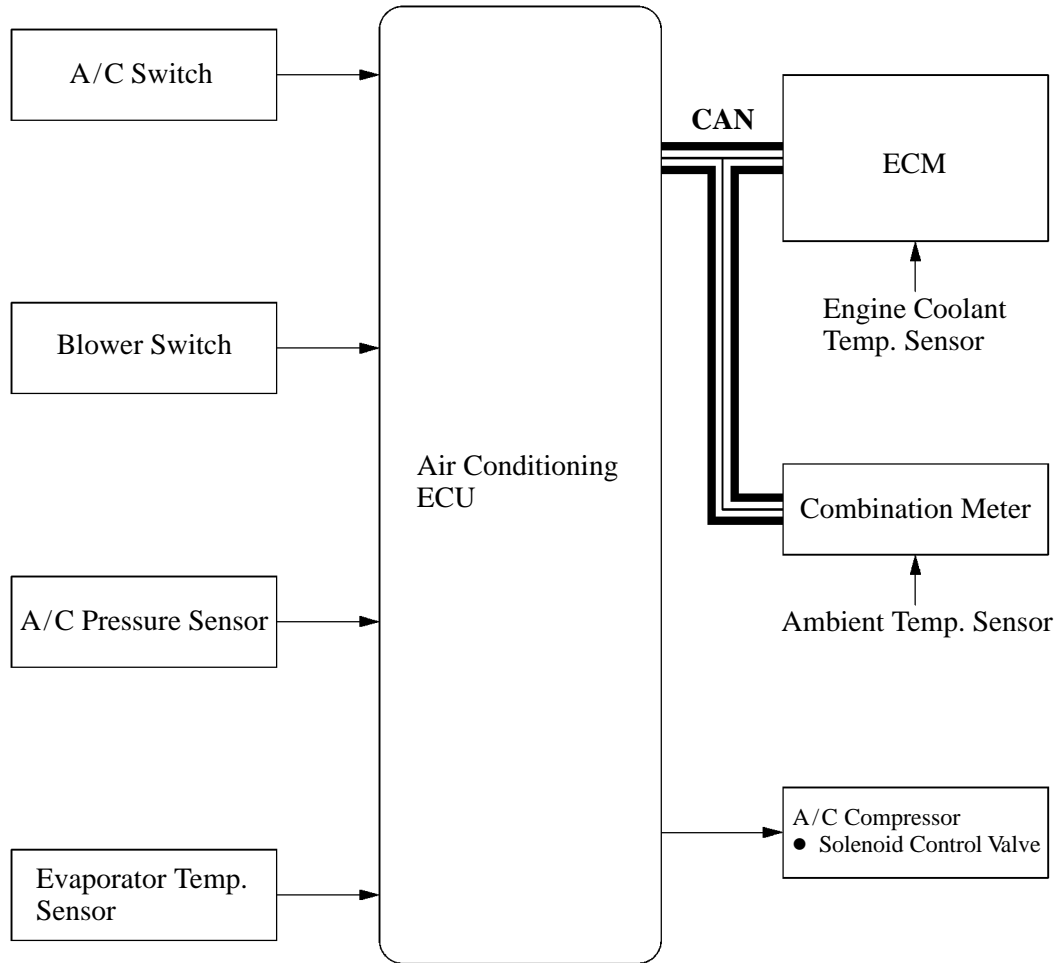


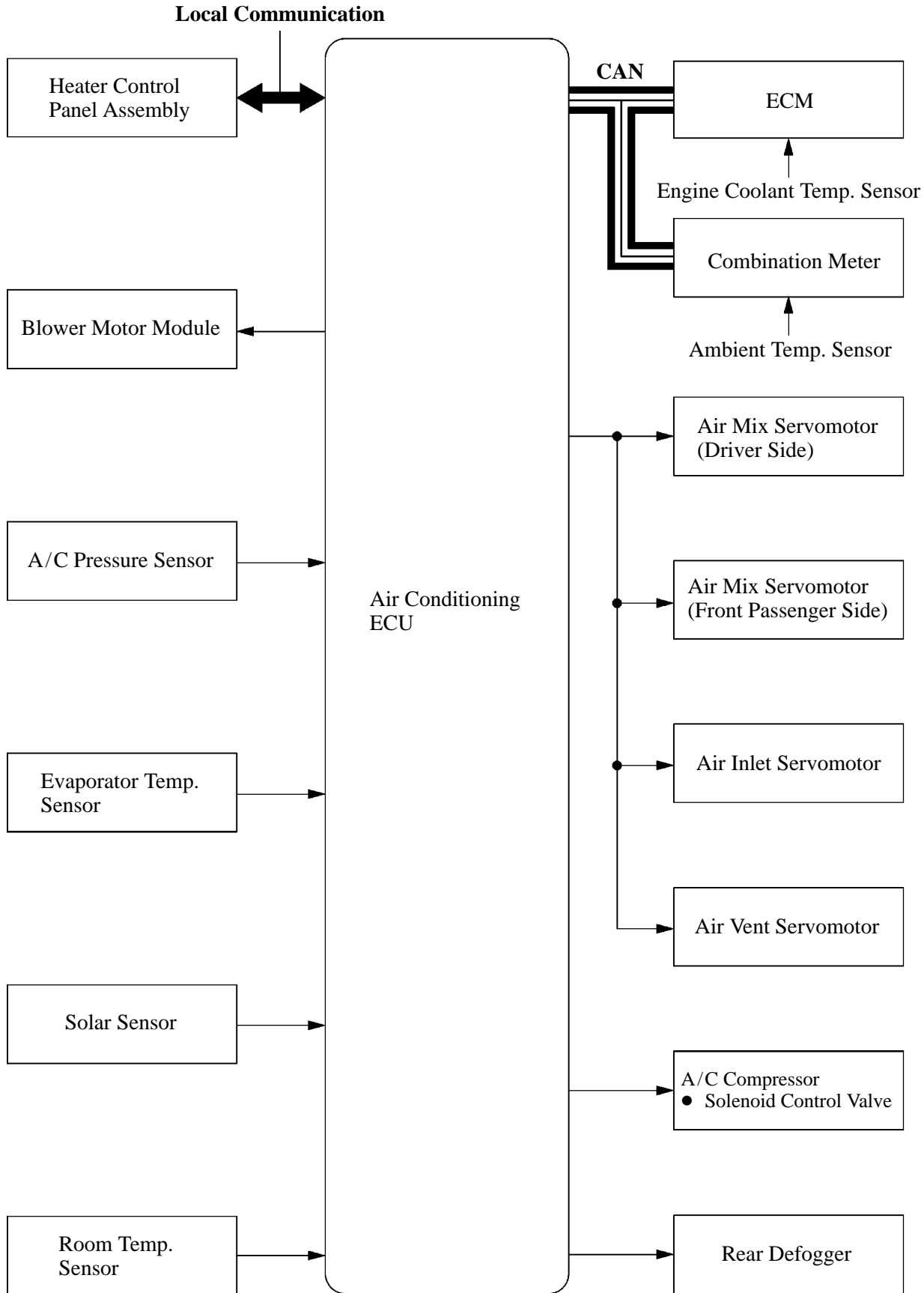
■ SYSTEM DIAGRAM

► Manual Air Conditioning ◀

