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Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [03/2023 -]
Title: HEATING / AIR CONDITIONING: AIR CONDITIONING SYSTEM (for PHEV Model): GENERAL; 2023 - 2024 MY Prius Prime [03/2023 -]		

GENERAL

OUTLINE

(a) All models have single automatic air conditioning.

(b) The heater and air conditioner system provides control via the air conditioning amplifier assembly and heat pump ECU assembly.

(c) The air conditioning amplifier assembly functions as one of the ECUs that comprise the CAN*1 communication system, and it inputs each sensor and switch signals via a direct line, as well as signals required for air conditioning control from the ECM and other parts via a communication line, in order to perform precise air conditioning control according to the vehicle condition. Also, signals related to the air conditioning are output from the air conditioning amplifier assembly to other ECUs via CAN communication.

HINT:

*1: CAN is an abbreviation for Controller Area Network, and provides serial communication compliant with ISO (International Organization for Standardization) specifications.

(d) An air conditioning control assembly is used for all models.

The main air conditioner switches are operated from the air conditioning control assembly.

The air conditioning amplifier assembly and air conditioning control assembly transmit and receive various switch signals and indicator display signals via LIN communication.

(e) Automatic air conditioning control is utilized which uses a neural network*2 that operates using a method that precisely controls the air conditioning in accordance with the feelings of the occupants, resulting in comfortable air conditioning.

HINT:

*2: This control is capable of performing complex control by artificially simulating the information processing method of the nervous system of living organisms in order to establish a complex input/output relationship that is similar to a human brain.

(f) A heat pump air conditioner was adopted, and an air conditioning system superior in energy efficiency was realized.

(1) Securing of heating performance at the time of the EV run was planned without depending on engine cooling water temperature at the time of the low temperature.

(2) The contribution to EV flying range was planned by heating in high efficiency.

(3) The air conditioning amplifier assembly determines the operation mode based on the air conditioning control switch signal, solar radiation sensor, and each sensor connected by direct line.

The heat pump ECU assembly outputs operation signals to the electric solenoid valves and electric type expansion valve in accordance with the operation mode.

SPECIFICATIONS

Heater Radiator

SPECIFICATIONS	
Core Type	Straight Flow Aluminum-II (SFA-II)

SPECIFICATIONS		
Core Size	Width	222.3 mm (8.8 in.)
	Height	120 mm (4.72 in.)
	Depth	27 mm (1.06 in.)
	Fin Pitch	1.8 mm (0.07 in.)

Cooler Evaporator

SPECIFICATIONS		
Core Type		Beneficial Refrigerant Stream (BRS)
Core Size	Width	239.5 mm (9.4 in.)
	Height	231 mm (9.09 in.)
	Depth	38 mm (1.50 in.)
	Fin Pitch	3.0 mm (0.12 in.)

Blower Fan

SPECIFICATIONS		
Fan Type		Sirocco Two-layer
Fan Size (Upper side)	Diameter	122 mm (4.80 in.)
	Height	55 mm (2.17 in.)
Fan Size (Lower side)	Diameter	125 mm (4.92 in.)
	Height	38 mm (1.50 in.)

Other Component

SPECIFICATIONS		
Outer Heat Exchanger Type		Multi-Flow IV (MF-IV)
Outer Heat Exchanger Size	Height	376.6 mm (14.8 in.)
	Width	686 mm (27.0 in.)
	Depth	22 mm (0.87 in.)
	Fin Pitch	3.1 mm (0.122 in.)
Compressor Type		ESB34
Compressor Oil		ND-OIL11
Refrigerant Type		HFO-1234yf (R1234yf)

ITEM	CHARACTERISTICS
Air Conditioning System	• Single automatic air conditioning is used. • Automatic air conditioning control is utilized which uses a neural network that controls the air conditioning with more comfort in accordance with the feelings of the occupants.

