

**GROUP 55**

**HEATER, AIR  
CONDITIONING AND  
VENTILATION**

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## GENERAL DESCRIPTION

M2551001500040

The blower, heater, and evaporator have been integrated with the heater and A/C system to achieve a greater fan power and noise reduction.

### FEATURES

#### ENHANCEMENTS IN COMFORT

- With the adoption of fully-automatic A/C, the outside/inside air circulation switching, air outlet, and outlet air temperature are automatically controlled according to the ambient temperature, solar radiation, and passenger compartment temperature so that the optimum air conditioner is achieved. <Automatic A/C>
- By the adoption of clean air filter, the air quality inside the passenger compartment has been enhanced.

#### ENHANCEMENTS IN OPERATION PERFORMANCE

- Operability has been enhanced by the adoption of large triple dial.
- Customise function has been added for the enhanced convenience.

#### ENHANCEMENTS IN FUEL ECONOMY

- The high efficiency compressor with a 2-step profile oil separator has been installed, thus enhancing the fuel economy.
- The idle-up speed is controlled in two steps to secure the air cooling performance during summer and to enhance the fuel economy in the seasons with moderate temperature.

- Enhancement of fuel economy by the cooling fan control depending on the refrigerant pressure and vehicle speed.

#### ENHANCEMENT IN SAFETY

- A/C system is stopped when the air bags are deployed.
- Crushable space has been adopted to heater unit to reduce the risk of passenger injuries in case of a collision.

#### GLOBAL ENVIRONMENT PROTECTION

- New refrigerant system (HFC134a) has been adopted.
- By the optimisation of A/C system, the refrigerant charging amount has been reduced.
- Clean air filter media and its cover are separated to reduce waste materials.

#### ENHANCEMENTS IN SERVICE QUALITY

- Reduction of refrigerant gas leakage and enhancement in serviceability by incorporating condenser and receiver
- Clean air filter is installed to the backside of glove box to facilitate the filter replacement.

