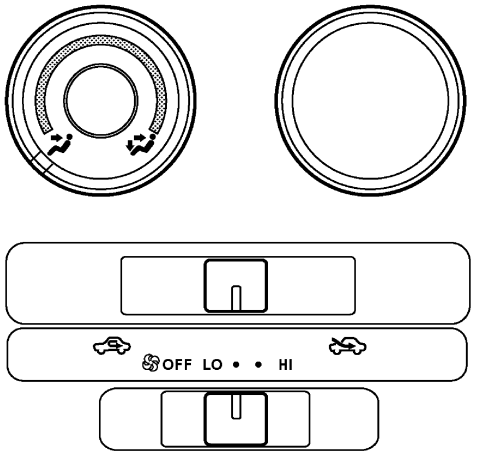
■CONSTRUCTION AND OPERATION

1. Heater Control Panel

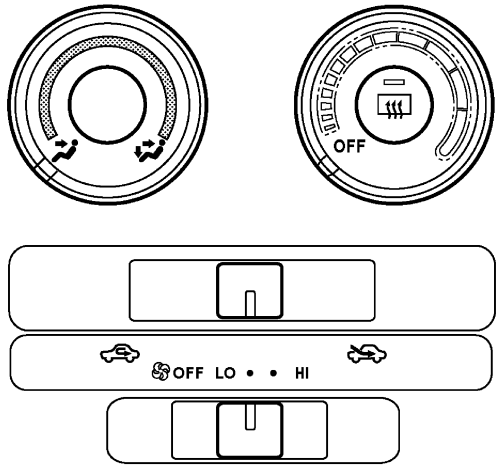
General

- The rotary switch type heater control panel is used.
- On the previous model, the air outlet mode and the air inlet temperature control switches were operated with a single cable. Instead, the new models use two cables on pulleys that are always operated in the pulling direction.
- 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 enhancing the comfort level.



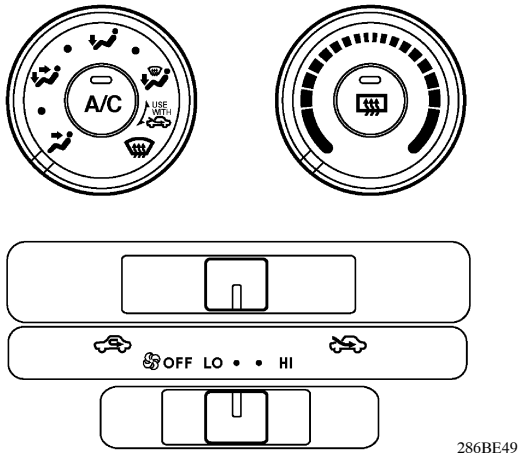
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Models with Boost/Vent



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Models with Boost/Vent and Cooler

