

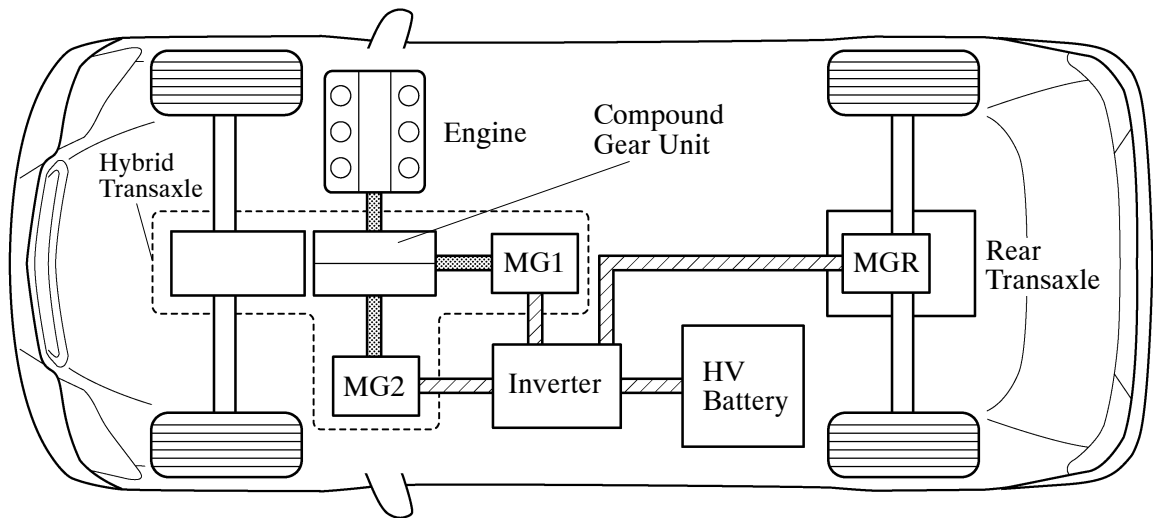
■ FEATURES OF THS-II

1. General

- The THS-II offers the following representative features:
 - Uses a variable-voltage system in which a boost converter boosts the operating voltage of the system to a maximum voltage of DC 650V and an inverter converts the direct current into an alternating current, which supplies the system voltage to MG1, MG2 and MGR.
 - A motor speed reduction planetary gear unit, whose purpose is to reduce motor speed, is used to enable the high-speed, high-output MG2 to adapt optimally to the power split planetary gear unit in the hybrid transaxle.
- The THS-II consists primarily of the following components:

▨: Mechanical Power Path

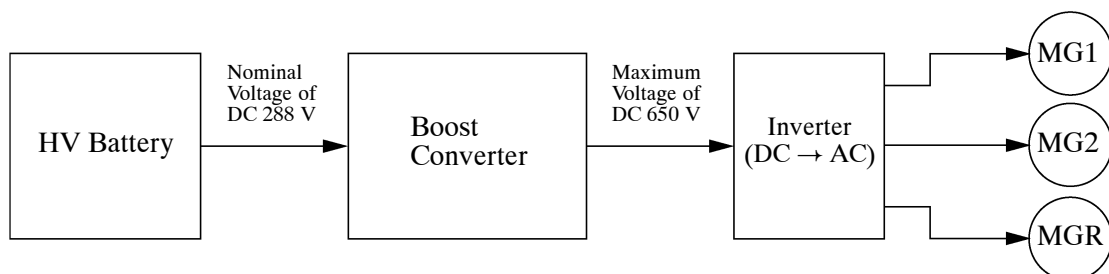
▨: Electrical Path



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2. Variable-voltage System

In the THS-II of the new RX400h, a boost converter is used inside the inverter assembly. The boost converter boosts the system operating voltage to a maximum voltage of DC 650V and the inverter converts direct current into alternating current, in order to drive MG1, MG2 and MGR at a high voltage as well as minimize the electrical loss associated with the electric power supply at a smaller current. Thus, MG1, MG2 and MGR can be operated at high speeds and high output.



