

Course 071 Toyota Hybrid System



Welcome

Course Agenda

Day One

- Hybrid System Overview
- Transaxle Operation

Day Two

- High Voltage System
- Engine

Day Three

- Brake System
- Electric Power Steering
- Air Conditioning
- Multiplex Communication
- Hybrid General Maintenance

Worksheet Overview

- **Worksheet 1: Hybrid Walkarounds**
- **Worksheet 2: Data List Test Drive**

- **ILD 1: Transaxle Assembly Parts Identification**
- **ILD 2: Inverter Safety**
- **ILD 3: Battery Safety**

- **Worksheet 3: High Voltage System**
- **Worksheet 4: HV Battery State of Charge**

- **ILD 4: Highlander Hybrid EPS on Pico Scope**

- **Worksheet 5: Techstream (Hybrid EPS Initialization, Electric Air Conditioning System)**



Hybrid System Overview

Toyota Hybrid Technology

Toyota has been researching emission reduction technology since 1975.

HYBRID
SYNERGY
DRIVE



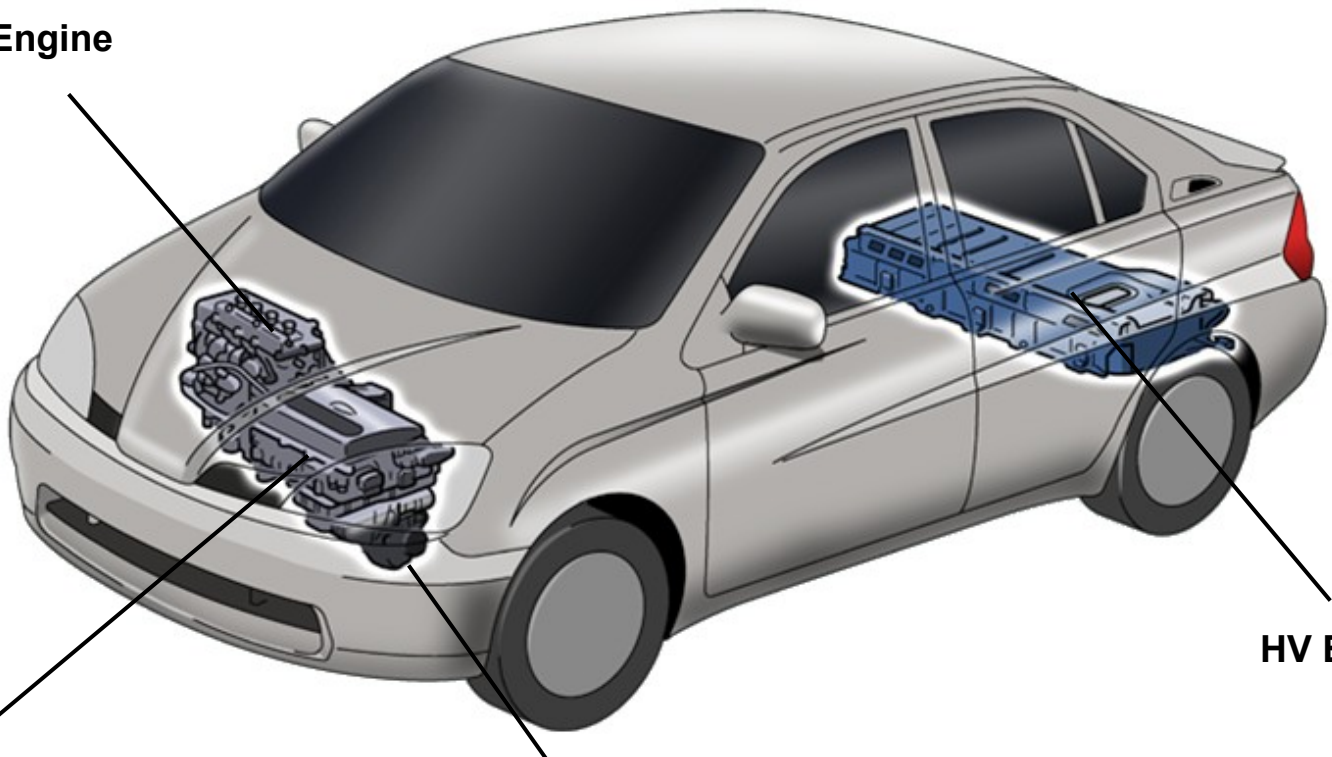
Toyota is the world leader in hybrid technology.

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Toyota Hybrid System (THS)