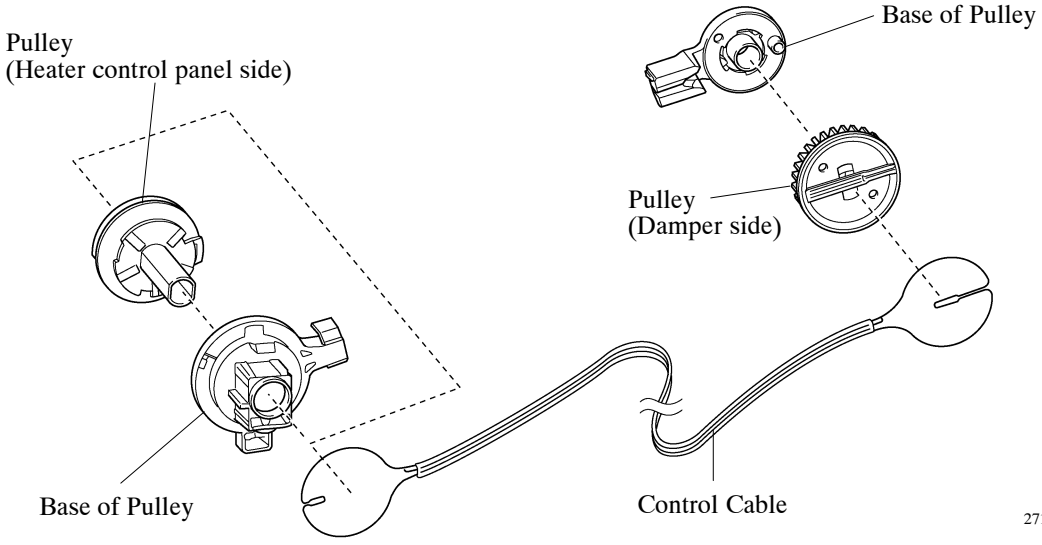


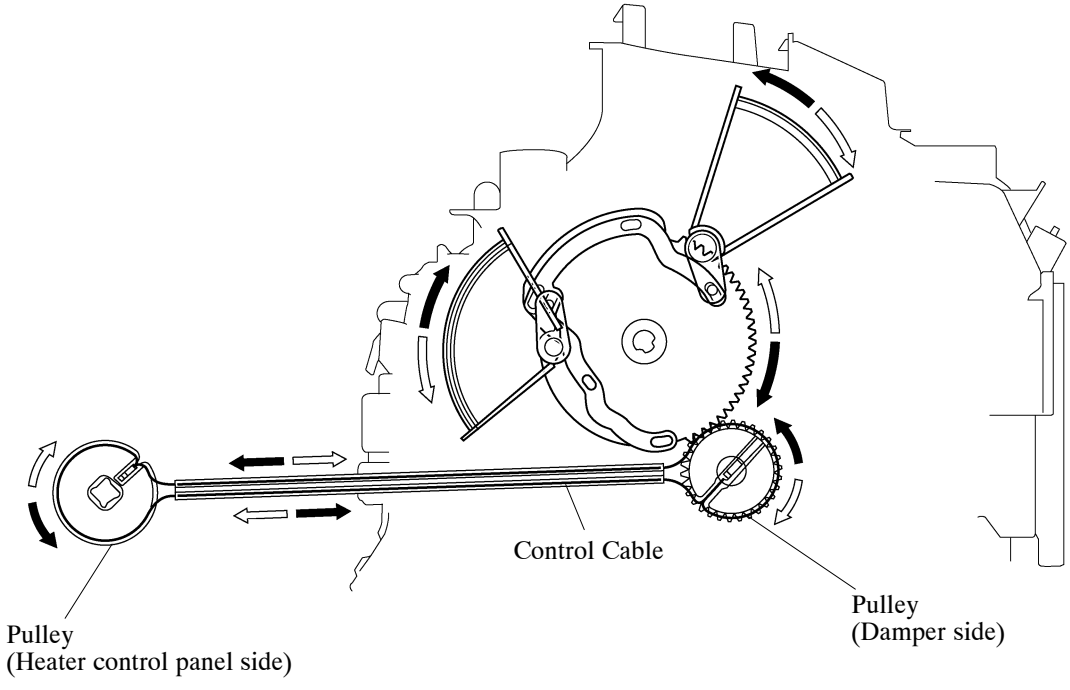
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Models with Air Conditioner

Heater Control Cable

- On the previous model, the air outlet mode and the air inlet temperature control switches were operated with a single cable. Instead, the new models uses two cables on pulleys that are always operated in the pulling direction.
- 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.



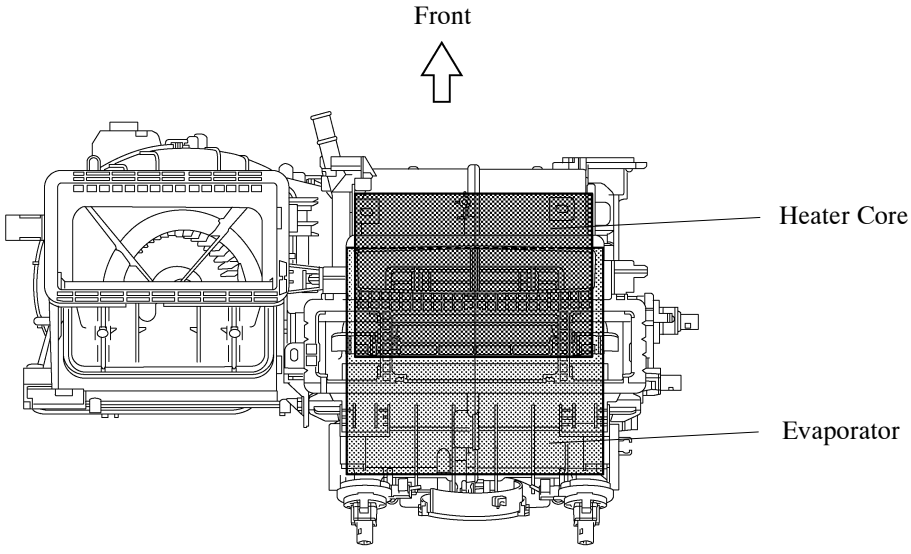


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2. Air Conditioner Unit

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. As a result, the air conditioner unit has been made compact and lightweight.