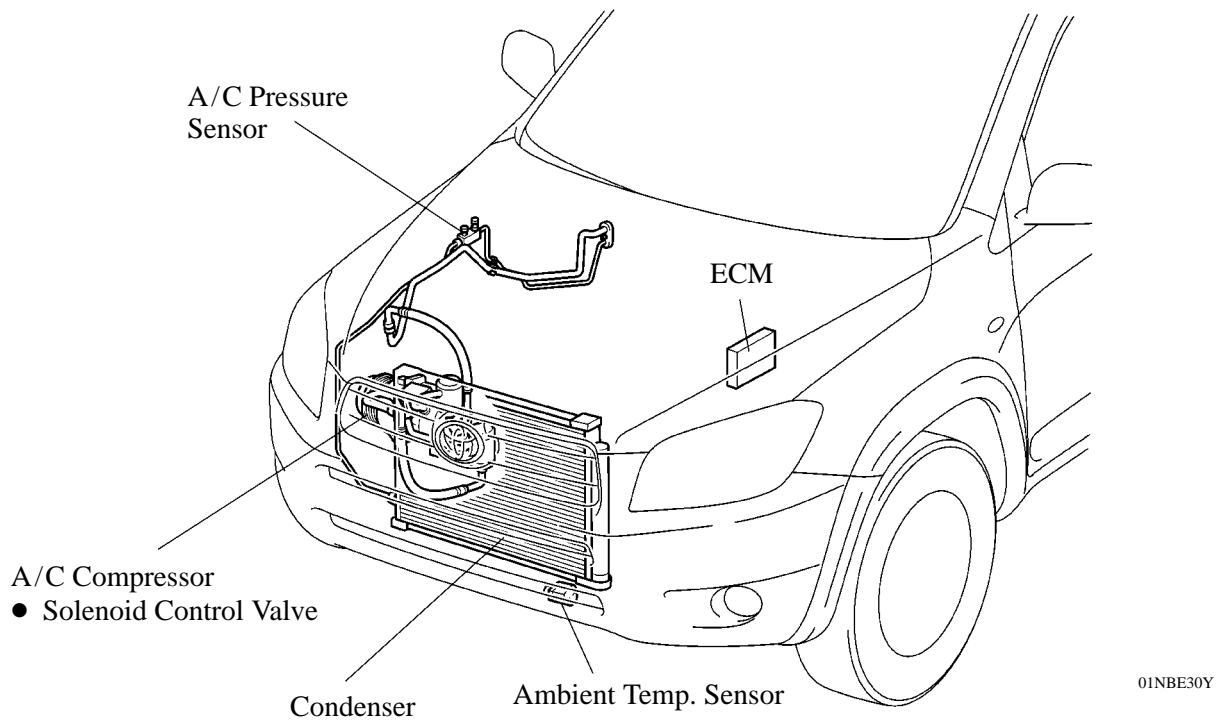


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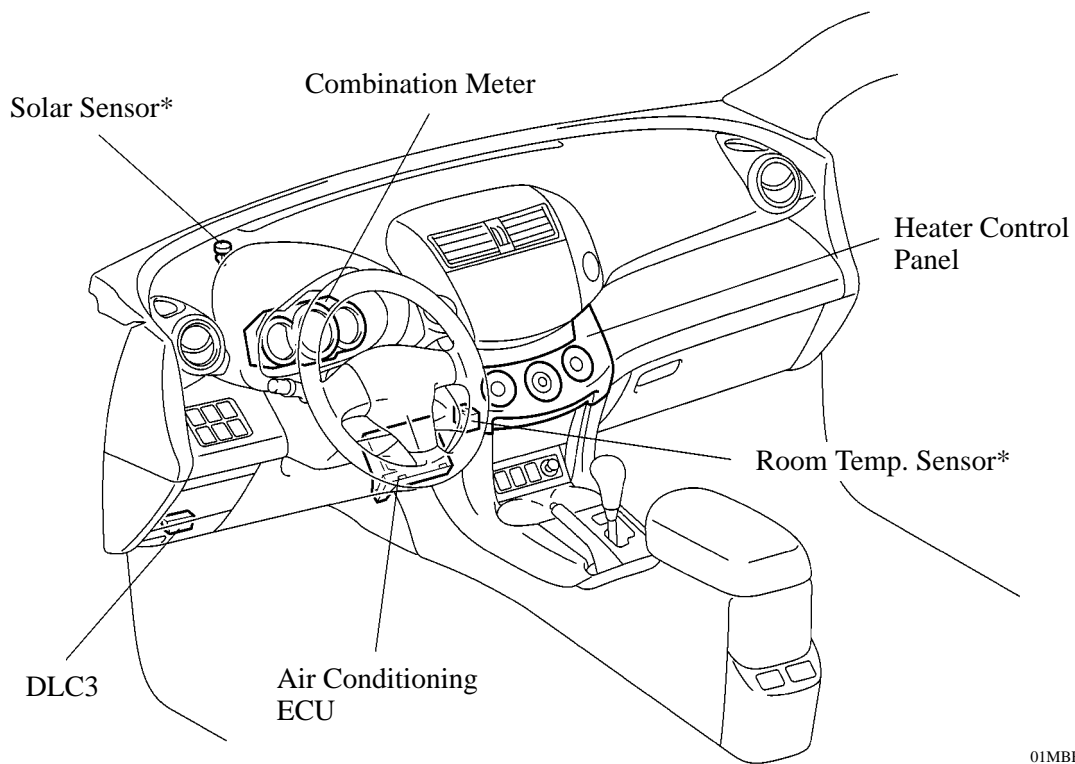
► Automatic Air Conditioning ◀