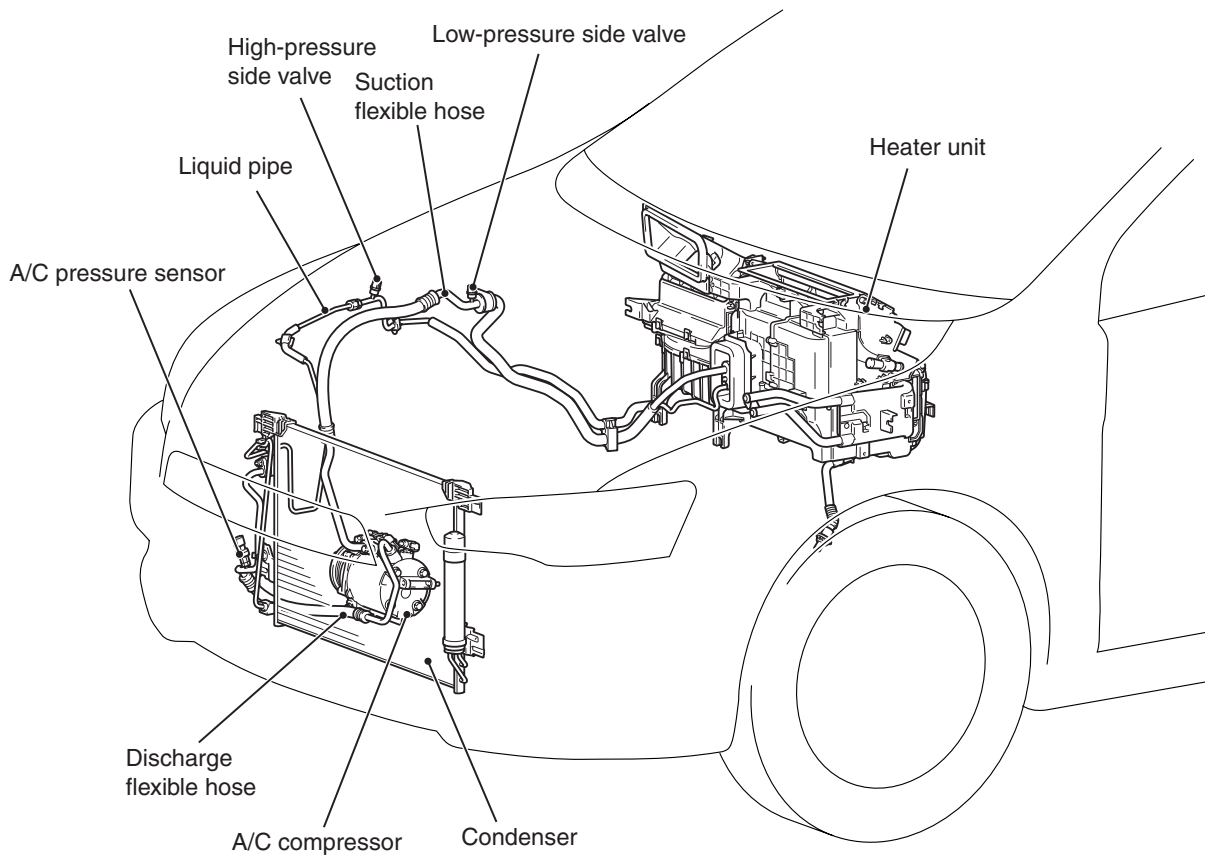
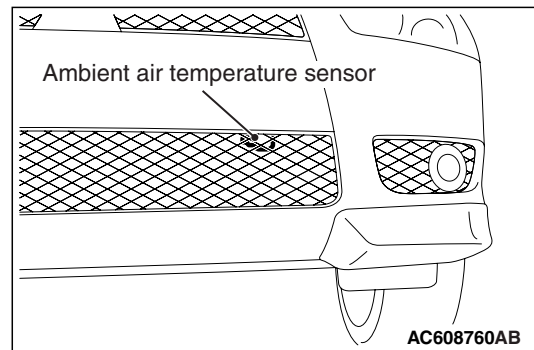
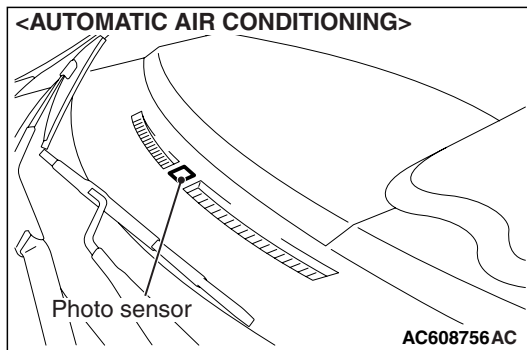
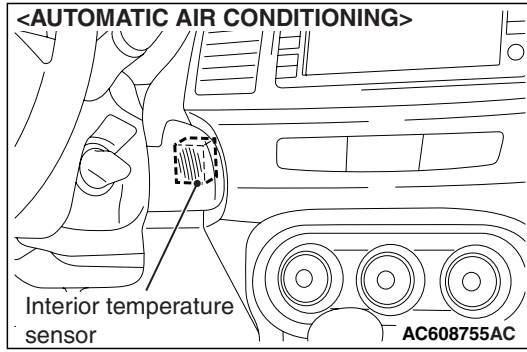
#### ENHANCEMENTS IN RESPONSIBILITY