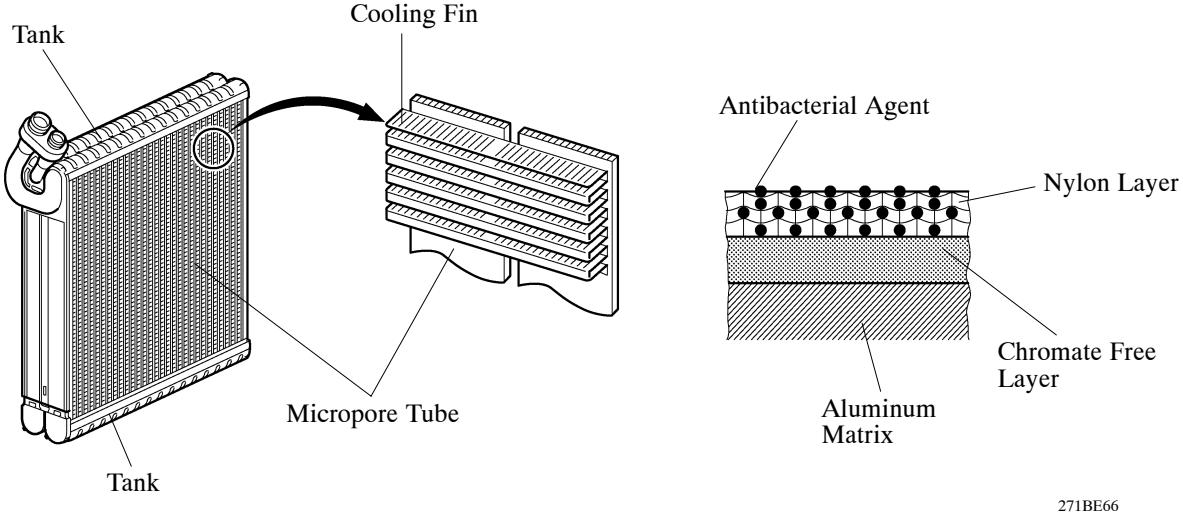
RHD Model

Evaporator

- By placing the tanks at the top and the bottom of the evaporator unit and adopting a micropore tube construction, the following effects have been realized:

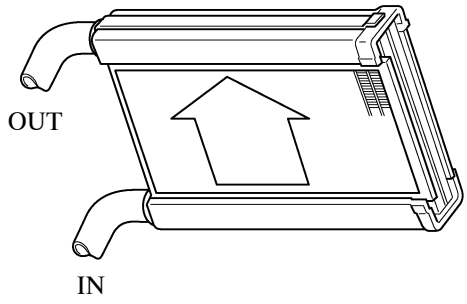
  a) The heat exchanging efficiency has been improved.
  b) The temperature distribution has been made more uniform.
  c) The evaporator has been made thinner.

- 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 under 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.