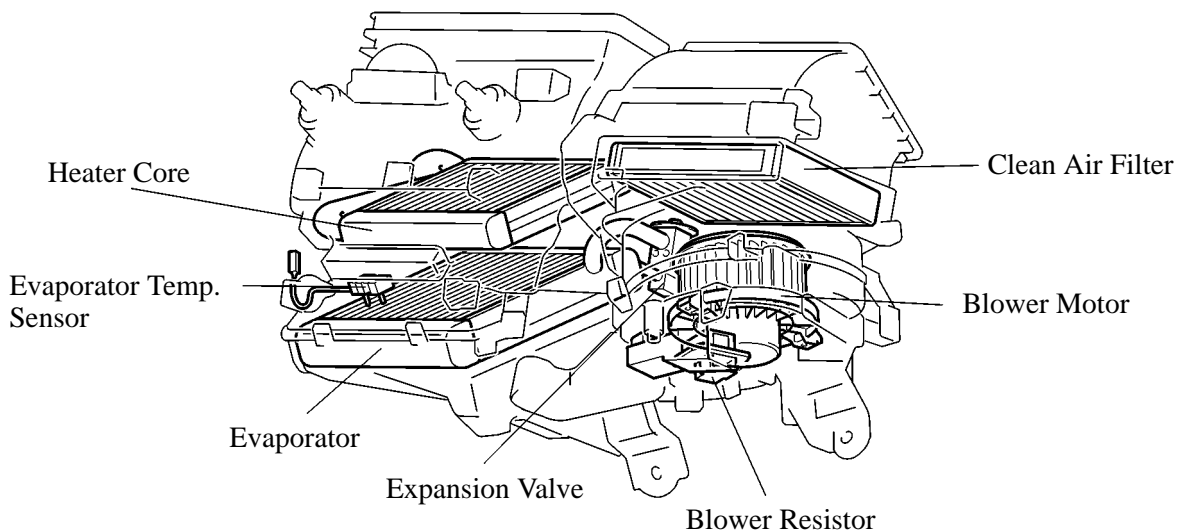
■ LAYOUT OF MAIN COMPONENTS



With Air Conditioning Models

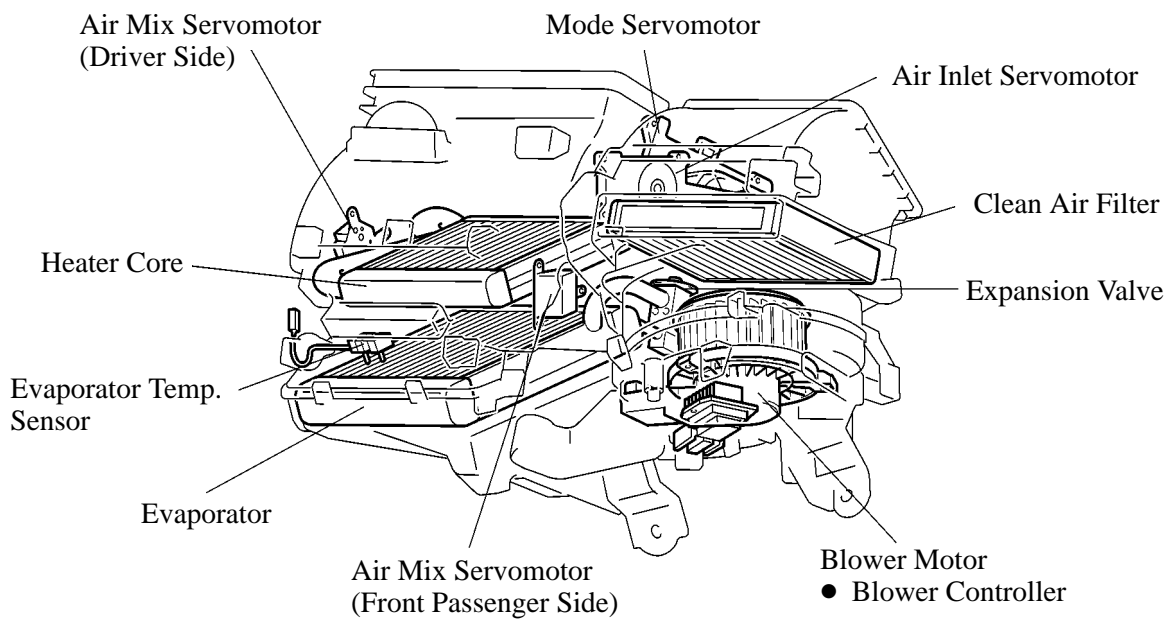


*: Only for Models with Automatic Air Conditioning



Manual Air Conditioning Models

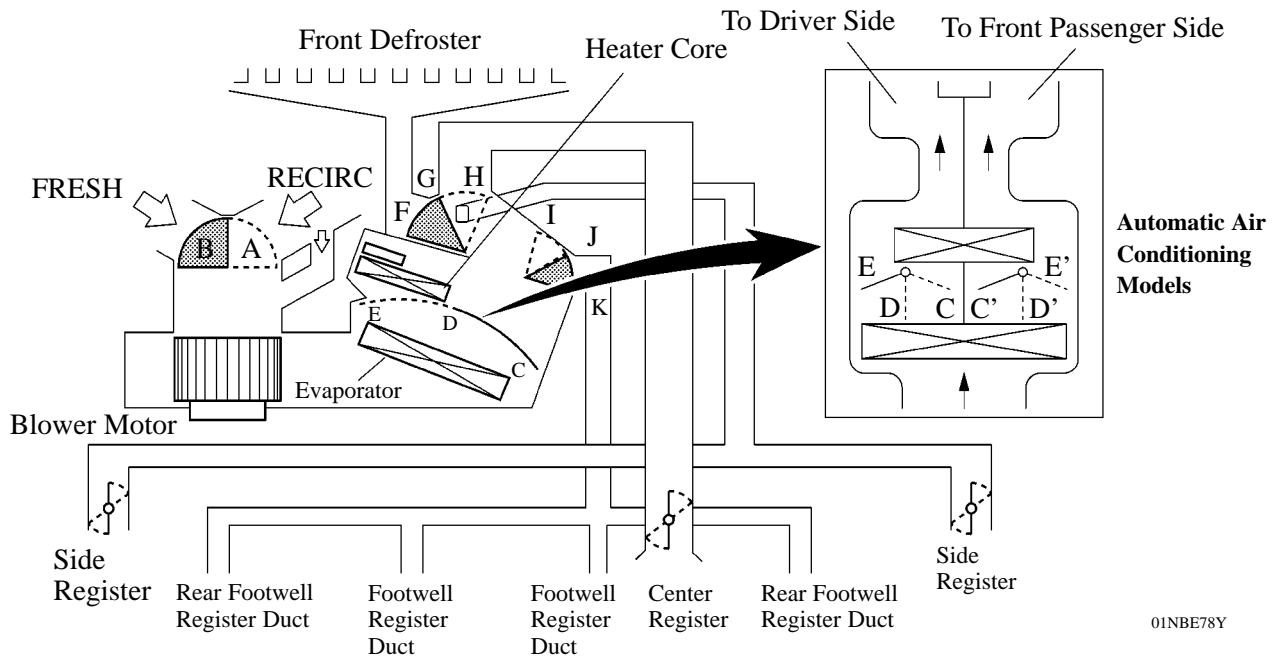
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Automatic Air Conditioning Models

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■ **MODE POSITION AND DAMPER OPERATION**



► **Function of Main Damper** ◀

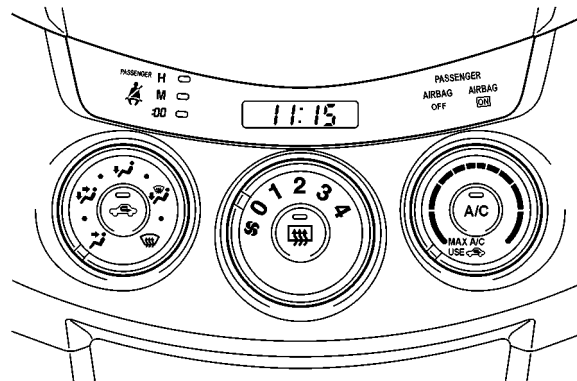
Control Damper	Operation Position	Damper Position	Operation
Air Inlet Control Damper	FRESH	A	Brings in fresh air.
	RECIRC	B	Recirculates internal air.
Air Mix Control Damper	MAX COLD - MAX HOT Temp. Setting (Auto A/C): 16°C (61°F) - 30°C (86°F)	C - D - E (C' - D' - E')	Varies the mixture ratio of the fresh air and the recirculation air in order to regulate the temperature continuously from HOT to COLD.
Mode Control Damper	DEF 187BE28	H, K	Defrosts the windshield through the front defroster and side register.
	FOOT/DEF 187BE27	H, J	Defrosts the windshield through the front defroster and side register, while air is also blown out from the footwell register duct and rear footwell register duct.
	FOOT 187BE26	H, I	Air blows out of the footwell register dust, rear footwell register duct, and side register. In addition, air blows out slightly from the front defroster.
	BI-LEVEL 187BE25	F, I	Air blows out of the center register, side register, footwell register duct and rear footwell register duct.
	FACE 187BE24	F, K	Air blows out of the center register and side register.

■ CONSTRUCTION AND OPERATION

1. Heater Control Panel

Heater Control Panel (Manual Control Type)

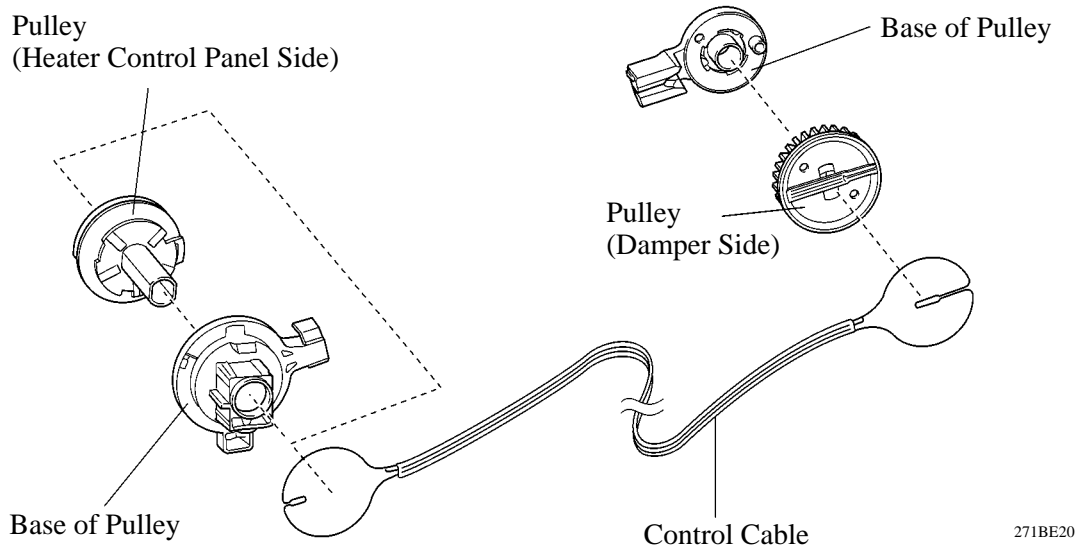
- The rotary switch type heater control panel is used.
- The '06 models use two cables on pulleys to operate the heater control panel and damper.
- Five air outlet modes are provided on the control panel on the models with air conditioning. To realize finer mode settings, a positive feel is provided between the positions of these modes, thus realizing the high comfort level.
- When the FOOT/DEF or DEF mode is selected, the A/C compressor turns ON and the air conditioning switches to the fresh mode. As a result, the fogging of the window glass is eliminated quickly.



