BODY ELECTRICAL

AUXILIARY BATTERY

■DESCRIPTION

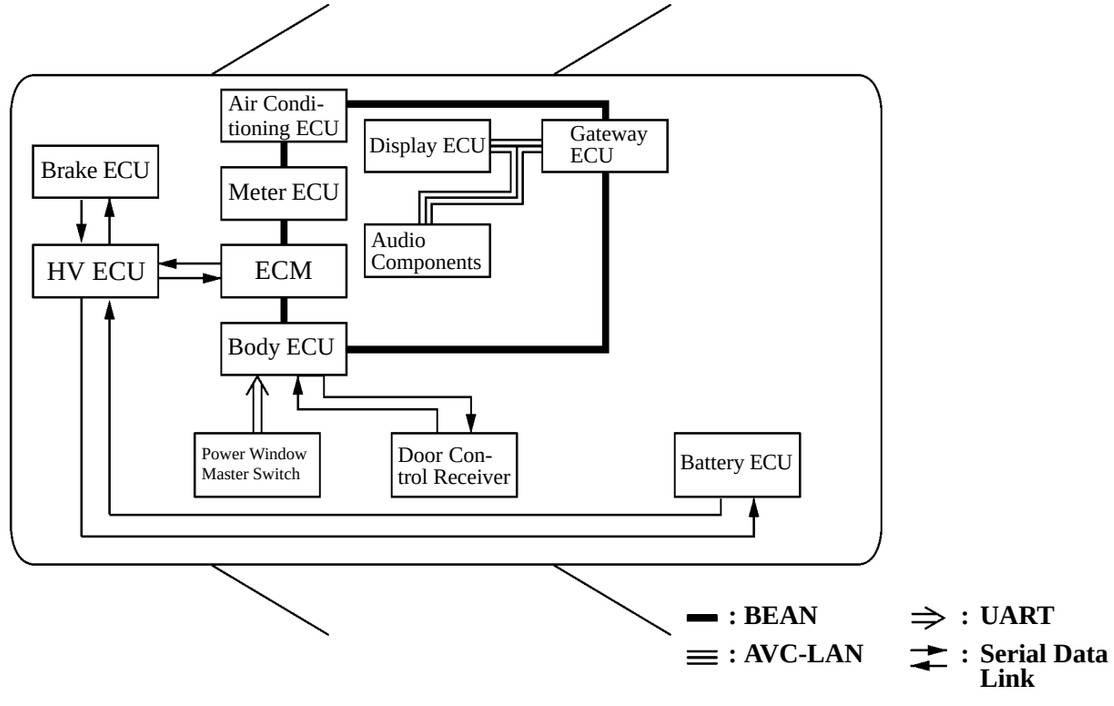
All the body electrical systems and auxiliary equipment operate using the same 12 V battery used on ordinary gasoline engine vehicles.
However, as the battery structure is different, Prius uses an exclusive battery. See page 42 in the THS (TOYOTA Hybrid System) section for details of the auxiliary battery structure.

MULTIPLEX COMMUNICATION SYSTEM

■DESCRIPTION

- A multiplex communication system has been adopted for body electrical system control and to achieve a slimmer wiring harnesses configuration.
- BEAN (Body Electronics Area Network) has been adopted between the body ECU, ECM, meter ECU, air conditioning ECU, and the gateway ECU. Furthermore, AVC-LAN (Audio Visual Communication-Local Area Network) has been adopted between the display ECU and the audio components.
  The conversion of communication signals between BEAN and AVC-LAN is performed by the gateway ECU.
- UART (Universal Asynchronous Receiver Transmitter), which performs unidirectional communication, has been adopted between the body ECU and the power window master switch.
- A serial data link has been adopted between the body ECU and the door control receiver. In addition, a serial data link has been adopted between the ECM, HV ECU, brake ECU, and the battery ECU, which pertain to the control of the hybrid system.

▶ System Diagram ◀



182BE01

■SYSTEM OPERATION

1. General

The ECUs that pertain to the body electrical system perform the functions and system controls described below.

Gateway ECU

- Conversion of data between AVC-LAN and BEAN
- Transmission of vehicle information to the display ECU, in order for it to be displayed on multi-information display

Body ECU

- Power window system control (Front, Rear passenger only)
- Door lock control system control
- Wireless door lock remote control system control
- Theft deferrent system control
- Daytime running light system control
- Illuminated entry system control
- Light auto turn-off system control
- Seat belt warning system control
- Key reminder system control
- Diagnosis

Meter ECU

- Meter control
- Illumination and flashing control of indicator and warning lights
- Sounding control of warning buzzer

Air Conditioning ECU

Air Conditioning control

ECM

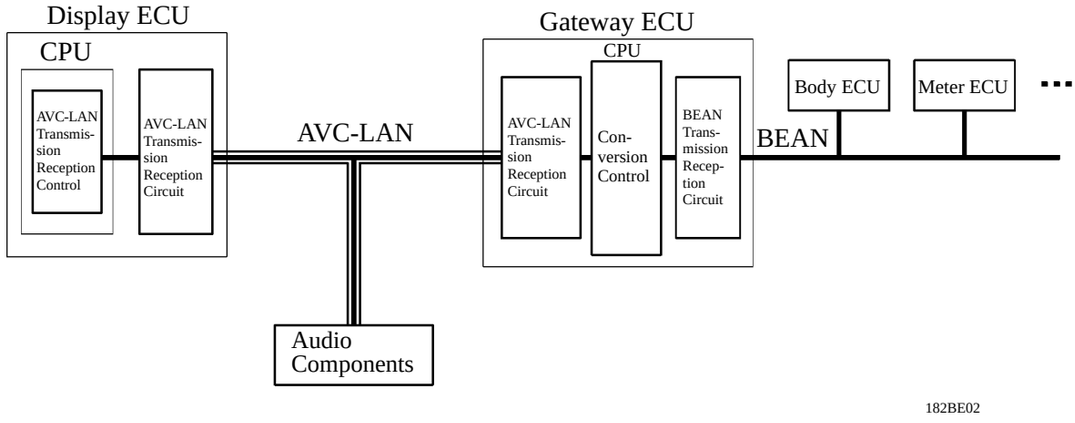
- Engine control
- Diagnosis

Display ECU

- Transmission and reception associated with audio and visual functions

2. Gateway Function (Gateway ECU)

This multiplex communication system has adopted BEAN (Body Electronics Area Network) between the body ECU, ECM, meter ECU, air conditioning ECU, and the gateway ECU, as well as AVC-LAN between the display ECU and the audio components. Because the data configuration differs between BEAN and AVC-LAN, their data must be converted in order for them to exchange each other's data. The conversion of communication data is performed by the gateway ECU. As a result, it has become possible for a single communication line to transmit various types of information.

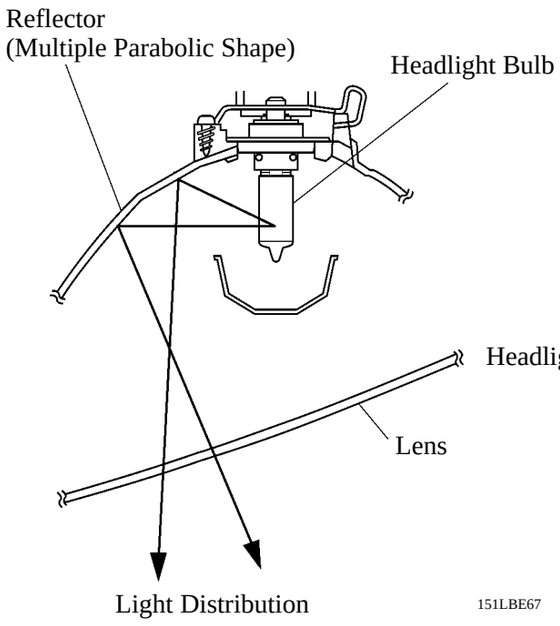


LIGHTING

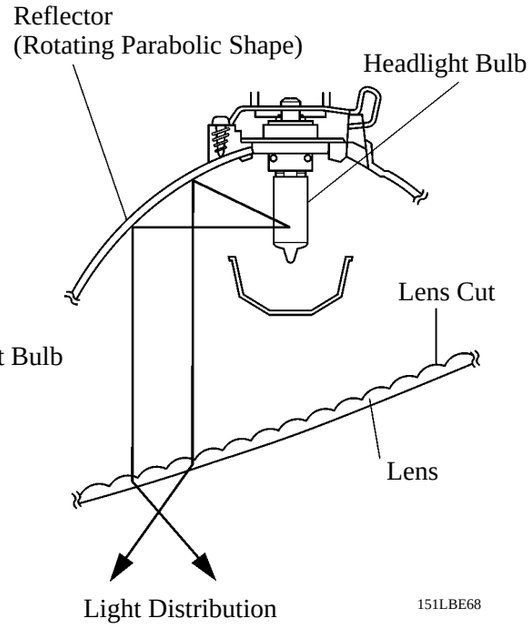
■HEADLIGHTS

The prius has newly adopted the multi-reflector headlights. Conventional headlights accomplish the dispersion and distribution of the light that is emitted by the bulbs through the lens cut pattern. However, with the multi-reflector type headlights, the light from the bulbs is dispersed and distributed through multiple parabolic shaped reflectors. As a result, the lens cut pattern is no longer provided in the center of the lens, thus realizing a clear look.

▶ Light Distribution Diagram ◀



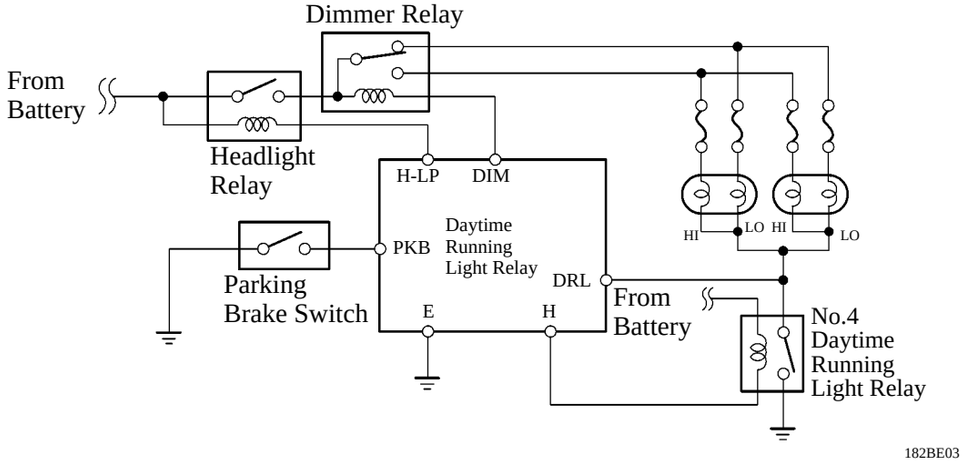
Multi-Reflector Type Headlight



Conventional Headlight

■DAYTIME RUNNING LIGHT SYSTEM

The daytime running light system is adopted for Canada model as standard and U.S.A. model as optional equipment. This system is designed to automatically activate the headlights (dimmed low beams) during the daytime to keep the car highly visible to other vehicles.
This system is controlled by a semi-conductor relay circuit (daytime running light relay).



■ILLUMINATED ENTRY SYSTEM

- When a door is unlocked through a key operation or transmitter operation, or if a door is opened or closed, the illuminated entry system turns ON the dome light. If the ignition switch is turned to the ACC or ON position or if all doors are locked during the 15 seconds in which this light are ON, they will immediately turn OFF.
- This system is controlled by the body ECU.

■LIGHT AUTO TURN-OFF SYSTEM

- When the ignition key is turned from ON or ACC to LOCK position and the driver's door is opened with the taillights and headlights on, this system automatically turns them off.
- This system is controlled by the body ECU.

METER

■COMBINATION METER

1. General

- The combination meter is available as a digital display type. It is located at the upper center of the instrument panel to improve its visibility.
- For this combination meter, a meter ECU that effects multiplex communication through the use of BEAN (Body Electronics Area Network) has been adopted.
- The display of the speedometer can be switched between km/h and MPH readings by operating the km/h-MPH selector switch located in the middle of the center cluster. Furthermore, the odo/trip meter can be switched between odometer and tripmeter readings by operating the odo/trip selector/reset switch located in the middle of the center cluster.
- A “READY” light that informs the driver that the vehicle is ready to be driven has been adopted.
- A master warning light that informs the driver if an abnormality occurs in either the EMPS (Electric Motor-assisted Power Steering), HV batteries, or the THS (TOYOTA Hybrid System) has been adopted.
- An output control warning light has been adopted to show the drop of power function due to the output drop of HV batteries.
- For the purpose of making corrections in the calculation of the fuel level by the meter ECU, two inclination sensors that detect the vehicle’s longitudinal and latitudinal inclinations have been provided in the meter ECU. In addition, an outer ambient temperature sensor has been provided in the fuel tank to detect the temperature in the fuel tank.

U.S.A. Model

182BE04

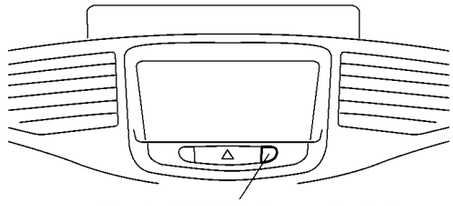
Canada Model

182BE16

2. Construction and Operation

Speedometer

- The speedometer is displayed digitally through the VFD (Vacuum Fluorescent Display). It can be switched between the km/h and MPH readings by operating the km/h-MPH selector switch located in the middle of the center cluster.
- The vehicle speed signal, which originates at the speed sensor that is installed in the hybrid transaxle, travels via the HV ECU and ECM (BEAN) and is received by the meter ECU.



Km/h-MPH Selector Switch

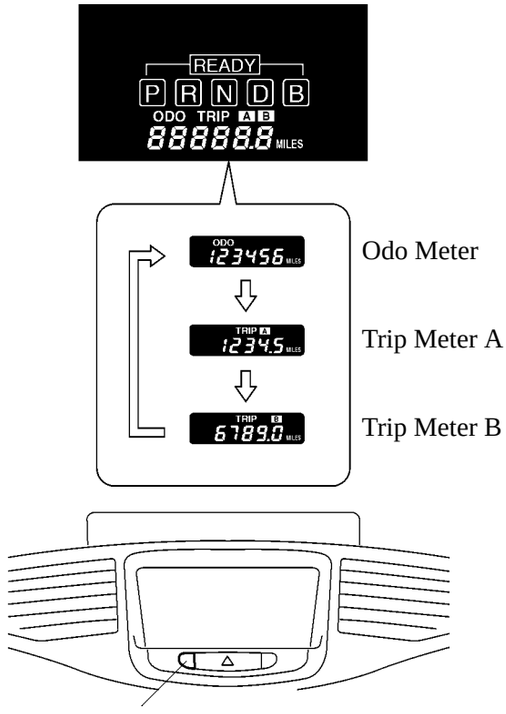
182BE05

Odo/Trip Meter

Similar to the speedometer, the odo/trip meter is displayed digitally through the VFD (Vacuum Fluorescent Display). By operating the odo/trip selector/reset switch located in the middle of the center cluster, its display can be switched in the following sequence: odometer → trip meter A → trip meter B.

While trip meter A or B is displayed, pressing the odo/trip selector/reset switch 0.8 seconds or longer causes the driven distance displayed by the current trip mode to revert to 0.0 mile or 0.0 km.

The trip meter will resume measuring the distance at the moment the odo/trip selector/reset switch is released.