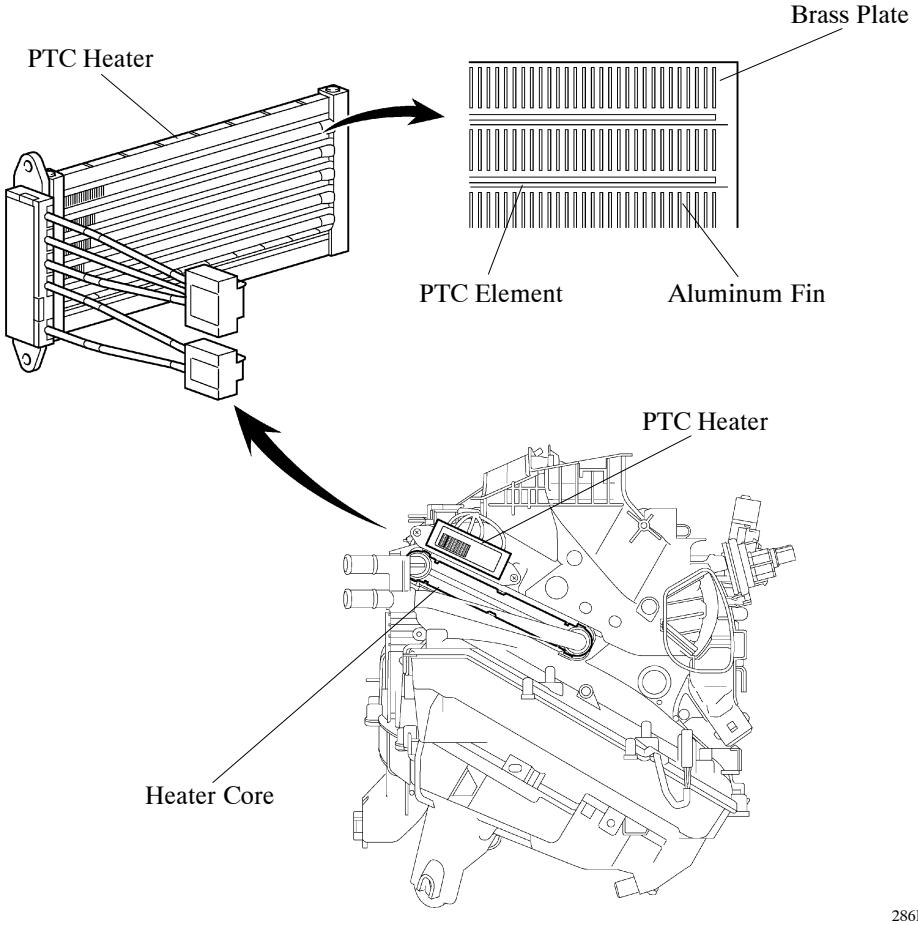


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PTC Heater

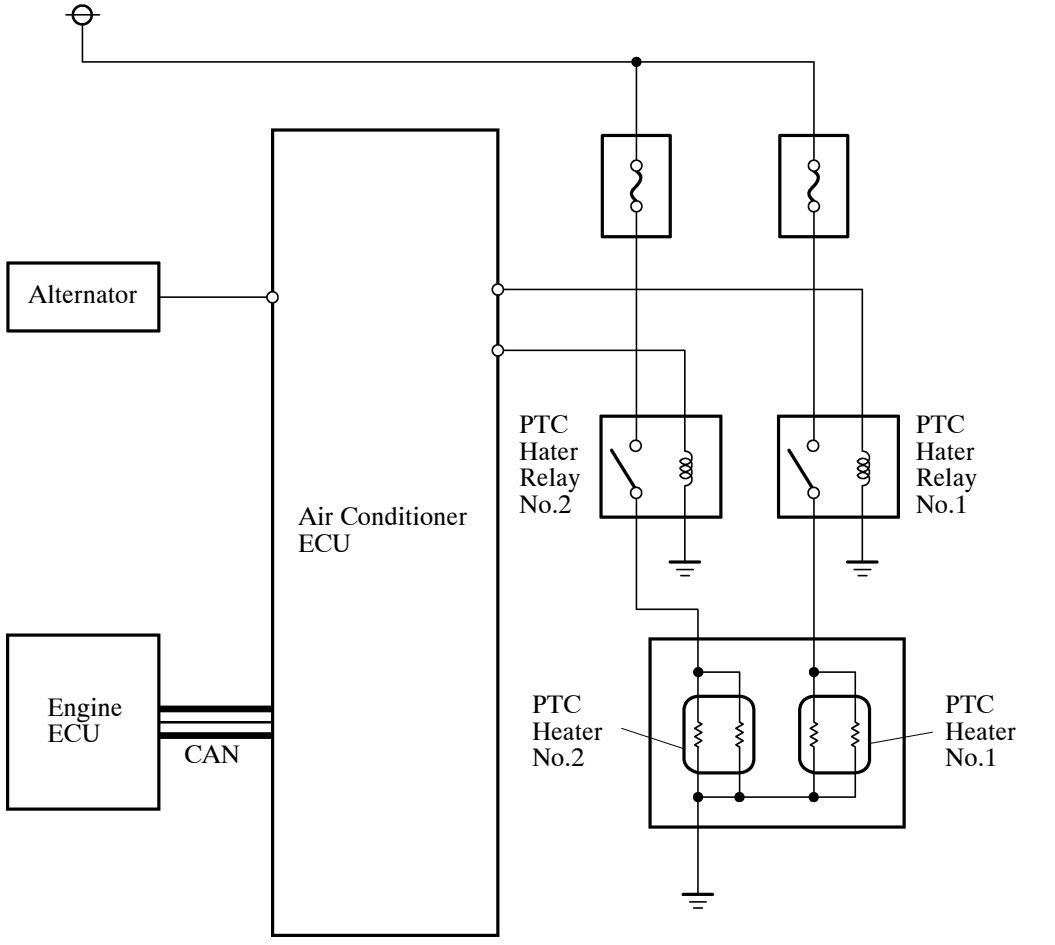
1) General

- On the 2KD-FTV engine models for cold area, 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.



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2) Wiring Diagram

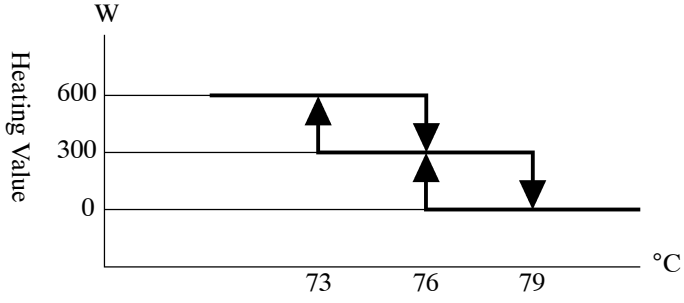


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3) PTC Heater Operating Conditions

The ON/OFF function of the PTC heater is controlled by the air conditioner ECU in accordance with the engine coolant 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 ◀



Engine Coolant Temperature

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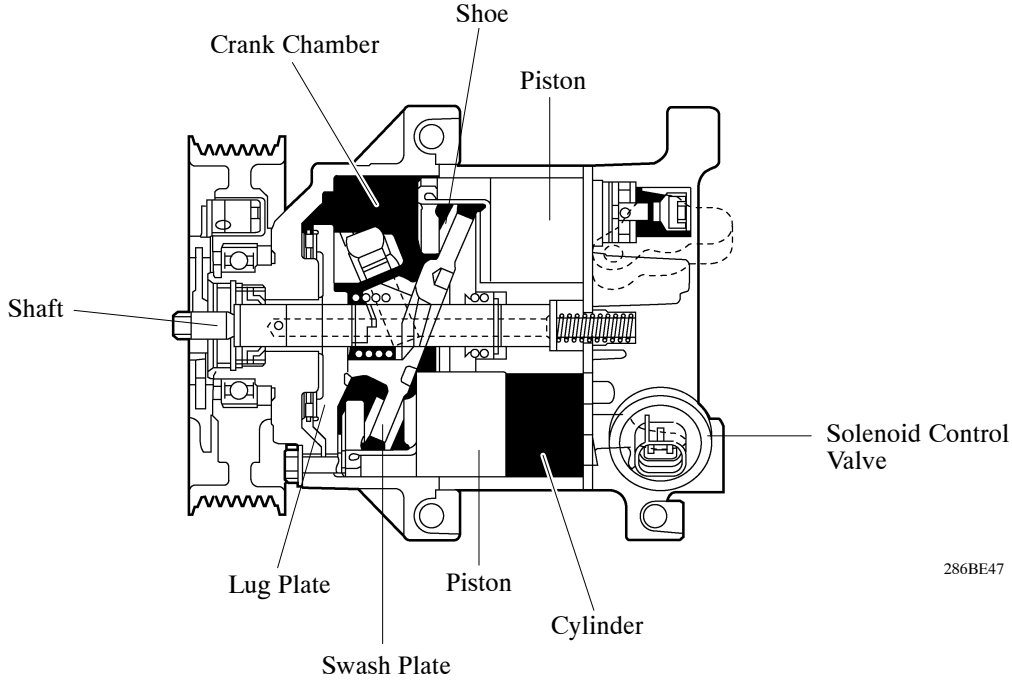
3. A/C Compressor

General

- On the 2TR-FE engine models, an external control continuously variable capacity air conditioner compressor is used.
- This compressor is a continuously variable capacity type in which its capacity varies in accordance with the cooling load of the air conditioner.
- A solenoid control valve that adjusts the suction pressure to control it as desired is provided.