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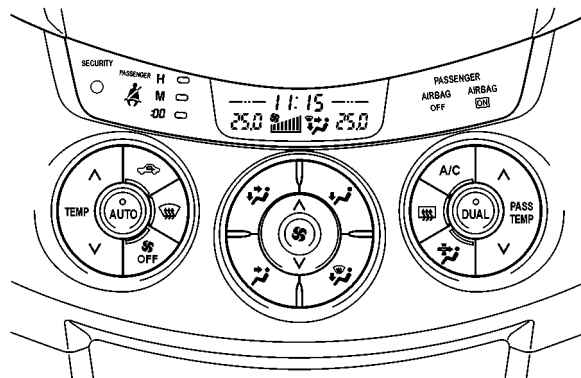
Heater Control Cable

- The '06 models use two cables on pulleys that are always operated in the pulling direction to operate the heater control panel and damper.
- This cable is circular, and is placed around the cable pulleys that are provided at the heater control panel and the damper.
- The operation of the heater control panel is transmitted to the damper via the control cable, which always moves in the pulling direction. Due to the consistent action point of the pulleys, the fluctuation of the operating effort has been minimized through the use of the pulleys. These measures have improved the ease of use and reduced the operating effort.



Heater Control Panel (Automatic Control Type)

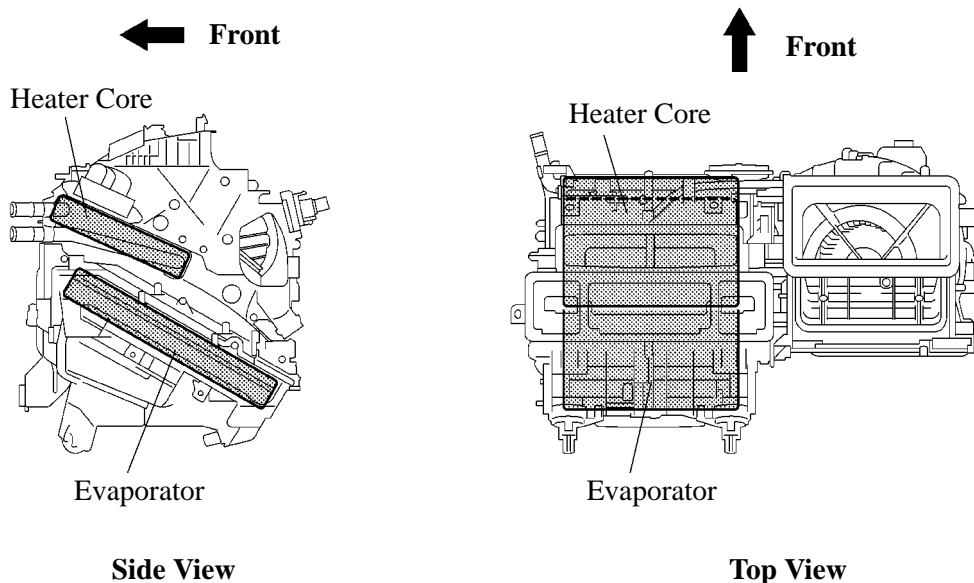
- The push switch type heater control panel with LCD (Liquid Crystal Display) is used to ensure excellent visibility.
- The temperature control switches for the driver and front passenger are provided on the heater control panel to enhance their ease of use.



2. Air Conditioning and Blower Units

General

A semi-center location air conditioning unit, in which the evaporator and heater core are placed in the vehicle's longitudinal direction, is used.

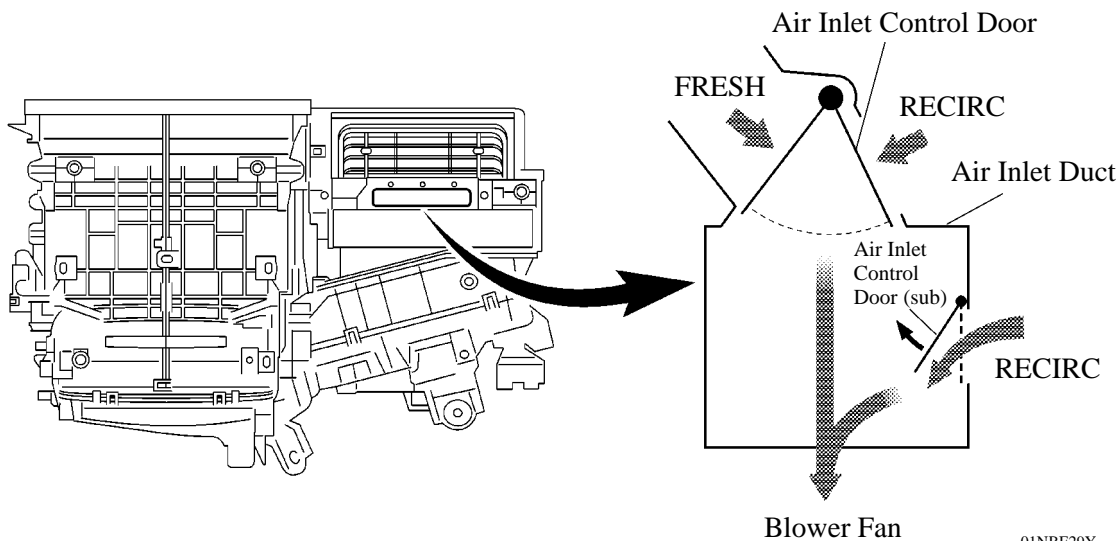


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Partial Recirculation System

The partial recirculation system is used.

This system has an air inlet control door (sub) in the cabin side of the air inlet duct. Thus, it is able to cycle a small volume of recirculated air even in the FRESH mode, thus enhancing heating and air conditioning performance. When the blower switch is ON, the suction force of the blower fan opens this air inlet control door (sub).

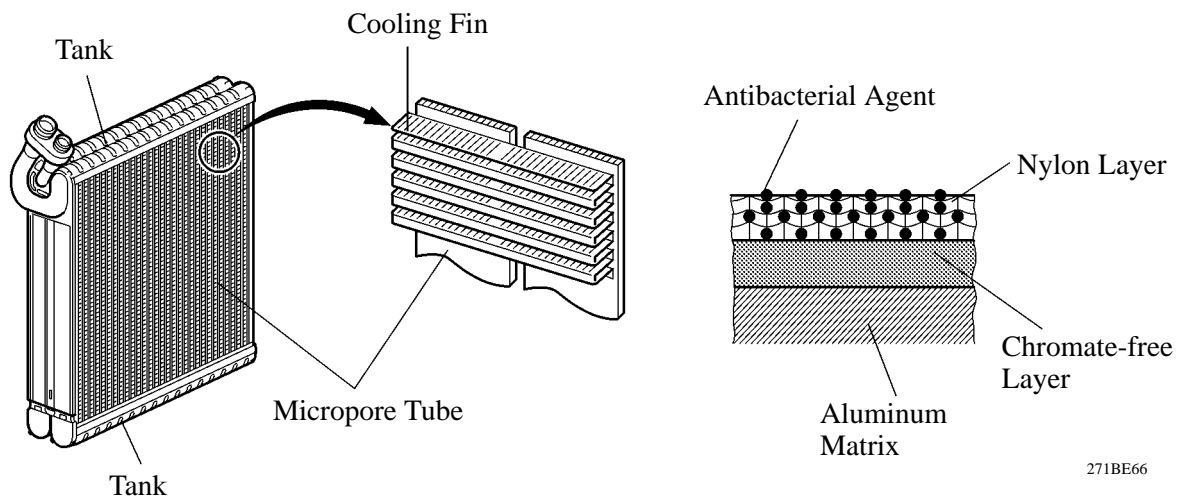


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Evaporator

A revolutionary super-slim structure evaporator is used. Placing the tanks at the top and the bottom of the evaporator and adopting a micropore tube construction have realized the following effects:

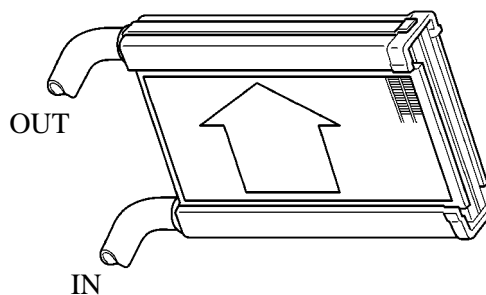
- The heat exchanging efficiency is improved.
- The temperature distribution is made more uniform.
- The evaporator is made thinner: 58 mm (2.3 in.) → 38 mm (1.5 in.)
- The evaporator body has been coated with a type of resin that contains an antibacterial agent in order to minimize the source of foul odor and the propagation of bacteria. The substrate below this coating consists of a chromate-free layer to help protect the environment.