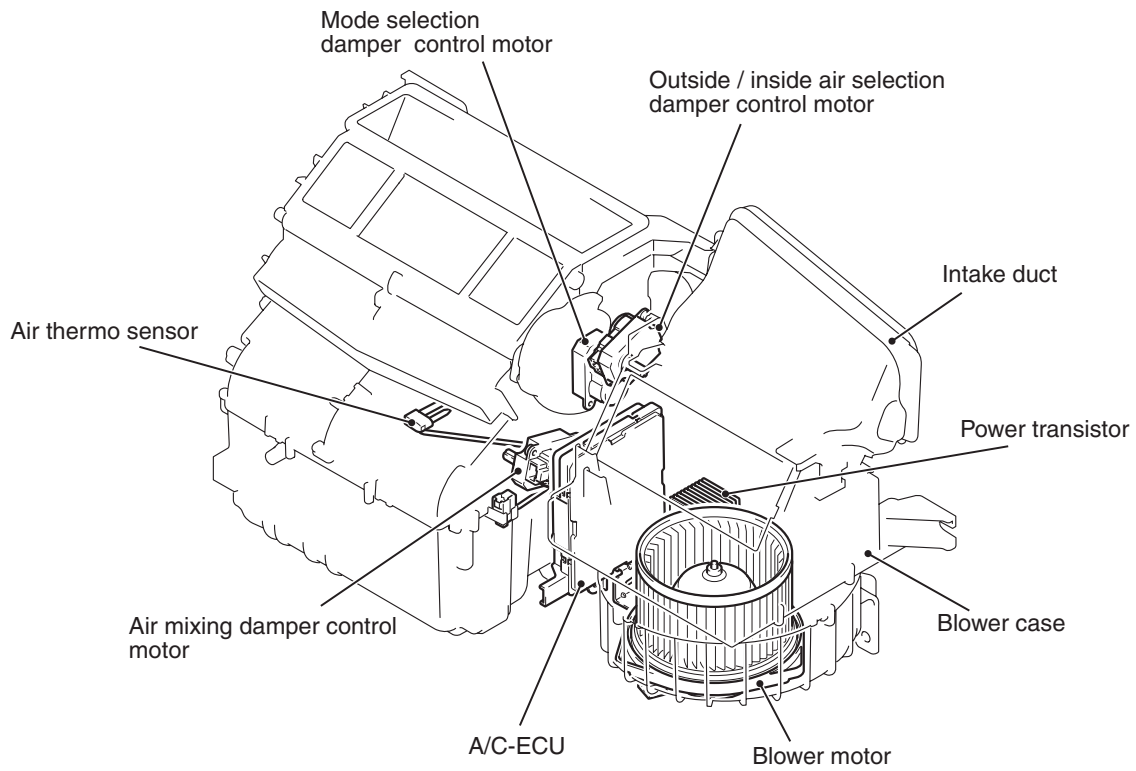
Reliable information transmission is achieved by connecting A/C-ECU and each ECU via CAN communication.

### SPECIFICATIONS

ITEM		SPECIFICATION
Air conditioning switch type		Rotary type
Compressor type		MSC90CAS
Cooling output		5.5 kw
Heating output		5.7 kw
Refrigerant	Type	R134a (HFC-134a)
	Charge quantity g (oz.)	480 - 520 (16.9 - 18.3)