'01 – '03 Prius

1NZ-FXE Engine



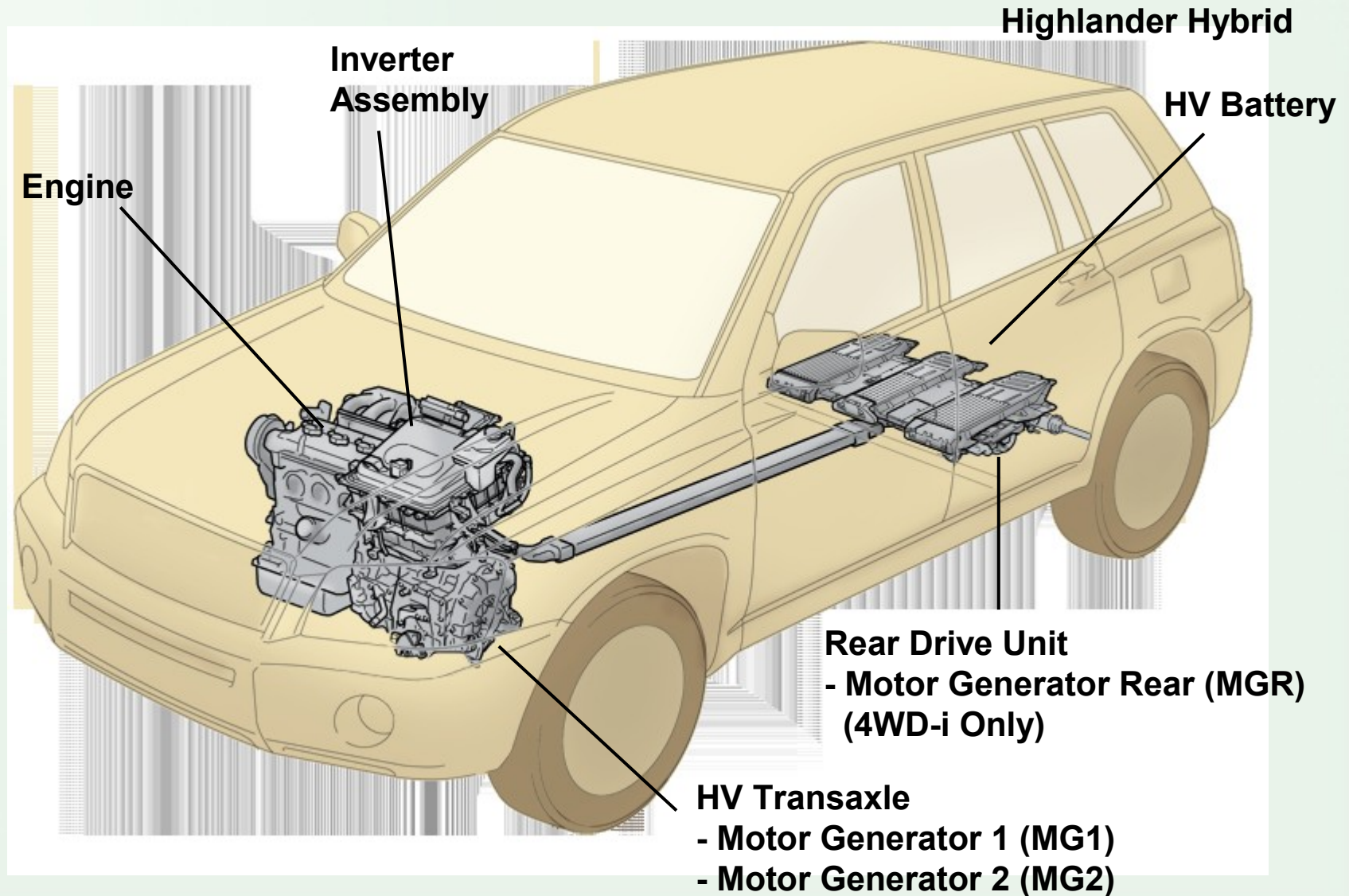
HV Battery

Inverter

Hybrid Transaxle

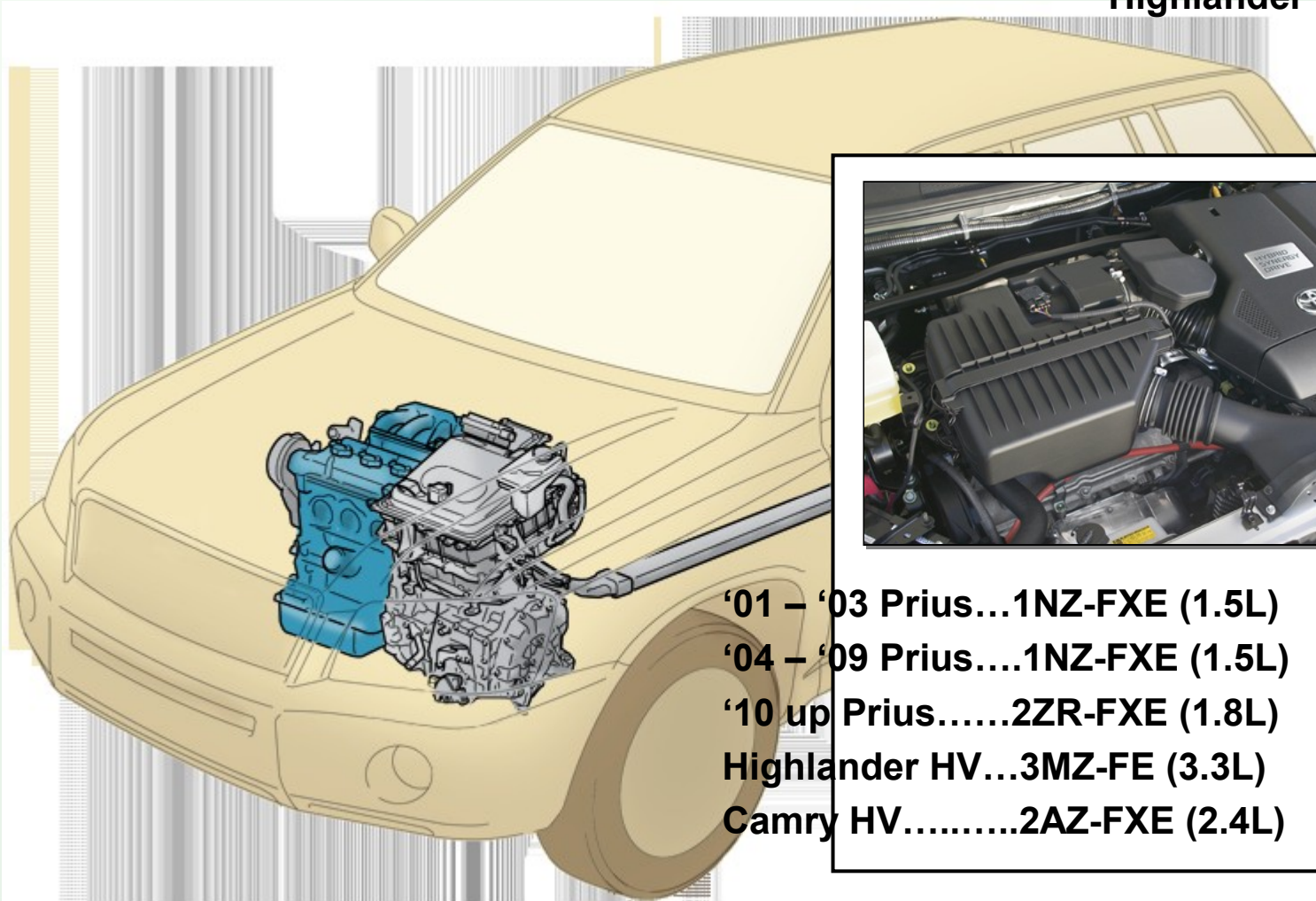
- Motor / Generator 1
- Motor / Generator 2

