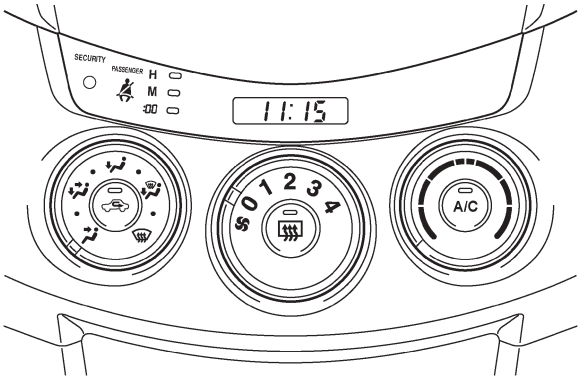
■CONSTRUCTION AND OPERATION

1. Heater Control Panel

Heater Control Panel (Manual Control Type)

- The rotary switch type heater control panel is used.
- The new 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 conditioner. 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 conditioner switches to the fresh mode. As a result, the fogging of the window glass is eliminated quickly.

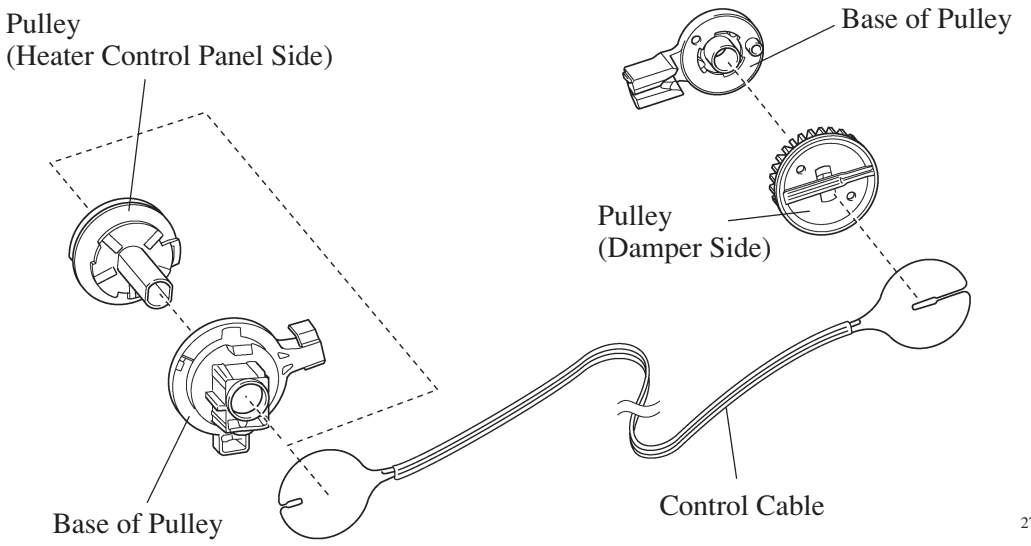


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Manual A/C LHD Models

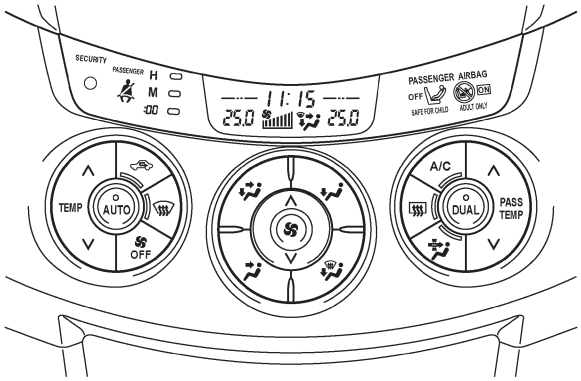
Heater Control Cable

- The new 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.



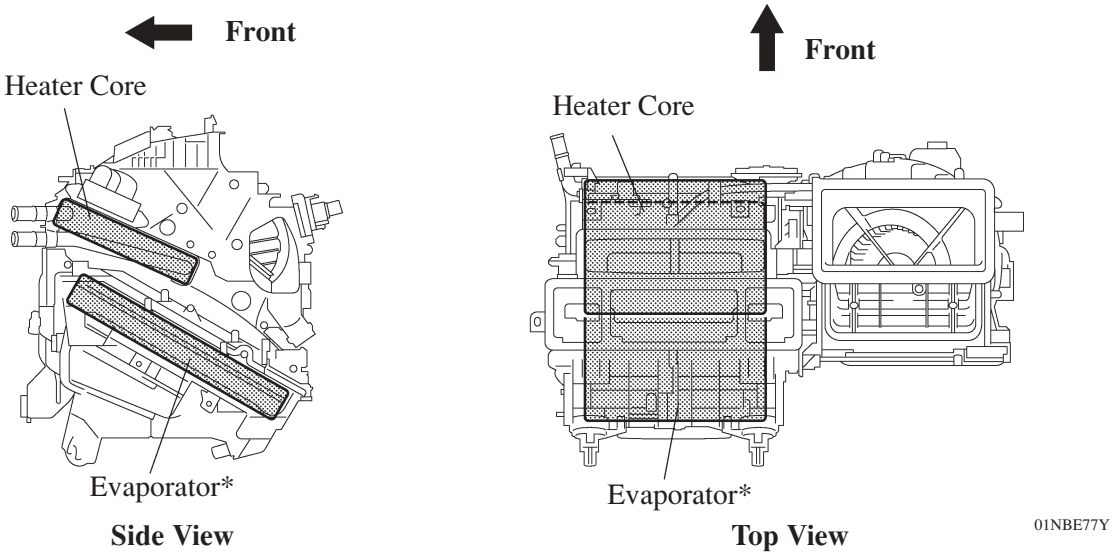
Automatic A/C LHD Models

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2. Air Conditioner and Blower Units