CONSTRUCTION DIAGRAM



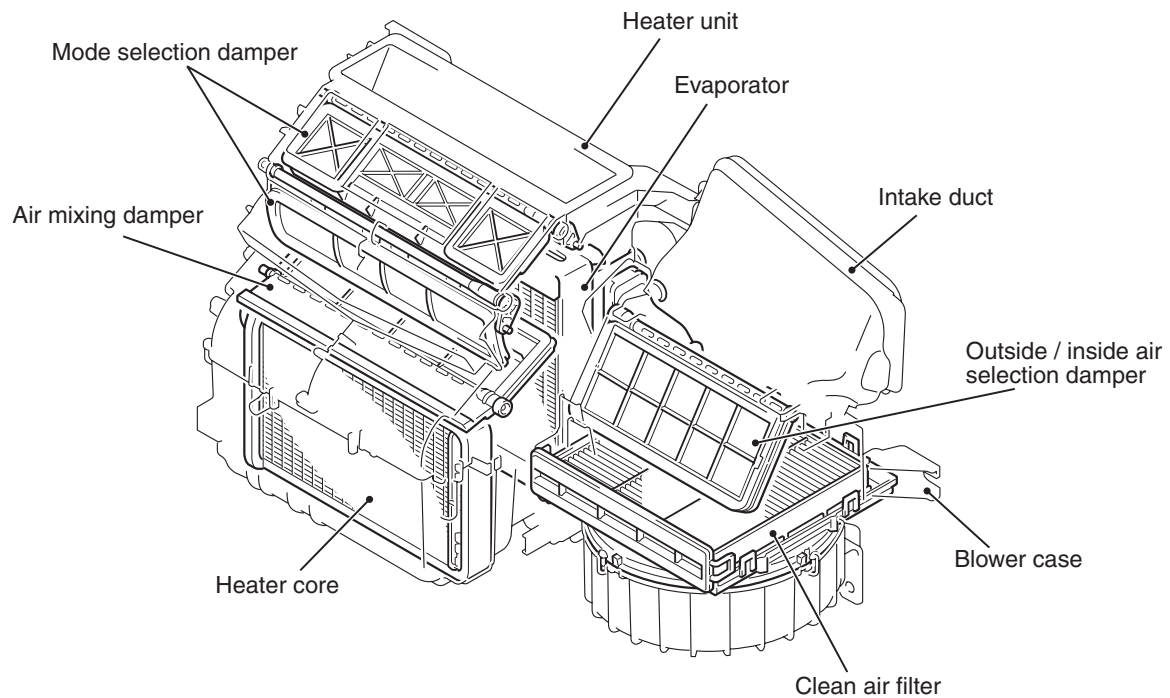


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## HEATER AND AIR CONDITIONING SYSTEM

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### HEATER UNIT ASSEMBLY



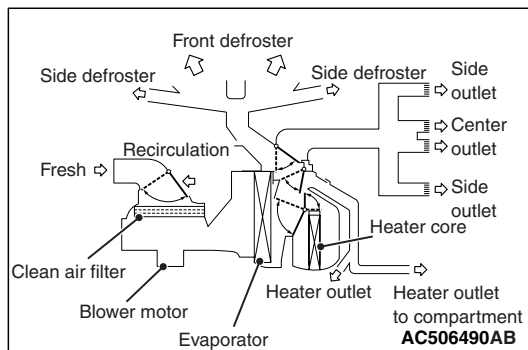
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The following new unit integrated blower, heater and evaporator to increase the air flow, reduce noise, and enhanced cooler and heater performance;:

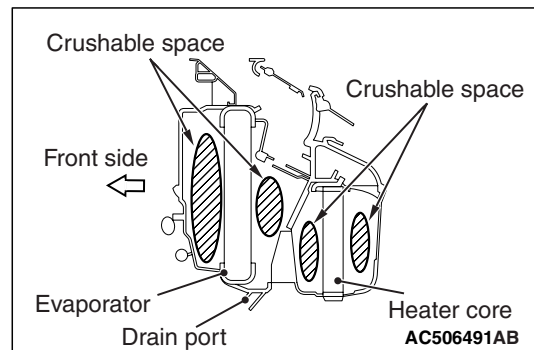
- Integrated heater/cooling unit has been adopted for large air flows and low noise.
- Crushable space has been secured to reduce the risk of passenger injuries.
- Air mix damper that is also used as a reheating prevention damper has been adopted to enhance the air cooling performance.
- The A/C condensate water outlet (drain port) has been installed to behind the evaporator to restrain the clogging of drain by foreign materials.
- The outlet air temperature of the defroster has been set lower than that of foot to prevent overheating the driver's face.

- Fin thermo sensor to directly measure evaporator temperature reduces occurrence risk of an evaporator freeze which will lead to the compressor lock.
- Clean air filter has been introduced as standard to protect the unit from the intrusion of foreign materials (fallen leaves and others). and, it removes the pollen and dust, and enhances the air quality inside the passenger compartment.
- Clean air filter media and cover have been separated to reduce the waste material amount generated during the filter replacement.
- The installation position of clean air filter has been set to the backside of glove box to facilitate the filter replacement operation. And, the one-touch tab structure has been adopted for the cover installation to enable the replacement operation without tools.

## OPERATION



## CRUSHABLE SPACE

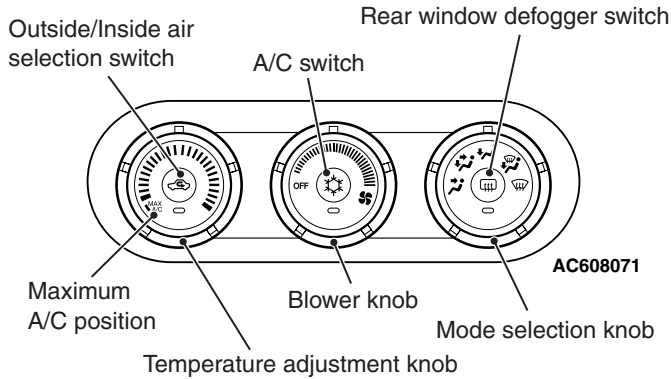


The evaporator and heater core has been longitudinally installed in the vehicle length, and the crushable space has been adopted so that the structure absorbs the impact in case of a collision and reduces the risk of passenger injuries.