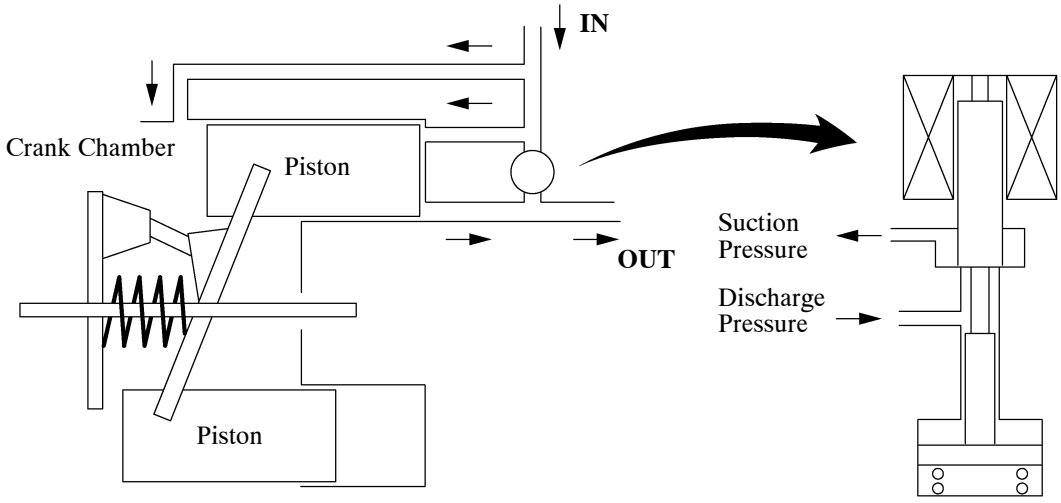
Construction

This compressor consists of the shaft, lug plate, piston, shoe, crank chamber, cylinder, swash plate, and solenoid control valve. When the shaft rotates, this movement is transmitted via the lug plate that is connected to the shaft to rotate the swash plate. This rotational movement of the swash plate is transmitted via the shoe to the reciprocal movement of the piston in the cylinder, which performs the suction, compression, and discharge of the refrigerant.



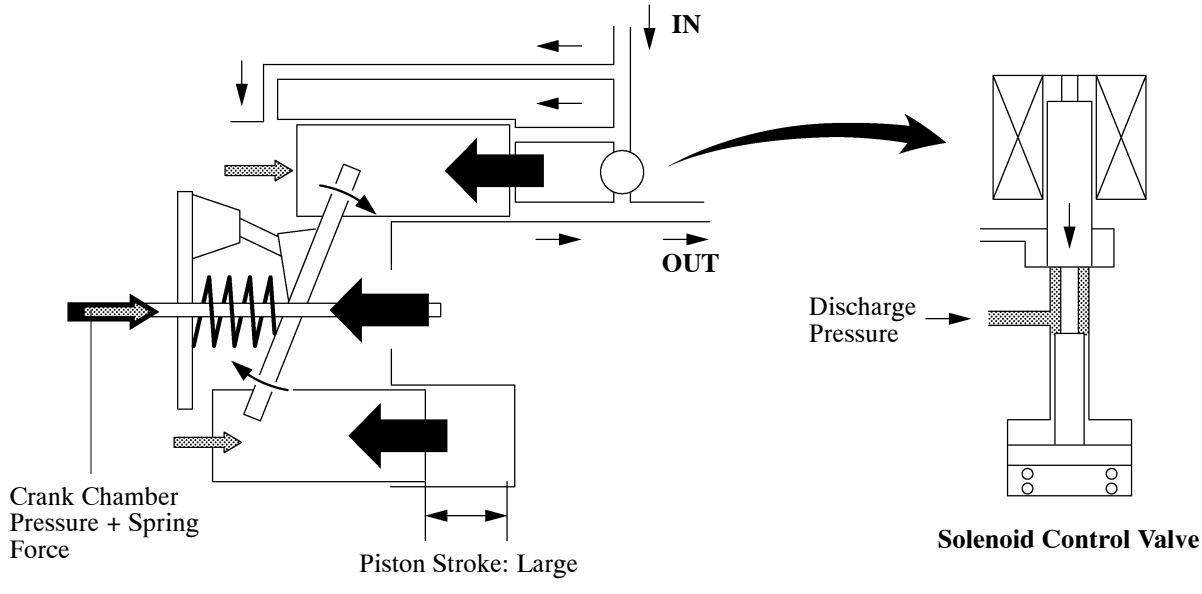
Operation

- The crank chamber is connected to the suction passage. A solenoid control valve is provided between the suction passage (LO pressure) and the discharge passage (HI pressure). The solenoid control valve operates under the duty cycle control in accordance with the signals from the A/C amplifier or air conditioner ECU. The duty cycle control, which changes linearly between 0 to 100%, varies the discharge capacity.