General

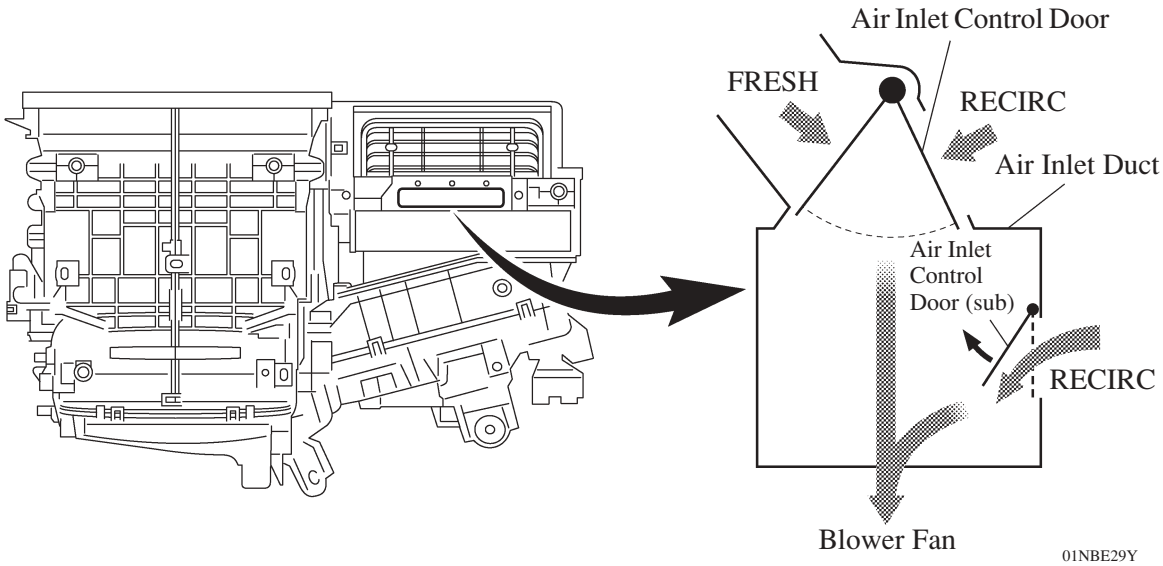
A semi-center location air conditioner unit, in which the evaporator and heater core are placed in the vehicle's longitudinal direction, is used.



*: Only for Models with Air Conditioner

Partial Recirculation System

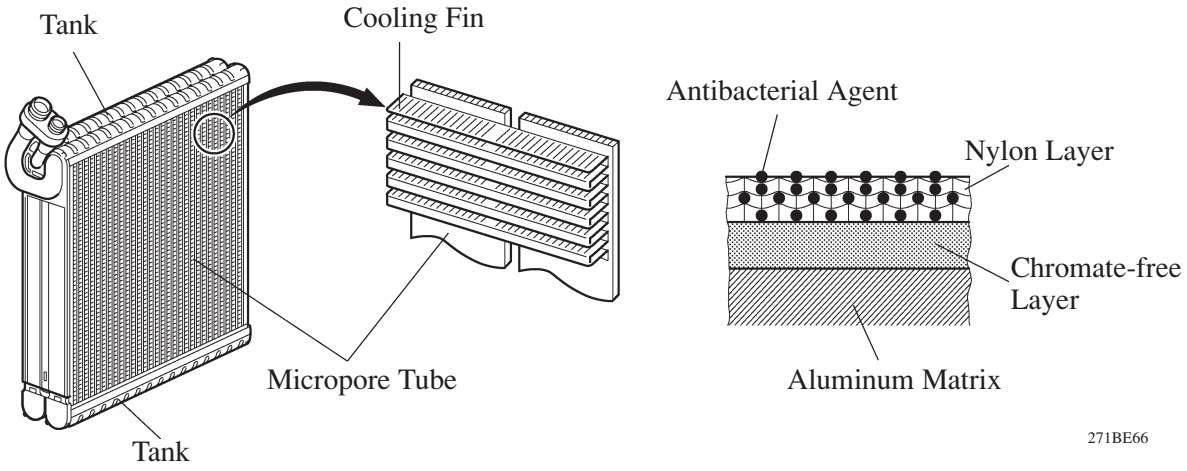
The partial recirculation system is used.
This system has an air inlet control door (sub) in the cabin side of the air inlet duct. Thus, it is able to cycle a small volume of recirculated air even in the FRESH mode, thus enhancing heating and air conditioning performance. When the blower switch is ON,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