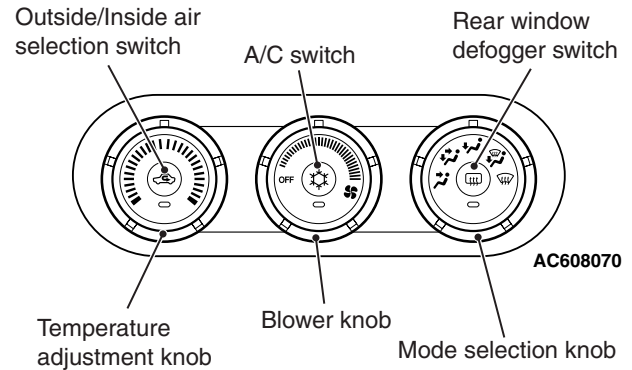
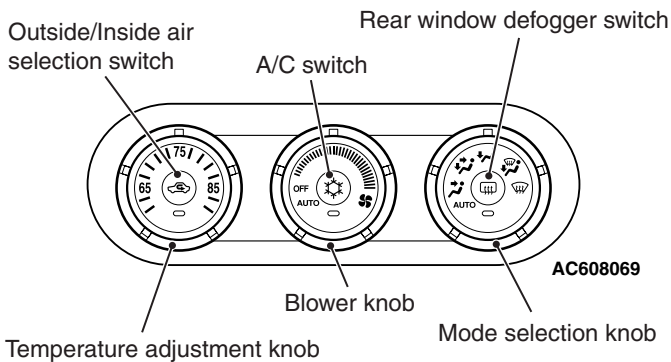
## HEATER CONTROL

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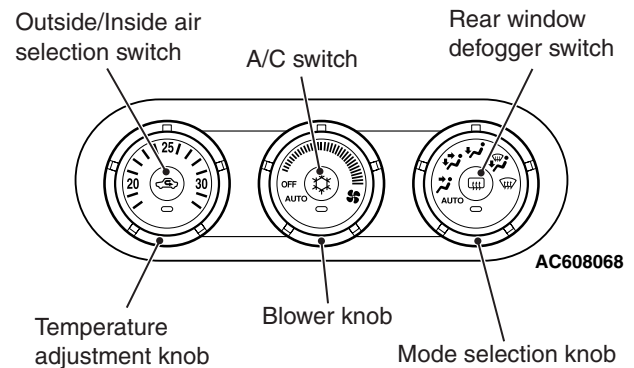
## HEATER CONTROLLER

<MANUAL A/C>  
<Vehicles for USA>

## &lt;Vehicles for CANADA&gt;

<AUTOMATIC A/C>  
<Vehicles for USA>

## &lt;Vehicles for CANADA&gt;



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The features of the heater controller described below have been designed for better appearance, easier operation, and enhanced visibility.

- Each dial for the air outlet switching, fan volume control, and temperature adjustment has been enlarged to enhance operability.
- Ring lights have been adopted to inside the dials to enhance appearance during nighttime. <Vehicles with automatic A/C>
- AUTO and OFF positions of the fan volume control dial have been exchanged with one another. This change prevents the dial to pass the AUTO position when the fan volume control is turned OFF, and eliminates the necessity of manual reselection when switching the inside/outside air selection manually, thus enhancing the operability. <Vehicles with automatic A/C>
- When the air outlet switching dial and fan volume control dial are turned to the AUTO position, the A/C switch has been made to automatically turn ON to enhance convenience. (Using the customize function, this function can be cancelled. Refer to P.55-7.) <Vehicles with automatic A/C>

## A/C-ECU

M2551001200265

### CONTROL

#### FORCED DEF CONTROL

When air outlet position is switched to DEF, A/C is automatically turned ON, and outside/inside air selection damper is set to the fresh air position to quickly defrost the windshield screen.

#### MAX A/C CONTROL <MANUAL A/C>

When the temperature adjustment knob is turned to the maximum A/C position with the blower knob at position other than OFF, the following controls are made by the A/C-ECU.