Hybrid System Overview (THS II)



Hybrid System Engines

Highlander Hybrid



- '01 – '03 Prius...1NZ-FXE (1.5L)
- '04 – '09 Prius...1NZ-FXE (1.5L)
- '10 up Prius.....2ZR-FXE (1.8L)
- Highlander HV...3MZ-FE (3.3L)
- Camry HV.....2AZ-FXE (2.4L)

Hybrid Drivetrain Components

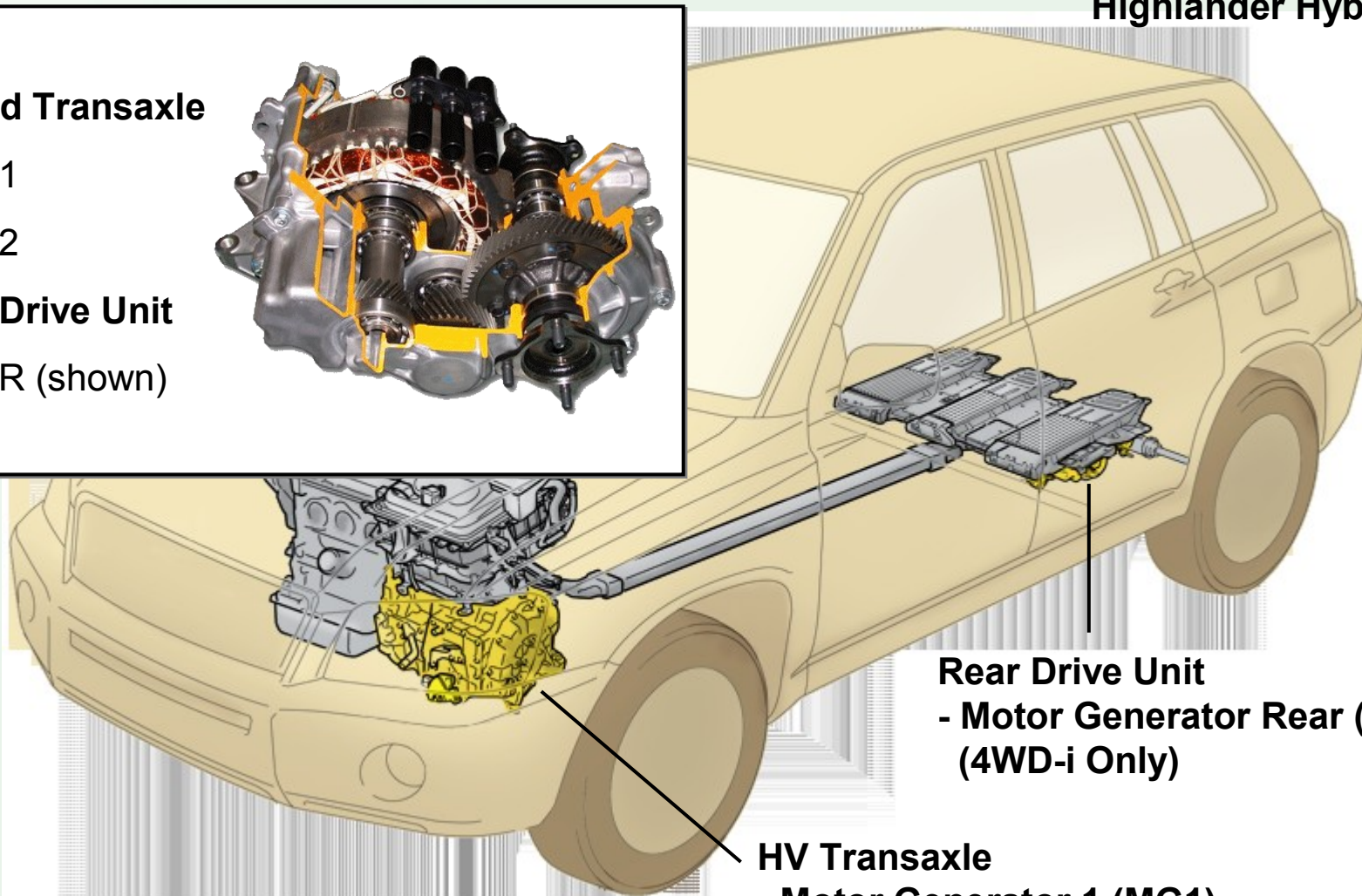
Highlander Hybrid

Hybrid Transaxle

- MG1
- MG2

Rear Drive Unit

- MGR (shown)