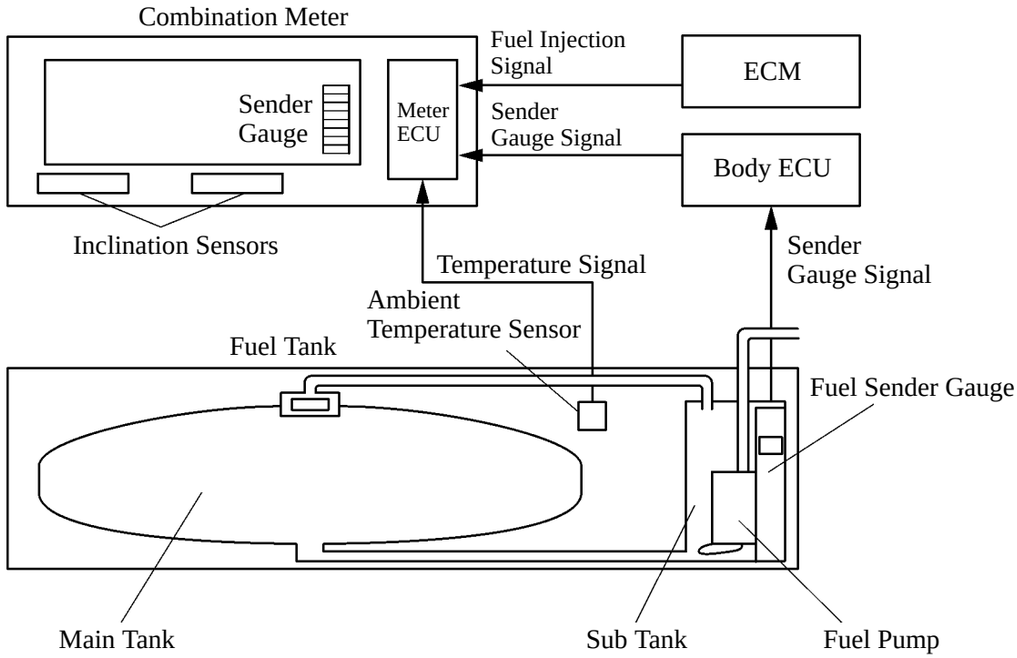


Odo/Trip Selector/Reset Switch

182BE06

Fuel Gauge

For the purpose of correcting the calculation of the fuel level by the meter ECU, two inclination sensors that detect the vehicle's longitudinal and latitudinal inclinations have been provided in the meter ECU, and an ambient temperature sensor has been provided in the fuel tank to detect the temperature in the fuel tank. The fuel level is calculated by the meter ECU in accordance with the signals of the sender gauge located in the sub tank that have been received via the body ECU, and the fuel injection signals received from the ECM. At this time, corrections are made by the signals from the inclination sensors that detect the vehicle's longitudinal and latitudinal inclinations and the ambient temperature sensor that detects the temperature in the fuel tank.



“READY” Light

When the shift position is P, turning the ignition switch to START causes the “READY” light to flash and enables the vehicle to be driven. Then, this indicator illuminates and the buzzer sounds simultaneously.

Flashes when the ignition switch is turned to START

Illuminates when the vehicle is ready to be driven

182BE08

Service Tip

If the indicator does not illuminate, the vehicle cannot be driven because one of the driving prohibition conditions listed below applies.

- Service plug disconnected.
- Hybrid system abnormality.
- Driving prohibition condition due to overload on MG1, MG2 or inverter.
- Inverter unit cover is left open.
- HV ECU has detected a collision.

Master Warning Light

A master warning light that informs the driver if an abnormality occurs in either the EMPS, HV batteries, or the THS has been adopted.
If an abnormality occurs in the system, the master warning light illuminates and the multi-information display shows the warning items. For details, see page 178.

Output Control Warning Light

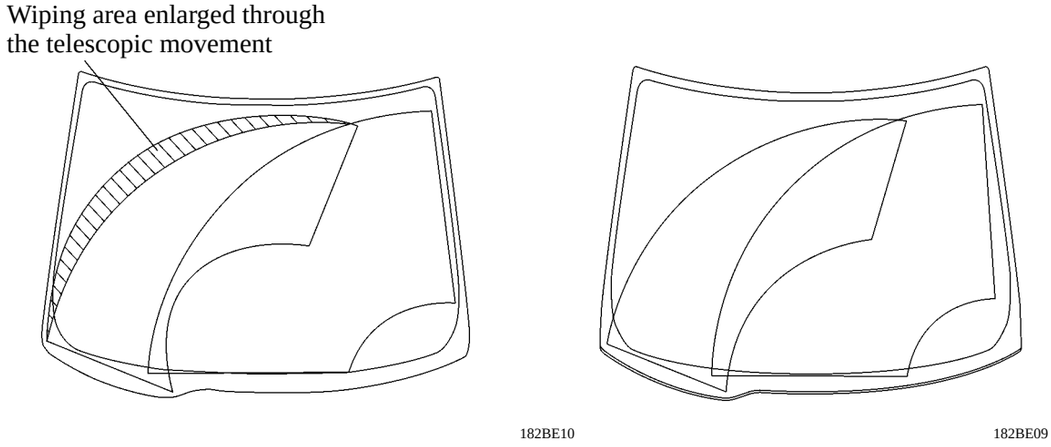
An output control warning light has been adopted to show the drop of power function due to the output drop of HV batteries.
This warning light comes on when the temperature of HV batteries is higher or lower than that of specified range, or when SOC (State of Charge) is lower than the specified value with the shift position in R range. When this warning light comes on, avoid sudden acceleration and drive carefully.

WIPER

■TELESCOPIC WIPER

1. General

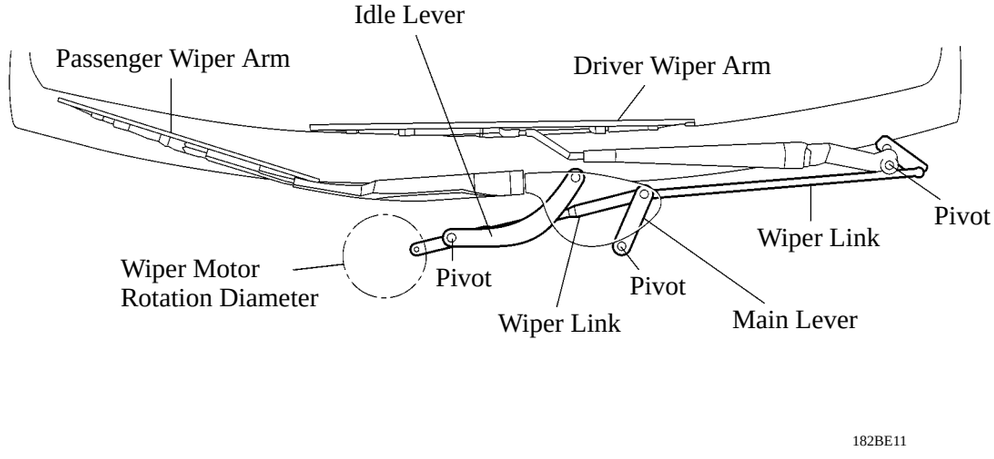
- The telescopic wiper has been adopted.
- The telescopic wiper consists of a wiper arm for the front passenger side that wipes telescopically from the stopped position to the upper return position in order to enlarge the wiping area.



Telescopic Type **Conventional Type**

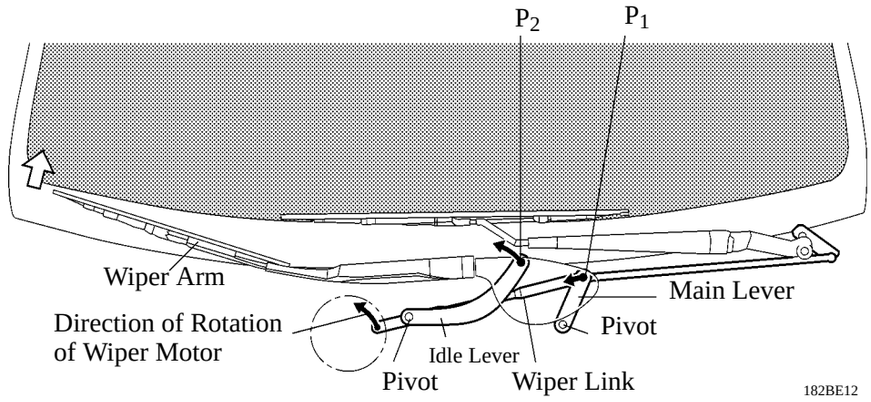
2. Construction

The telescopic wiper mainly consists of a driver wiper arm, passenger wiper arm, main lever, idle lever, wiper link and wiper motor.

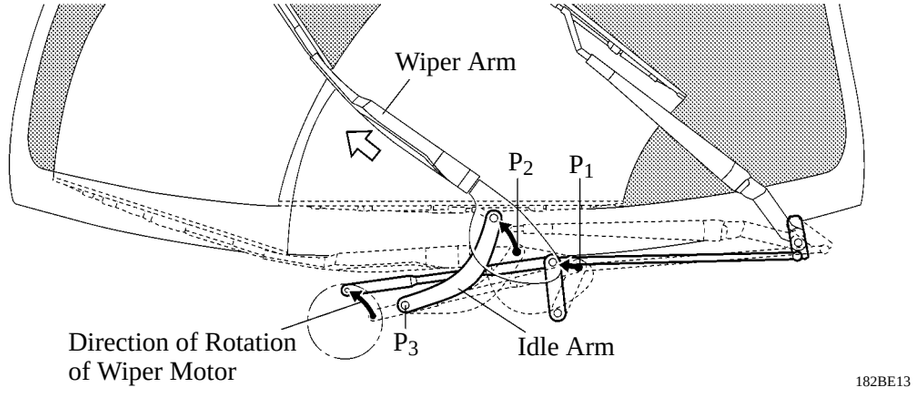


3. Operation

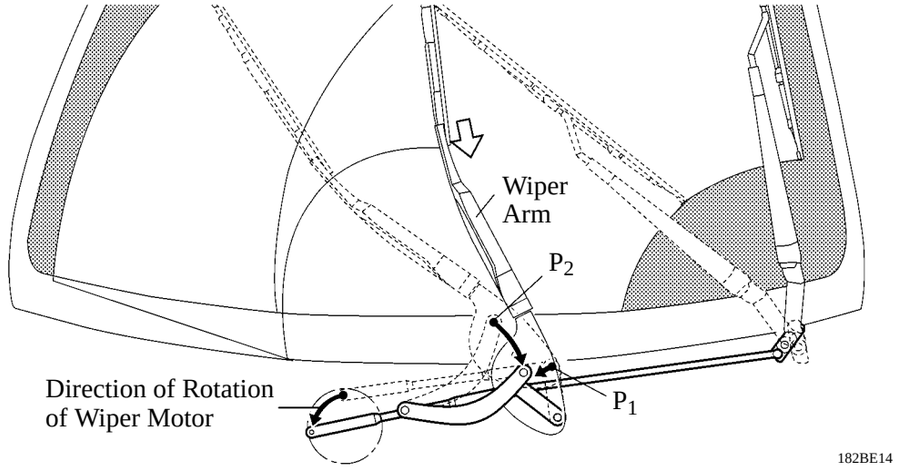
- With the rotation of the wiper motor, the wiper link for driving wiper will operate and connection point P_1 with the main lever will move toward the arrow mark by the influence of the wiper link with a pivot as a supporting point. With this, the connection point P_2 between the wiper arm and the idle lever becomes the supporting point of the pry and starts wiping by holding the arm upward.



- In addition, when the wiper motor rotates, P_1 and P_2 will move toward the arrow mark.
  Then, the wiper arm with P_3 as a supporting point will rise by the influence of the idle arm as if expanding upward to the left. With this, it enables to wipe wider range.



- When the wiper motor rotates more, P_1 and P_2 will move toward the arrow mark. The wiper arm with P_2 as a supporting point will move toward contracting direction and wipe further to the upper reversal position.



AIR CONDITIONING

■DESCRIPTION

The air conditioning system in the Prius has the following features:

- Both heating and demisting performances are realized by adopting performances are realized by adopting the 2-way flow heater type air conditioning unit.
- A multi-tank, super-slim structure evaporator has been adopted.
- An automatic air conditioning system which provides enhanced air conditioning comfort according to the occupant's senses has been adopted.
- A semi-center location air conditioning unit, in which the evaporator and heater core are placed in the vehicle's longitudinal direction, has been adopted.
- A compact, high-performance scroll compressor with oil separator has been adopted.
- The heat exchange efficiency has been improved through the adoption of the sub-cool condenser.
  This condenser is integrated with the radiator to minimize the space they occupy in the engine compartment.
- A compact, lightweight, and highly efficient straight flow (full-path flow) aluminium heater core has been adopted.
  This heater core is integrated with a PTC (Positive Temperature Coefficient) heater, which excels in heating performance.
- PTC heaters have been provided in the air duct at the footwell outlet in front of the air conditioning unit. However, air conditioning without the PTC heaters is offered as an option on the U.S.A. models.
- An electrical water pump with a bypass valve that provides a stable heater performance even if the engine is stopped due to a function of the THS (TOYOTA Hybrid System) has been adopted.
- A clean air filter that excels in removing pollen and dust is standard equipment.

▶ Performance ◀

Item			Performance
Heater	Heat Output	W	5300
	Air Flow Volume	m^3/h	330
	Power Consumption	W	170
Heater Core Integrated PTC Heater	Heat Output	W	330 (165 x 2)
PIC Heater*1	Heat Output	W	165 x 2
Air Conditioning	Heat Output	W	4200*2
	Air Flow Volume	m^3/h	450
	Power Consumption	W	200

*1: U.S.A. Cold Area Specification Model and Canada Model
*2: When the compressor is at 1,800 rpm

▶ Specifications ◀

Item				Specifications	
Ventilation and Heater	Heater Core	Type		Straight Flow (Full-path Flow)	
		Size W x H x L	mm (in.)	216.9 x 140 x 27 (8.5 x 5.5 x 1.1)	
		Fin Pitch	mm (in.)	1.8 (0.07)	
	Blower	Motor Type		S70F-13T	
		Fan Size Dia. x H	mm (in.)	External Air	132 x 41 (5.2 x 1.6)
				Internal Air	150 x 36 (5.9 x 1.4)
Air Conditioning	Condenser	Type		Multi-Flow Type (Sub-Cool Type)	
		Size W x H x L	mm (in.)	600 x 349.8 x 37.5* (23.6 x 13.8 x 1.5)	
		Fin Pitch	mm (in.)	2.8 (0.11)	
	Evaporator	Type		Drawn Cup (Multi-tank, Super Slim Structure)	
		Size W x H x L	mm (in.)	253.2 x 215 x 58 (10.0 x 8.5 x 2.3)	
		Fin Pitch	mm (in.)	3.5 (0.14)	
	Compressor	Type		SCS06	

*: With the radiator

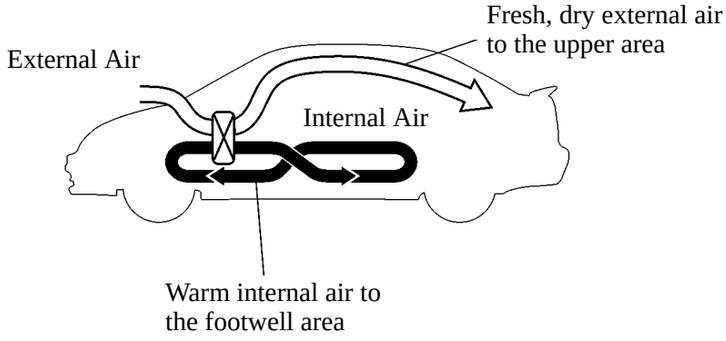
■CONSTRUCTION AND OPERATION

1. Air Conditioning Unit

Air Conditioning Assembly

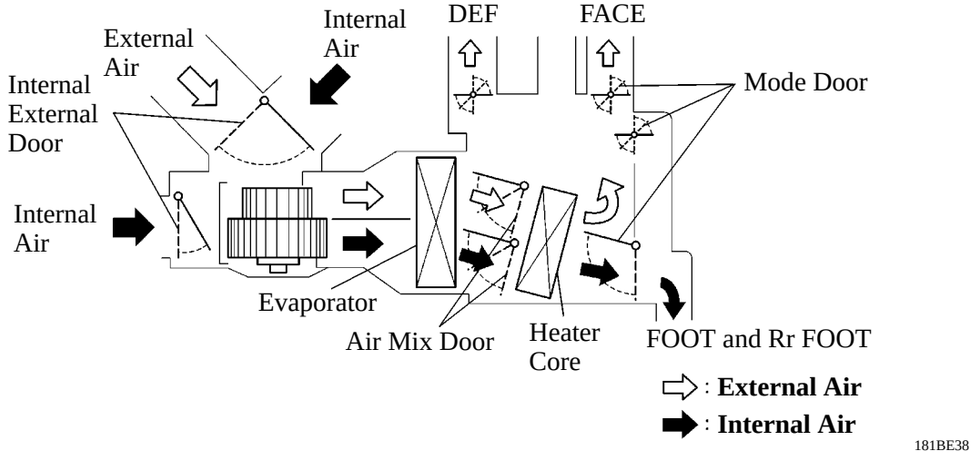
1) General

- A semi-center location air conditioning unit, in which the multi tank type evaporator and straight flow heater core are placed in the vehicle's longitudinal direction, has been adopted.
- Both heating and demisting performances are realized by adopting the 2-way flow heater type air conditioning unit.
  This unit, which introduces external air and internal air simultaneously, discharges warm internal air to the footwell area, and the fresh, dry external air to the upper area. Thus, it realizes both excellent heating performance and demisting performance.