271BE66

SFA-II Heater Core (SFA-II: Straight Flow Aluminum-II)

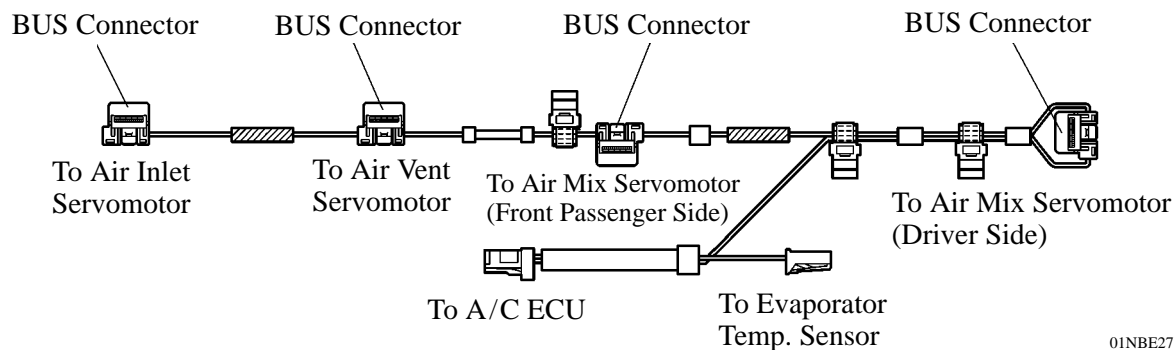
This heater core has been made more compact and higher performance by making the core section finer and improving the shapes of the tank section and flow section. Also, the environment is considered. By using aluminum as the material, the amount of the environmental burden disposal (lead) is reduced.



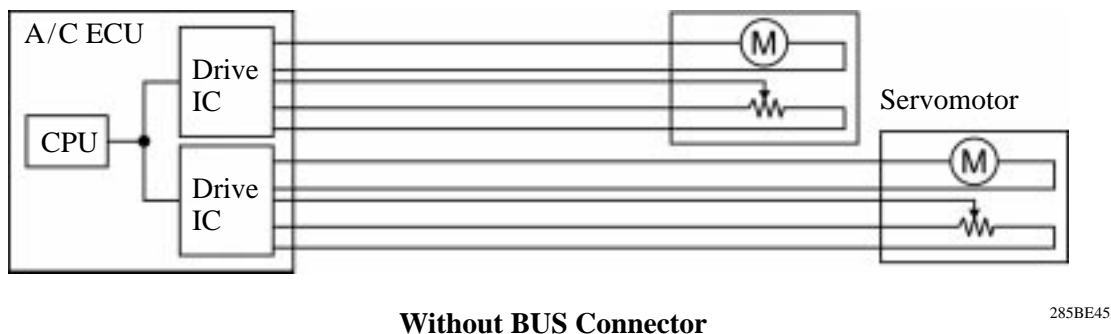
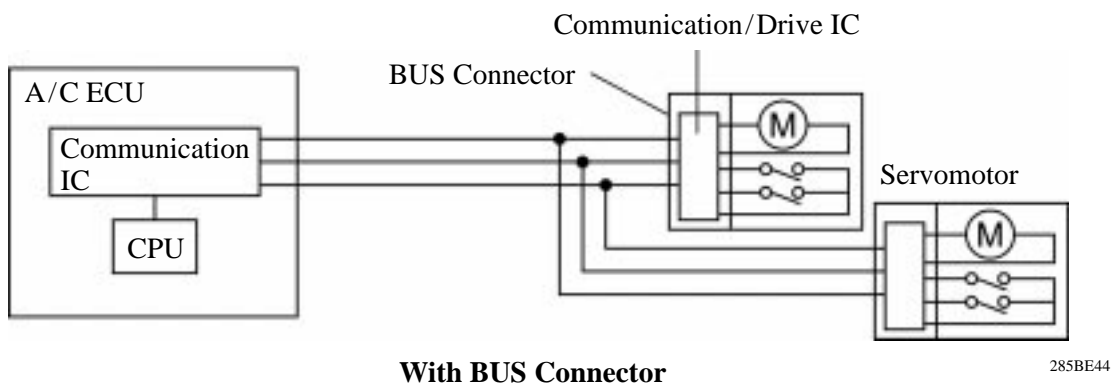
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BUS Connector (Only for Models with Automatic Air Conditioning)

A BUS connector is used in the wire harness connection that connects the servomotor from the air conditioning ECU.



The BUS connector has a built-in communication/drive IC, which communicates with each servomotor connector, actuates the servomotor, and has a position detection function. This enables bus communication for the servomotor wire harness to realize a more lightweight construction and the reduced number of wires.

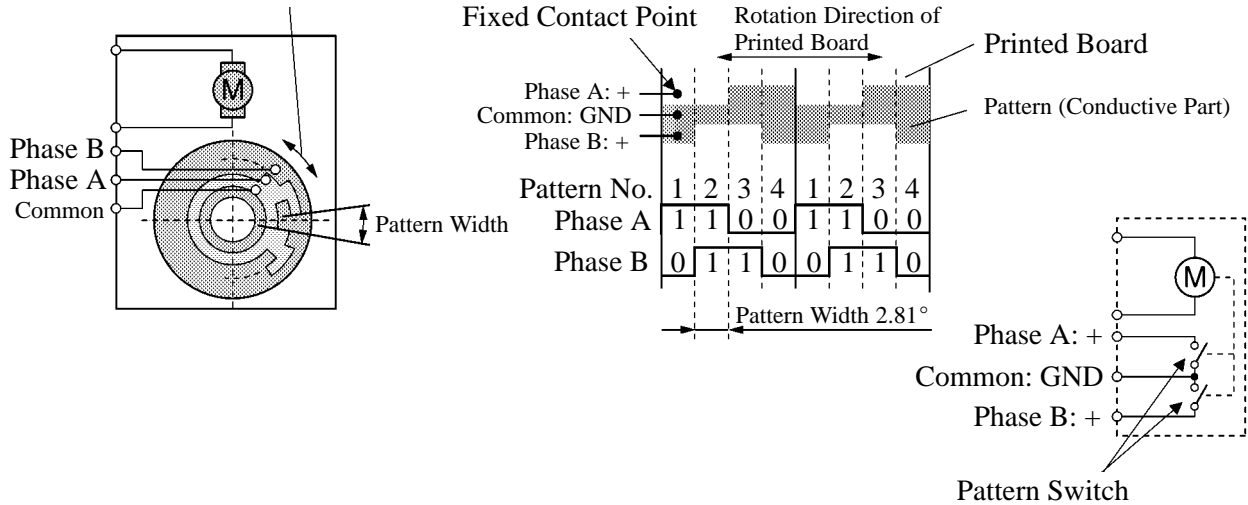


Servomotor (Only for Models with Automatic Air Conditioning)

In contrast to the previous type that detects the position by way of a potentiometer voltage, the pulse pattern type servomotor detects the relative position by way of the 2-bit ON/OFF signals.

The forward and reverse revolutions of this motor are detected by way of two phases, A and B, which output four types of patterns. The air conditioning ECU counts the number of pulse patterns in order to determine the stopped position.

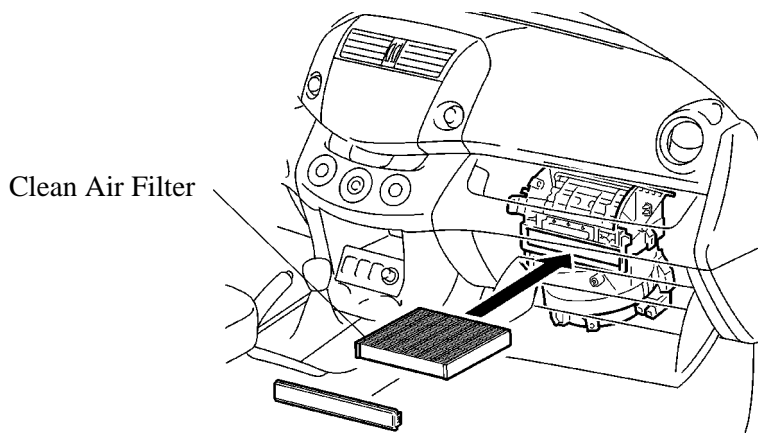
Rotation Direction of Printed Board



281BE126

Clean Air Filter

A clean air filter (high efficiency type) is used to remove dust, pollen, and other micron particles from air entering from outside the vehicle to provide a comfortable cabin of clean air. The clean air filter is installed in the upper section of the blower fan for easy replacement of the clean air filter without the need for tools by removing the one-touch clip in the glove box, making this easy to service.