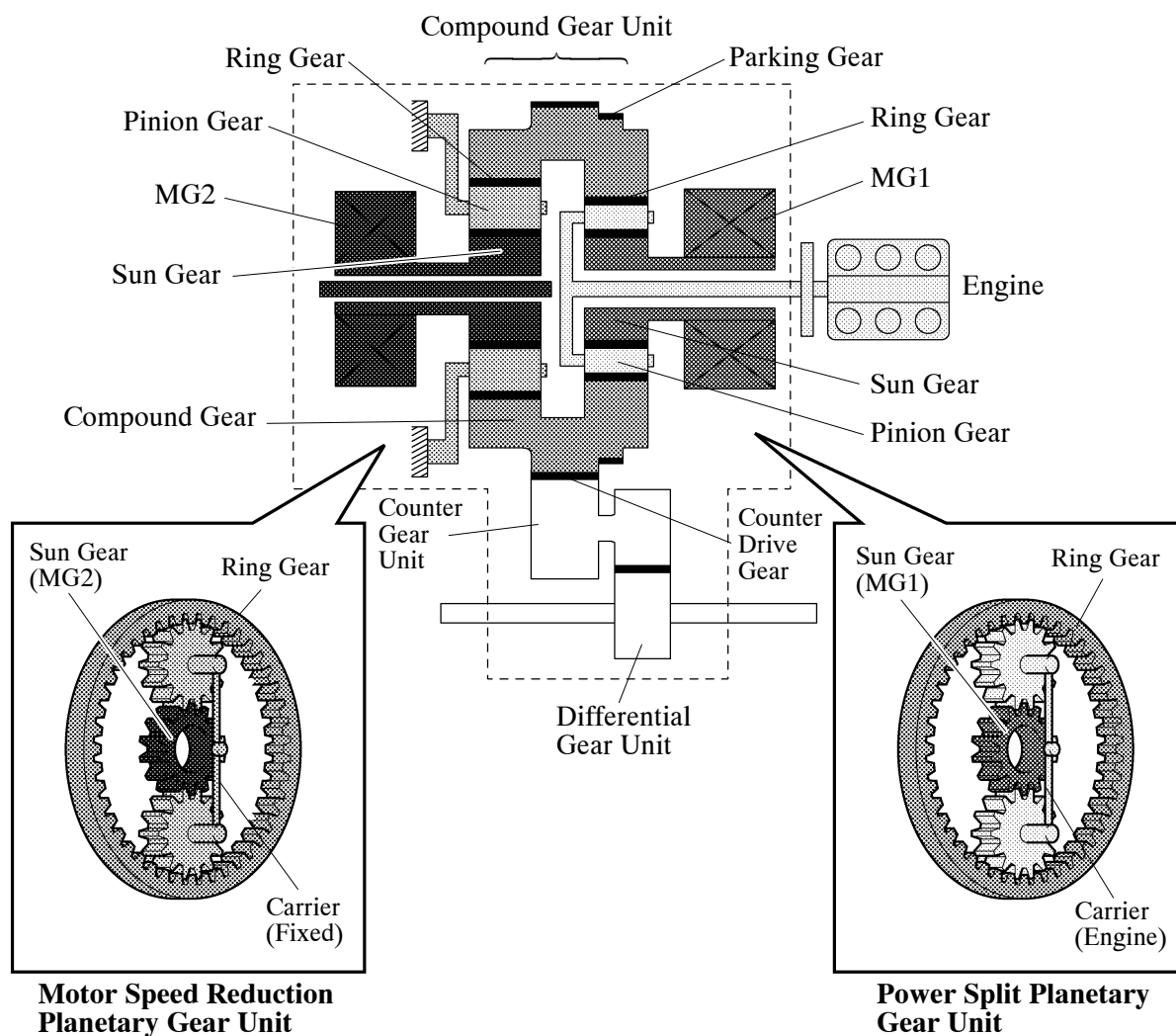
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3. Hybrid Transaxle

- This system drives the vehicle by combining the motive forces of the engine and the MG2 in an optimal manner in accordance with the driving conditions of the vehicle. In this system, the engine power forms the basis. The power split planetary gear unit in the hybrid transaxle splits the engine power two ways: one to drive the wheels, and the other to drive MG1, so that it can function as a generator.
- This hybrid transaxle consists primarily of MG1, MG2, a compound gear unit (which consists of a motor speed reduction planetary gear unit and a power split planetary gear unit), a counter gear unit, and a differential gear unit.
- The engine, MG1 and MG2 are mechanically joined via the compound gear unit.
- The compound gear unit contains a motor speed reduction planetary gear unit and a power split planetary gear unit. The motor speed reduction planetary gear unit reduces the rotational speed of MG2, and the power split planetary gear unit splits the motive force of the engine two ways: one to drive the wheels, and the other to drive MG1, so that it can function as a generator.
- In the motor speed reduction planetary gear unit, the sun gear is coupled to the output shaft of MG2, and the carrier is fixed. Furthermore, the compound gear unit uses a compound gear, in which two planetary ring gears, a counter drive gear, and a parking gear are integrated.