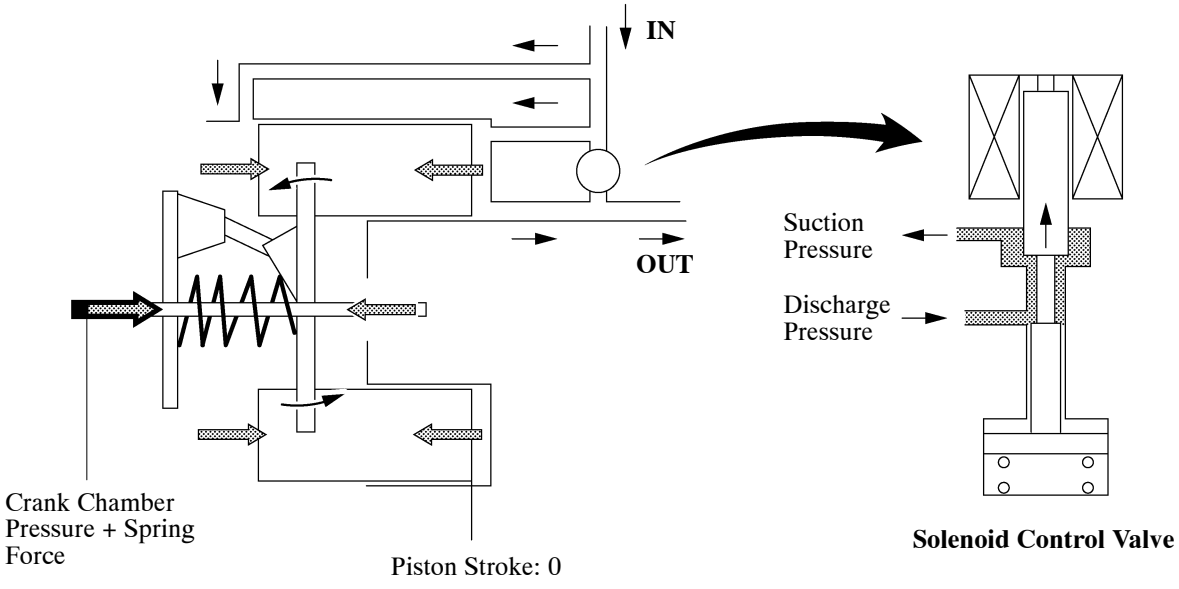
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- When the solenoid control valve closes (solenoid coil is energized), a difference in pressure is created and the pressure in the crank chamber decreases. Then, the pressure that is applied to the right side of the piston becomes greater than the 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.



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- 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 the lag plate becomes vertical. As a result, there is no piston stroke and the discharge capacity turns to 0.



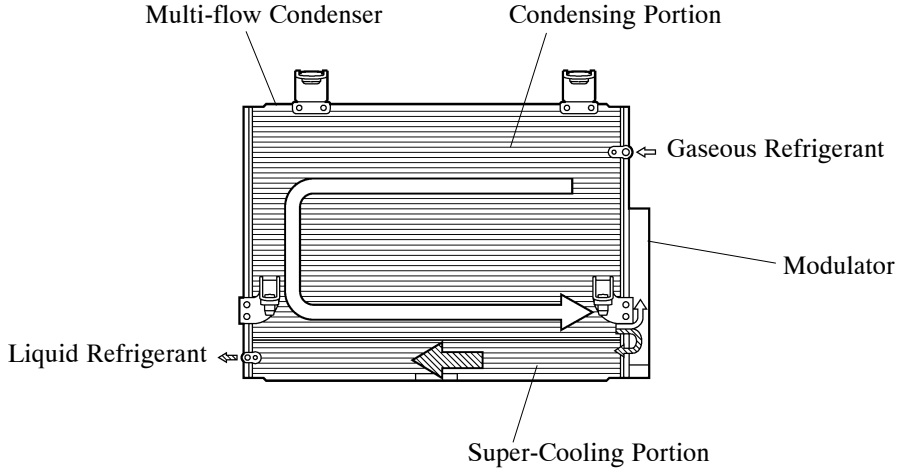
4. Condenser

General

The new model uses a sub-cool condenser. This is a multi-flow condenser consisting of two cooling portions: a condensing portion and 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

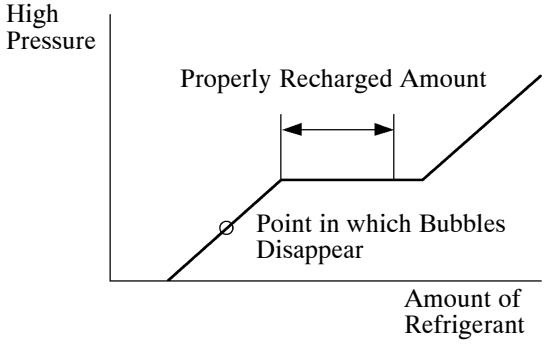
In the sub-cool cycle, after the refrigerant passes through the condensing portion of the condenser, both the liquid refrigerant and the gaseous refrigerant that could not be liquefied are cooled again in the super-cooling portion. Thus, the refrigerant is sent to the evaporator in an almost completely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