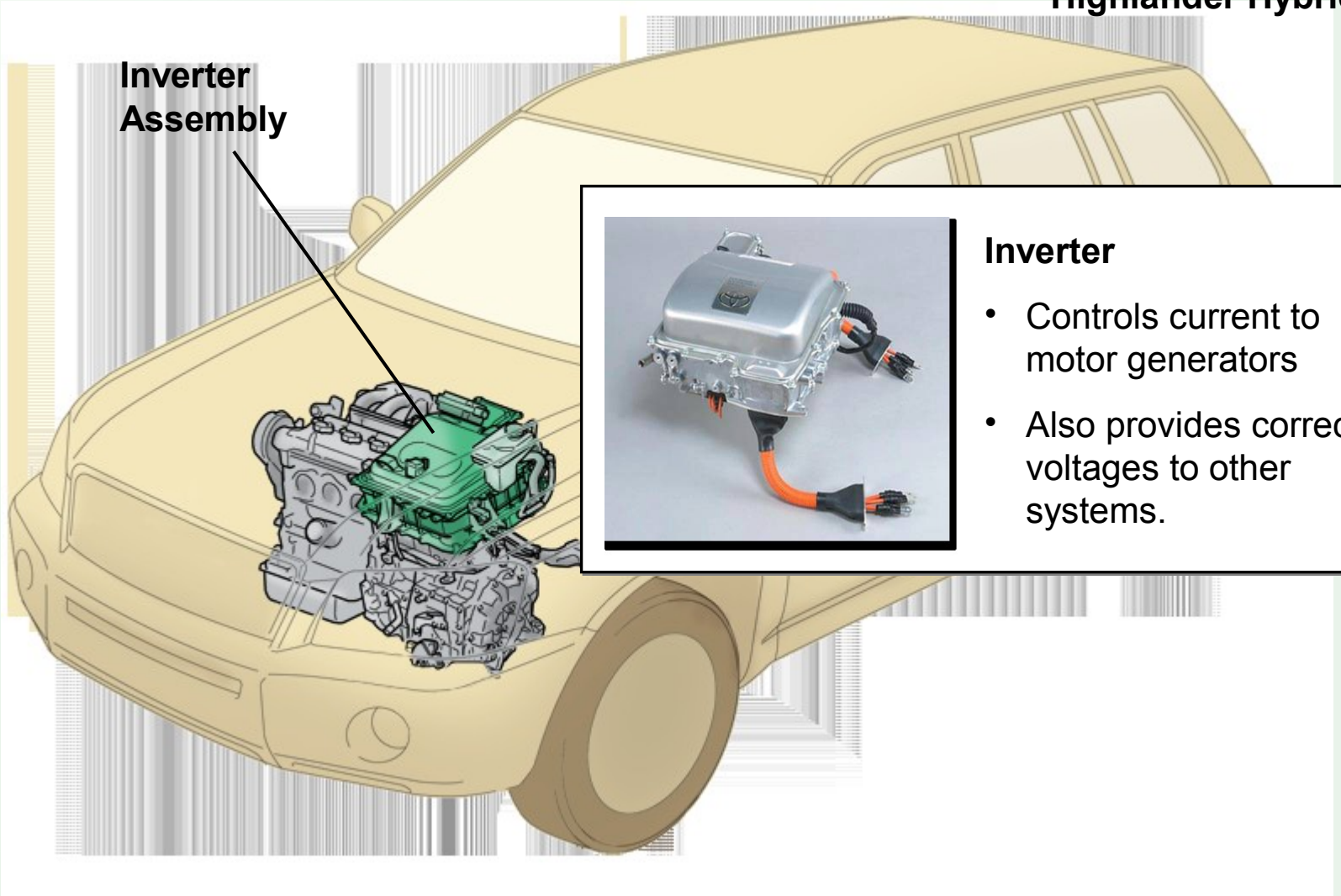
Rear Drive Unit
- Motor Generator Rear (MGR)
(4WD-i Only)

HV Transaxle
- Motor Generator 1 (MG1)
- Motor Generator 2 (MG2)

Hybrid Drivetrain Components

Highlander Hybrid

Inverter
Assembly



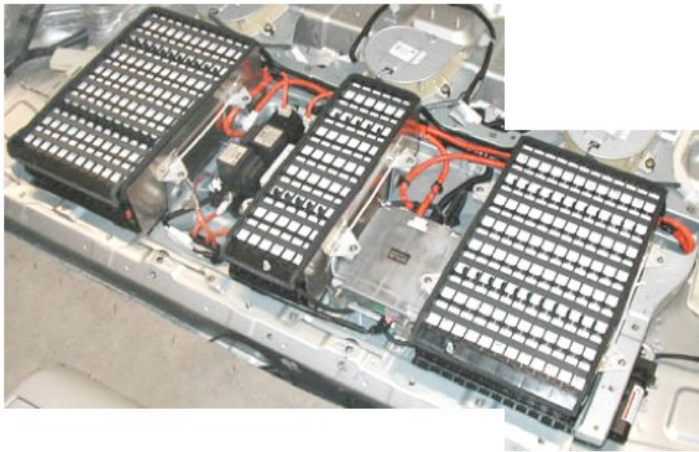
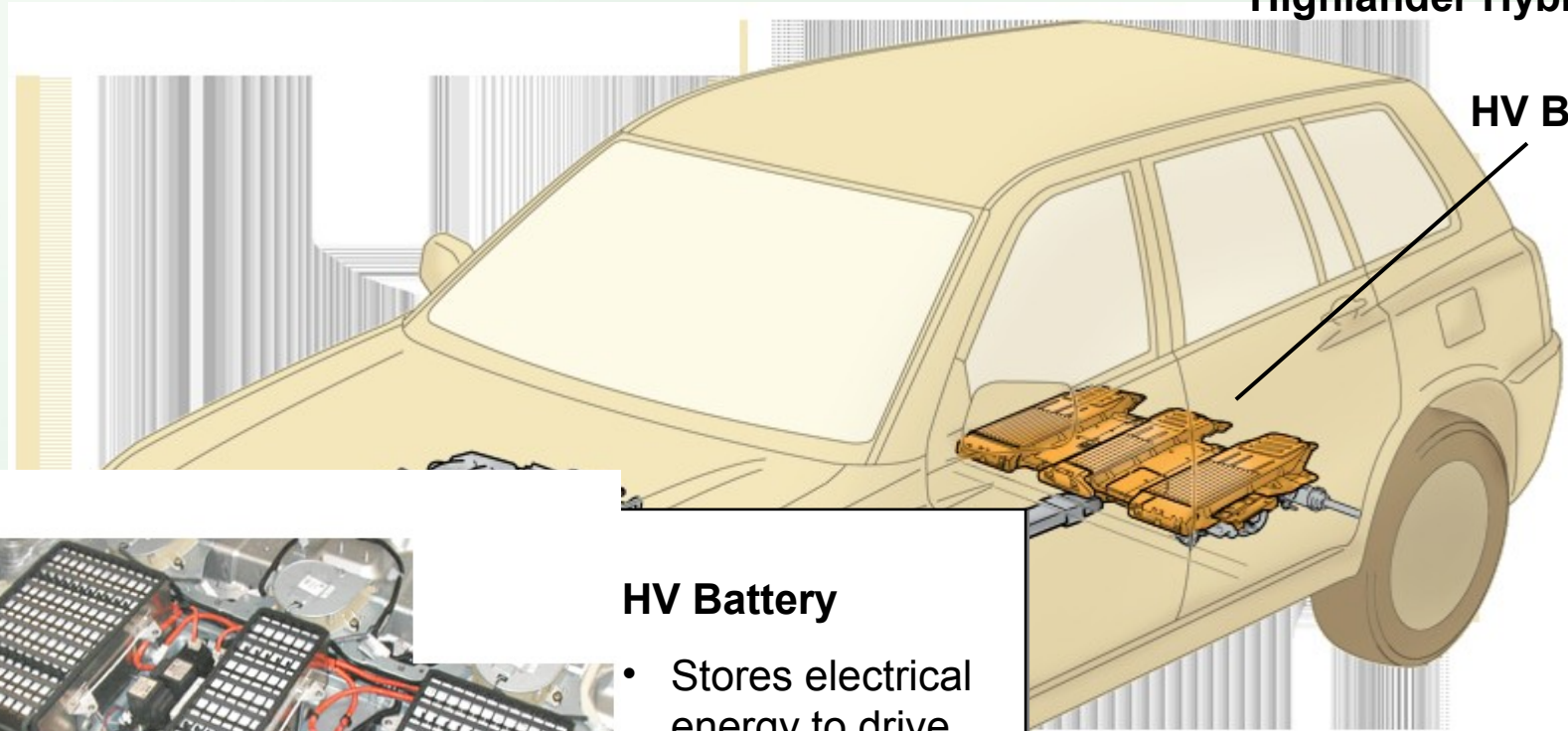
Inverter

