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Model Year Start: 2023	Model: Prius Prime	Prod Date Range: [03/2023 -]
Title: HYBRID / BATTERY CONTROL: PLUG-IN CHARGE CONTROL SYSTEM: PLUG-IN CHARGE CONTROL; 2023 - 2024 MY Prius Prius Prime [03/2023 -]		

PLUG-IN CHARGE CONTROL

FUNCTION OF MAIN COMPONENTS

COMPONENT		FUNCTION
Electric Vehicle Charger Assembly		Boosts the AC voltage from the external power source and converts it into DC power to charge the HV battery assembly.
Plugin Charge Control ECU		<ul style="list-style-type: none"> Communicates with the charging cable or plug-in charger and sends signals such as the charging current, charging voltage, etc., to the hybrid vehicle control ECU. Performs plug-in charging based on signals sent from the hybrid vehicle control ECU. Sends lock and unlock request signals to the fuel lid with motor lock assembly. Illuminates the charge lid light.
Hybrid Vehicle Control ECU		Sends charger operation signals to the plugin charge control ECU.
HV Battery Assembly	Battery ECU Assembly	When the battery heating system is operating, turns on the HV battery heater relay.
	No. 1 Traction Battery Heater	Heats the traction battery when the temperature of the HV battery is extremely low.
	Battery Voltage Sensor	Detects the HV battery temperature and sends the information to the battery ECU assembly.
DC/DC Converter (Inverter with Converter Assembly)		When the battery heater system is operating, supplies power to the battery heater at a reduced voltage.
Compressor with Motor Assembly		Performs suction, compression and discharge of refrigerant gas and is driven by the electric motor.
Charge Cable (Electric Vehicle Charger Cable Assembly)		<ul style="list-style-type: none"> When the charge connector is connected to the charger inlet, supplies voltage from the external power source. Has a CCID that automatically performs an electrical leakage test when the charging connector is connected. Has a CCID that cuts off the voltage of the external power source if electrical leakage is detected while performing an electrical leakage test when plug-in charging. Reconnects the power when the system returns to normal.
Combination Meter Assembly		Allows scheduled charge times to be added, confirmed or changed, and immediate charging or next scheduled charge time to be confirmed or changed via the multi-information display.
Charge inlet (AC Charger Inlet Cable)		When the charge connector of the charge cable is connected, supplies voltage from the external power source to the electric vehicle charger assembly.

COMPONENT	FUNCTION
Charge Lid Light (Spot Lamp Assembly)	Illuminates when the charger lid is open.
EV Charger Lid Indicator Assembly	Illuminates or flashes to indicate the plug-in charging status.
Lid Courtesy Switch Assembly	Sends the charging port lid open or closed signal to the plugin charge control ECU.
Cable EV Charger Lock Assembly	Locks and unlocks the charging connector and charge inlet based on request signals from the plugin charge control ECU.
Radio and Display Receiver Assembly	Allows scheduled charge times to be added, confirmed or changed, and immediate charging or next scheduled charge time to be confirmed.
Steering Pad Switch Assembly	When the switch is operated, displays the timer charging screen on the multi-information display.

FUNCTION

CONTROL	FUNCTION
Charging Control	Depending on the status of the HV battery assembly, the electric vehicle charging assembly optimally adjusts the amount of power. When nearing full charge, it gradually reduces the voltage until the battery is fully charged.
Charging Schedule Control	Enables charging to be performed at the desired time by registering a timer charging schedule in advance. In addition, the timer setting can be configured according to the user's preferences, such as starting and stopping charging at specified times, performing charging at the same time on specified days of the week, etc.
Battery Heating Control	When the HV battery assembly is being charged and the HV battery assembly temperature is low, the HV battery assembly temperature is raised using the traction battery heater in order to enhance the drivability of the vehicle when driven by the motors.
Pre-charging Battery Cooling Control	When the temperature of the HV battery assembly is high and charging is performed, battery deterioration is suppressed by using the refrigerant cooling system to cool the battery before charging begins.

(a) Charging Schedule

(1) When registering a charge event, each of the following functions can be set:

1. Charging Mode

Charge mode can be selected from the following 2 modes.

CHARGE MODE	DETAIL
Start Time	Starts charging at the set time and ends charging when the HV battery is fully charged.
Start-Stop Time	Performs charging in accordance with the set start-time and stop-time.

2. Repeated Setting

By selecting the desired day of the week, the charge event can be set to repeatedly be performed.

3. ON/OFF of Charge Now

When the charging cable is connected to the vehicle, if one or more charge events have been registered, charging does not start until the set time of the charging event. To start

charging immediately without changing the registered contents of the charge events, set "Charge Now" to ON and the scheduled charge times will temporarily ignored and charging will begin as soon as the charge cable is connected.