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NOTE:

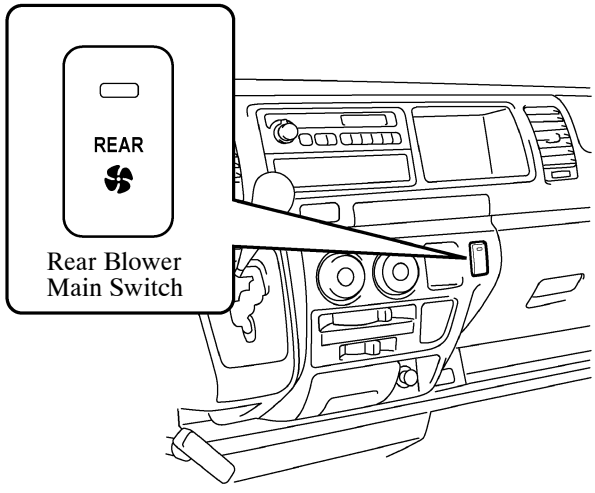
The point at which the air bubbles disappear in the refrigerant of the sub-cool cycle is lower than the proper amount of refrigerant with which the system must be filled. Therefore, if the system is recharged with refrigerant based on the point at which the air bubbles disappear, the amount of refrigerant 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 Hiace Repair Manual (Pub. No. RM1171E).



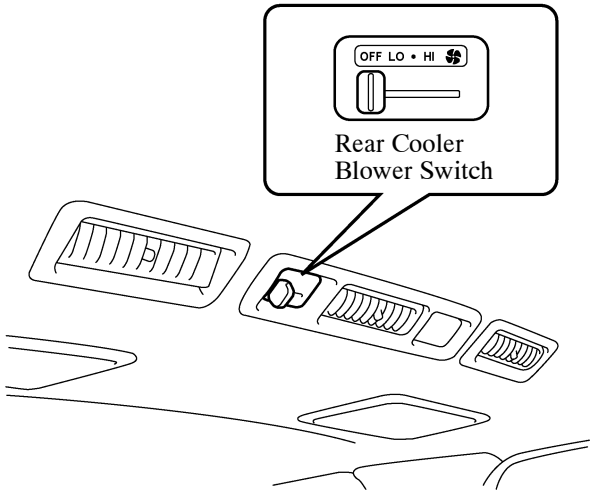
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5. Rear Control

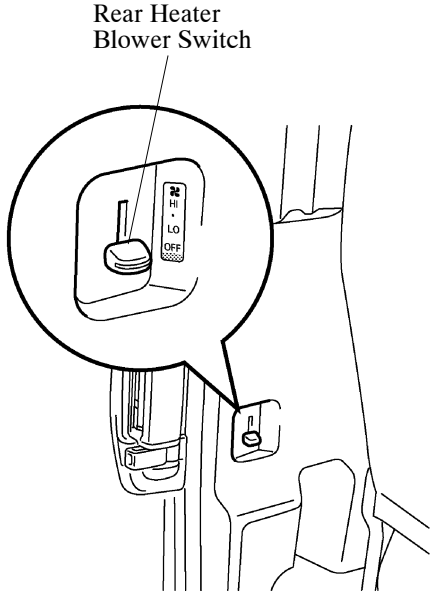
- A rear blower main switch is used, which makes it possible to switch the rear cooler and rear heater ON/OFF from the front seat when the rear blower is ON. This switch is positioned on the heater control panel.
- A lever type blower switch is used for the rear cooler. This switch is installed above behind the front seat.
- When the front air conditioner is not operating, the rear cooler can only blow out air.
- A lever type blower switch is used for the rear heater. This switch is installed at the bottom of the left side center pillar.