ITEM	CHARACTERISTICS
	• A heat pump system that uses the heat from high temperature refrigerant is used, realizing a high efficiency heating system.
Air conditioning unit / Air ducts	• An air-conditioning unit is used that has a two-layer unit that can simultaneously introduce outside air and circulate inside air by dividing the inside of the unit into an upper layer and a lower layer. Ventilation loss is reduced by circulating air internally and window fogging is prevented by introducing outside air. • A high efficiency brushless motor is used for the blower motor. • A small diameter high efficiency 2 stage type sirocco fan is used for the blower fan to enable 2 layers of air (inside/outside). • A wide angle small-size defroster nozzle assembly is used. • An internal condenser (condenser assembly) is used, which makes it possible to perform heating using only a heat pump.
Cooler Evaporator	A BRS (Beneficial Refrigerant Stream) evaporator with excellent heat transfer performance is used.
Heater Core	A small size high-performance SFA-II (Straight Flow Aluminum-II) heater core is used.
Clean Air Filter	A pollen removing type of clean air filter is used.
Compressor	A compressor (model ESB34) with an attached electric motor with integrated inverter is used.
Outer Heat Exchanger (Cooler Condenser Assembly)	A high efficiency lightweight Multi-Flow IV (MF-IV) type outer heat exchanger is used.
Cooling/Heating Electric Expansion Valve	For temperature regulation and increased efficiency, an electric type expansion valve is used.
Accumulator Assembly	The solenoid valves for switching the heat pump cycle and accumulator tank for storing surplus refrigerant have been compactly integrated.
Battery Cooling System	A battery cooling system is used to perform cooling of the HV battery which uses refrigerant.
Refrigerant	HFO-1234yf (R1234yf) refrigerant is used for its significant reduction in global warming potential together with the prevention of harm to the ozone layer.