2) Construction

A partition plate divides the inside of the air conditioning unit into two parts, the external air passage, and the internal air passage. Thus, by controlling the external air door and the internal air door separately, the external air and internal air are introduced into the cabin in the following three modes: fresh-air mode, recirculation mode, and fresh-air/recirculation (2-way flow) mode.



Airflow During 2-way Flow Control

3) 2-Way Flow (Fresh-air/Recirculation) Mode

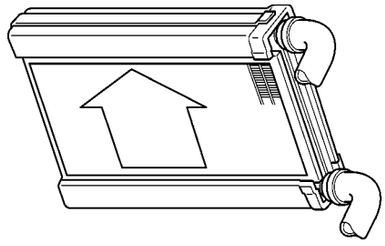
When all the conditions listed below are met, the external air door, internal air door, which are controlled by the air conditioning ECU, are switched to the 2-way flow mode.

- External air mode in the selected state
- Blower switch in the ON state (except OFF)
- Tentative air mix damper opening angle is above the specified value. (MAX HOT)
- Mode select switch in either FOOT or FOOT/DEF state

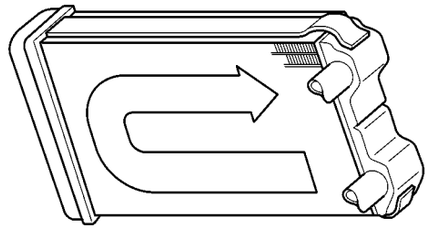
Heater Core and PTC Heater

1) General

- A compact, lightweight, and highly efficient straight flow (full-path flow) aluminum heater core has been adopted.

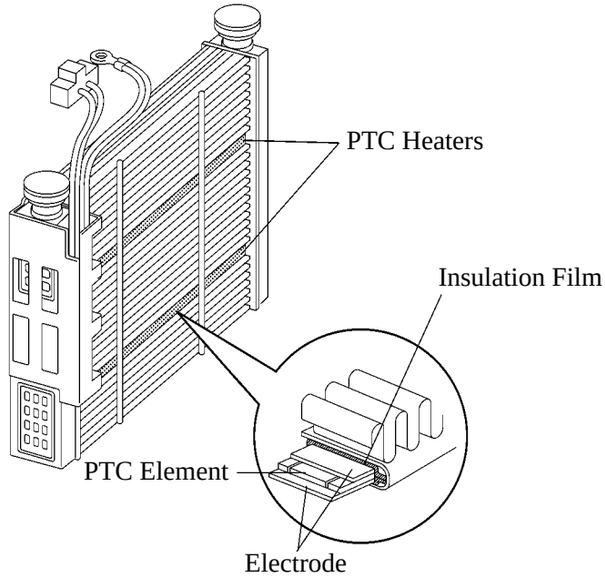


New (Straight Flow) 152BE21



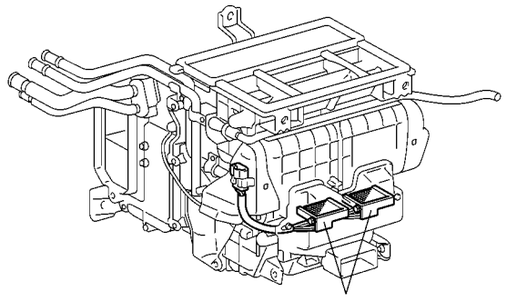
Previous (U-turn Flow) 152BE22

- The 2 PTC (Positive Temperature Coefficient) heaters have been built into the heater core.



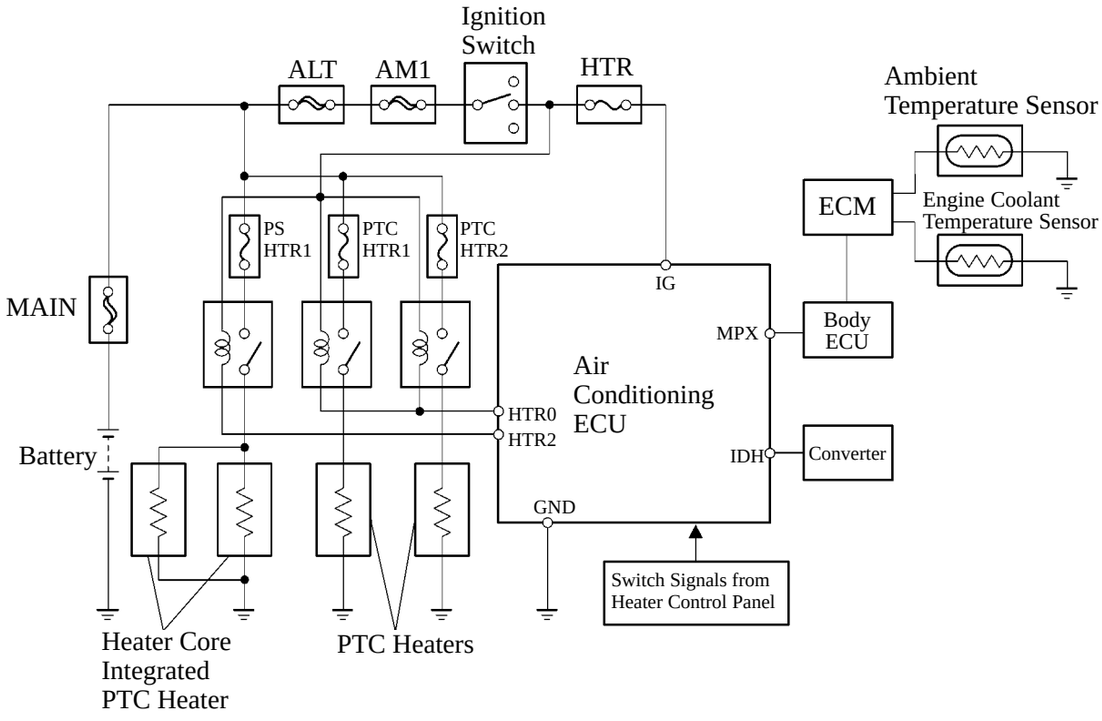
165BE18

- PTC heaters have been provided in the air duct at the footwell outlet in front of the air conditioning unit. However, air conditioning without the PTC heaters is offered as an option on the U.S.A. models.
  This PTC heater, which is a honeycomb-shaped PTC thermistor, directly warms the air that flows in the duct.



182BE17

▶ Wiring Diagram ◀



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2) Operation

a. Heater Core Integrated PTC Heater Model

The heater turns ON when all the conditions listed below have been met.

i) Outlet is in the DEF mode:

- Coolant temperature is below the specified value.
- Ambient temperature is below the specified value.
- Converter's PTC heater prohibition signal is OFF.

ii) Outlet is in the FOOT or FOOT/DEF mode:

- Coolant temperature is below the specified value.
- Tentative air mix damper opening angle is above the specified value. (MAX HOT)
- Converter's PTC heater prohibition signal is OFF.

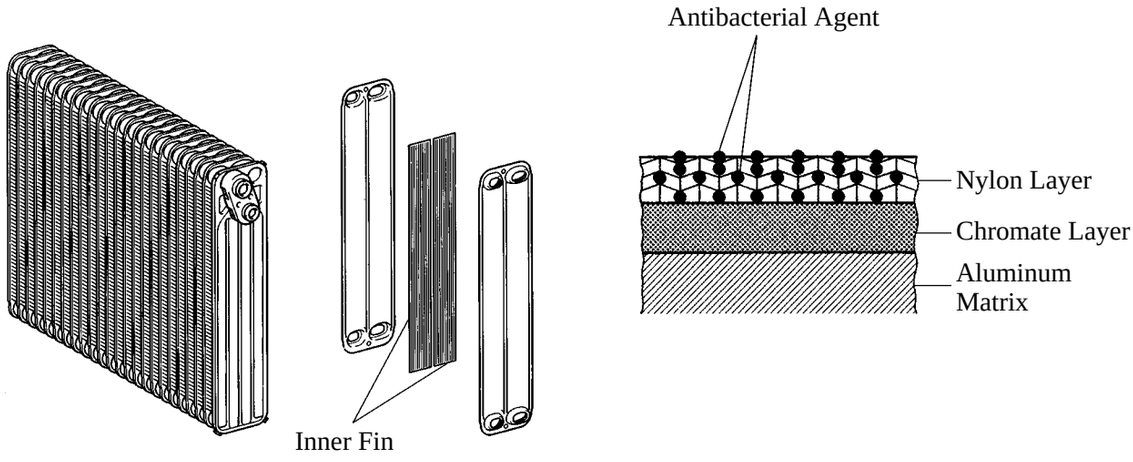
b. Heater Core Integrated PTC Heater and PTC Heater Model

In the case of the heater core integrated PTC heater and PTC heater model, the conditions under which the heater core integrated PTC heater operates are the same as those for the heater core integrated PTC heater model described above. Furthermore, in the heater core integrated PTC heater and PTC heater model, the PTC heater turns ON when all the conditions listed below have been met.

- Outlet is in the FOOT or FOOT/DEF mode.
- Blower switch in the ON state.
- Coolant temperature is below the specified value.
- Tentative air mix damper opening angle is above the specified value. (MAX HOT)
- Converter's PTC heater prohibition signal is OFF.

Evaporator

By placing the tanks at the top and the bottom of the evaporator unit and by adopting an inner fin construction, the heat exchanging efficiency has been improved and the evaporator unit's temperature distribution has been made more uniform. As a result, it has become possible to realize a thinner evaporator construction. Furthermore, the evaporator body has been coated with a type of resin that contains an antibacterial agent in order to minimize the source of foul odor and the propagation of bacteria.

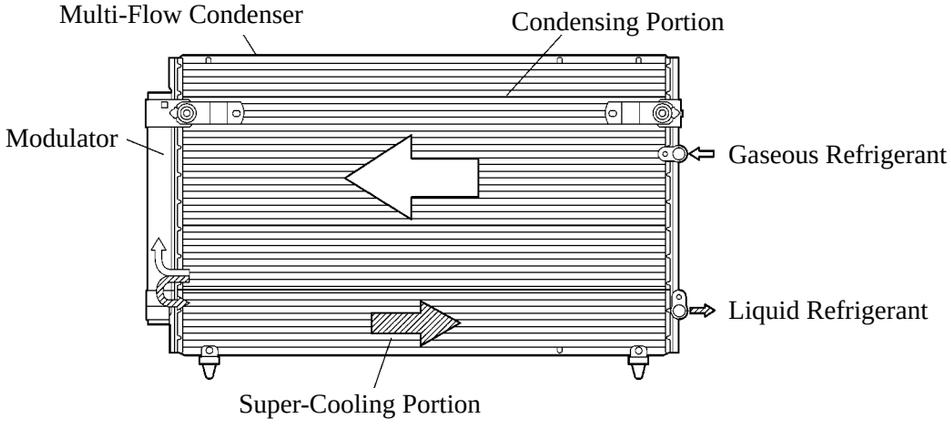


2. Condenser

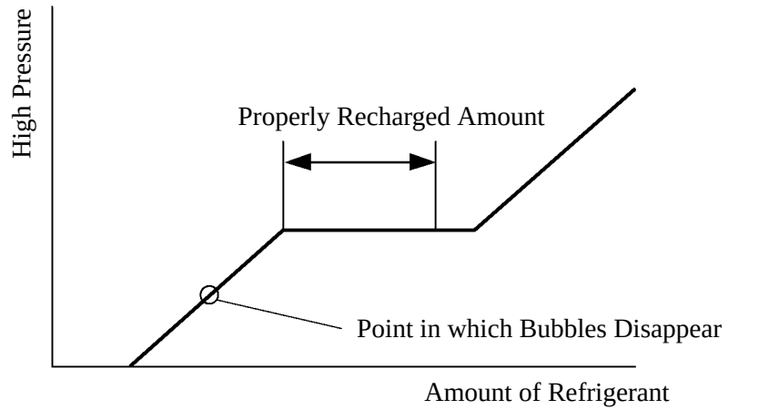
The Prius has adopted sub-cool condenser in which a multi-flow condenser (consisting of two cooling portions: a condensing portion and a super-cooling portion) and a gas-liquid separator (modulator) have been integrated. This condenser has adopted the sub-cool cycle for its cooling cycle system to improve the heat exchanging efficiency.
This condenser is integrated with the radiator to minimize the space they occupy in the engine compartment. For details, see page 54 in the Engine Cooling System Section.

Sub-Cool Cycle

In the sub-cool cycle of the sub-cool condenser that has been adopted, after the refrigerant passes through the condensing portion of the condenser, both the liquid refrigerant and the gaseous refrigerant that could not be liquefied are cooled again in the super-cooling portion. Thus, the refrigerant is sent to the evaporator in an almost completely liquefied state.



NOTE: The point at which the air bubbles disappear in the refrigerant of the sub-cool cycle is lower than the proper amount of refrigerant with which the system must be filled. Therefore, if the system is recharged with refrigerant based on the point at which the air bubbles disappear, the amount of refrigerant would be insufficient. As a result, the cooling performance of the system will be affected.
For the proper method of verifying the amount of the refrigerant and to recharge the system with refrigerant, see the 2001 Prius Repair Manual (Pub. No.RM778U).



152BE40

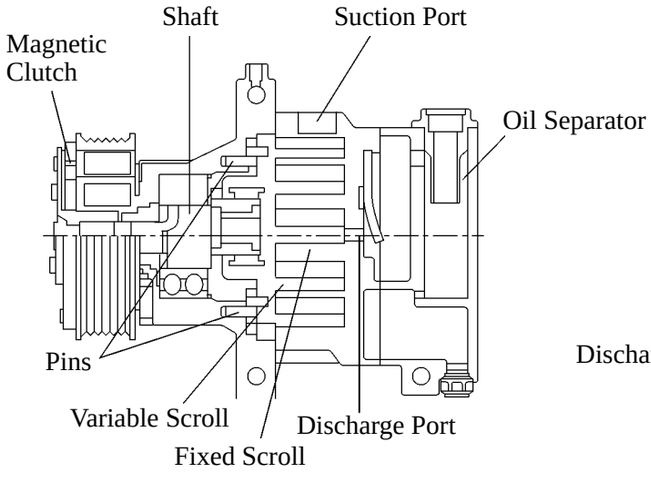
3. Compressor

General

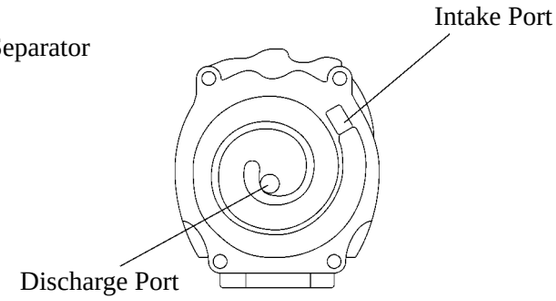
A compact and high performance scroll compressor with oil separator has been adopted.

