System Outline

This system controls the following modes in order to achieve the most efficient operations to match the driving conditions.

1. Motor Generator Condition

(1) Supply of electrical power from the HV battery to motor generator no.2 provides force to drive the wheels.

(2) While the tires are driven by the engine via the planetary gears, motor generator no.1 activates to supply electricity via the planetary gears to motor generator no.2 to drive the wheels.

(3) When the vehicle is decelerating, kinetic energy from the wheels is recovered into electrical energy and used to recharge the HV battery by motor generator no.2.

The hybrid vehicle control ECU switches between these modes (1, 2, 1+2, or 3) according to the driving conditions. However, when the state of charge of the HV battery is low, the HV battery is charged by the engine turning motor generator no.1.

2. Inverter

* The inverter converts high–voltage direct current of HV battery to three–phase alternating current for driving motor generator no.1 and motor generator no.2.
* The activation of the power transistors is controlled by the HV ECU. In addition, the inverter transmits necessary information for current control, such as the output amperage or voltage, to the HV ECU.
* Along with motor generator no.1 and motor generator no.2, the inverter is cooled by the exclusive radiator of the coolant system that is separated from that of the engine.
* In vehicle collision, circuit breaker sensor installed in the inverter outputs collision signal to stop the system.
* Boost converter has been adopted in the inverter, which increases rated voltage output from HV battery of DC 201.6V to DC 500V. After increasing voltage, the inverter converts direct current to alternating current.

3. Converter

The power source for auxiliary equipment of the vehicle such as the lights, audio system, and the air conditioning system, as well as the ECUs, is based on a rated voltage of DC 12V system. Because the generator outputs at DC 201.6V, the converter is used to transform the voltage from rated voltage of DC 201.6V to DC 12V in order to recharge the auxiliary battery. The converter is installed on the underside of the inverter.

4. HV Battery

* In Prius, the sealed nickel hydride (Ni–MH) battery has been adopted. This HV battery has high power density, lightweight and longevity to match characteristics of TOYOTA hybrid system. Because TOYOTA hybrid system controls charge/discharge to maintain charge/discharge control to maintain SOC (State of charge) at constant level while the vehicle is operating normally, it does not have to rely on the use of external recharges.
* The HV battery, battery ECU, system main relay and the cooling fan are put in a signal case which is placed in the luggage compartment behind the rear seat to make more effective use of vehicle space.
* A service plug that shuts off circuit is provided in the middle of the 28 modules (Rated battery capacity = 201.6V). Before servicing any portion of the high–voltage circuits, make sure to remove the service plug.
  Please do not READY ON when you remove the service plug. There is a possibility that battery ECU breaks down.
* To ensure the HV battery's performance, the battery ECU controls the operation of the cooling fan to avoid the heat that is generated in the HV battery during charging and discharging.

5. Regenerative System Operation

This system operates the motor as a generator to change the kinetic energy of the vehicle into the electricity when accel pedal is released or foot braking decelerates the vehicle speed, and store the electricity in the battery.

Service Hints

H14 (A), H15 (B), H16 (C) Hybrid Vehicle Control ECU

(B) 6–Ground : Always approx. 12 volts
(C) 6, (C) 7–Ground : Approx. 12 volts with the hybrid system at ON (READY) position
(A) 7–Ground : Approx. 12 volts with the power SW at IG ON position
(B) 3–Ground : Approx. 12 volts with the brake pedal depressed
(A) 1, (A) 4–Ground : Always continuity