Evaporator

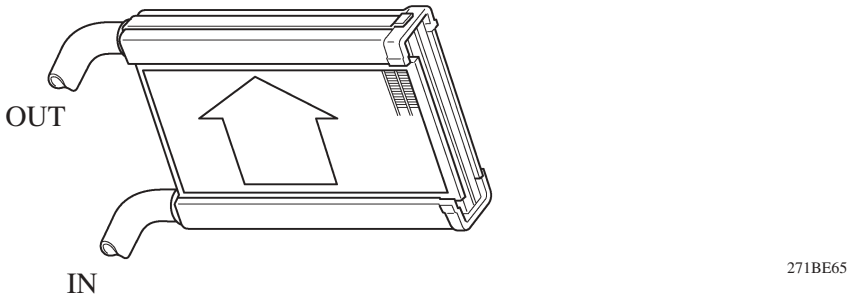
A revolutionary super-slim structure evaporator is used. Placing the tanks at the top and the bottom of the evaporator and adopting a micropore tube construction have realized the following effects:

- 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.



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

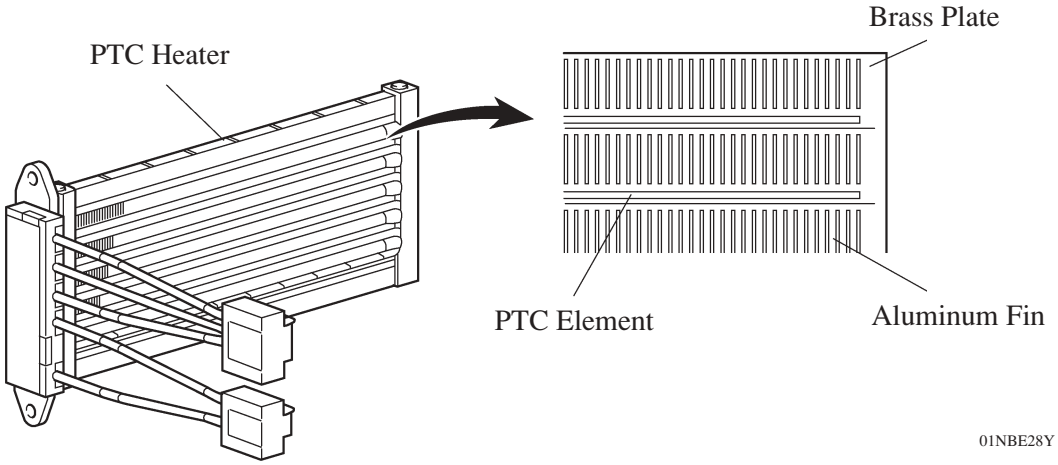
This heater core has been made more compact and higher performance by making the core section finer and improving the shapes of the tank section and flow section. Also, the environment is considered. By using aluminum as the material, the amount of the environmental burden disposal (lead) is reduced.



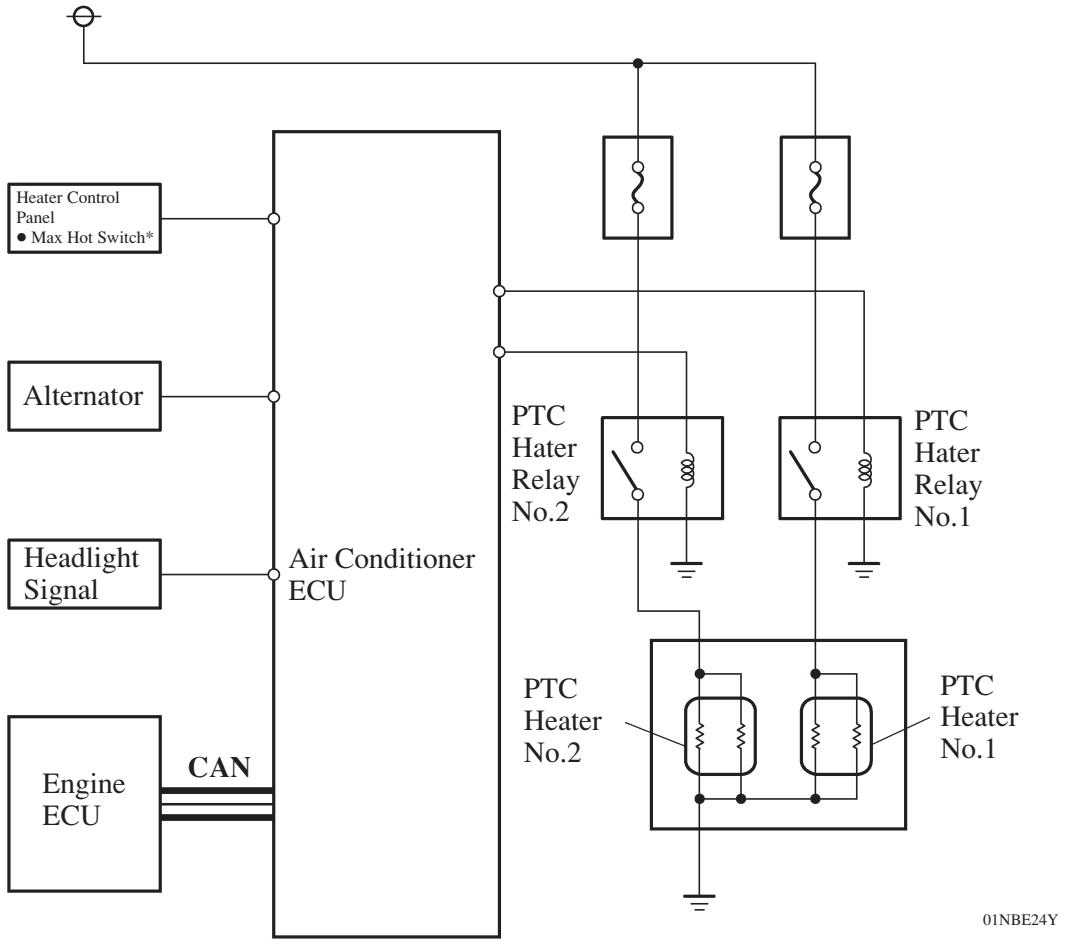
PTC (Positive Temperature Coefficient) Heater