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Service Tip

The clean air filter on the U.S.A models should be changed at 30,000 miles. On the Canada models, it should be changed at 16,000 km. However, it varies with the conditions or environment.

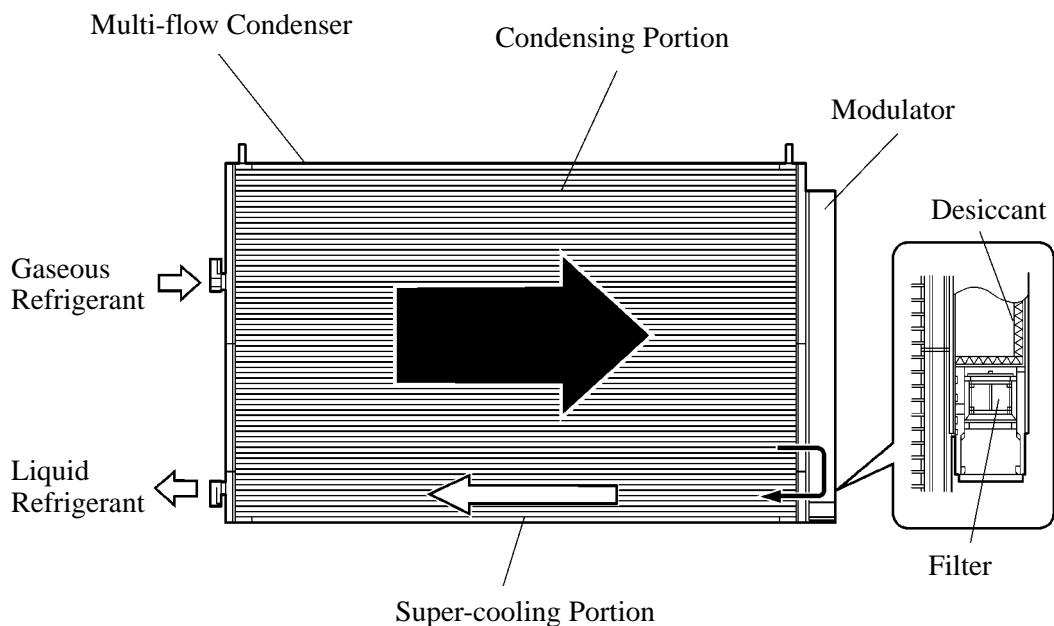
3. Condenser

General

The '06 models use a sub-cool condenser. This is a multi-flow condenser consisting of three portions: a condensing portion, a super-cooling portion and a gas-liquid separator (modulator) all integrated together. This condenser uses a sub-cool cycle for its cooling cycle system to improve heat-exchanging efficiency.

Sub-cool Cycle

In the sub-cool cycle, 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.

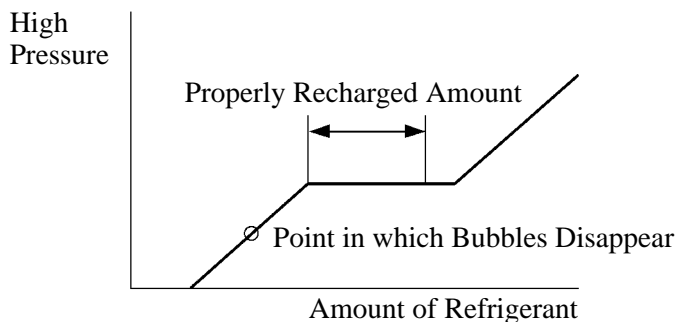


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NOTE:

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. If the system is overcharged with refrigerant, this will also lead to a reduced performance.

For the proper method of verifying the amount of the refrigerant and to recharge the system with refrigerant, see the 2006 RAV4 Repair Manual (Pub. No. RM01M1U).



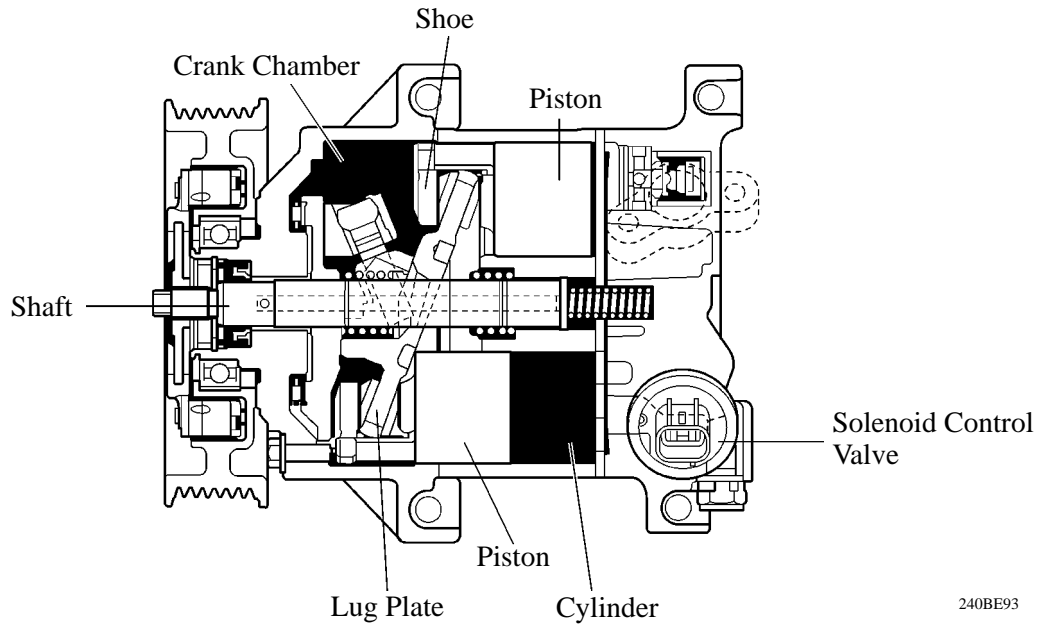
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4. A/C Compressor

General

A/C compressor is continuously variable capacity type in which its capacity varies in accordance with the cooling load of the air conditioning.

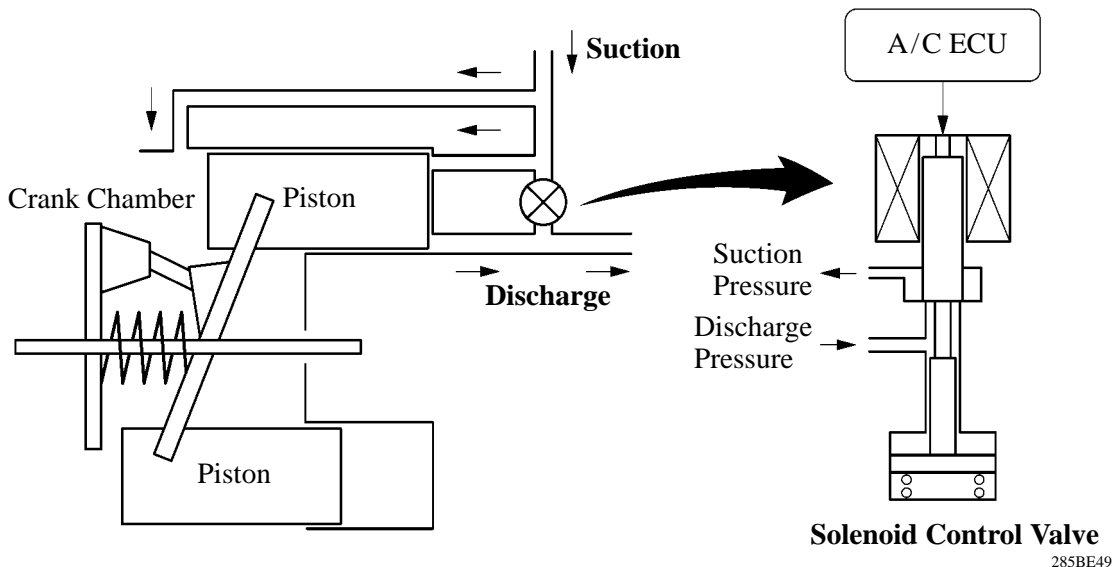
- This compressor consists of the shaft, lug plate, piston, shoe, crank chamber, cylinder, and solenoid control valve.
- A solenoid control valve that adjusts the suction pressure so that the suction pressure can be controlled as desired is provided.
- The plastic DL (Damper Limiter) type A/C pulley is used.