- Controls current to motor generators
- Also provides correct voltages to other systems.

Hybrid Drivetrain Components

Highlander Hybrid

HV Battery



HV Battery

- Stores electrical energy to drive the system

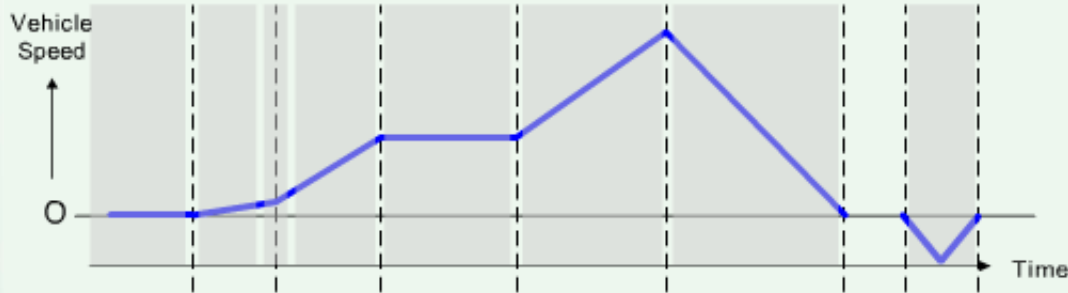
Hybrid Vehicle Safety Precaution

2010 Prius



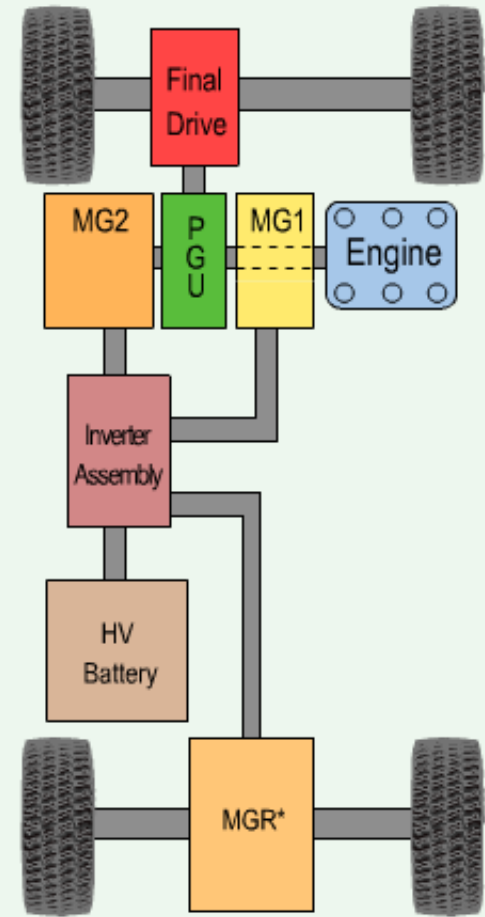
- All hybrid system high-voltage wire harnesses are **orange**.
- The HV battery and other high-voltage components have High Voltage caution labels.
- Do not carelessly touch these wires and components.

Hybrid System Control Modes



Click each part of the drive cycle above for an explanation.