1) General

- On the 2AD-FTV and 2AD-FHV engine LHD models, a PTC (Positive Temperature Coefficient) heater is used to improve the heating performance.
- The PTC heater is located above the heater core in the air conditioner unit.
- The PTC heater consists of a PTC element, aluminum fin, and brass plate. When current is applied to the PTC element, it generates heat to warm the air that passes through the unit.



2) Wiring Diagram

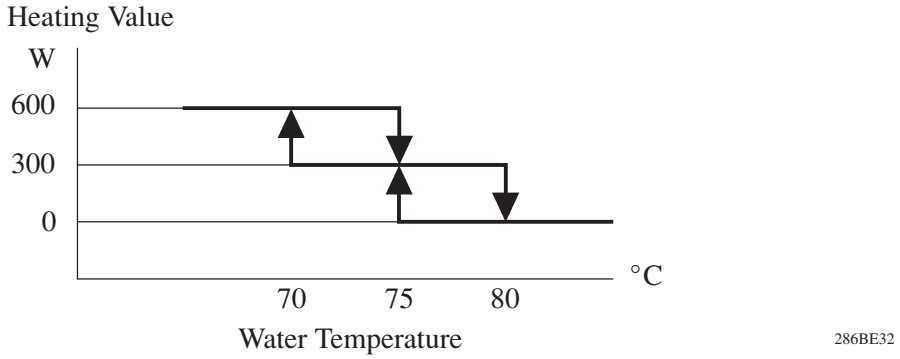


*: Only for Models with Manual Air Conditioner

3) PTC Heater Operating Conditions

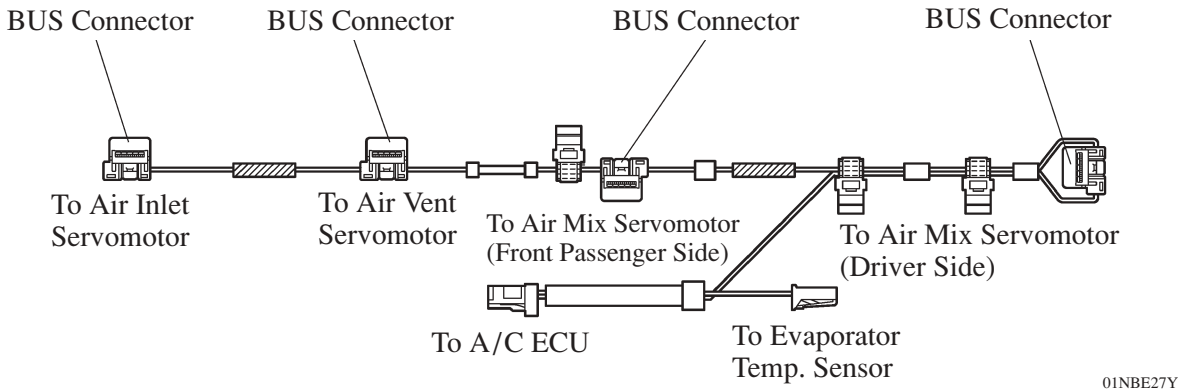
The ON/OFF function of the PTC heater is controlled by the air conditioner ECU in accordance with the water temperature, engine speed, air mix setting, and electrical load (alternator power ratio).
For example, the number of the operating PTC heaters varies with the water temperature as in the graph below.

▶ Heating Value Pattern ◀

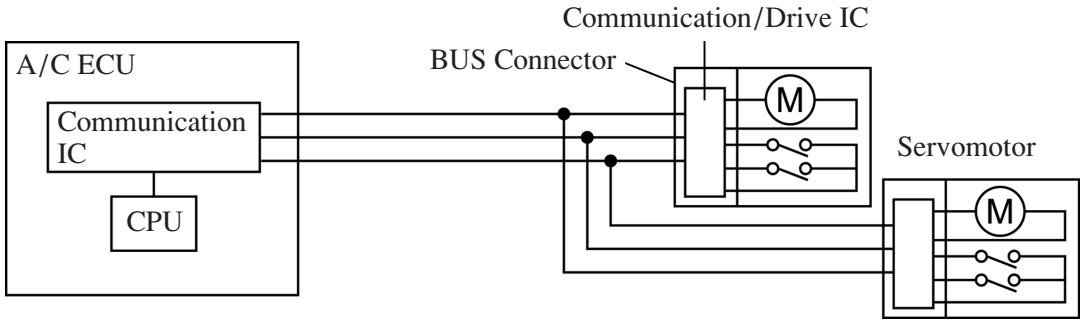


BUS Connector (Only for Models with Automatic Air Conditioner)