(b) Battery Heating Control

- (1) When plug-in charging, if the temperature of the HV battery assembly drops, the 2 traction battery heaters located under the battery stacks are operated to raise the battery temperature to improve the drivability of the vehicle when in EV mode.
- (2) The power for the traction battery heater is supplied from the HV battery assembly at a lower voltage via the DC/DC Converter Assembly.
- (3) The battery heating system can be set to on or off via the multi-information display.
- (4) When the battery heating system is operating during charging, the charging time is longer than usual.

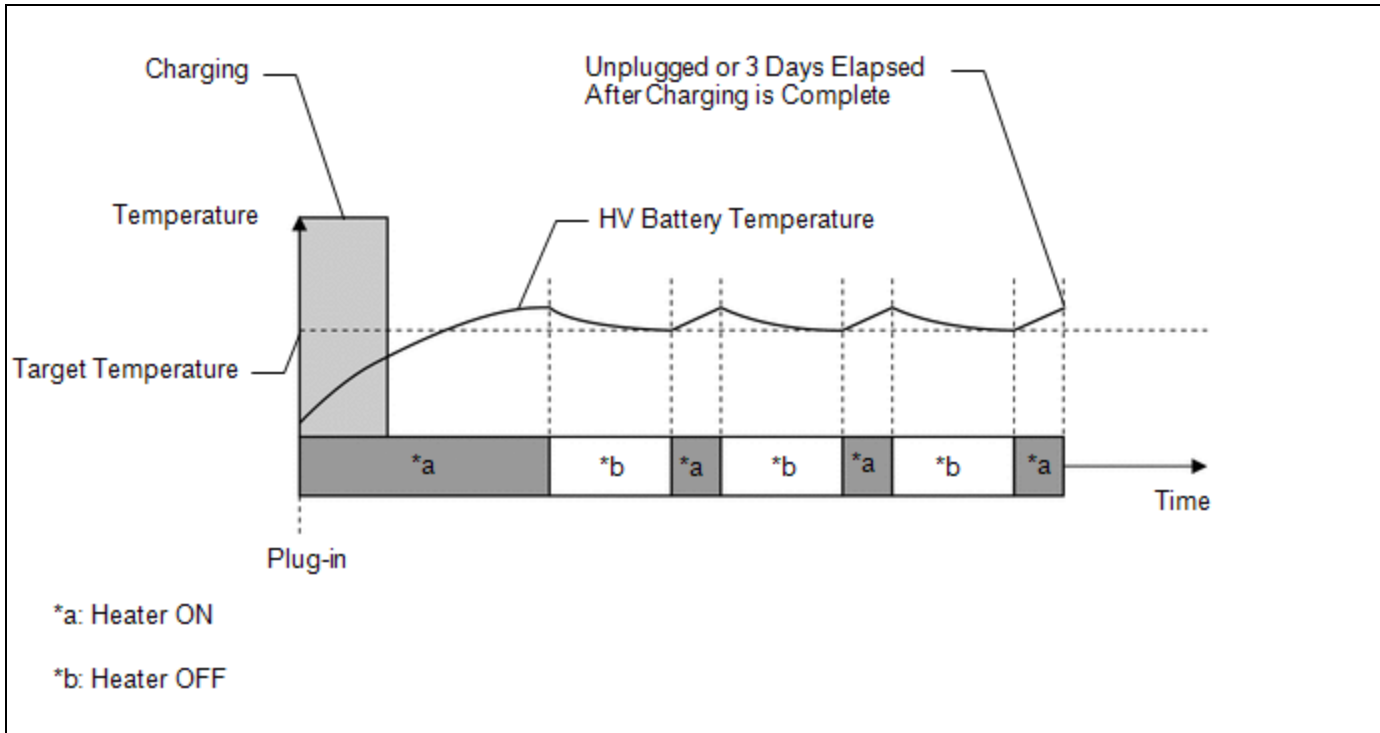
(c) Pre-charging Battery Cooling Control

- (1) Straight after driving, if the HV battery assembly temperature is high when charging begins, the refrigerant cooling system is operated to efficiently cool the HV battery assembly to prevent high battery temperatures, especially when the SOC is high, and to minimize deterioration of the HV battery assembly.
- (2) The pre-charging battery cooling system can be set to on or off via the multi-information display.

