel by applying pressure on it.
- To slow/stop the vehicle utilize tire and road friction

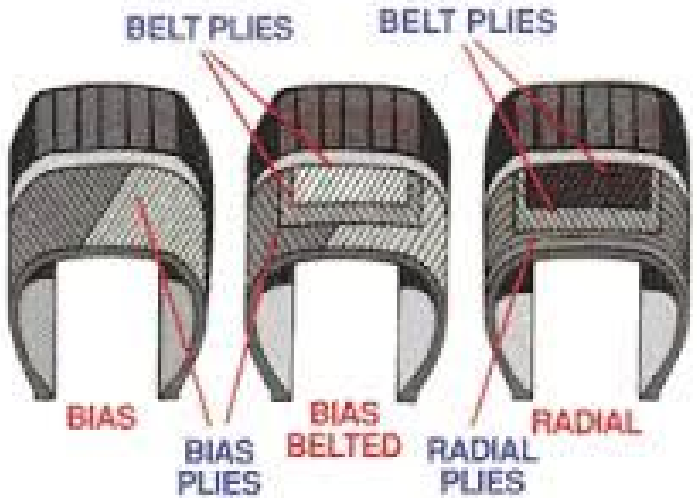
Brake Type

- Disc Brake
- Drum Brake




Brake Fluid Reservoir
Fluid Inlet Port
Compensating Port
Return Spring
Master Cylinder Assembly
Pushrod to Brake Pedal/ Lever
Master Cylinder Piston
Brake Caliper Pistons
Hydraulic Lines
Caliper Assembly
Rotor (Brake Disk)

Tire



Function

- Media between Vehicle and Road surface.
- Absorb the shock
- Give a friction into road surface to keep stability of vehicle.

Tire Type

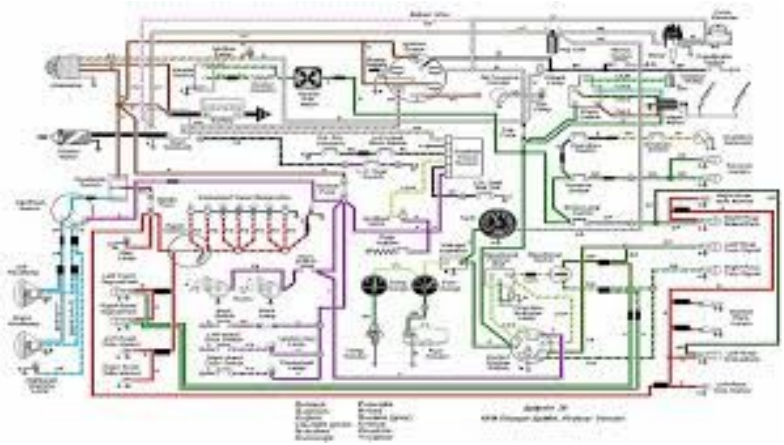
- Bias
- Bias Belted
- Radial

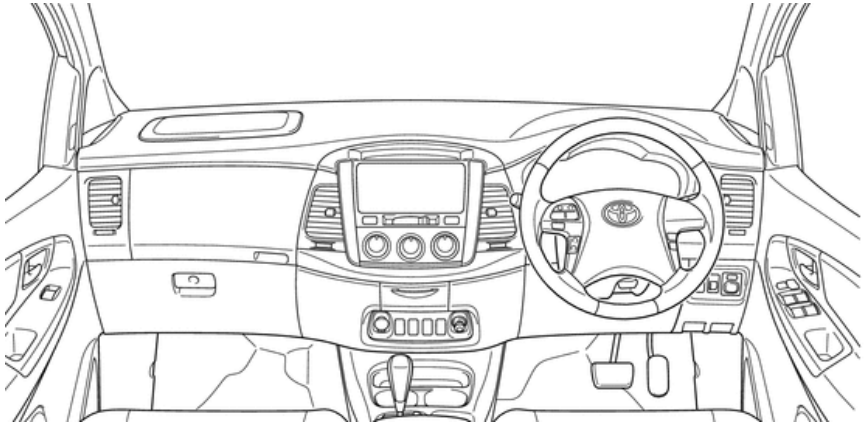
つながる(CONNECTING)

- Electrical, Interior

つながる(CONNECTING)

- Electrical, Interior





SUMMARY

❑ Definition of Vehicle & Car

Vehicle is thing used for transporting people or goods, especially on land.

Car is wheeled motor vehicle, typically with four wheels, used for transportation.

❑ TMMIN Model Line-up

- MPV : Kijang INNOVA, Sienta
- SUV : Fortuner
- Sedan : Vios, Limo
- Hatch Back : Yaris, Etios

❑ Number of Component

In each Toyota Model are consists more than 3000 parts, more than 80 companies and it categorized by 6 big Components

❑ Vehicle Basic Components

- Chassis & Frame (Frame, Suspension, Steering, Brake, etc.)
- Power Train (Engine, Drive Train, Encopa, etc.)
- Drive Train (Transmission, Differential, etc.)
- Body & Exterior (Body shell, Function, etc.)
- Interior (Instrument Panel, Seat, etc.)
- Electrical & Wire Harness (ECU, Battery, W/H, etc.)

❑ Vehicle Basic Function

- Running（走る）
- Turning（曲がる）
- Stopping（止まる）
- Connecting（つながる）

Thank You