Construction

The scroll compressor with oil separator consists of a spirally wound fixed scroll and variable scroll that form a pair, and oil separator, and a magnetic clutch.
The fixed scroll is integrated with the housing. Because the rotation of the shaft causes the variable scroll to revolve while maintaining the same posture, the volume of the space that is partitioned by both scrolls varies to perform the suction, compression, and the discharge of the refrigerant gas.
A pin is attached behind the variable scroll to prevent the autorotation of the variable scroll, allowing it only to revolve.
Locating the suction port directly above the scrolls enables direct suction, thus realizing improved suction efficiency.
Containing a built-in oil separator, this compressor is able to separate the compressor oil that is intermixed with the refrigerant and circulates in the refrigeration cycle, thus realizing a reduction in the oil circulation rate.



165BE21



Fixed Scroll

165BE22

Operation

1) Suction

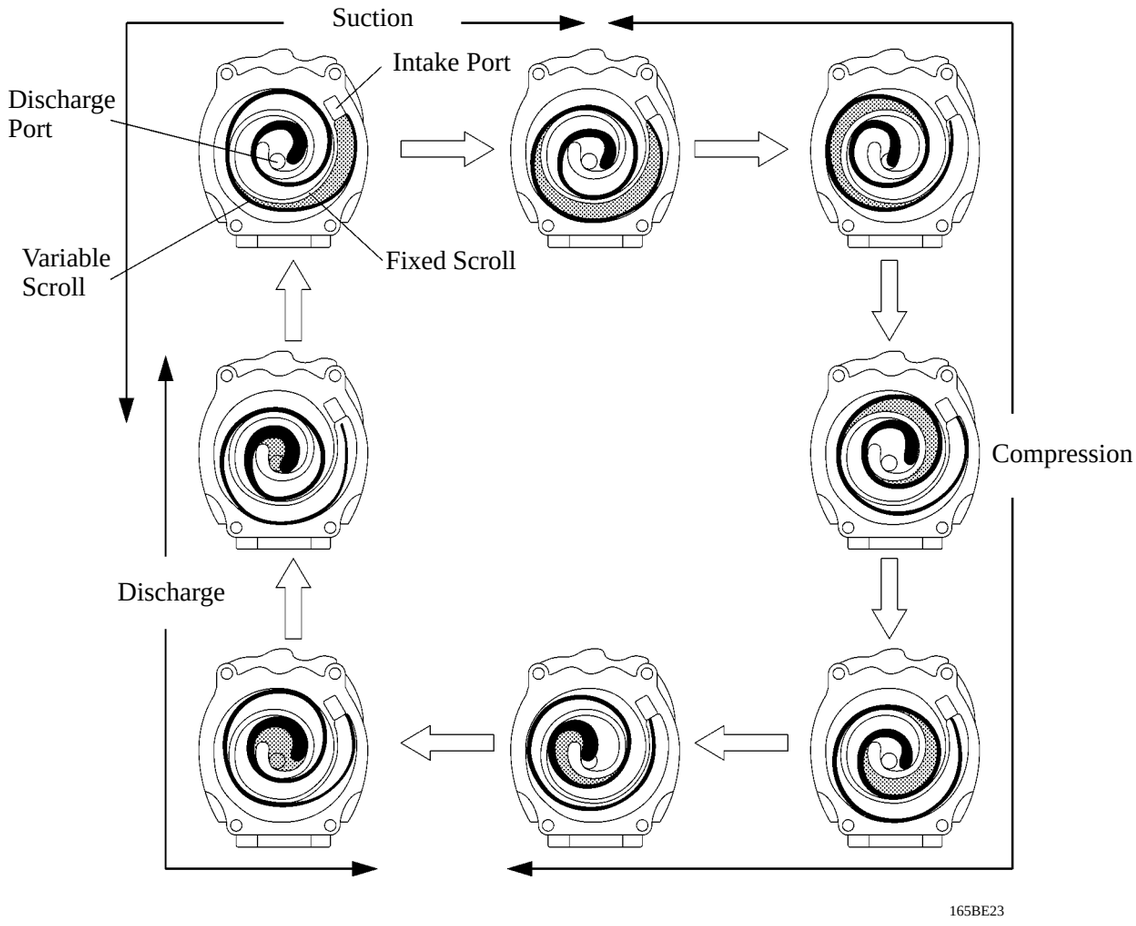
As the capacity of the compression chamber, which is created between the variable scroll and the fixed scroll, increases in accordance with the revolution of the variable scroll, refrigerant gas is drawn in from the intake port.

2) Compression

From the state at which the suction process has been completed, as the revolution of the variable scroll advances further, the capacity of the compression chamber decreases gradually. Consequently, the refrigerant gas that has been drawn in becomes compressed gradually and is sent to the center of the fixed scroll. The compression of the refrigerant gas is completed when the variable scroll completes approximately 2 revolutions.

3) Discharge

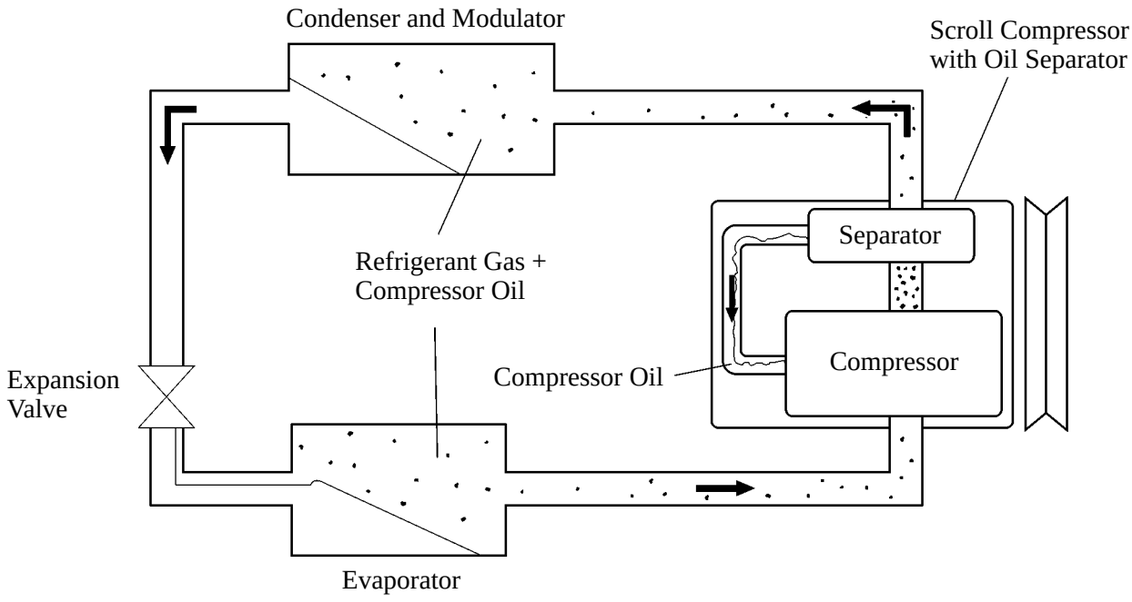
When the compression of the refrigerant gas is completed and the refrigerant pressure becomes high, the refrigerant gas discharges through the discharge port located in the center of the fixed scroll by pushing the discharge valve.



Oil Separator

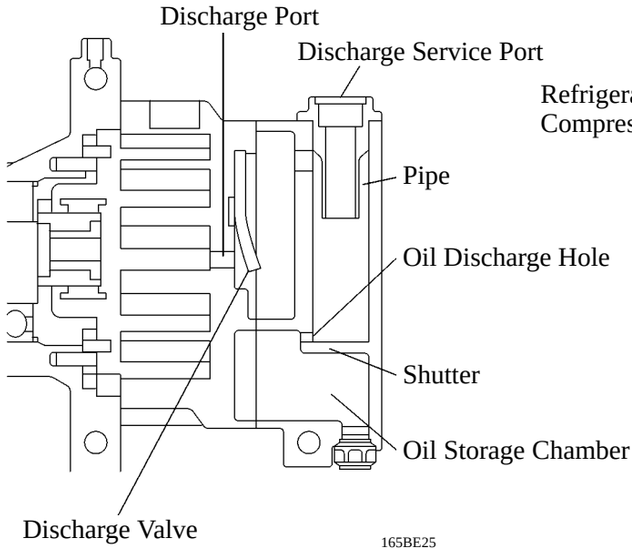
1) General

A CS (Centrifugal with Shutter) type oil separator has been adopted to reduce the circulation rate of the compressor oil that is intermixed with the refrigerant and circulates in the refrigeration cycle.
This oil separator is provided with a cylindrical pipe in the separator case, enabling the refrigerant gas that has been discharged through the discharge gas inlet to be separated into refrigerant gas and oil through centrifugal force, and minimizing the outflow of the oil to the discharge service port. As a result, the oil circulation rate has been reduced and makes energy savings possible.

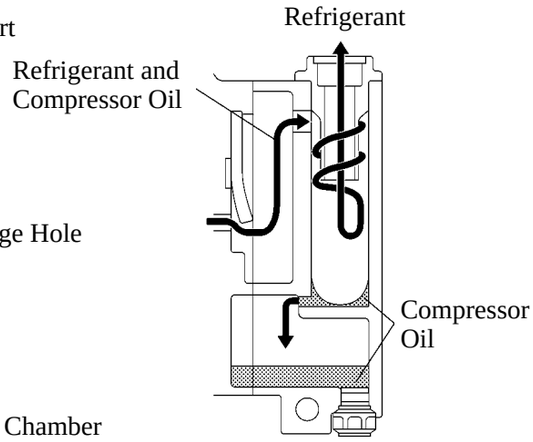


2) Construction and Operation

The refrigerant gas that is discharged from the discharge port flows by rotating around the cylindrical pipe in the oil separator. At this time, the centrifugal force that is created during the rotation separates the refrigerant gas and the compressor oil due to the difference in their specific gravity. The refrigerant gas with the lighter specific gravity passes through the inside of the pipe and travels from the discharge service port to the outside of the compressor. The compressor oil with the heavier specific gravity is discharged through the oil discharge hole in the shutter and is stored in the oil storage chamber. Then, the compressor oil is fed again into the compressor and circulates inside the compressor.



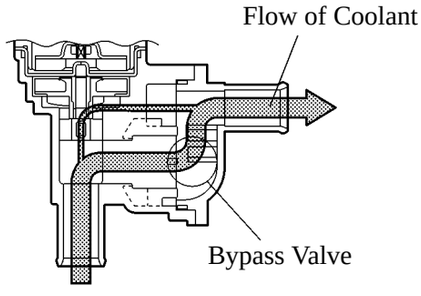
165BE25



165BE26

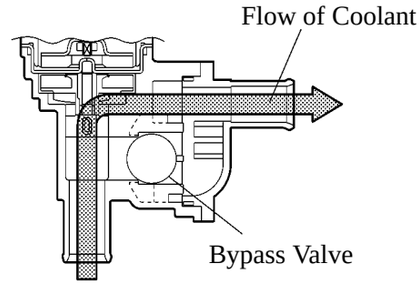
4. Water Pump (For Air Conditioning)

An electrical water pump with a bypass valve that provides a stable heater performance even if the engine is stopped due to a function of the THS has been adopted.
When the engine is running, this water pump ceases its operation and opens the bypass valve to minimize the flow resistance of the coolant that is pumped by the engine water pump.



Water Pump OFF
(Engine ON)

182BE19

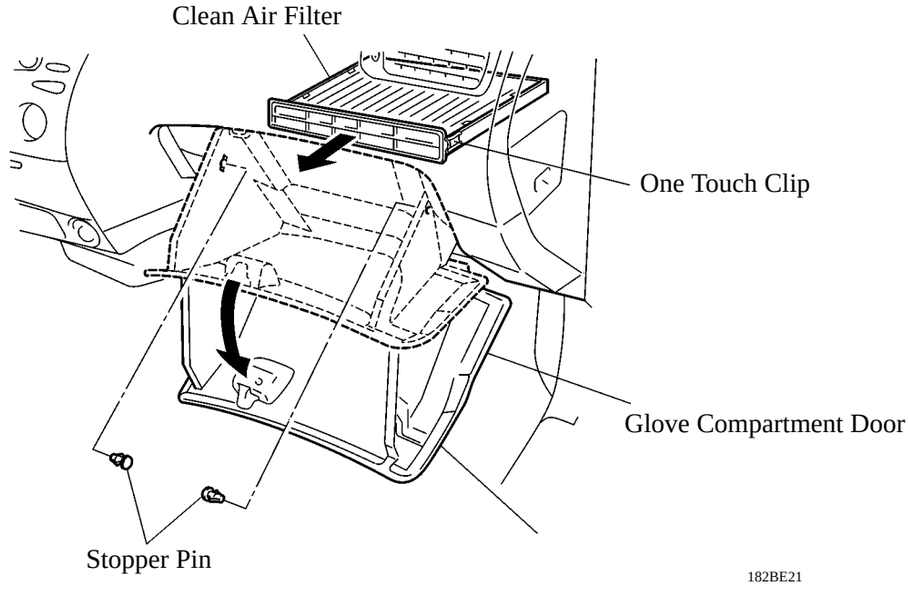


Water Pump ON
(Engine OFF)

182BE20

5. Clean Air Filter

A clean air filter that excels in removing pollen and dust is standard equipment.
This filter, which cleans the air in the cabin, is made of polyester. Thus, it can be disposed of easily as a combustible material, a feature that is provided in consideration of the environment.
To facilitate the replacement of the filter, a one-touch clip is used in the filter cover which is unified with filter case. Thus, a construction that excels in serviceability has been realized.



Service Tip

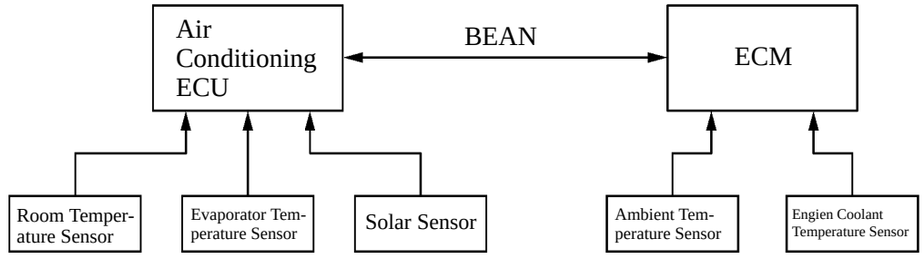
The replacement interval for the clean air filter is 30,000 km or 2 years.
However, it varies with the use conditions (or environment).

6. Air Conditioning ECU

General

- An automatic control type air conditioning has been adopted. This system uses an air conditioning ECU to perform the calculation of the required outlet air temperature control, temperature control, blower control, air inlet control, air outlet control, and compressor control.
  The information that is necessary for effecting the controls are the signals from the room temperature sensor, evaporator temperature sensor, and solar sensor that are directly transmitted to the air conditioning ECU, and the signals from the ambient temperature sensor and the engine coolant temperature sensor that are transmitted via the ECM. These signals are calculated by the air conditioning ECU to effect the proper control.

▶ System Diagram ◀

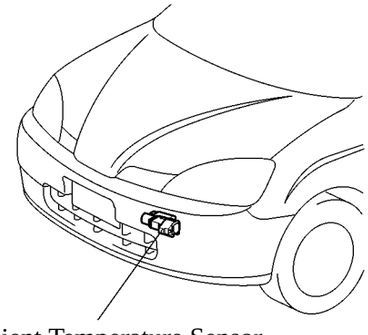


182BE22

Sensors

1) Ambient Temperature Sensor

The ambient temperature sensor has been provided on the left, in front of the condenser. The signals from this sensor are transmitted to the air conditioning ECU via the ECM.