For details, refer to P310 Hybrid Transaxle on page CH-2.

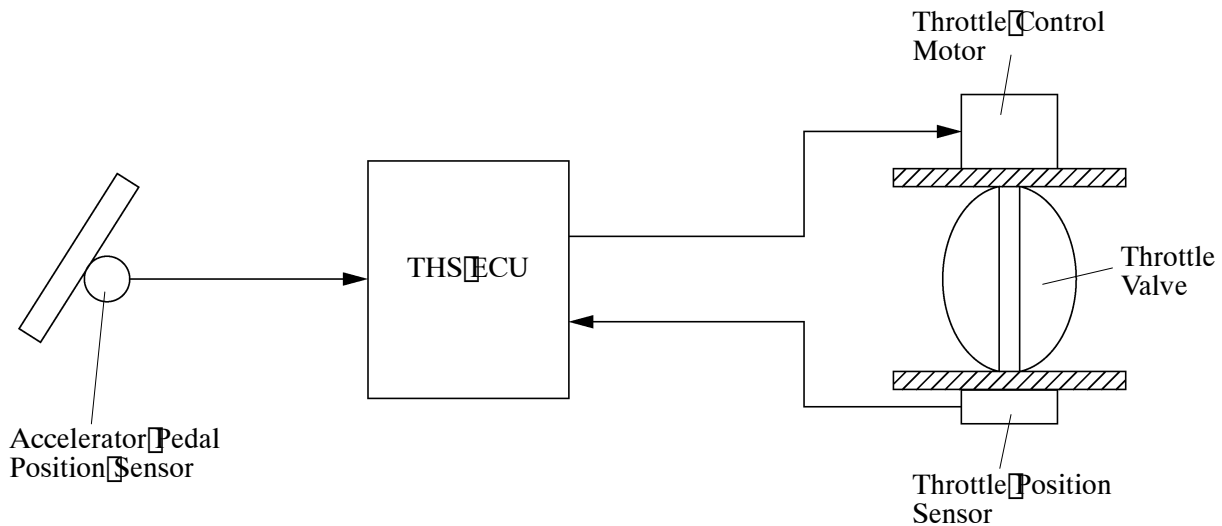
► Image Diagram ◀



4. Link-Less

The ETC (Electronic Throttle Control System-intelligent) is used. This is a link-less system that does not use an accelerator cable. Instead, it uses an accelerator pedal position sensor and a throttle position sensor to detect the accelerator pedal position and the throttle position.

The THS ECU calculates the target engine speed and the required engine motive force in accordance with the signals provided by the accelerator pedal position sensor, vehicle driving conditions, and the SOC (state of charge) of the battery. Based on the results of this calculation, the THS ECU optimally controls the throttle valve. For details, refer to 3MZ-FE Engine on [page EG-46](#).



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5. Clutch-Less System

A clutch-less system is used to mechanically link the front wheels and MG2 via gears. To disengage the motive force in the neutral position, the shift position sensor outputs an N position signal to turn OFF all the power transistors in the inverter (which connects MG1 and MG2). As a result, the operation of MG1 and MG2 shuts down, thus rendering the motive force at the wheels to zero.

6. Regenerative Brake

The regenerative brake function operates MG2 and MGR as a generator while the vehicle is decelerating or braking and stores this electrical energy in the HV battery.

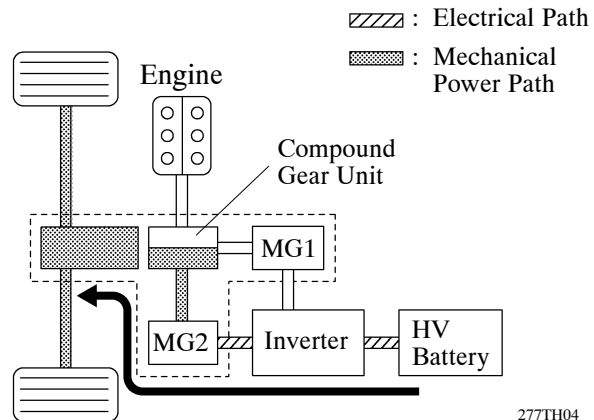
For details, refer to the Outline of Regenerative Brake Cooperative Control in the Brake Control System, on [page CH-42](#).

7. Basic Operation

This system generates a motive force in combination with the engine, MG1, MG2, and MGR in accordance with the driving conditions. Representative examples of the various combinations are described below.