Subject to control	MAX COOL
Air mix damper	MAX COOL position
Air outlet mode	Selected position
Air volume	Selected position
Outside/inside air selection damper	Air recirculation position*
Air conditioner switch	ON*

*NOTE: "\*" Manual operation is disabled during max A/C control.*

#### MAX COOL, MAX HOT CONTROL <AUTOMATIC A/C>

When the set temperature is at 18.0 °C <61° F> (MAX COOL) or at 32.0 °C <89° F> (MAX HOT) with the air outlet and air volume at the AUTO positions, the following controls are made automatically by the A/C-ECU.

Subject to control	MAX COOL	MAX HOT
Air mix damper	MAX COOL position	MAX HOT position
Air outlet mode	FACE position	FOOT position
Air volume	Maximum	Maximum
Outside/inside air selection damper	Air recirculation position*	Fresh air position*
Air conditioner switch	ON*	OFF*

*NOTE: "\*" indicates that when the automatic control is not cancelled using the customise function, the manual operation is disabled.*

#### REAR WINDOW DEFOGGER TIMER CONTROL

In order to prevent battery consumption, the defogger is automatically turned OFF, 20 minutes after it is turned ON.

#### IDLE-UP CONTROL

A/C-ECU and the engine ECU communicate with each other through the CAN communication. The idle-up speed of the engine is controlled in two steps depending on the A/C load to secure the air cooling performance during summer and to enhance fuel economy in seasons with moderate temperature.

#### DETECTION CONTROL FOR REFRIGERANT LEAKS

A/C-ECU determines if the refrigerant amount is less than specified or refrigerant pressure is abnormal by using the ambient temperature (ambient temperature sensor to measure refrigerant inflation rate) and refrigerant pressure (measured by the A/C pressure sensor). When refrigerant amount or refrigerant pressure is judged abnormal, the compressor is cut-off to protect the A/C system.

*NOTE: When abnormality occurs, the A/C indicator flashes.*

#### PROTECTION CONTROL AT AIR BAG DEPLOYMENT (DURING COLLISION)

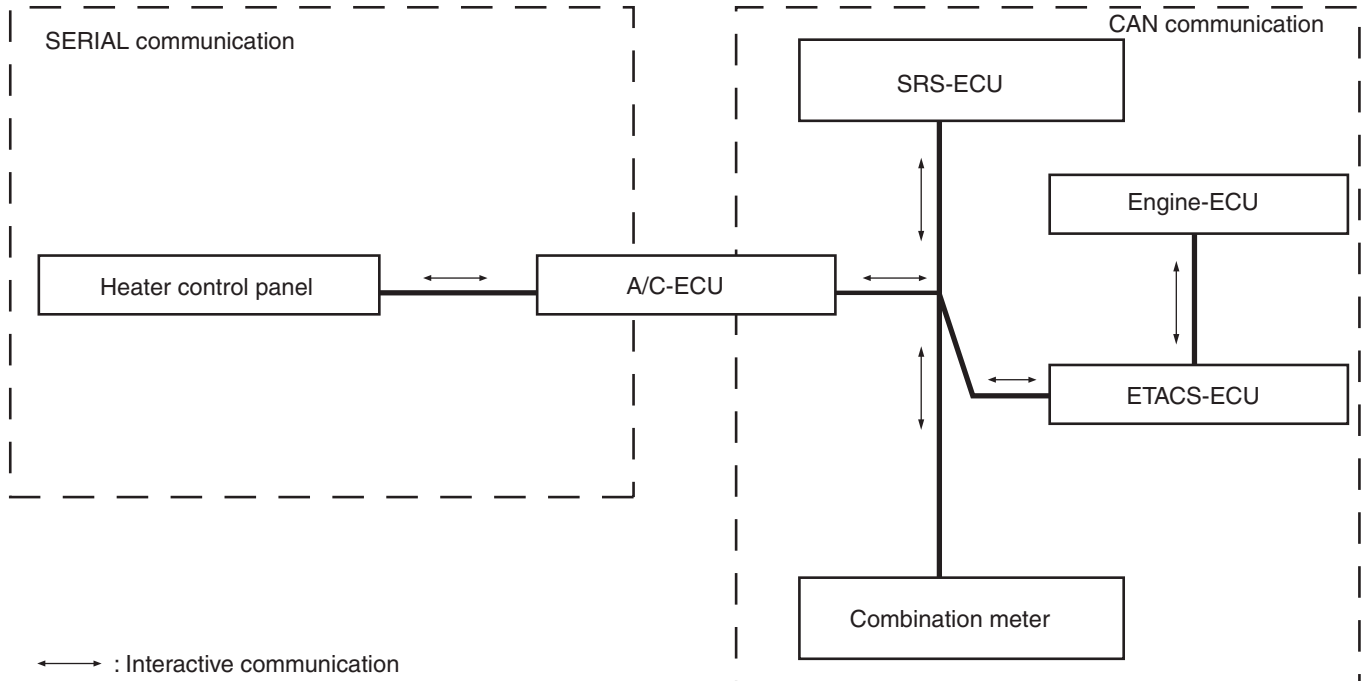
When the air bag deployment is detected, the A/C system is stopped.