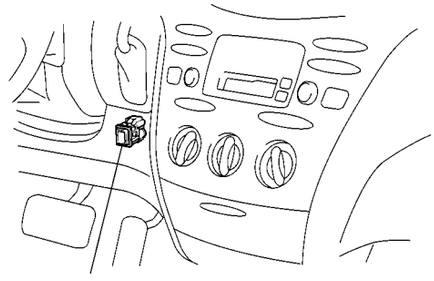


Ambient Temperature Sensor

182BE23

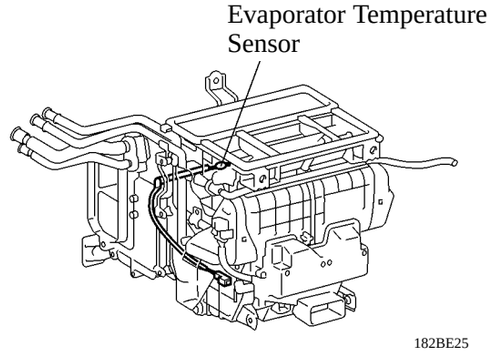
2) Room Temperature Sensor

The room temperature sensor has been provided inside the instrument finish lower panel.
The signals from this sensor are directly transmitted to the air conditioning ECU.



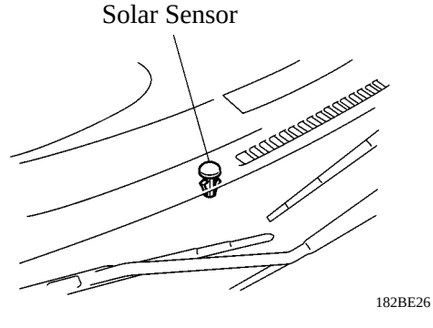
3) Evaporator Temperature Sensor

The evaporator temperature sensor has been provided behind the evaporator in the air conditioning unit.
The signals from this sensor are directly transmitted to the air conditioning ECU.



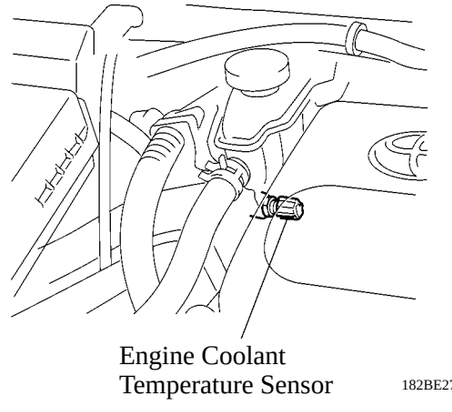
4) Solar Sensor

The solar sensor has been provided on top of the instrument panel.
The signals from this sensor are directly transmitted to the air conditioning ECU.



5) Engine Coolant Temperature Sensor

The water temperature sensor has been provided on the water outlet area on the left side of the engine.
The signals from this sensor are transmitted to the air conditioning ECU via the ECM.



Calculation of Required Outlet Air Temperature (TAO: Temperature Air Outlet)

After receiving the signals from the sensors and the temperature control switch setting, the air conditioning ECU uses the formula shown below to calculate the required outlet air temperature, to regulate the servomotors and blower motor. This is an outlet air temperature that is required in maintaining the set temperature in a stable manner.

$$TAO = K_{SET} \times TSET - Kr \times TR - K_{AM} \times TAMdisp - Ks \times TS + C - TC$$

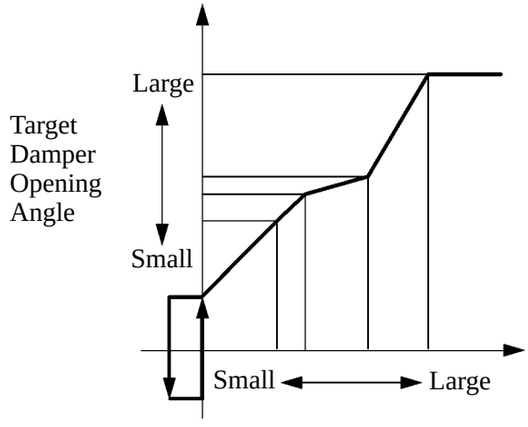
K_{SET}	= Setting Temperature Coefficient	TSET	= Setting Temperature
Kr	= Room Air Temperature Coefficient	TR	= Room Air Temperature
K_{AM}	= Ambient Air Temperature Coefficient	TAMdisp	= Ambient Air Temperature
Ks	= Solar Radiation Coefficient	TS	= Solar Radiation
C	= Correct Constant	TC	= Compressor ON/OFF Correct Constant

Temperature Control System

1) Air Mix Damper Control

In response to the temperature control switch setting, the required ambient temperature, evaporator temperature sensor, and engine coolant temperature sensor compensations are used by the air mix damper control to calculate a tentative damper opening angle, through an arithmetic circuit in the air mix damper, to arrive at a target damper opening angle.

▶ Calculating the Target Damper Opening ◀



182BE50

Blower Control System

1) Blower Motor Startup Control

When the blower motor is started up, the blower voltage in the auto mode (low speed) is output to the blower controller for 3 seconds. This is designed to protect the blower controller from a sudden startup current surge.

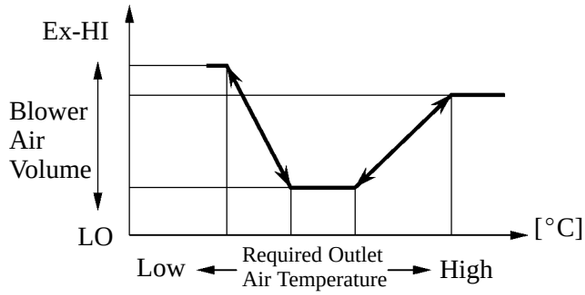
2) Manual Control

Sets the blower speed according to operation of the blower switch.

3) Automatic Control

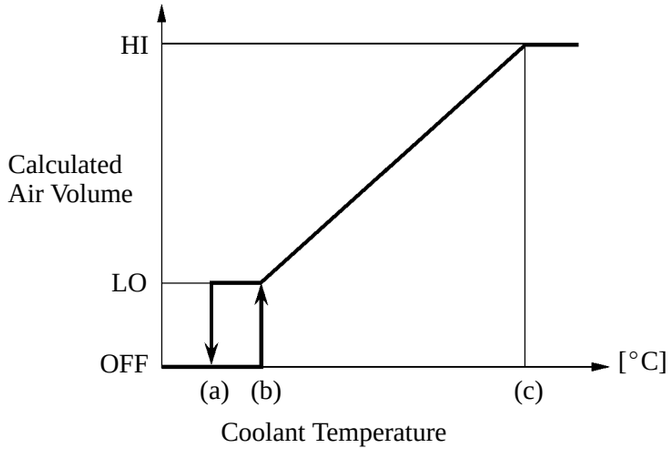
a. Stepless Air Volume Control

As shown on the right, when the AUTO switch on the heater control panel is pushed, the air conditioning ECU automatically regulates the voltage to the blower controller, in accordance with the required outlet air temperature, to deliver stepless air volume.



b. Warm-Up Control

When the coolant temperature detected by the engine coolant temperature sensor is below a predetermined level and the air outlet is in the FOOT or BI-LEVEL mode, the blower does not operate. When the coolant temperature reaches specified temperature (b), the blower motor operates at low speed. When the coolant temperature is between specified temperature (b) to (c), the air flow calculation using the engine coolant temperature sensor signal, and, the air flow calculation using the required outlet air temperature are compared, and the lesser of the two is automatically selected as the air flow to be used. When the coolant temperature reaches specified temperature (c) or more, the blower motor runs at high speed. Moreover, when the coolant temperature is under specified temperature (a), and the warm-up control is effected (blower motor off), the air outlet is switched to the DEF mode. Later, when the blower motor turns on, the air outlet changes from the DEF mode to the FOOT or BI-LEVEL mode.

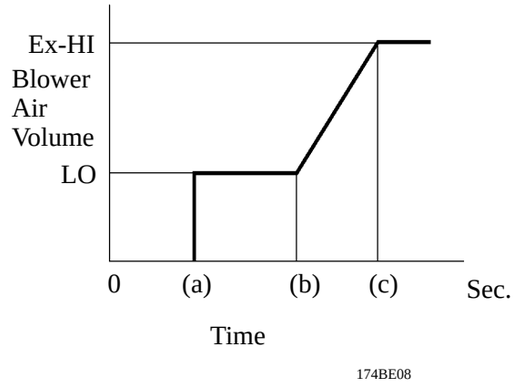


c. Time-Lagged Air Flow Control

2 types of time-lagged air flow control (in accordance with the temperature detected by the evaporator temperature sensor) help prevent hot air from being emitted from FACE or BI-LEVEL vent.

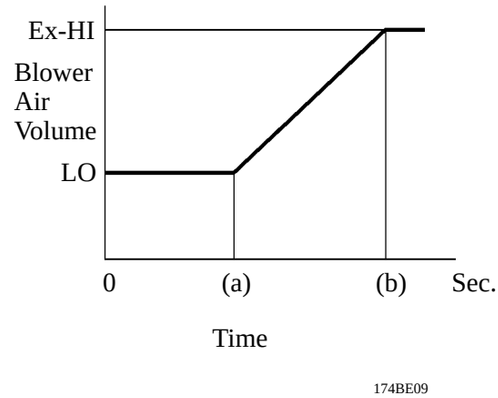
i) Evaporator temperature sensor at specified temperature or more

As shown in the diagram on the right, this control turns OFF the blower motor for approximately specified time (a) and turns ON the compressor to cool the air conditioning unit.
After approximately specified time (a) have elapsed, the blower motor rotates in the manual LO mode, allowing the cooled air to be discharged from the vents. Thus, the discomfort that is associated with the discharge of warm air is prevented.
Between approximately specified time (b) to (c), the airflow volume according to the timelagged airflow control and the airflow volume of the blower control according to the calculation of the required outlet air temperature are compared. The airflow volume is then regulated at the smaller volume of the two.
After specified time (c) have elapsed, control is effected by the blower control according to the calculation of the required outlet air temperature.



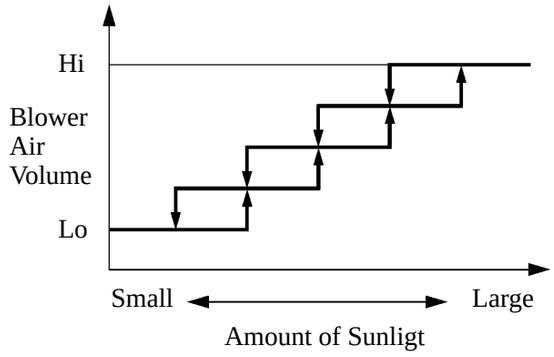
ii) Evaporator temperature sensor at specified temperature or less

As shown in the diagram on the right, for approximately specified time (a), the blower motor rotates in the manual LO mode.
Thereafter, up to approximately specified time (b), the airflow volume according to the time-lagged airflow control and the airflow volume according to the blower control of the calculation of the required outlet air temperature are compared. The airflow volume is then regulated at the smaller volume of the two.
After specified time (b) have elapsed, control is effected based on the blower control according to the calculation of the required outlet air temperature.



d. Sunlight Air Flow Control

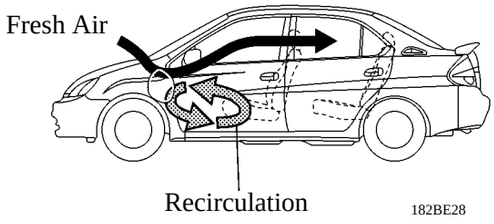
Controls the blower speed in accordance with the intensity of the sunlight when the air outlet mode is at FACE or BI-LEVEL. The blower low speed can be adjusted up to 4 steps, in response to the sunlight signal received from the solar sensor.



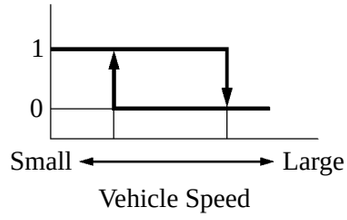
182BE51

2-Way Flow Mode Control

At the time of selecting FRESH mode, air conditioning ECU will judge it as 2-way flow mode when the blower outlet is selected to FOOT or FOOT/DEF, the tentative air mix damper opening angle is above the specified valve (MAX HOT), and either the blower volume is more than the specified volume or the vehicle speed is less than the specified speed.



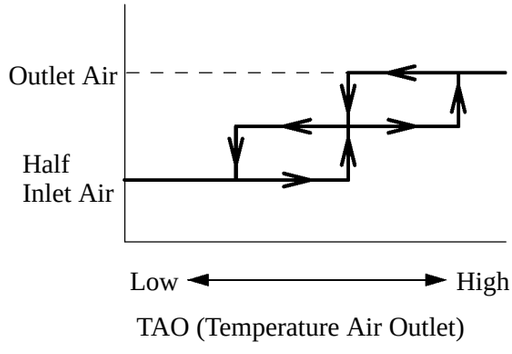
182BE28



182BE29

Half Inlet Air Mode Control

At the time of selecting FRESH mode, air conditioning ECU will judge it as half inlet air mode when the blower outlet mode is selected to FACE or BI-LEVEL and TAO (Temperature Air Outlet) is more than the specified temperature, and operates both outlet air introduction and inlet air circulation at the same time.

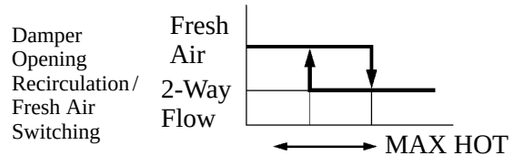


182BE52

Air Inlet Control System

1) Manual Control

Drives the air inlet servomotor according to the operation of the air inlet control switch and fixes the dampers in the FRESH or RECIRC position.
The 2-way flow mode control switches the recirculation/fresh-air function in accordance with the opening of the air mix damper, calculates the target opening of the damper, and rotates the servomotor.



Tentative Damper Opening Angle (During 2-Way Flow Mode)

182BE31

2) Battery ECU Forced Fresh Air Mode

When the air conditioning ECU receives the forced fresh air mode signal from the battery ECU via the HV ECU and the ECM, the damper forcefully switches to the FRESH mode.

3) DEF, FOOT/DEF Mode Control

When the mode switching switch is switched to FOOT/DEF mode from DEF mode or other than FOOT/DEF mode, air conditioning ECU switches to FRESH mode forcibly.
Also, when the mode switching switch is switched to DEF mode from other than DEF mode, air conditioning ECU turns MAX mode ON and switched to FRESH mode forcibly.

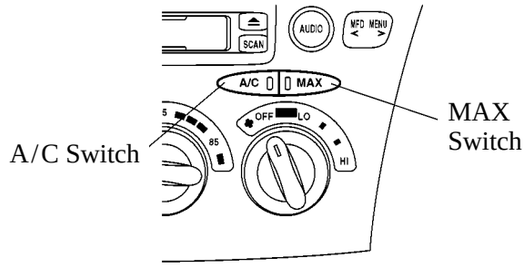
Compressor Control System

1) OFF Control

Turns OFF the magnetic clutch of the compressor when the conditions for turning the blower motor OFF during warm-up control have been met.

2) Compressor Lock Judgment

When the magnetic clutch is ON, if the air conditioning ECU judges that the compressor has been locked, it turns OFF the magnetic clutch relay and flashes the indicator lamp in the A/C or MAX switch. The conditions in which the ECU judges the compressor to have locked are when a slippage rate of 80% or more has been continued for 3 seconds or more.



182BE33

3) Refrigerant Pressure Malfunction Detection

By monitoring the pressure switch signal, this system can judge the refrigerant pressure to be abnormal, and turns off the compressor magnetic clutch relay, if the pressure switch remains off.

4) MAX Switch ON Control

a. General

In case of usual air conditioning operation, the air conditioning system shows superior control on cooling performance and fuel efficiency by combining the engine ON/OFF control by the hybrid control and the air conditioning ON/OFF control.
In this MAX switch ON control, it controls by attaching greater importance to cooling performance of the air conditioning.