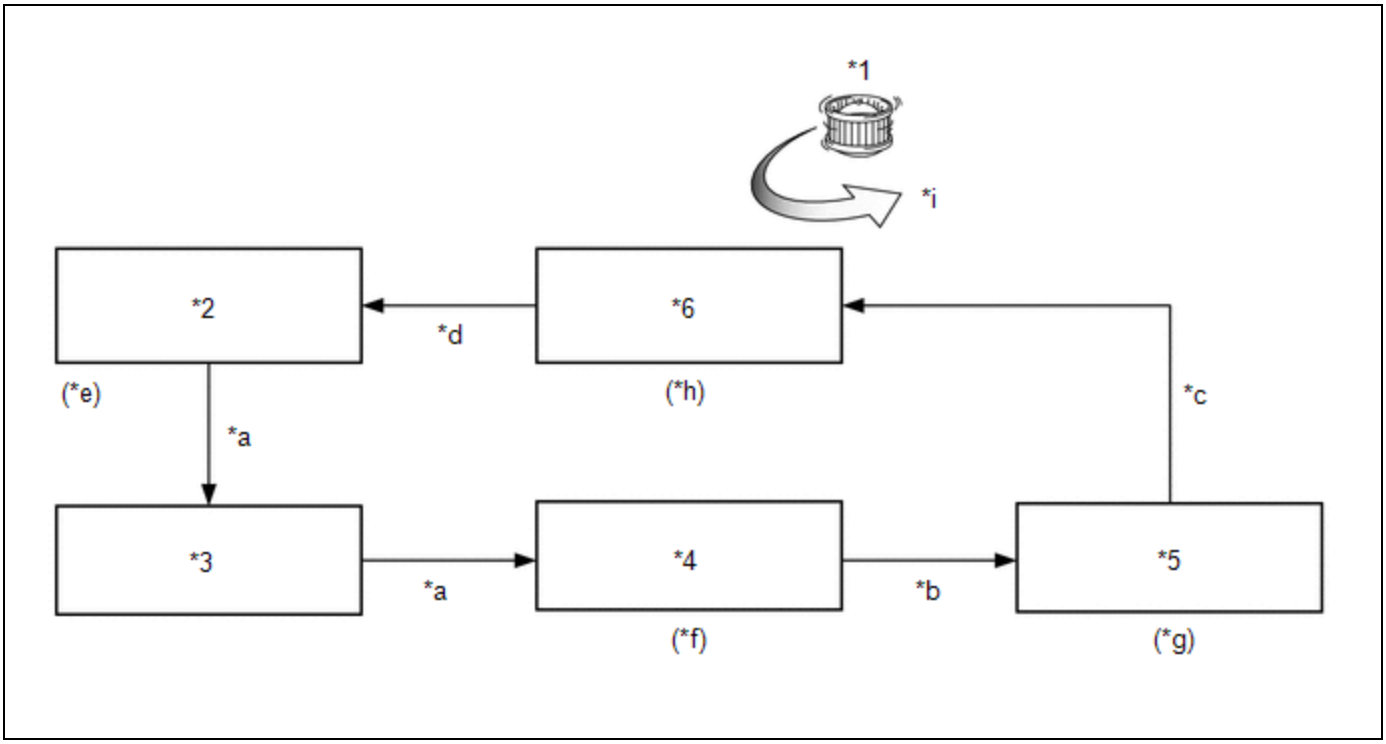
MAIN FEATURES

(a) Heat pump air conditioning system refrigeration cycle

(1) By using magnet valves to switch between the circuits of each unit, the heat pump air conditioning system operates a cooler cycle during cooling and a heat pump cycle during heating.

(2) During the cooler cycle when cooling, refrigerant which is pumped through the outer heat exchanger by the compressor with motor assembly at high-temperature and high-pressure, is expanded within the evaporator via the cooler expansion valve to provide cooling within the vehicle cabin.