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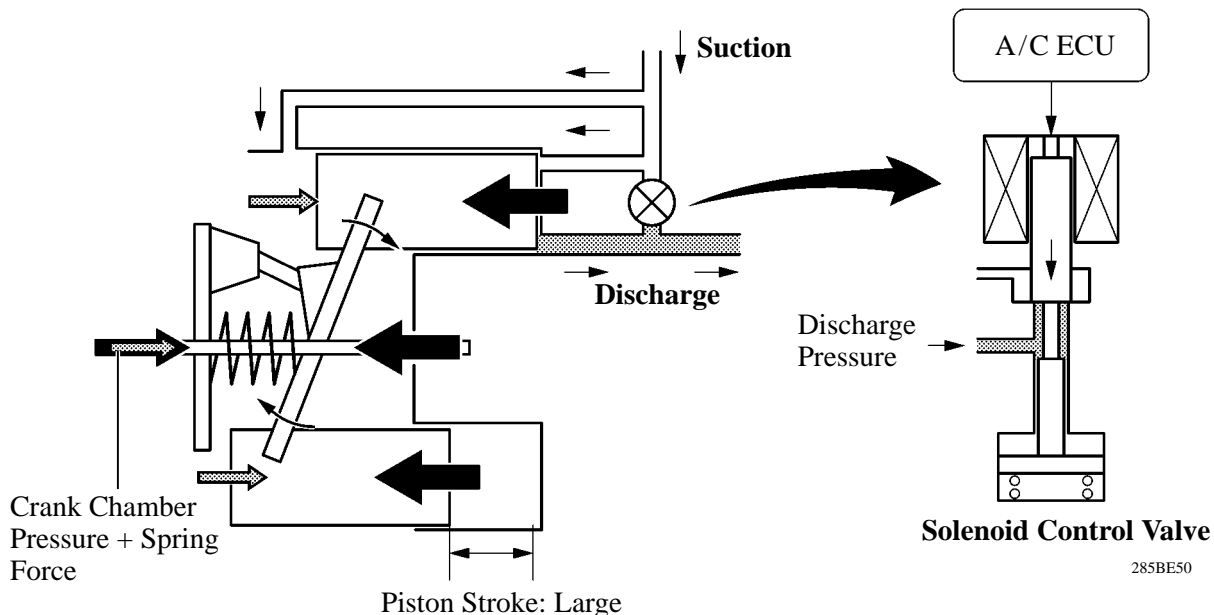
Operation

- The crank chamber is connected to the suction passage. A solenoid control valve is provided between the suction passage (low pressure) and the discharge passage (high pressure).
- The solenoid control valve operates under duty cycle control in accordance with the signals from the A/C ECU.

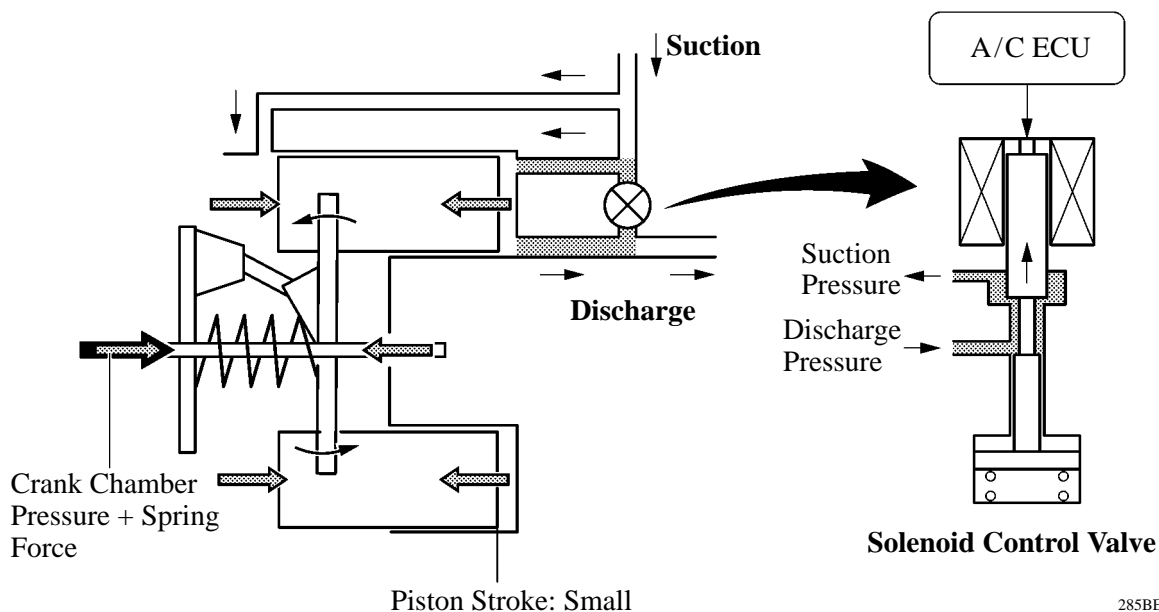


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- When the solenoid control valve closes (solenoid coil is energized), a difference in pressure is created and the pressure in the crank chamber decreases. Then, the pressure that is applied to the right side of the piston becomes greater than the pressure that is applied to the left side of the piston. This compresses the spring and tilts the lug plate. As a result, the piston stroke increases and the discharge capacity increases.

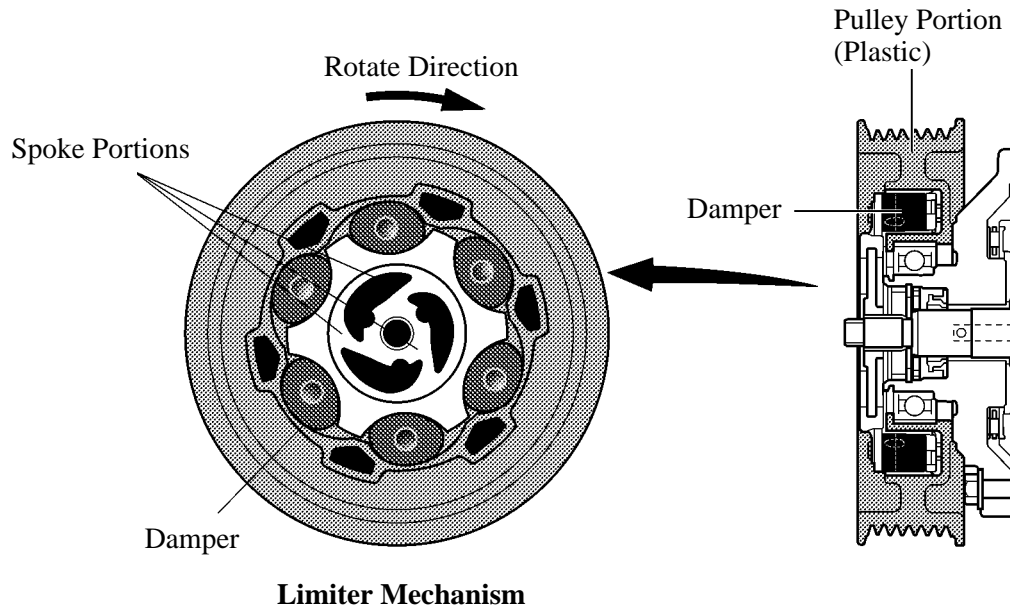


- When the solenoid control valve opens (solenoid coil is not energized), the difference in pressure disappears. Then, the pressure that is applied to the left side of the piston becomes the same as the pressure that is applied to the right side of the piston. Thus, the spring elongates and eliminates the tilt of the lug plate. As a result, there is no piston stroke and the discharge capacity decreases.



Plastic DL Type A/C Pulley

This pulley contains a damper to absorb the torque fluctuations of the engine and a limiter mechanism to protect the drive belt in case the compressor locks. In the event that the compressor locks, the limiter mechanism causes the spoke portion of the pulley to break, thus separating the pulley from the compressor. To reduce weight, the pulley portion is made of plastic.



■ AIR CONDITIONING CONTROL

1. Air Conditioning ECU

The air conditioning ECU has following controls.