#### CUSTOMISE FUNCTION

Depending on the user's preference, the following functions can be selected. The programmed information is held even when the battery is disconnected.

- Automatic control for inside/outside air selection  
Press and hold (approximately for 10 seconds) the inside/outside air selection switch to cancel the automatic control for inside/outside air selection.
- A/C automatic control  
Press and hold (approximately for 10 seconds) the A/C switch to cancel the A/C automatic control.

**COMMUNICATION**



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A/C-ECU performs the signal transmission and reception with each ECU via CAN (Controller Area Network)\*<sup>1</sup>. Also, with the heater control panel, it transmits and receives signals via serial communication.

*NOTE: : For details of CAN communication, refer to GROUP 54C –Controller Area Network P.54C-2.*

**CAN COMMUNICATION INPUT SIGNALS TABLE**

Signal	Transmitter ECU
Engine coolant temperature signal	ENGINE-ECU
Vehicle speed signal	
Engine speed signal	
Ambient temperature signal	ETACS-ECU
Wiper signal	
Ignition key signal	
Average ambient temperature signal	COMBINATION METER

**DIAGNOSTIC FUNCTION**

A/C-ECU has the following functions for easier system checks.

- DIAGNOSTIC FUNCTION

- Service data output
- Actuator test

*NOTE: For each item, refer to the Workshop Manual.*



## A/C COMPRESSOR

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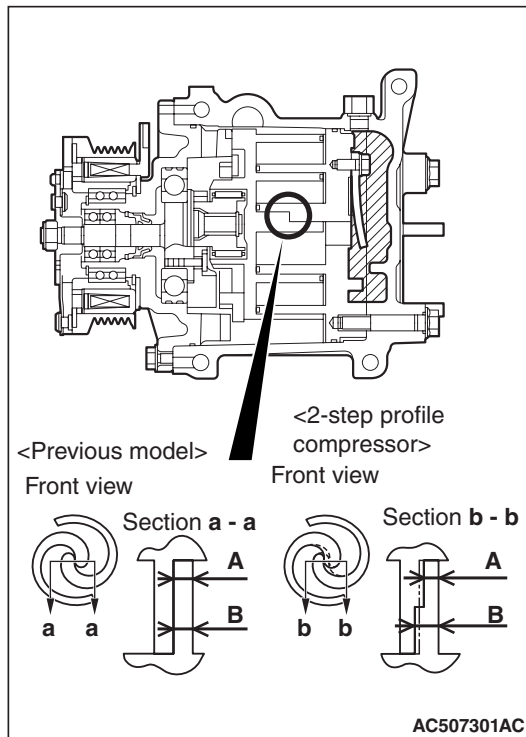
### HIGH EFFICIENCY COMPRESSOR WITH INTEGRATED OIL SEPARATOR

High efficiency compressor with integrated oil separator has been adopted to enhance fuel economy by reducing the A/C operating rate.

### MAGNETIC CLUTCH WITH THERMAL FUSE

At the compressor lock, the thermal fuse integrated in the magnet clutch is blown due to the frictional heat against the compressor in order to reduce risk of the drive belt breakage. The thermal fuse, together with the coil, is coated with resin to enhance resistance to corrosion.