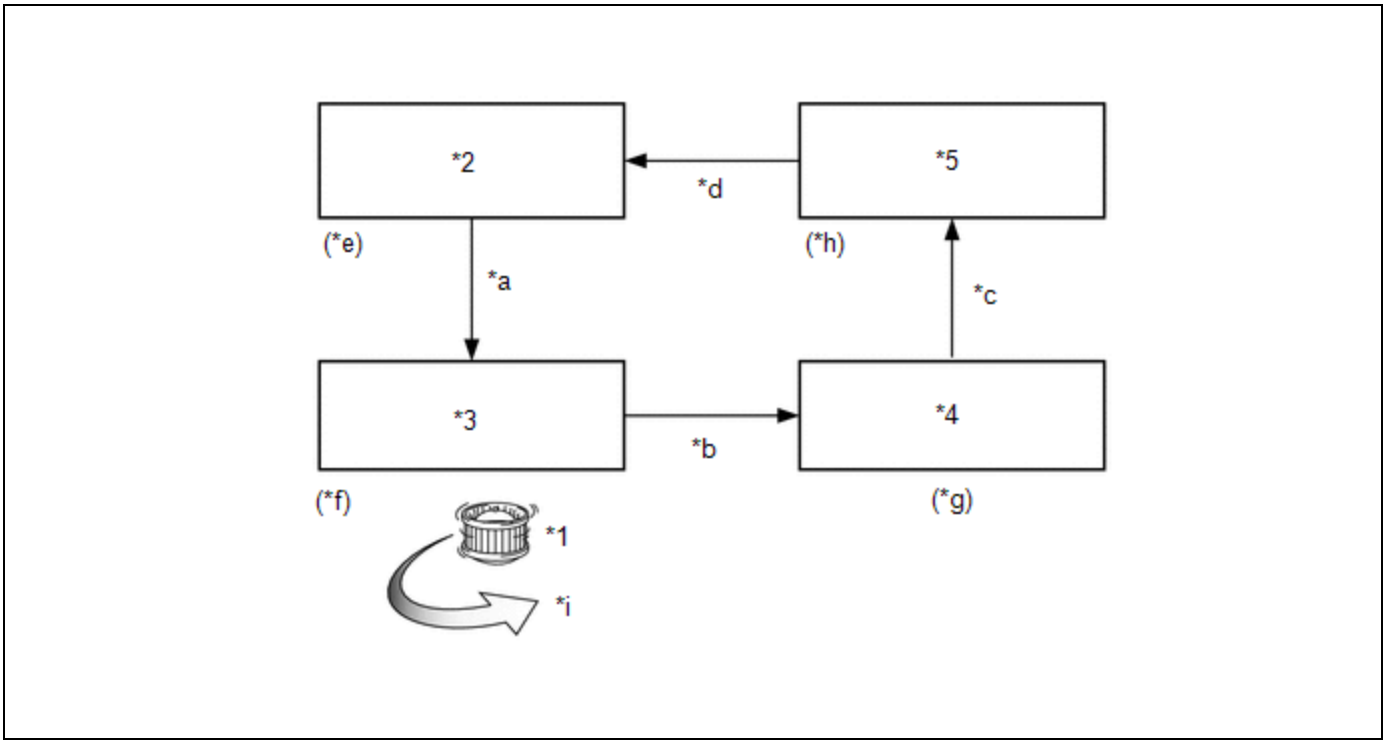
Cooling



*1	Blower Motor with Fan Sub-assembly	*2	Compressor with Motor Assembly
*3	Internal Condenser (Condenser Assembly)	*4	Outer Heat Exchanger (Cooler Condenser Assembly)
*5	Cooling Electric Expansion Valve (Cooler Expansion Valve)	*6	No. 1 Cooler Evaporator Sub-assembly
*a	High Temperature High Pressure Gaseous Refrigerant	*b	High Temperature High Pressure Liquid Refrigerant
*c	Low Temperature Low Pressure Misty Refrigerant	*d	Low Temperature Low Pressure Gaseous Refrigerant
*e	Compression	*f	Radiation of Heat
*g	Expansion	*h	Absorption of Heat
*i	Cool Air	-	-

(3) During the heat pump cycle when heating, by changing the circuit by operating magnet valves, refrigerant which is pumped through the internal condenser by the compressor with motor assembly at high-temperature and high-pressure, is expanded within the outer heat exchanger via the heater expansion valve in order to absorb heat to provide heating within the vehicle cabin.

Heat Pump Heater



*1	Blower Motor with Fan Sub-assembly	*2	Compressor with Motor Assembly
*3	Internal Condenser (Condenser Assembly)	*4	Heating Electric Expansion Valve (Magnet Valve Assembly)
*5	Outer Heat Exchanger (Cooler Condenser Assembly)	-	-
*a	High Temperature High Pressure Gaseous Refrigerant	*b	High Temperature High Pressure Liquid Refrigerant
*c	Low Temperature Low Pressure Misty Refrigerant	*d	Low Temperature Low Pressure Gaseous Refrigerant
*e	Compression	*f	Radiation of Heat
*g	Expansion	*h	Absorption of Heat
*i	Warm Air	-	-

PRECAUTION

(a) Precaution for Refrigerant HFO-1234yf (R1234yf)

(1) Compatibility

1. The parts used in the refrigerant cycle, the compressor oil, etc. of the HFO-1234yf (R1234yf) system are not compatible with the conventional HFC-134a (R134a) system.
2. Always use HFO-1234yf (R1234yf) as the refrigerant.

CAUTION:

- Do not charge the system with refrigerant near open flames, as HFO-1234yf (R1234yf) is combustible.
- When charging the system with refrigerant, make sure that the area is well ventilated (especially be careful in areas where the gas can easily accumulate such as under lifts and in garage pits, as the gas is heavier than air).
- Follow any local regulations regarding combustible gases.
- Be sure to use a refrigerant recovery unit that is compatible with HFO-1234yf (R1234yf) systems.
- High pressure gas is used for the air conditioning system. Be sure to follow the procedure described in the repair manual.

HINT:

The shape of the service port for refrigerant charging has an exclusive design conforming to international standards for HFO-1234yf (R1234yf) to prevent improper refrigerant charging.

(2) Compressor Oil

1. Always use ND-OIL 11 as the compressor oil.
2. When parts of the air conditioning system are removed, quickly block off any areas that are exposed to the outside air with plugs, vinyl tape, etc., as the oil used for HFO-1234yf (R1234yf) systems absorbs moisture easily.
3. Do not allow the compressor oil to spray, as the oil used for HFO-1234yf (R1234yf) systems has harmful effects on acrylic resins.

(3) Caution Label

1. Please confirm the vehicle caution label for the symbol marks used for the vehicle.

SYMBOL NAME	SYMBOL
Caution	
Air Conditioning System	
Air Conditioning System Lubricant Type	
Requires Registered Technician to Service Air Conditioning System	
Flammable Refrigerant