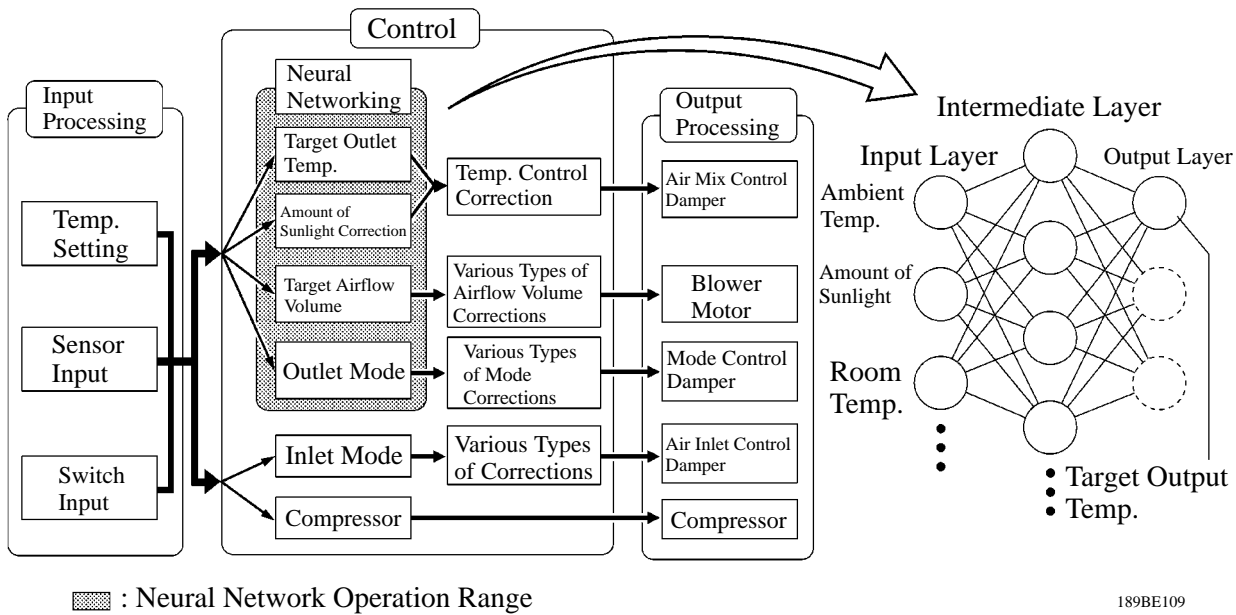
Control	Outline	Automatic	Manual
Neural Network Control [See next page]	This control is capable of effecting complex control by artificially simulating the information processing method of the nervous system of living organisms in order to establish a complex input/output relationship that is similar to a human brain.	○	—
Outlet Air Temperature Control	In compliance with the temperature setting at the temperature control switch, the neural network control calculates the outlet temperature based on the input signals from various sensors. In addition, corrections in accordance with the signals from the evaporative temperature sensor and the water temperature sensor are added to control the outlet air temperature.	○	—
Blower Control	Controls the blower motor in accordance with the airflow volume that has been calculated by the neural network control based on the input signals from various sensors.	○	—
Air Outlet Control	Automatically switches the outlets in accordance with the outlet mode ratio that has been calculated by the neural network control based on the input signals from various sensors.	○	—
Air Inlet Control	Automatically controls the air inlet control damper in accordance with the airflow volume that has been calculated by the neural network control.	○	—
Variable Capacity Compressor Control	Controls the compressor to turn ON/OFF and the discharge capacity based on the signals from various sensors.	○	○
Outer Temperature Indication Control	Based on the signals from the ambient temperature sensor, this control calculates the outside temperature, which is then corrected in the air conditioning ECU, and shown in the multi-information display in the combination meter and air conditioning panel.	○	—
Rear Window Defogger Control	Switches the rear defogger on for 15 minutes when the rear defogger switch is switched on. Switches it off if the switch is pressed while it is operating.	○	—
Micro Dust and Pollen Filter Control [See page BE-37]	Quickly removes pollen from the face areas of the driver and front passenger when the micro dust and pollen filter switch is pressed.	○	—
Self-diagnosis	Checks the sensors in accordance with operation of air conditioning switches, then clock displays a DTC (Diagnosis Trouble Code) to indicate if there is a malfunction or not (sensor check function).	○	○
	Drives the actuators through a predetermined sequence in accordance with the operation of the air conditioning switches (actuator check function).	○	—

2. Neural Network Control

- In the previous automatic air conditioning system, the ECU determined the required outlet air temperature and blower air volume in accordance with the calculation formula that has been obtained based on information received from the sensors.

However, because the sensors of a person are rather complex, a given temperature is sensed differently, depending on the environment in which the person is situated. For example, a given amount of solar radiation can feel comfortably warm in a cold climate, but extremely uncomfortable in a hot climate. Therefore, as a technique for effecting a higher level of control, a neural network is used in the automatic air conditioning system. With this technique, the data that has been collected under varying environmental conditions is stored in the ECU, which effects control to provide enhanced air conditioning comfort.

- The neural network control consists of neurons in the input layer, intermediate layer, and output layer. The input layer neurons process the input data of the outside temperature, the amount of sunlight, and the room temperature based on the outputs of the switches and sensors, and output them to the intermediate layer neurons. Based on this data, the intermediate layer neurons adjust the strength of the links among the neurons. The sum of these is then calculated by the output layer neurons in the form of the required outlet temperature, solar correction, target airflow volume, and outlet mode control volume. Accordingly, air conditioning ECU controls the servomotors and blower motor in accordance with the control volumes that have been calculated by the neural network control.

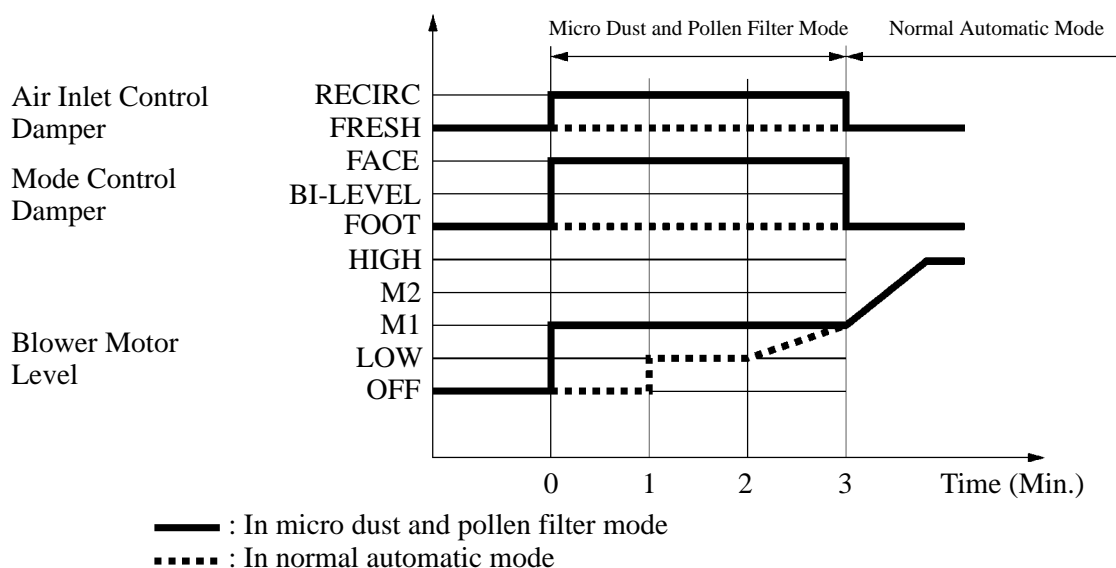


3. Micro Dust and Pollen Filter Control

Operation

- When the micro dust and pollen filter switch is pressed, the air conditioning ECU changes to the recirculation mode and face mode. This allows the air conditioning to direct clean air, which has passed through the clean air filter, to the face areas. Thus, the air conditioning removes pollen and captures it in the clean air filter.
- From the micro dust and pollen filter control, the air conditioning automatically resumes normal automatic mode control after 3 minutes at normal temperatures, or after 1 minute when the outside temperature is low (5°C maximum).

▶ Example of Operation in Warm-up ◀



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4. Self-diagnosis

The air conditioning ECU has a self-diagnosis function. It stores any operation failures in the air conditioning system memory in the form of DTC (Diagnostic Trouble Code).

For details, see the 2006 RAV4 Repair Manual (Pub. No. RM01M1U).