ACCESSORIES

■MULTI-INFORMATION DISPLAY

1. General

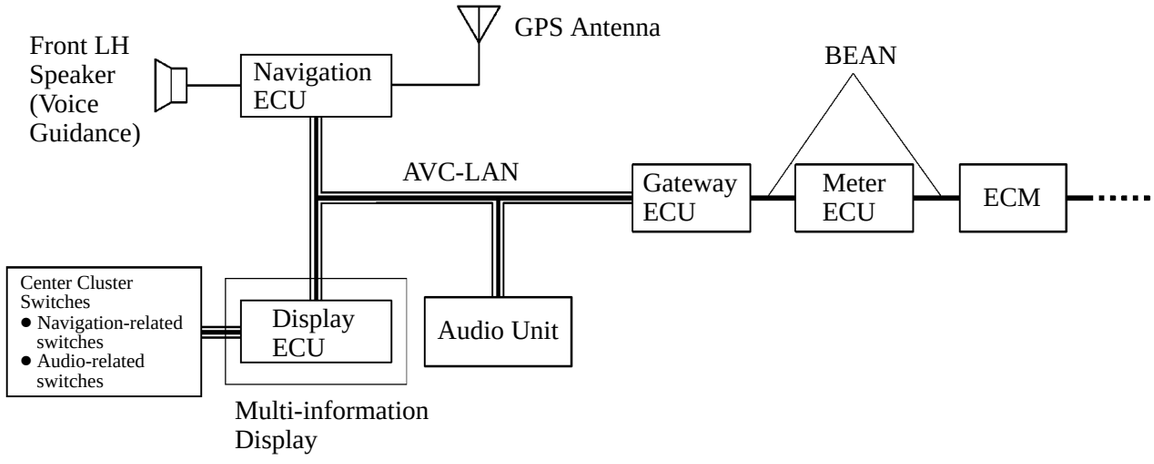
- A multi-information display has been provided on top of the center console as standard equipment. Consisting of a 5.8-inch wide LCD (Liquid Crystal Display) screen, this multi-information display provides a vehicle information screen, warning screen, and an audio operation screen. The outside temperature is also shown on the screen.
- A GPS (Global Positioning System) voice navigation is offered as an option. Through the use of the GPS and the map data in a DVD (Digital Versatile Disc), this navigation system analyzes the position of the vehicle and indicates that position on the map that is displayed on the screen. Additionally, it provides voice instructions to guide the driver through the route to reach the destination that has been selected.

Listed below are the main functions of the multi-information display.

Function	Outline
Map Screen Display*	● Enlargement/reduction, rotation and movement of map. ● Indication of current position and direction of travel. ● Correction of current position. ● Setting, change and indication of route. ● Voice guidance. ● Indication of enlarged intersections. ● Memory and indication of map position.
Audio Screen Display	Status of audio equipment and audio operation screen indication.
Information Screen Display	● Energy monitor screen indication. ● Fuel consumption screen indication.
Adjustment Screen Display	● Sound quality adjustment screen indication. ● Image quality adjustment screen indication. ● No indication.
On-screen Display	● Audio status indication. ● Warning indication.
Interrupt Screen Display	Warning indication.
Diagnosis Screen Display	● Display system diagnosis. ● Displays various type of coefficient settings.

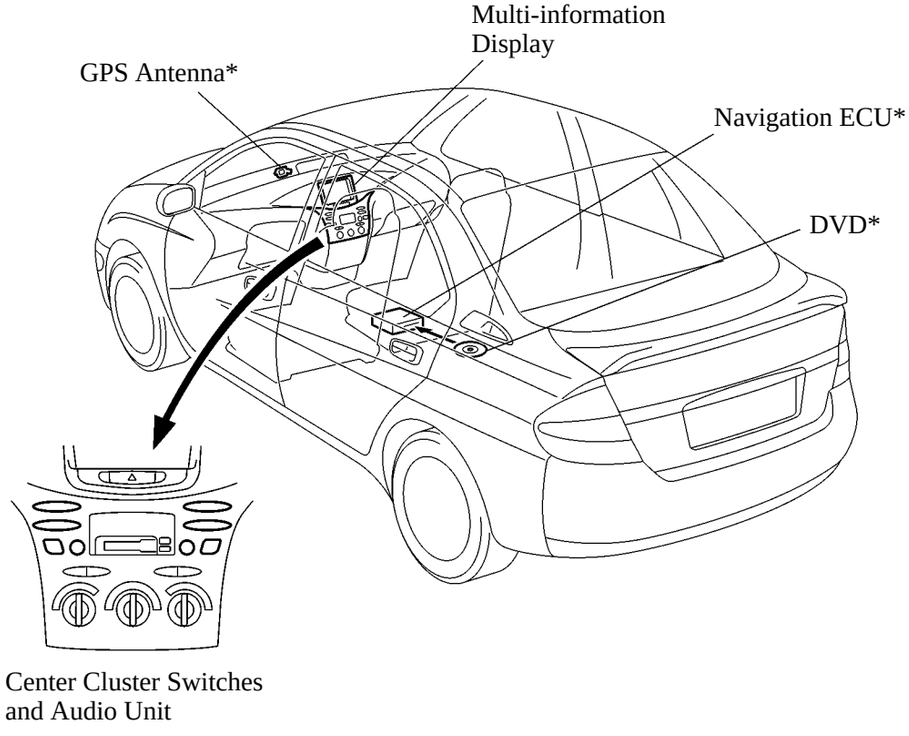
*: with GPS Voice Navigation System

2. System Diagram



182BE34

3. Layout of Components



182BE35

*: with GPS Voice Navigation System

4. Construction and Operation

General

This system mainly consists of a multi-information display, navigation ECU, display ECU, gateway ECU, GPS antenna and audio unit.
The navigation ECU, display ECU, gateway ECU, and the audio unit all maintain communication through the AVC-LAN.

Navigation ECU

The navigation ECU is provided on the models with the GPS voice navigation. Based on the map data on the DVD, signals from the GPS satellites, signals from the built-in gyro sensor, and signals from the vehicle's speed sensor, this ECU calculates the vehicle's present position, direction of travel, and driven distance, and transmits the data to the display ECU. In addition, it outputs navigation voice instructions.

Display ECU

Upon receiving the vehicle information that is transmitted by the gateway ECU, the navigation information that is transmitted by the navigation ECU, and the operation information from the audio unit, the display ECU displays these data on the multi-information display.

Gateway ECU

The gateway ECU transmits the vehicle information to the display ECU in order for it to be displayed on multi-information display. Because vehicle information is transmitted by the ECUs that maintain communication on the BEAN (Body Electronics Area Network), the gateway ECU converts this information into signals for AVC-LAN use and sends it to the display ECU.

GPS Antenna

The GPS antenna is provided on the models with the GPS voice navigation.
The GPS antenna receives signals from the GPS satellites that are located on the orbits that circle the earth at an approximate altitude of 20,000 km. The GPS satellites continuously transmit orbit signals and the signal transmission time.

Multi-information Display

- The multi-information display has the functions for displaying the map screen, audio screen, information screen, adjustment screen, interrupt screen, and on-screen.
- This system's self-diagnosis function can be displayed and operated on the multi-information display. For details, refer to the 2001 Prius Repair Manual (Pub. No. RM778U).

1) Map Screen

The map screen is a function that is provided in the GPS voice navigation system.
Based on the map data on the DVD, signals from the GPS satellites, signals from the built-in gyro sensor, and signals from the vehicle's speed sensor, the vehicle's present position, direction of travel, and driven distance are calculated and displayed on this screen. This screen has the display functions listed below.

Item		Outline
Map Display	Heading Up/North Up	Changes the orientation of the map.
	Front Wide	Displays a map in the direction of travel of the vehicle in an enlarged form.
	Stepless Scale Display	Changes the scale of the map from the basic 11 steps to an even finer display.
	Direct Scale Change	Directly select and display the map scale.
	Multi-step Scale Display	Change and display the map scale in 11 stages.
	Scroll Display	Scrolls the screen to display the desired point on the map.
	Split-view Display	Displays different modes on a screen that is split into two views.
	Points-of-Interest Display	Displays selected types of marks on the map.
	Taillight-interlocked Map Color Change	Changes the displayed color on the map screen when the taillights are turned ON.
	Road Number Sign Board Display	Displays the road numbers on the map.
Destination Search	Hybrid Points-of-interest Search	Narrows the search by names of the points-of-interest, category, and areas.
	Points-of-interest Pinpoint Display	Pinpoints and displays the position of the point-of-interest.
	House Number Search	Searches for a house number.
	Special Memory Point	Sets a pre-registered point as a destination point while driving.
	Nearest Points-of-Interest Search List Display	Searches nearest points-of-interest and displays a list.
	Intersection Search	By specifying two streets, the point at which they intersect is set as the destination point.
	Emergency Search	Performs a specific search for hospitals, police stations, and dealers.
	Freeway Entrance/Exit Search	Searches for the destination by the name of the street that connects to a freeway entrance/exit.
Search	Route Search	Searches for multiple routes.
	Search Condition Designation	Searches for the recommended, shortest, and other routes.
	Regulated Road Consideration	Performs search while considering regulated roads.
	Avoidance Area	Avoids a designated area and searches a route.

(Continued)

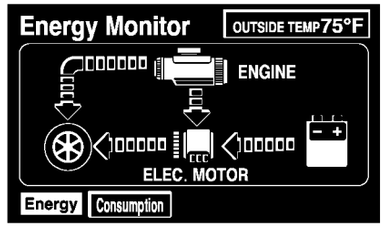
Item		Outline
Guidance	Right or Left Turn Guidance	Voice guidance to instruct the direction of travel to be taken.
	Freeway Direction of Travel Guidance	Voice guidance to instruct the direction of travel to take on the freeway.
	Distance Display to Destination	Displays the distance from the present location to the destination.
	Freeway Branch Type Specimen Guidance	Type specimen for guidance to a freeway branch.
	Intersection Zoom-in Display	Zoom-in display when approaching an intersection.
	Turn List Display	Displays a turn list on the right side of the two-screen display when approaching an intersection.

2) Information Screen

The information screen provides two types of indications: the energy monitor screen indication that displays the present energy flow of the hybrid system, and the fuel consumption screen indication that displays the average fuel consumption rate, the amount of regenerative energy, and the instantaneous fuel consumption rate.

a. Energy Monitor Screen Indication

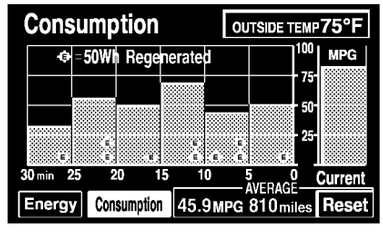
This screen indicates the energy transmission direction for checking the current drive method (engine, motor or both), the power generation status by the engine and status of regenerative energy use.



182BE36

b. Fuel Consumption Screen Indication

This screen indicates the average fuel consumption, recovered energy and the current fuel consumption, all at once.
The average fuel consumption is calculated using 5-minute units. The recovered energy over the past 5 minutes is indicated by symbols, with one mark representing 50 Wh.
In addition, the total fuel consumption before resetting and the total travel distance are displayed at the right bottom of the screen.

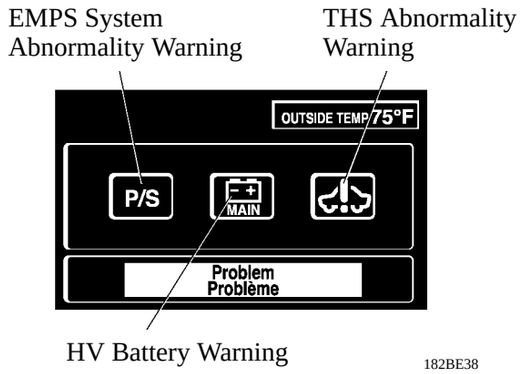


182BE37

3) Interrupt Screen

a. General

If an abnormal condition occurs in the vehicle system, even if another screen is being displayed, the interrupt screen automatically indicates a warning to inform the driver of an abnormality in the system. The warning indication screen flashes for 5 seconds the mark of the system in which the abnormality occurred. Then, it illuminates and remains displayed until the screen is switched or the system is reinstated to normal.



182BE38

▶ List of Warning Display Items ◀

Warning Display Item	Description of Warning
EMPS System Abnormality Warning	When an abnormality occurs in the EMPS (Electric Motor-assisted Power Steering) system.
HV Battery Warning*	When the HV battery voltage drops.
THS Abnormality Warning	When an abnormality occurs in the THS (TOYOTA Hybrid System).

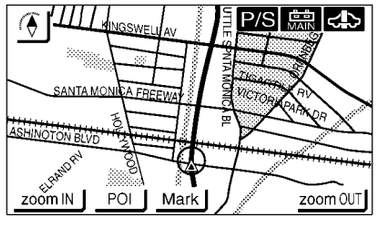
*: While “READY” light is lighting.

b. HV Battery Warning

When starting THS (when turning the IG key to START position) and if HV battery is displayed in this interrupt screen, it means that HV battery has abnormality.

4) On-screen

If the screen switches to another screen while displaying a warning indication, the mark of the system in which the abnormality occurred is displayed at the top right area of the screen. The displayed mark disappears when the system is reinstated to normal.



182BE39

5. GPS (Global Positioning System) Voice Navigation

General

- The GPS (Global Positioning System) function receives, via an GPS antenna, the signals that are transmitted from the GPS satellites located in space at an approximate altitude of 20,000 km, in order to determine the vehicle's present position.
- The GPS voice navigation function combines the radiowave navigation system that determines the present position through the GPS signals, and the self-contained navigation system that detects the driven distance and the direction of travel through the speed sensors and the gyro sensor that is contained in the navigation ECU. The GPS voice navigation function is a high-precision navigation system that indicates the vehicle position on the map display on the DVD and guides the route from the present position to the destination on a map and pictogram and through voice instructions.
  The multi-information display shows the data that has been calculated by the radiowave navigation system and the self-contained navigation system.

Construction and Operation

The GPS voice navigation function consists of the following components:

- GPS Antenna
- Speed Sensor
- GPS Receiver (contained in the navigation ECU)
- Gyro Sensor (contained in the navigation ECU)
- Navigation ECU
- Speaker

For details on the basic operation of the GPS antenna and the navigation ECU, see page 175.

1) Speed Sensor

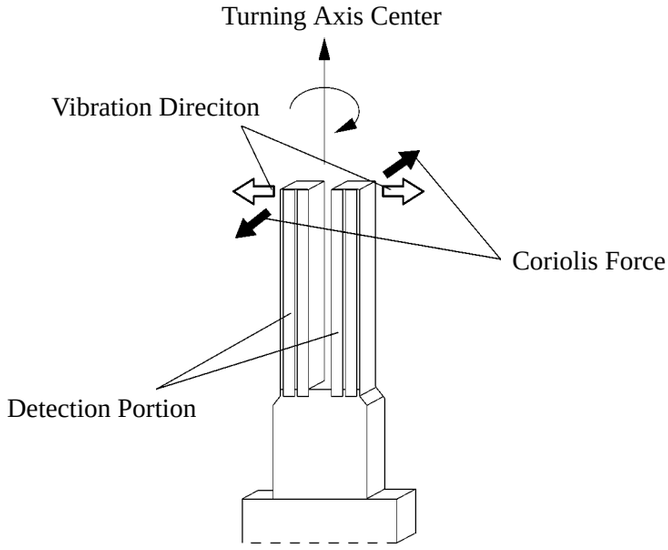
The navigation ECU will receive the vehicle speed signal directly from the meter ECU.

2) GPS Receiver

The GPS receiver demodulates the signals that are received by the GPS antenna from the satellites and outputs them to the navigation ECU.

3) Gyro Sensor

The gyro sensor is designed to detect the yaw rate of vertical axis turn of the vehicle and installed in the Navigation ECU.
The gyro sensor has a turning-fork shape type piezoelectric ceramic piece inside. This piezoelectric ceramic piece deforms by charging voltage and generates voltage by deforming with force.
The piezoelectric ceramic piece inside the gyro sensor is vibrated by the driving circuit and when the vehicle turns (when the detection portion turns to the axis direction), coriolis force is added to the detection portion. With this force, the detection portion is twisted. The voltage generated by this twisting is signal-processed inside the gyro sensor and outputted.
Navigation ECU receives this signal and judges the yaw rate of the vehicle.