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

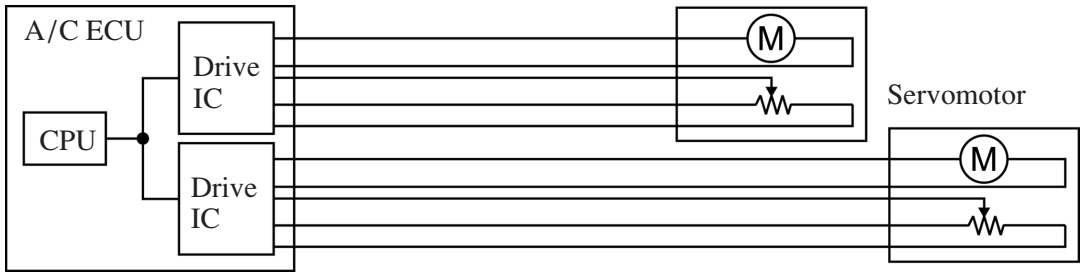


The BUS connector has a built-in communication/drive IC, which communicates with each servomotor connector, actuates the servomotor, and has a position detection function. This enables bus communication for the servomotor wire harness to realize a more lightweight construction and the reduced number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



With BUS Connector

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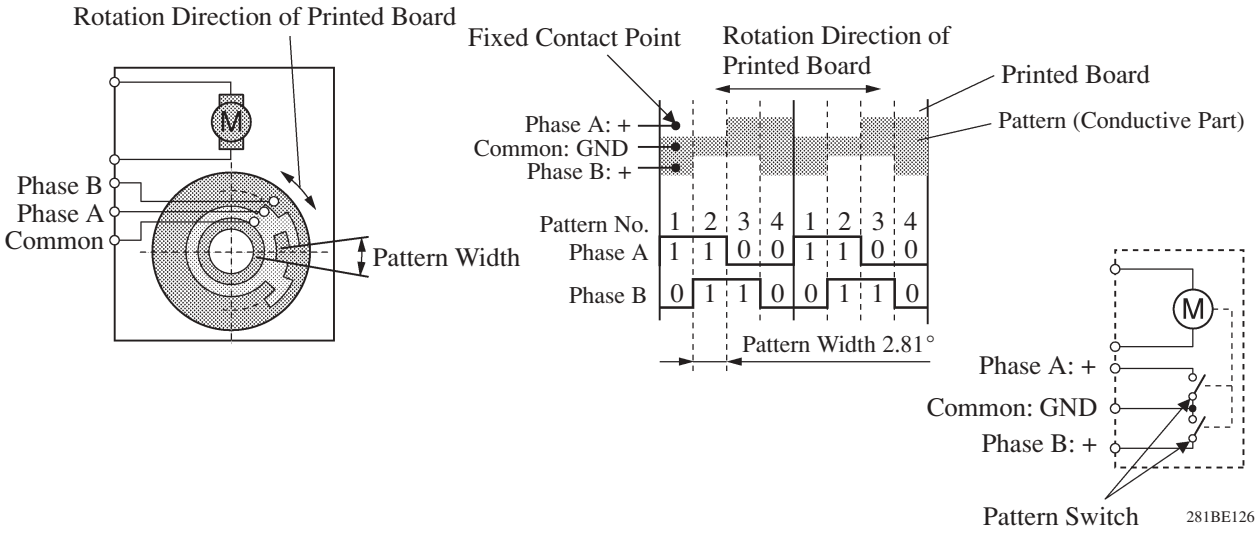
Without BUS Connector

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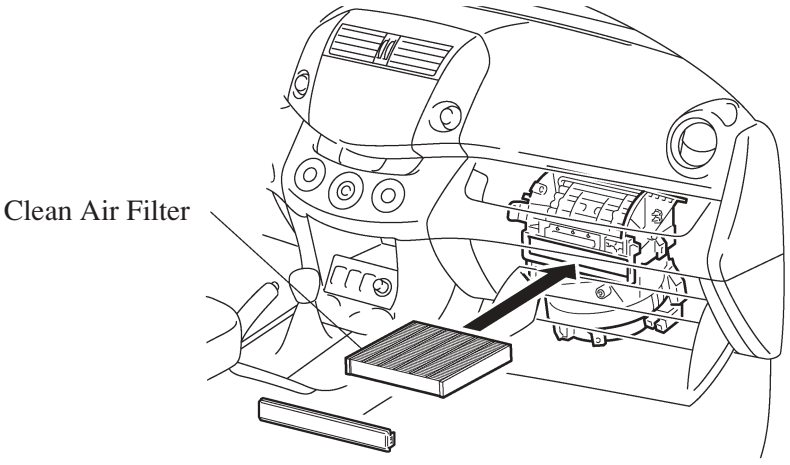
Servomotor (Only for Models with Automatic Air Conditioner)

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 conditioner ECU counts the number of pulse patterns in order to determine the stopped position.