SYSTEM CONTROL

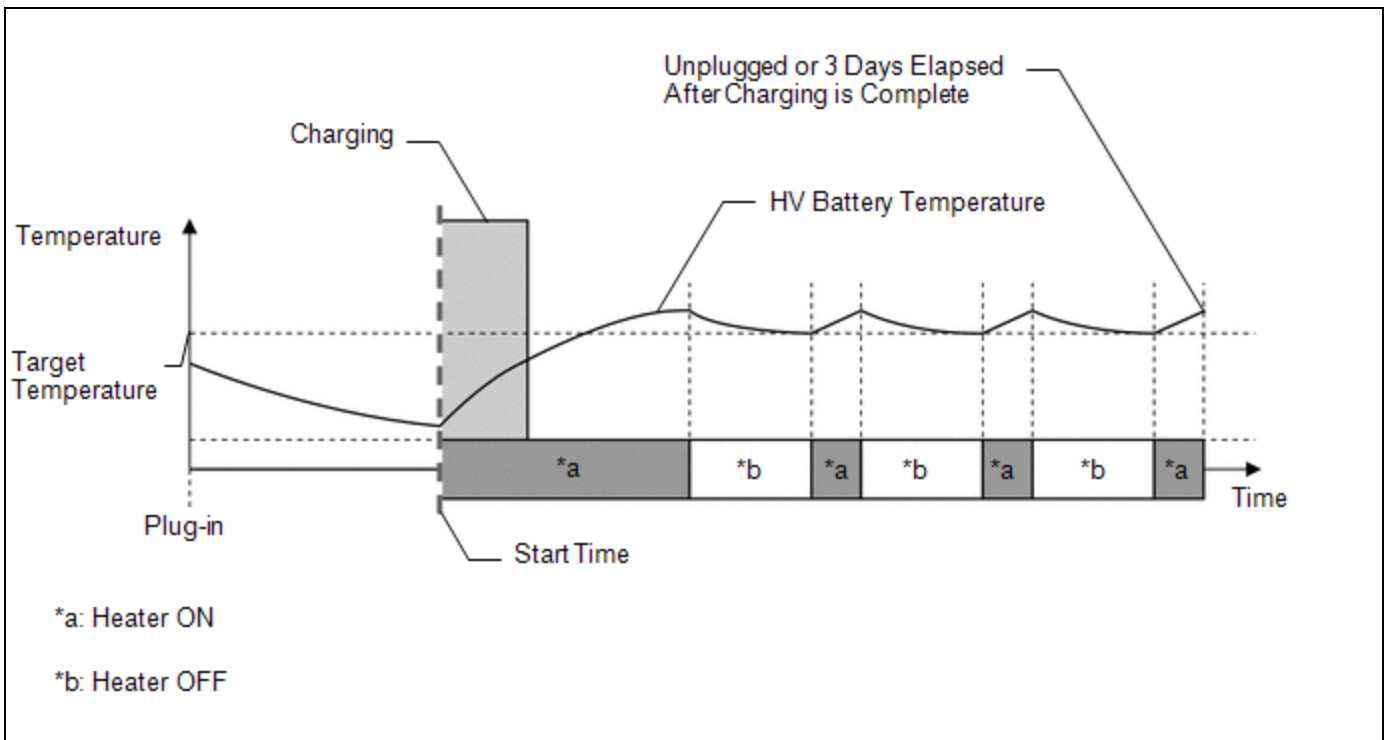
(a) Battery Heating System

- (1) When scheduled charging is not set or immediate charging is performed.
 1. When the charging connector is connected, the temperature of the HV battery assembly is automatically controlled to be above target temperature and is stopped when the charging connector is disconnected or after 3 days have elapsed.