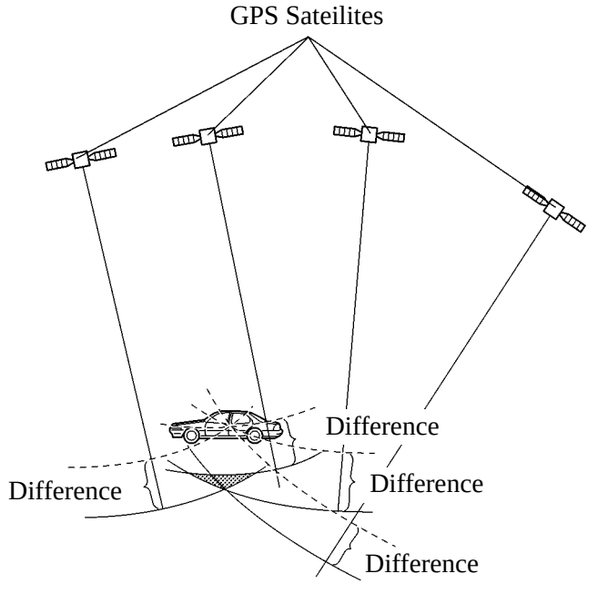
182BE49

4) Speaker

Outputs the sound signals that are transmitted from the power amplifier. Also outputs the navigation voice instructions via the front left speaker.

5) Detecting the Vehicle Position

The navigation ECU calculates the position based on the principle of a 3-point measurement.
The GPS satellites are equipped with high-precision clocks. Thus, the satellites are able to transmit continuous orbit signals and radiowave transmission time signals.
The navigation ECU also contains a clock, which can understand the radiowave time signals that are received from the satellites.
As a result, the length of time that is taken by the radiowaves to arrive from the satellites to the antenna can be determined. Thus, the lengths of time that elapse for the radiowaves of the 4 satellites to reach the antenna are measured. Each of these lengths of time are multiplied by the luminous flux (the rate of transmission of luminous energy: approximately 300,000 km per second), the results of which are the distances from the satellites to the antenna. Because the positions of the GPS satellites are known by their signals, the receiving point (vehicle position) can be rendered as the point in which the 4 spheres (of which the centers are the respective satellites) converge.
However, due to the differences that exist between the clocks of the satellite and the ECU, the 4 spheres do not converge at a single point. Therefore, the ECU uses another satellite to calculate the point at which the 4 spheres converge at a single point and corrects its internal clock. As a result, the ECU determines the vehicle position and adjusts its internal clock to the clocks of the satellites.



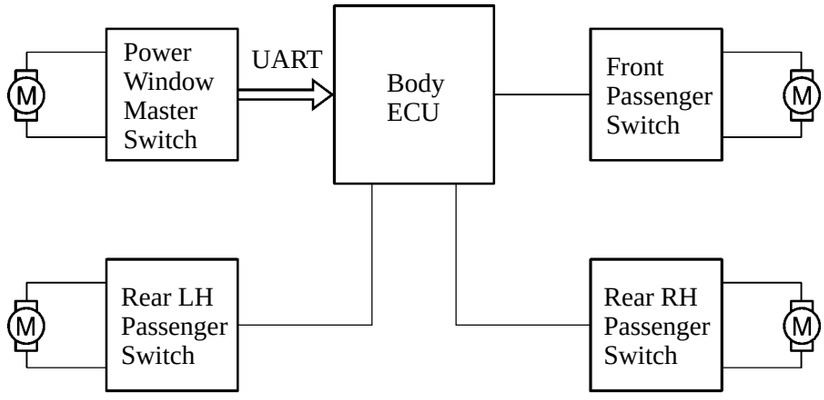
151LBE24

■POWER WINDOW SYSTEM

The power window system has the following features:

- This system includes one-touch auto-up and down and key-off operation function. The one-touch auto up and down function automatically fully closes and opens the driver's side window. The key-off operation function makes it possible to operate the power windows for approximately 45 seconds after the ignition key is turned to the ACC or LOCK position, if the front doors are not opened.
  Also, a jam protection function has been adopted to the closing operation of the driver's window. If a foreign object becomes jammed in the window during one-touch auto-up or key-off operation of the driver's window, this function automatically stops the power window and moves it downward.
- This system controls the driver's door through the power window master switch, and the front passenger and rear passenger doors through the body ECU. The power window master switch and the body ECU maintain communication through the UART (Universal Asynchronous Receiver Transmitter).

▶ System Diagram ◀



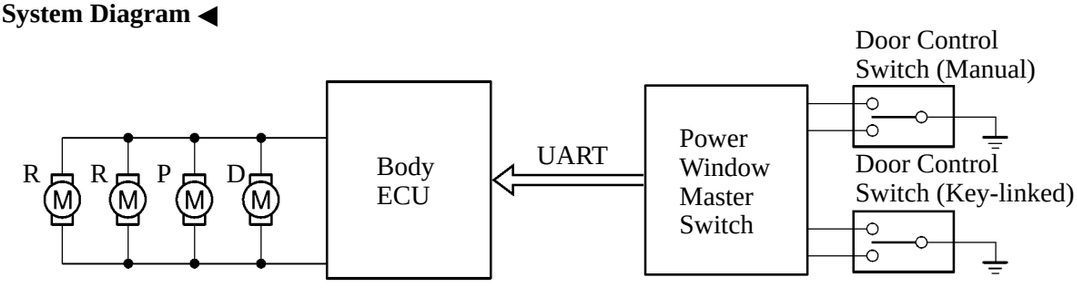
182BE40

■DOOR LOCK CONTROL SYSTEM

The door lock control system has the following features:

- This system has a “key-linked lock and unlock”, “key-confine prevention” and “manual unlock prohibition” functions.
- A 2-step unlock function is provided to unlock the driver’s door by turning the key cylinder first and to unlock passenger’s door by turning it the second time.
- The control of this system is effected by the body ECU. The door lock control signal from the driver’s door is transmitted from the power window master switch to the body ECU through the UART (Universal Asynchronous Receiver Transmitter).
- If you unlock using the ignition key from the conditions in which all the doors are locked, the dome light will be lighted.

▶ System Diagram ◀

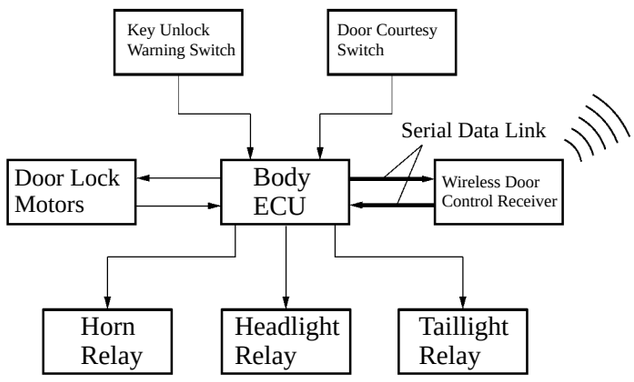


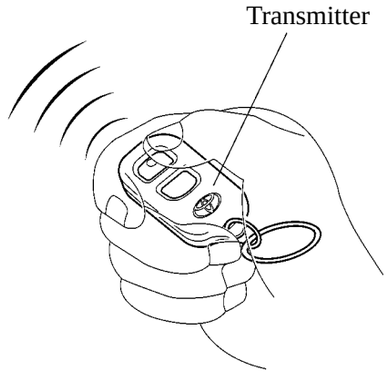
182BE41

■WIRELESS DOOR LOCK REMOTE CONTROL SYSTEM

The wireless door lock remote control system has the following features:

- In this system, the wireless door control receiver performs the code identification process and the body ECU effects the door lock control. Serial data link is provided for communication between the wireless door control receiver and the body ECU.
- A key-holder type transmitter has been adopted, and it contains the following three switches: the door lock switch, door unlock switch, and panic switch.
- A rolling code system, in which the signal configuration changes each time when a signal is transmitted by the transmitter, has been adopted.
- Panic alarm operation has been adopted.
- The verification light function has been adopted. When the transmitter is used to lock or unlock the doors, this function flashes the taillights to inform that the operation has been completed. However, at the time of unlocking, the dome light will be lighted.



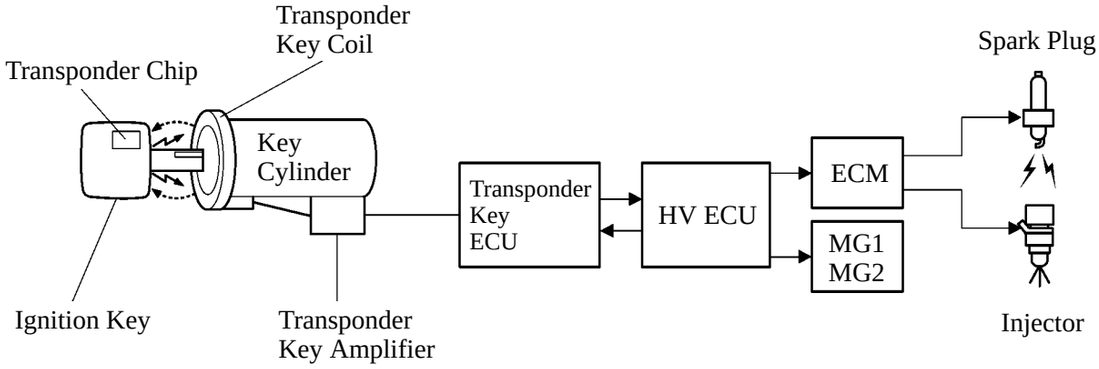


169BE10

■HV IMMOBILISER SYSTEM

The HV immobiliser system has a theft-deterrent system to disable the THS (TOYOTA Hybrid System) from starting using the ignition key without the ID code pre-registered.
This system adopts a transponder system which uses a transponder chip embedded in the grip of the ignition key. When the coil located around the ignition key cylinder receives the ID code signal transmitted by the transponder chip, the ECU determines whether or not the ID code matches the code registered.

▶ System Diagram ◀



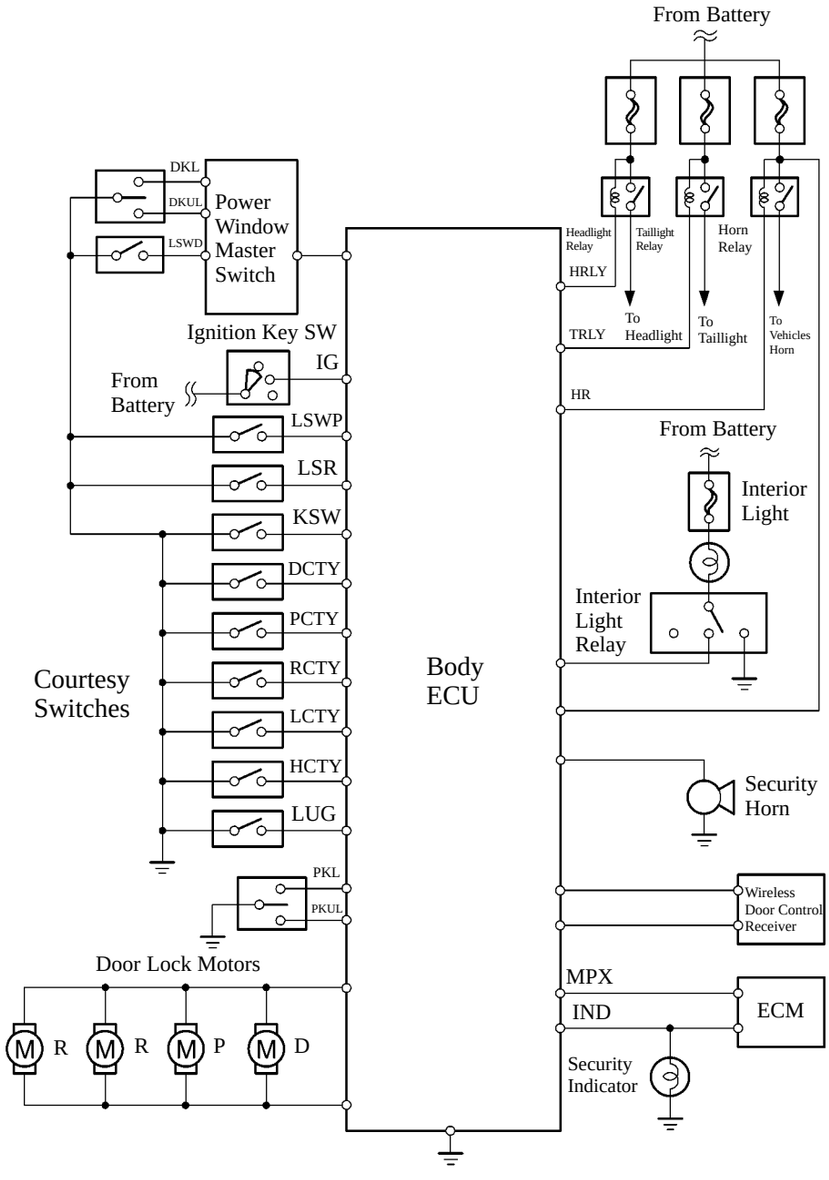
182BE42

■ THEFT DETERRENT SYSTEM

1. General

- The theft deterrent system uses the door lock control system components and some other parts. When somebody attempts to forcibly enter the vehicle or open the engine hood or luggage compartment door without a key, or when the battery terminals are removed and reconnected, the theft deterrent system sounds the vehicle's horn, security horn and flashes the headlights, taillights, hazard lights and interior light for about one minute to alert. At the same time, it locks all the doors.
- The control of this system is effected by the body ECU.

▶ Wiring Diagram ◀

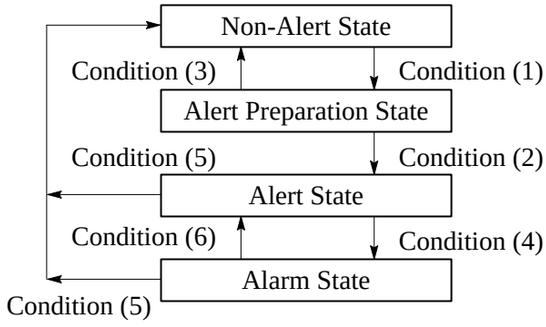


182BE43

▶ List of Input/Output Signals ◀

Terminal Name	Outline	Terminal Name	Outline
DKL	Driver's door key lock signal	LCTY	Rear left door courtesy switch status signal
DKUL	Driver's door key unlock signal	HCTY	Hood courtesy switch status signal
LSWD	Driver's door lock position switch signal	LUG	Luggage compartment door courtesy switch status signal
IG	Ignition key switch status signal	PKL	Front passenger door key lock signal
LSWP	Front passenger door lock position switch signal	PKUL	Front passenger door key unlock signal
LSR	Rear left door lock position switch signal	HRLY	Output signal to headlight relay
KSW	Ignition key cylinder's key presence/absence signal	TRLY	Output signal to taillight relay
DCTY	Driver's door courtesy switch status signal	HR	Output signal to vehicle horn relay
PCTY	Front passenger door courtesy switch status signal	MPX	Multiplex Communication (BEAN)
RCTY	Rear right door courtesy switch status signal	IND	Output signal to security indicator

2. Operation



Non-Alert State: When the security function is inactive

Without having the ignition key in the ignition key cylinder, if any one of the conditions listed below exists, the system transfers to the alert preparation state.

Condition (1)

- When the doors, engine hood, and luggage compartment door are all closed, the ignition key is used to lock all doors.
- When the doors, engine hood, and luggage compartment door are all closed, the wireless door lock remote control system is used to lock all doors.
- When all doors are locked, if any door, engine hood, or luggage compartment door is changed from "close" to "open", and "close" again, all doors, engine hood, and luggage compartment door will be locked.

Alert Preparation State: a delay time until the alert state

The system transfers to the alert state if the condition (2) listed below is met, and to the non-alert state if one of the conditions (3) is met.

Condition (2)

- When the doors, engine hood, and luggage compartment door are all closed and locked, and 30 seconds have elapsed.