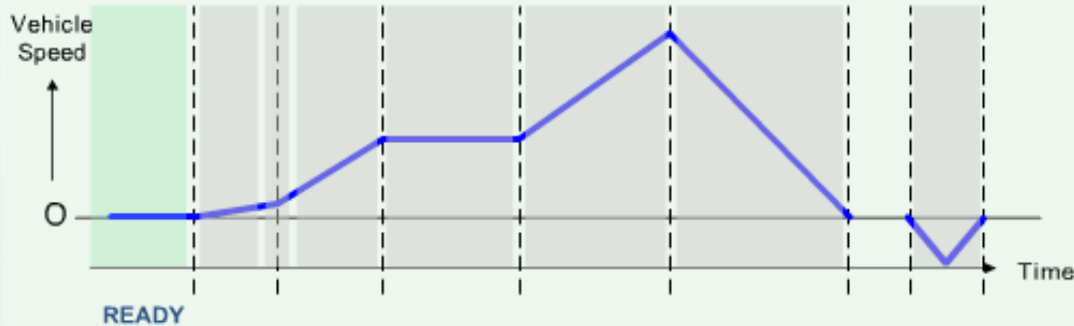
Roll over any component to the right for a description.



*If equipped with 4WD



READY



Click each part of the drive cycle above for an explanation.

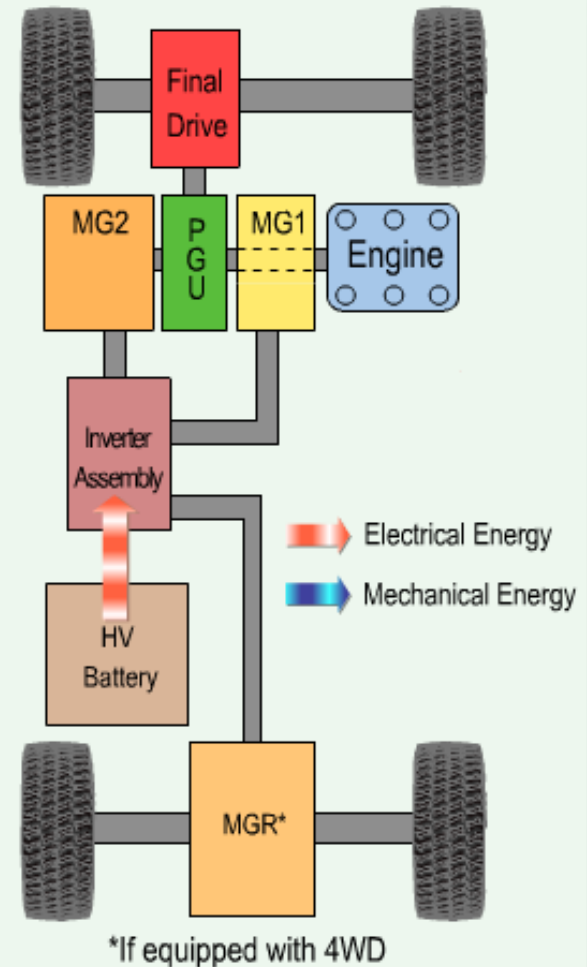
Roll over any component to the right for a description.

ENGINE OFF

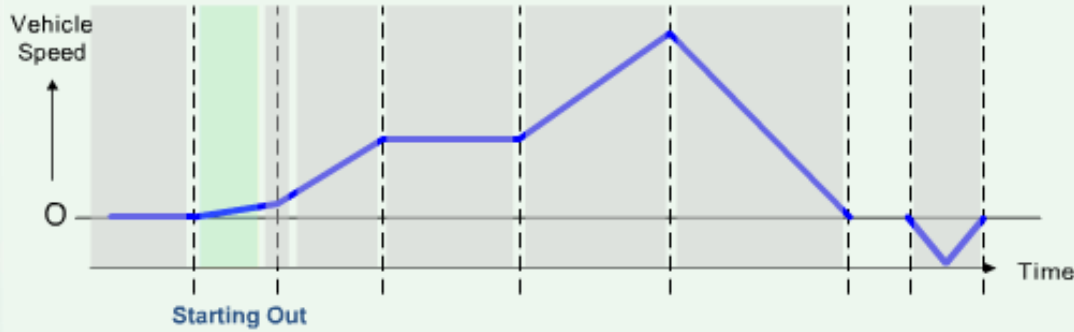
ENGINE STARTING

Click to the left to change engine state.

- Ignition switch ON and READY indicator ON.
- Vehicle is ready to drive.
- MG1, MG2 and MGR are stopped.
- Engine will start when required.