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.



Service Tip

- The replacement intervals are shown in the chart to the right.

Destination	Replacement Interval	
	Normal Condition	Dusty Condition
Europe	22500 km or 14000 miles	15000 km or 9000 miles
Australia	30000 km or 18500 miles	
G.C.C. Countries General Countries	20000 km or 12500 miles	

- Replace the clean air filter after the power source mode is selected to OFF.

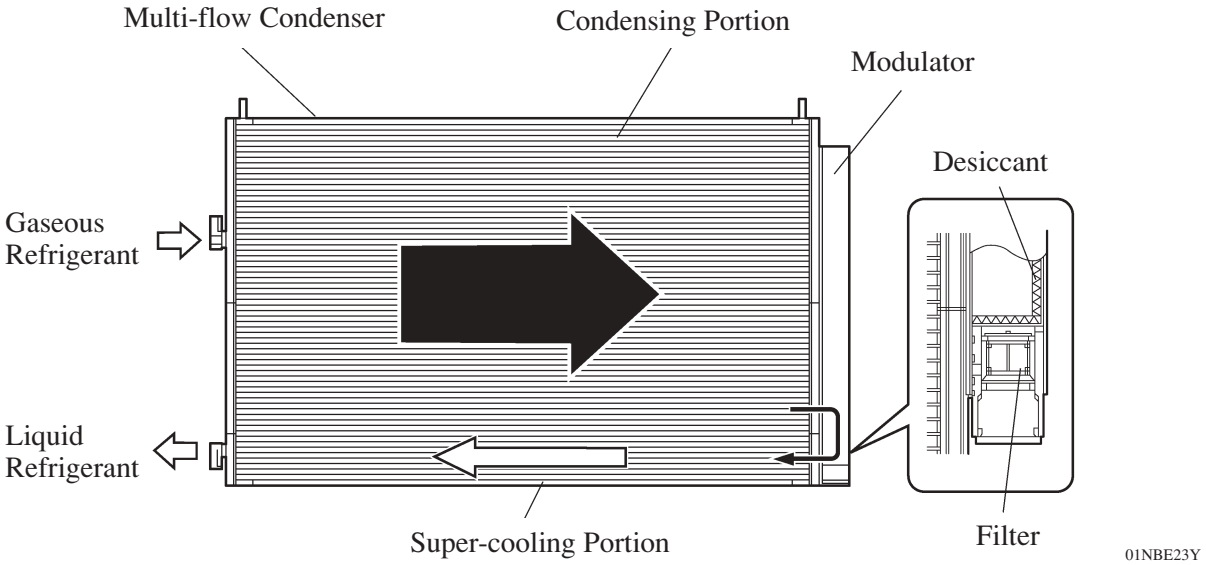
3. Condenser

General

The new 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

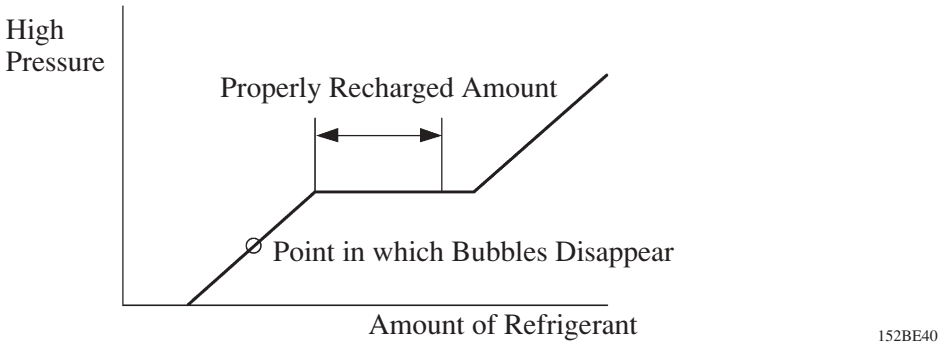
In the sub-cool cycle, after the refrigerant passes through the condensing portion of the condenser, both the liquid refrigerant and the gaseous refrigerant that could not be liquefied are cooled again in the super-cooling portion. Thus, the refrigerant is sent to the evaporator in an almost completely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



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 RAV4 Repair Manual (Pub. No. RM01N0E).