Condition (3)

- When one of the doors, engine hood, or luggage compartment door is changed from “close” to “open”.
- When one of the doors, engine hood, or luggage compartment door is changed from “lock” to “unlock”.
- When the ignition key is inserted in the ignition key cylinder.
- When a terminal is disconnected from the battery and re-connected.

Alert State: a state in which attempted theft can be detected

The system transfers to the alarm state if any one of the conditions (4) listed below is met, or to the non-alert state if any one of the conditions (5) is met.

Condition (4)

- Any door, engine hood, or luggage compartment door is opened.
- The ignition key or the wireless door lock remote control system other than the transmitter is used for unlocking.
- The luggage compartment door is opened with something other than the ignition key.
- The engine hood is opened.
- A terminal is disconnected from the battery and re-connected.
- The wiring harness is directly connected as if to turn the ignition switch ON.

Condition (5)

- The ignition key is used to unlock the doors or the luggage compartment door.
- The transmitter of the wireless door lock remote control system is used to unlock the doors.
- The ignition key is inserted in the ignition key cylinder and turned until the ignition switch is ON.

Alarm State: a state in which attempted theft can be detected

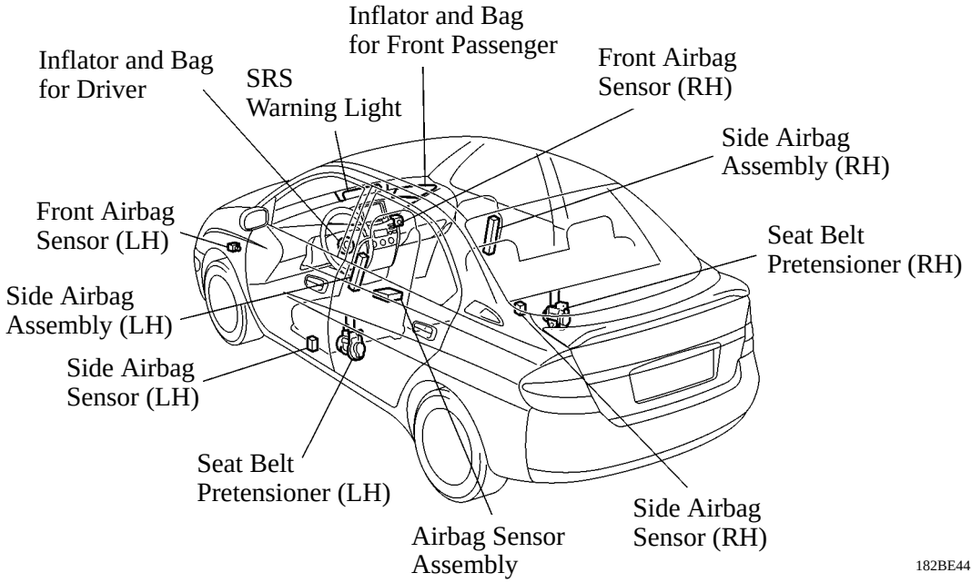
- When an attempted theft is detected, the system sounds the vehicle’s horn and the security horn, flashes the headlights, taillights, and hazard lights, and illuminates the interior light to alert the people in the area. If any one of the doors is unlocked, and the ignition key is not inserted in the ignition key cylinder, the system forcefully locks the doors once.
- The system transfers to the alert state if the condition (6) described below is met, or, when the system is in the alarm state, it transfers to the non-alert state if any one of the conditions (5) described above is met. At this time, the taillights are illuminated for 2 seconds to inform the driver that an attempted theft has been detected.

Condition (6)

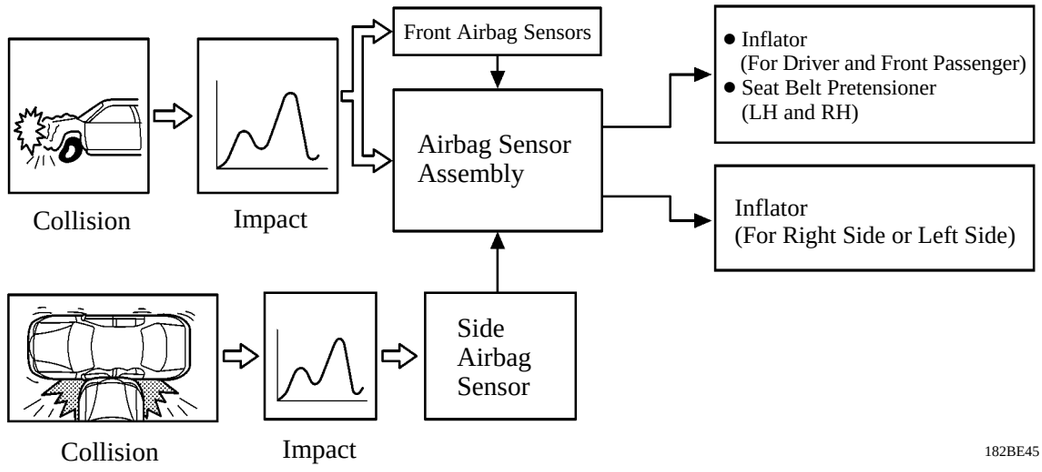
- After approximately 60 seconds of the alarm time have elapsed.

■SRS AIRBAG AND SRS SIDE AIRBAG

- The SRS (Supplemental Restraint System) airbags are provided for the driver and front passenger. The SRS airbags have been designed to help reducing the shocks to the heads and chests of the driver and front passenger in the event of a frontal impact collision as supplements to the seat belts.
  This system is a 3-sensor type airbag system to detect the impact during a front collision using the airbag sensor assemblies and front airbag sensor, and to make the airbag system and seat belt pretensioner operate as well.
  Also, the function of the ECU to memorize the seat belt wearing condition while inflating the airbag is added.
- The SRS side airbags are provided for the driver and front passenger as an option. The SRS side airbags have been designed to help reducing the impact energy that is transmitted to the driver and front passenger in the event of a side collision.
  The driver side and the front passenger side are each provided with one sensor.
- A fuel cut control has been adopted to stop the fuel pump when the SRS airbag is deployed, thus helping reduce fuel leakage.



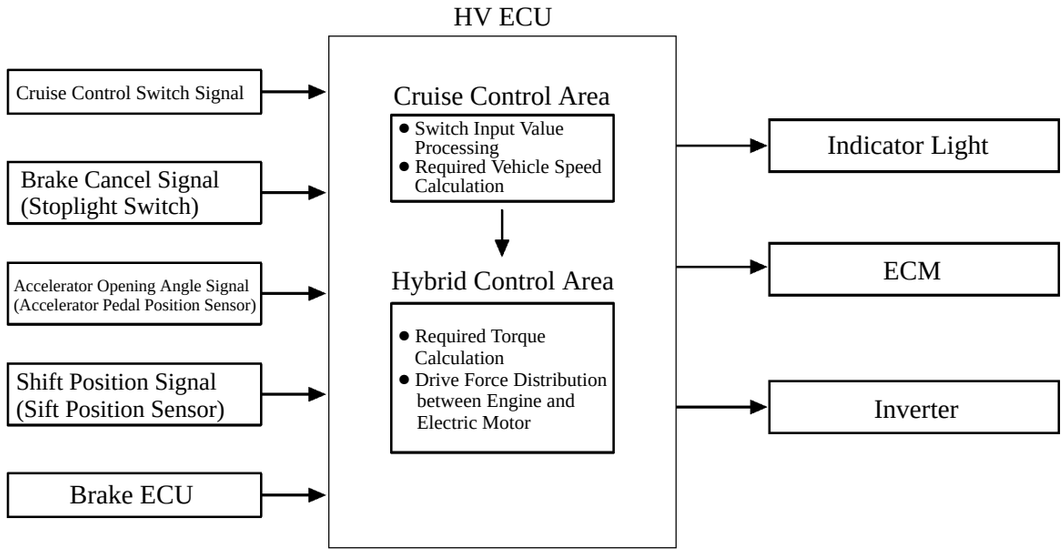
▶ System Diagram ◀



■CRUISE CONTROL SYSTEM

1. General

The Prius has adopted a cruise control system that uses the hybrid system, and it is offered as an option. This system, which is controlled by the HV ECU that is integrated with the cruise control ECU, operates the vehicle through an optimal combination of the drive forces of the electric motor and the engine in accordance with the setting on the cruise control switch.



182BE46

2. Construction

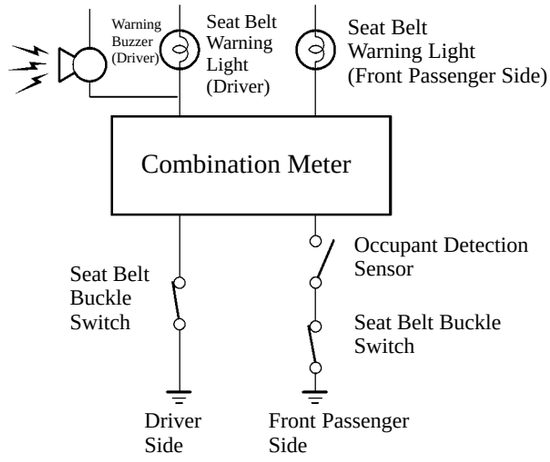
The cruise control system mainly consists of an HV ECU, cruise control switches, indicator, stoplight switch, accelerator pedal position sensor, and the shift position sensor.
The table below shows each of the functions.

Item	Function
HV ECU	Controls all the functions of the cruise control system in accordance with the signals from the sensors.
Cruise Control Main Switch	Cruise control system's ON/OFF signal requirement.
Cruise Control Switch	A three-directional switch that provides the SET/COAST, RESUME/ACCEL, and CANCEL functions. It requires the functions and settings in accordance with its operations.
Indicator Light	It is provided in the combination meter to display whether the system is ON or OFF.
Stop Light Switch	Detects that the driver has stepped on the brake pedal.
Accelerator Pedal Position Sensor	Detects the accelerator pedal opening angle.
Shift Position Sensor	Detects the shift position.

■ SEAT BELT WARNING SYSTEM

1. General

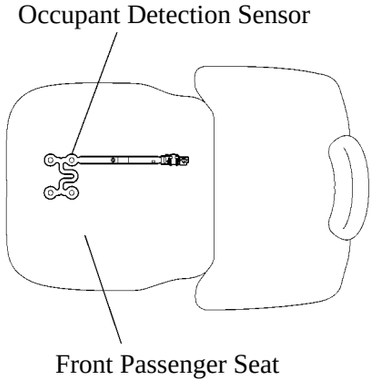
A seat belt warning system has been adopted. If the driver's seat belt is not buckled, the warning light flashes and the buzzer sounds. If the front passenger seat belt is not buckled, it flashes the warning light. When the ignition switch is turned ON, this system determines whether or not the seat belt is buckled by the ON or OFF condition of the switch that is provided in the seat belt buckle. The occupant detection sensor provided in the seat cushion of the front passenger seat determines whether or not an occupant is seated in the front passenger seat.



182BE47

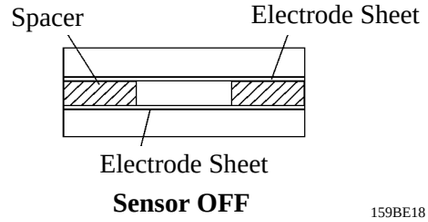
2. Occupant Detection Sensor

The occupant detection sensor, which is enclosed in the seat cushion of the front passenger seat, is used to detect whether or not the front passenger seat is occupied.
This sensor, which is shaped as illustrated below, consists of a construction in which two sheets of electrodes sandwich a spacer. When the occupant is seated, the electrode sheets come in contact with each other through the hole that is provided in the spacer portion, thus enabling the current to flow.
Thus, the sensor detects whether or not an occupant is seated in the front passenger seat.



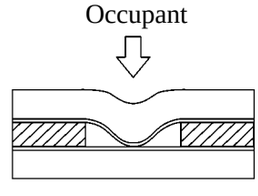
Upside View

182BE53



Sensor OFF

159BE18



Sensor ON

159BE19

MAJOR TECHNICAL SPECIFICATIONS

Item \ Area			U.S.A. and Canada	
Body Type			4-Door Sedan	
Vehicle Grade			—	
Model Code			NHW11L-AEEEBA	NHW11L-AEEEBK
Major Dimensions & Vehicle Weights	Overall	Length mm (in.)	4305 (169.5)	←
		Width mm (in.)	1695 (66.7)	←
		Height mm (in.)	1465 (57.6)	←
	Wheel Base	mm (in.)	2550 (100.4)	←
	Tread	Front mm (in.)	1475 (58.1)	←
		Rear mm (in.)	1480 (58.3)	←
	Effective Head Room	Front mm (in.)	985 (38.8)	←
		Rear mm (in.)	942 (37.1)	←
	Effective Leg Room	Front mm (in.)	1047 (41.2)	←
		Rear mm (in.)	899 (35.4)	←
	Shoulder Room	Front mm (in.)	1342 (52.8)	←
		Rear mm (in.)	1325 (52.2)	←
	Overhang	Front mm (in.)	815 (32.1)	←
		Rear mm (in.)	940 (37.0)	←
	Min. Running Ground Clearance	mm (in.)	125 (4.9)	←
	Angle of Approach	degrees	14°	←
	Angle of Departure	degrees	22°	←
	Curb Weight	Front kg (lb)	770 (1700)	←
		Rear kg (lb)	485 (1065)	←
		Total kg (lb)	1255 (1765)	←
	Gross Vehicle Weight	Front kg (lb)	890 (1965)	←
		Rear kg (lb)	750 (1650)	←
		Total kg (lb)	1640 (3615)	←
	Fuel Tank Capacity	ℓ (US. gal., lmp.gal.)	45* (11.9, 9.9)	←
	Luggage Compartment Capacity	m^3 (cu.ft.)	0.39 (137.7)	←
Performance	Max. Speed	km/h (mph)	160 (99.4)	←
	Max. Cruising Speed	km/h (mph)	160 (99.4)	←
	Acceleration	0 to 100 km/h sec.	12.7	←
		0 to 400 m sec.	19.0	←
	Max. Permissible Speed	1st Gear km/h (mph)	—	—
		2nd Gear km/h (mph)	—	—
		3rd Gear km/h (mph)	—	—
		4th Gear km/h (mph)	—	—
	Min. Turning Radius (Outside Front)	Wall to Wall m (ft.)	10.2 (33.5)	←
		Curb to Curb m (ft.)	9.4 (30.8)	←
Engine	Engine Type		1NZ-FXE	←
	Valve Mechanism		16-Valve, DOHC	←
	Bore × Stroke	mm (in.)	75.0 × 84.7 (2.95 × 3.33)	←
	Displacement	cm^3 (cu.in.)	1497 (91.4)	←
	Compression Ratio		13.0	←
	Carburetor Type		SFI	←
	Research Octane No.	RON	95	←
	Max. Output (EEC)	kW/rpm (HP@rpm)	52/4500 (70@4500)	←
	Max. Torque (EEC)	N·m/rpm (lb-ft@rpm)	111/4200 (82@4200)	←
Engine Electrical	Battery Capacity (5HR)	Voltage & Amp. Hr.	12 – 28	←
	Alternator Output	Watts	—	—
	Starter Output	kW	—	—
Chassis	Clutch Type		—	—
	Transaxle Type		P111	←
	Transmission Gear Ratio	In First	—	—
		In Second	—	—
		In Third	—	—
		In Fourth	—	—
		In Fifth	—	—
		In Reverse	—	—
	Counter Gear Ratio		—	—
	Differential Gear Ratio (Final)		3.905	←
	Brake Type	Front	Ventilated Disc	←
		Rear	L.T. Drum	←
	Parking Brake Type		L.T. Drum	←
	Brake Booster Type and Size	in.	Hydraulic	←
	Proportioning Valve Type		P-Valve	←
	Suspension Type	Front	MacPherson Strut	←
		Rear	Torsion Bean	←
	Stabilizer Bar	Front	STD	←
		Rear	STD	←
	Steering Gear Type		Rack and Pinion	←
	Steering Gear Ratio (Overall)		16.4~18.3	←
	Power Steering Type		Electric Motor	←

*: EPA / CARB ORVR Test conditions