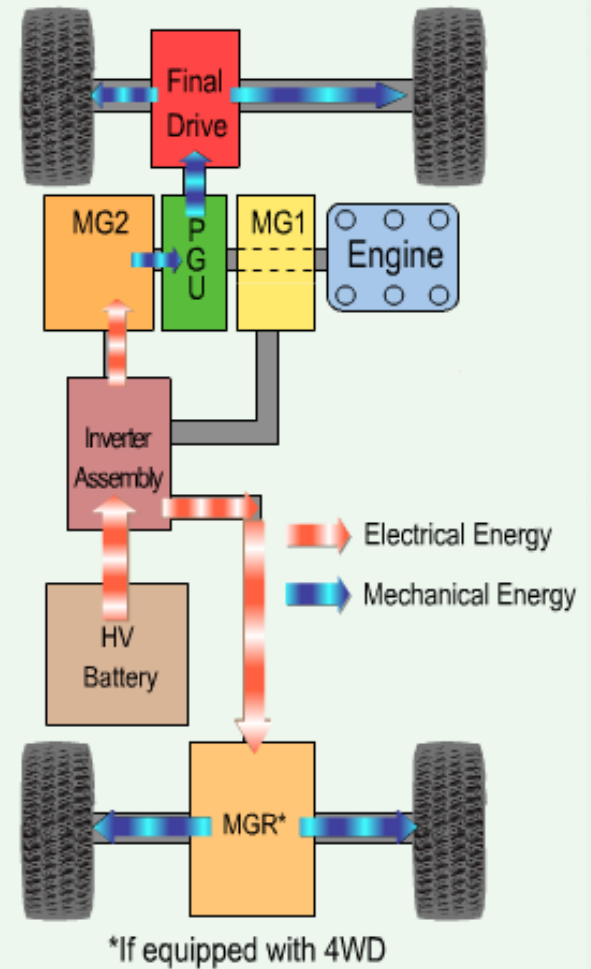
Starting Out



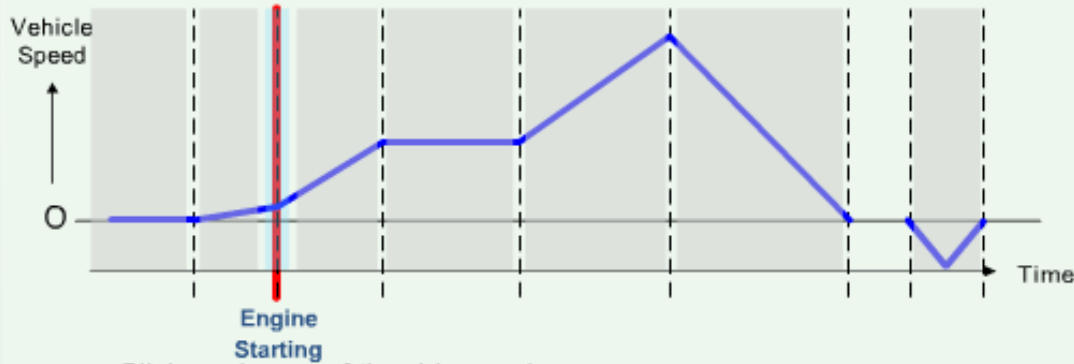
Click each part of the drive cycle above for an explanation.

Roll over any component to the right for a description.

- MG2 and MGR drive the vehicle.
- Engine is not required to drive the vehicle.



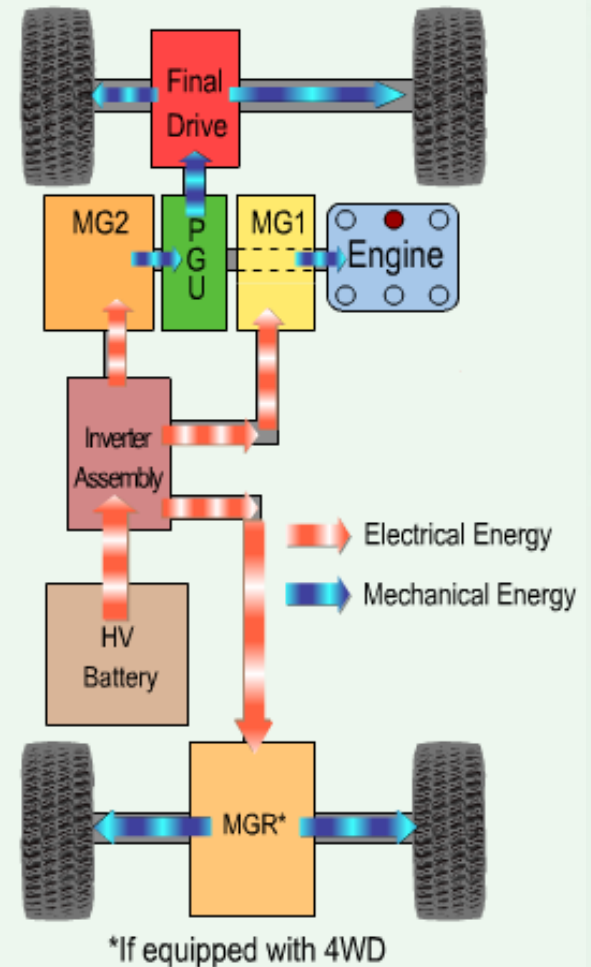
Engine Starting



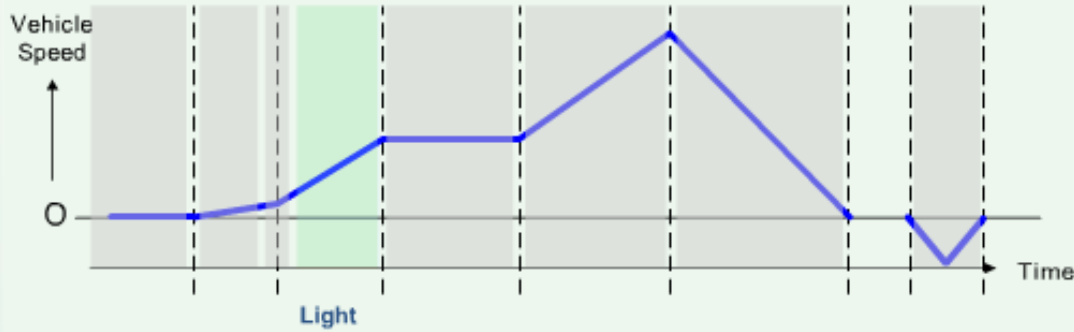
Click each part of the drive cycle above for an explanation.

Roll over any component to the right for a description.

- When drive torque increases, the engine is started.
- MG1 serves as a starter for the engine.