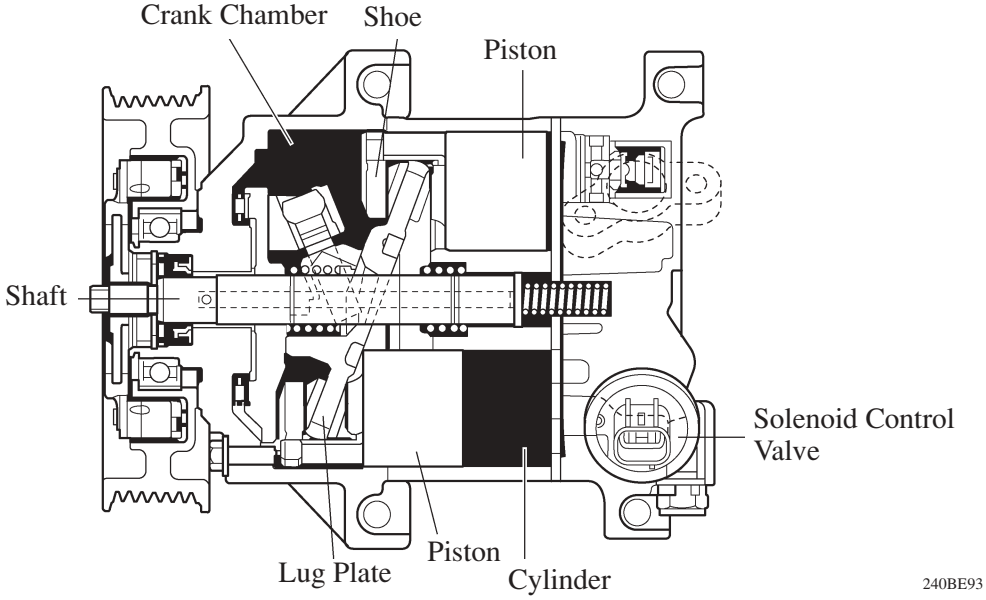


4. A/C Compressor

General

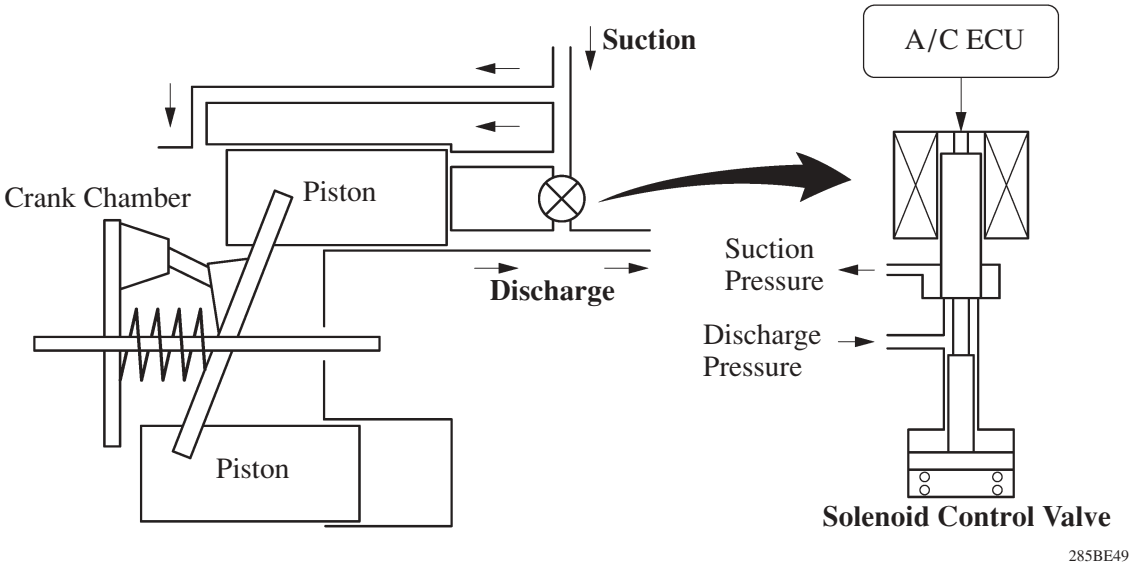
A/C compressor is continuously variable capacity type in which its capacity varies in accordance with the cooling load of the air conditioner.

- 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.