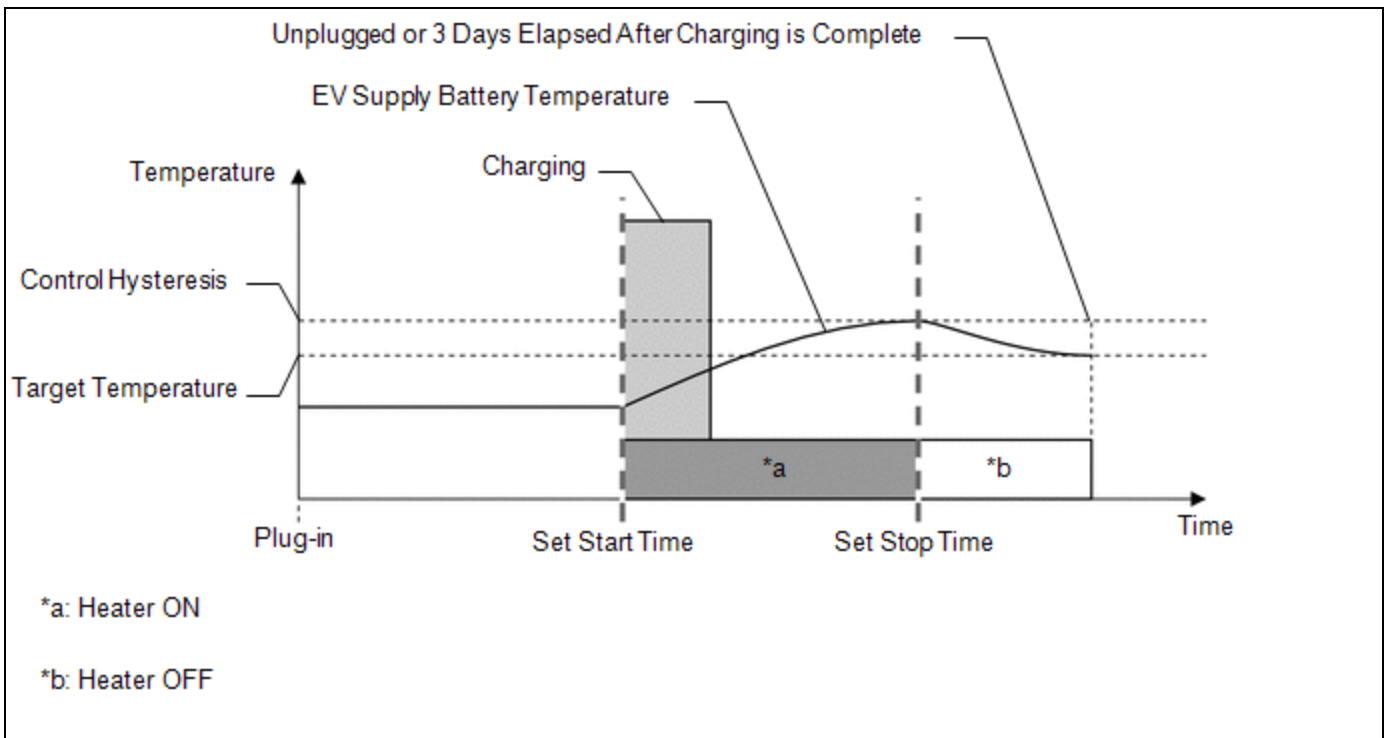
- (2) When scheduled charging (start time) is set.

1. The temperature of the HV battery assembly is automatically controlled to be above the target temperature at the scheduled charging start time and is stopped when the charging connector is disconnected or after 3 days have elapsed.



(3) When scheduled charging (start-stop time) is set.

1. When charging schedule (Start-Stop) is set, warming of the EV supply battery starts automatically so that the battery has reached the target temperature at the configured charging start time. When the configured stop time is reached, warming of the EV supply battery stops automatically. Also, warming stops automatically if the charging connector is disconnected or after 3 days elapse.



Charging Status Display

OPERATING	CHARGING INDICATOR	CCID (CHARGING CIRCUIT INTERRUPTING DEVICE)	SMARTPHONE*
Charging Only	Illuminated	Illuminated	Charging Status
Battery Heating Only	Illuminated	Illuminated	No Display
Charging and Battery Heating	Illuminated	Illuminated	Charging Status
*: Models with DCM (an application for using the remote service and the downloading of the dedicated app are necessary)			

(4) Even after the HV battery heater automatically stops after the charging cable remains connected to the vehicle for 3 days, It automatically increases the temperature of the HV battery to warm the HV battery in extremely low temperatures. (Alaska and Canada Only)

(b) Pre-charging Battery Cooling System

- (1) If battery cooling is set to ON in the setting tab of the multi-information display, the refrigerant cooling system is operated before charging is started.
- (2) The pre-charging battery cooling system operates when scheduled charging is not set and the temperature of the battery is above the required temperature. When scheduled charging is set, it operates based on the time calculated 30 minutes prior to the start of charging if the temperature of the battery is above the required temperature.
- (3) The pre-charging battery cooling system goes into standby mode 5 minutes prior to operating.
- (4) When the pre-charging battery cooling system is enabled and the HV battery assembly SOC is high, to ensure precise charging, the pre-charging battery cooling system does not operate.
- (5) When the pre-charging battery cooling system is enabled, if the HV battery assembly is excessively discharged, the pre-charging battery cooling system does not operate.
- (6) The pre-charging battery cooling stops when 30 minutes have elapsed after starting pre-charging battery cooling.
- (7) Pre-charging battery cooling system suspension conditions:
 - The engine hood is opened.
 - The ignition switch is turned ON (IG).
 - There is a remote air conditioning system request

FAIL-SAFE

- (a) The electric vehicle charger assembly has a self-protection function and automatically limits or stops power output in the event of overvoltage, overcurrent or excessive-temperature.
 - (1) If overvoltage or overcurrent is detected, charging is suspended.
 - (2) If an abnormal temperature is detected, the charging power is reduced.