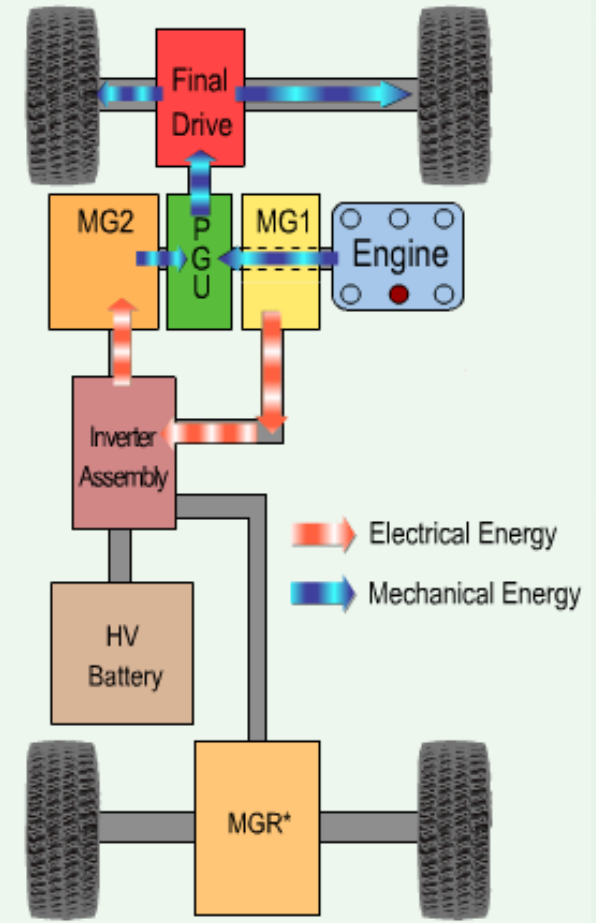
Light Acceleration



Click each part of the drive cycle above for an explanation.

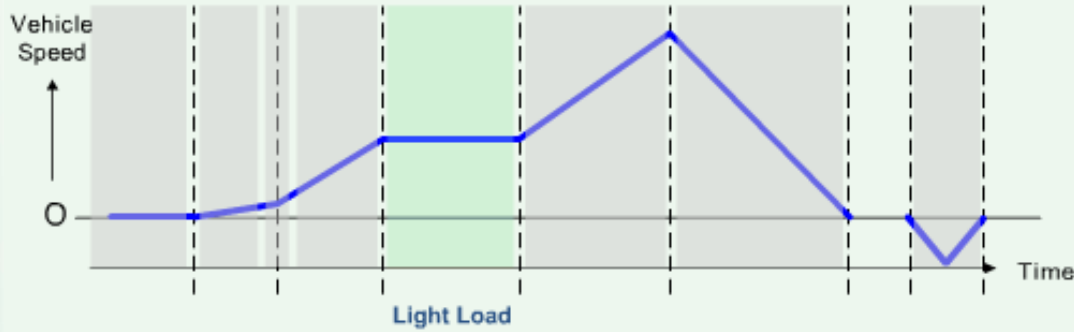
Roll over any component to the right for a description.

- MG2 and the engine drive the vehicle.
- MGR is stopped to improve fuel economy.
- Engine drives MG1 as a generator.



*If equipped with 4WD

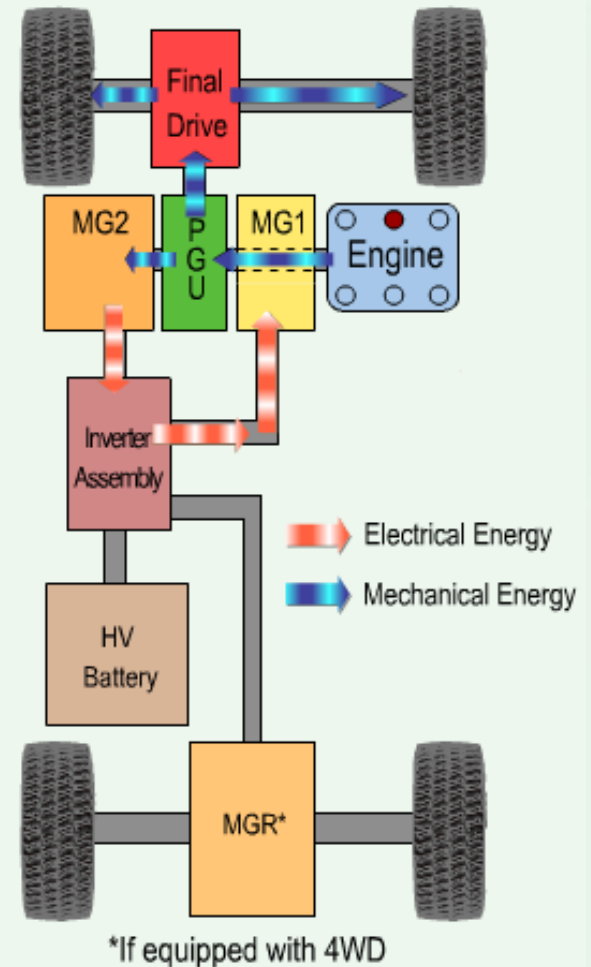
Light Load Cruise



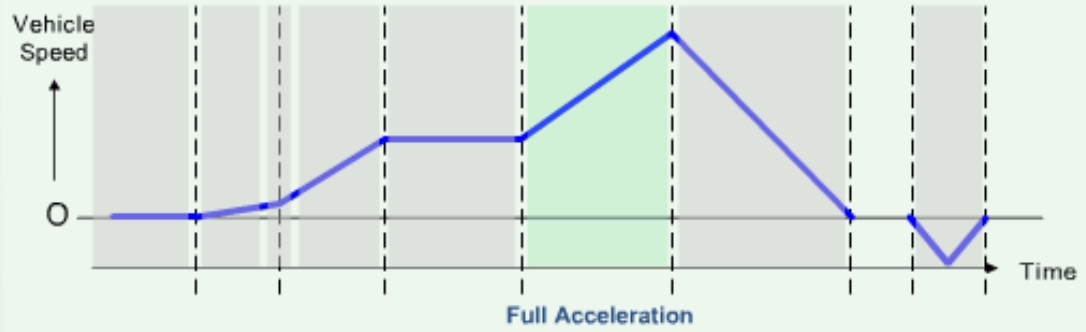
Click each part of the drive cycle above for an explanation.

Roll over any component to the right for a description.

- The engine drives the vehicle.
- MG2 works as a generator to power MG1, to control the planetary gear unit.



Full Acceleration



Click each part of the drive cycle above for an explanation.

Roll over any component to the right for a description.

- MG2 and the engine drive the vehicle.
- MGR provides additional power.
- HV battery supplies additional power.