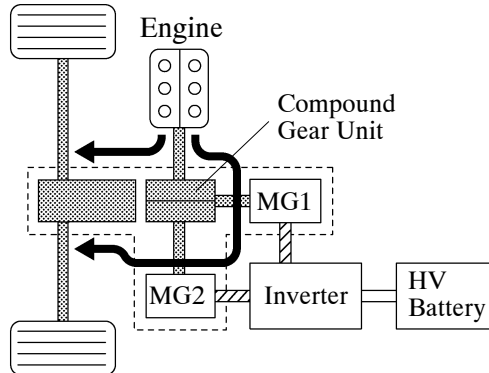
► Front Wheel ◀

- (1) Supply of electrical power from the HV battery to MG2 provides force to drive the front wheels.



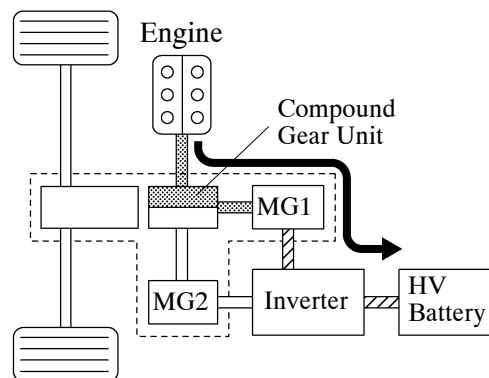
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- (2) While the front wheels are being driven by the engine via the planetary gears, MG1 is driven by the engine via the planetary gears, in order to supply the generated electricity to MG2.



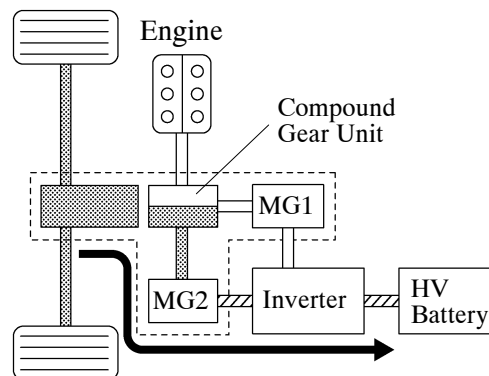
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- (3) MG1 is rotated by the engine via the planetary gears, in order to charge the HV battery.



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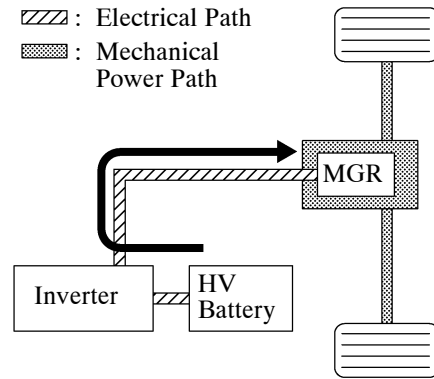
- (4) When the vehicle is decelerating, kinetic energy from the front wheels is recovered and converted into electrical energy and used to recharge the HV battery by means of MG2.



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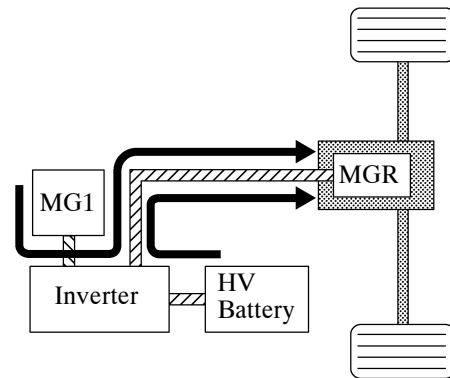
► Rear Wheel ◀

- (1) To ensure the proper driving force of the vehicle during start-off, or acceleration the electrical power of the HV battery is supplied to MGR in order to drive the rear wheels.



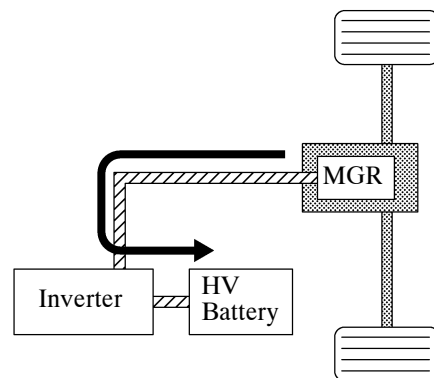
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- (2) During the full throttle acceleration of the vehicle, both the electrical power of the HV battery and the electrical power generated by the MG1 are supplied to the MGR in order to drive the rear wheels.



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- (3) When the vehicle is decelerating, kinetic energy from the rear wheels is recovered and converted into electrical energy and used to recharge the HV battery by means of MGR.



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