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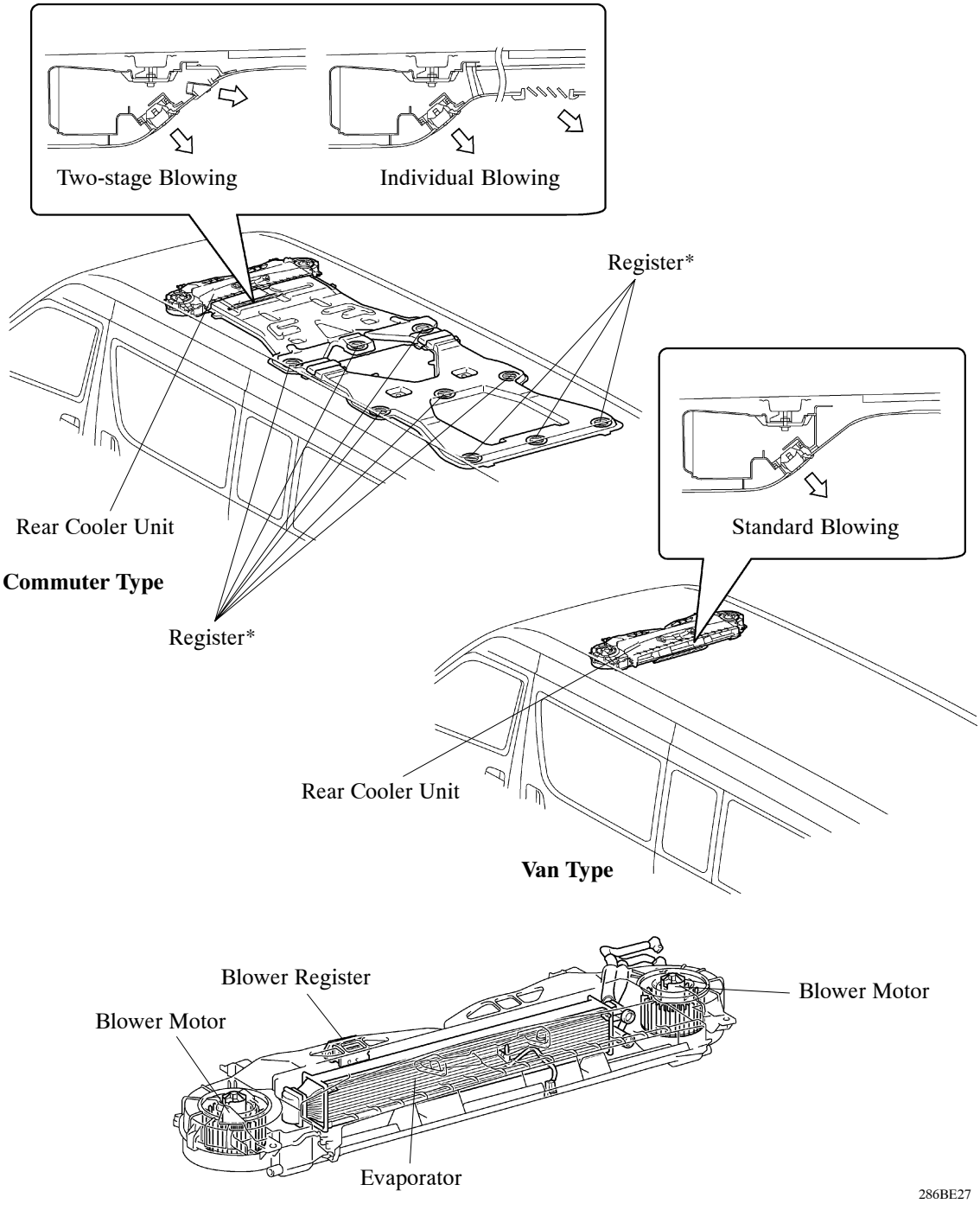
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6. Rear Cooler Unit

- An overhead type rear cooler unit, which is installed in the roof head lining rearward of the front seat, is used.
- A compact, lightweight flat-fin type flat tube evaporator with excellent cooling performance is used.
- The standard blowing type unit blower is used on the van type vehicle with the rear cooler.
- On the commuter type vehicle with the rear cooler, the blower port of the rear cooler unit is split into two levels, top and bottom, for two-level blowing*1. Ducts are used for individual blowing through the six or nine registers*2 above the seat sections.
- This gives excellent cooling performance for the rear seats.

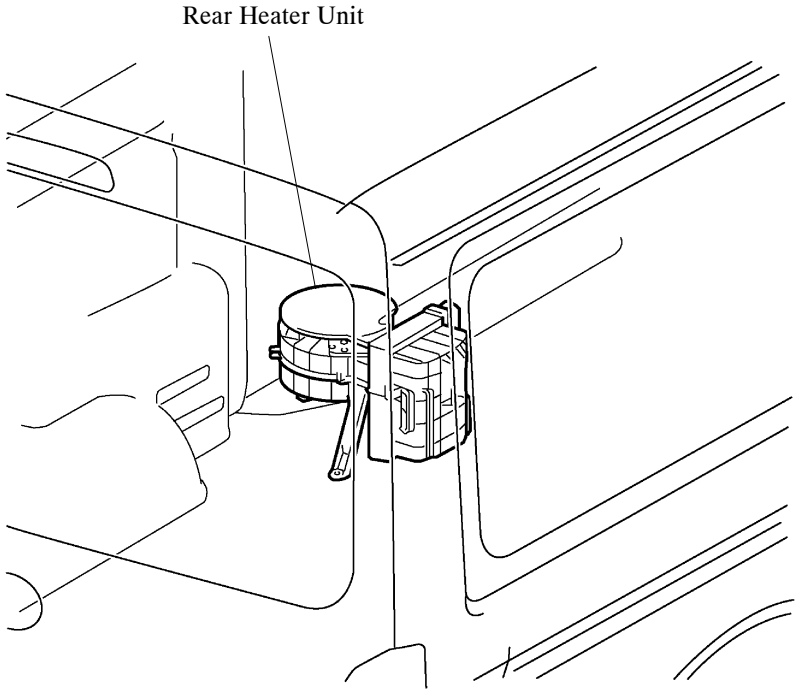
*1: Vehicle with two-stage blowing
*2: Vehicle with individual blowing



*: Vehicle with individual blowing

7. Rear Heater Unit

- The rear heater unit is provided under the second row rear seat. For the rear heater unit specifications, see page MO-40.
- The rear heater unit is provided with an SFA-II heater core (SFA-II: Straight Flow Aluminum-II) that is compact and high-performance and has excellent heating performance.



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