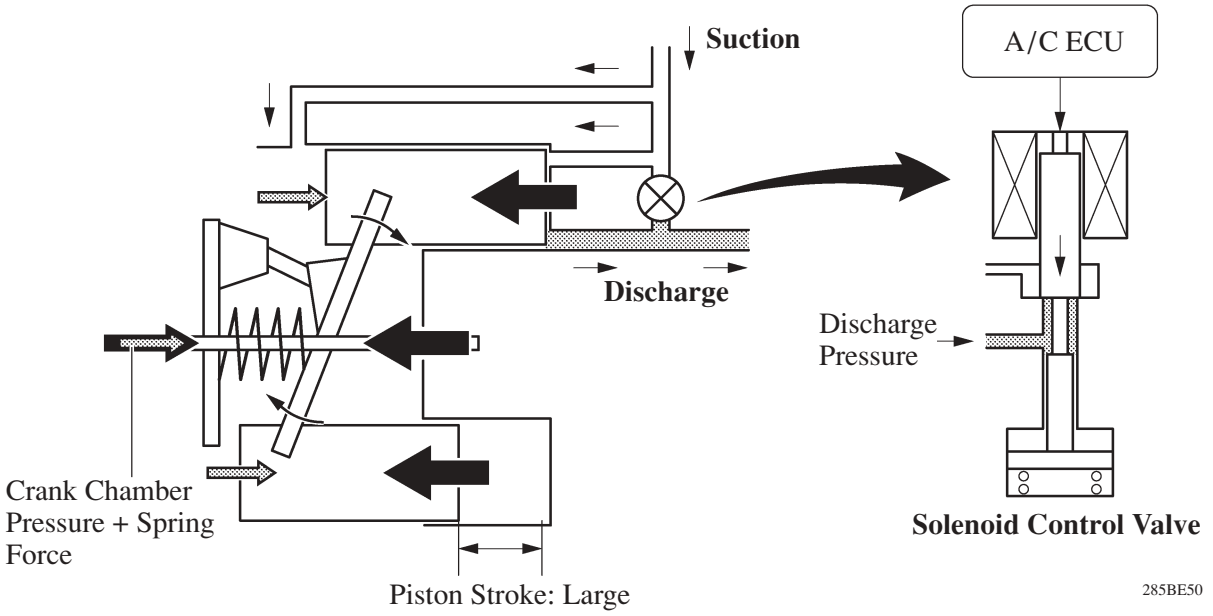


Operation

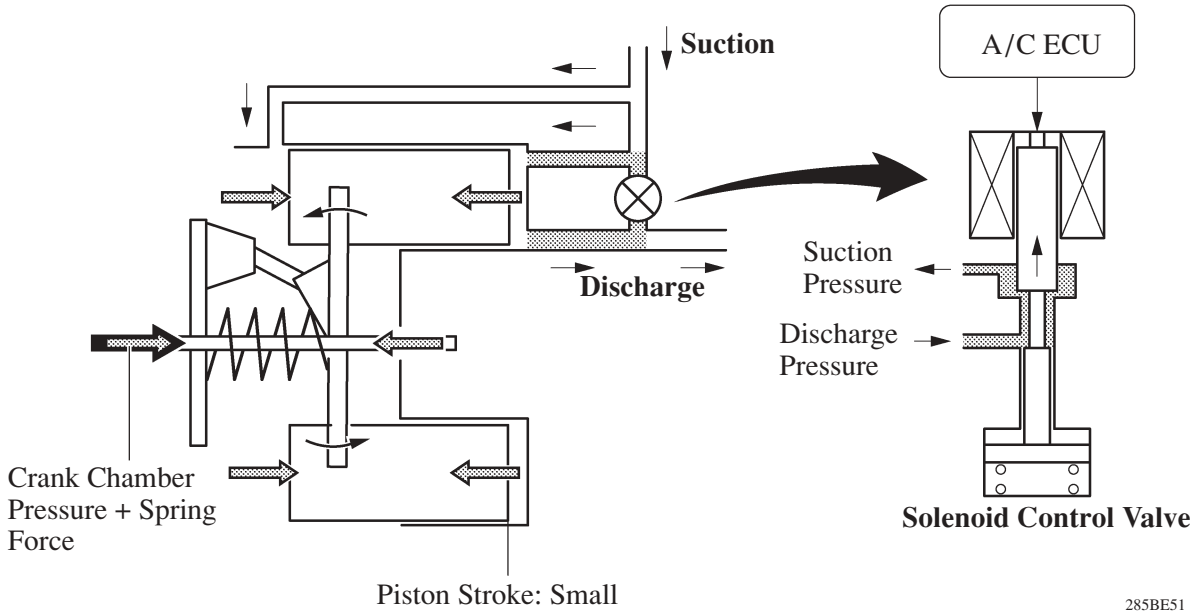
- The crank chamber is connected to the suction passage. A solenoid control valve is provided between the suction passage (low pressure) and the discharge passage (high pressure).
- The solenoid control valve operates under duty cycle control in accordance with the signals from the A/C ECU.



- 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.



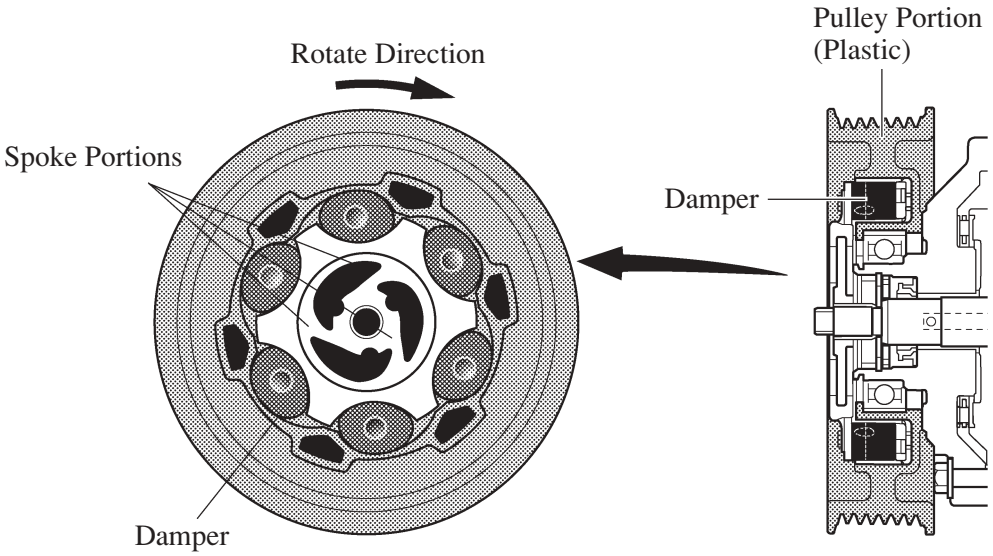
- When the solenoid control valve opens (solenoid coil is not energized), the difference in pressure disappears. Then, the pressure that is applied to the left side of the piston becomes the same as the pressure that is applied to the right side of the piston. Thus, the spring elongates and eliminates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



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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.



Limiter Mechanism

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