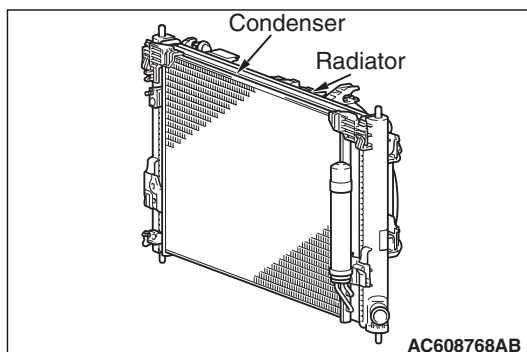
### 2-STEP PROFILE COMPRESSOR



The centre area of the scroll in the compressor provides 2-step profile, and thickness of area "B" shown in the figure has been increased to enhance strength. With this feature, thickness of area "A" shown where lesser load is applied is reduced, thus compressor performance is enhanced by compressing refrigerant even in central area, comparing to the previous model.

## CONDENSER

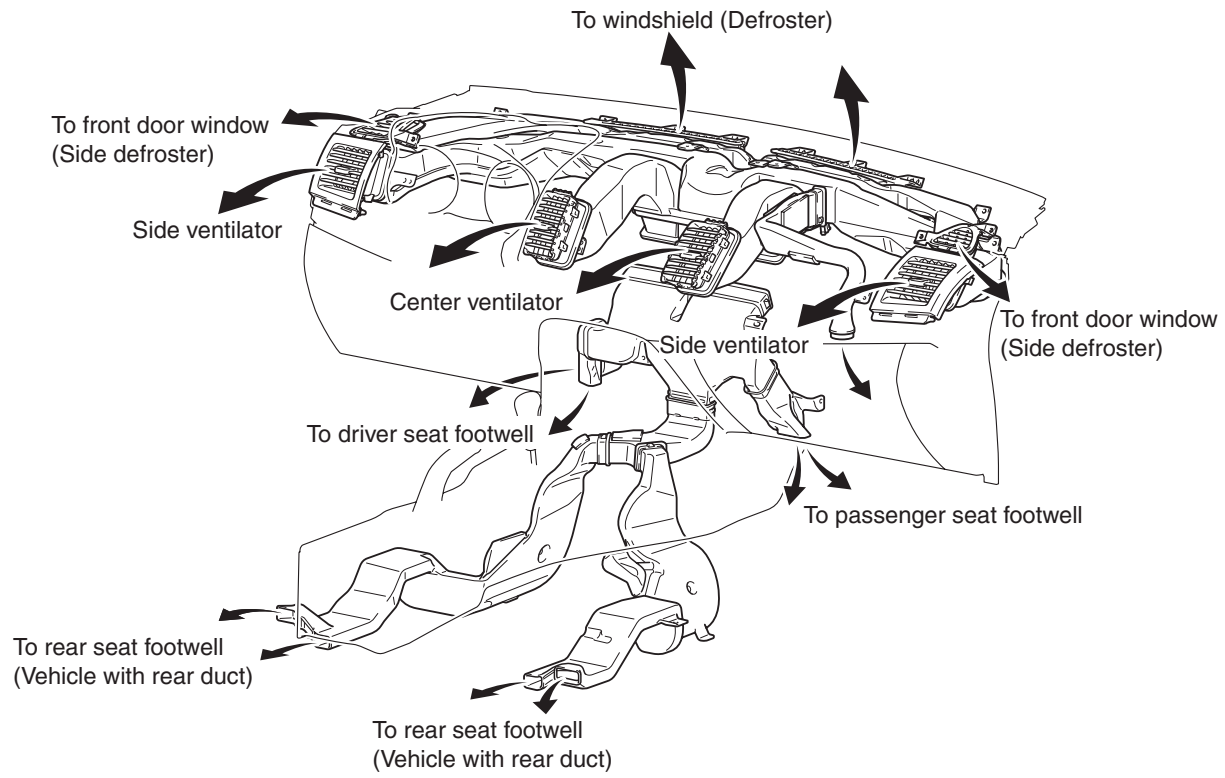
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The condenser has been integrated with the radiator (cooling module) to optimise ventilation and reduce weight.

## DUCT

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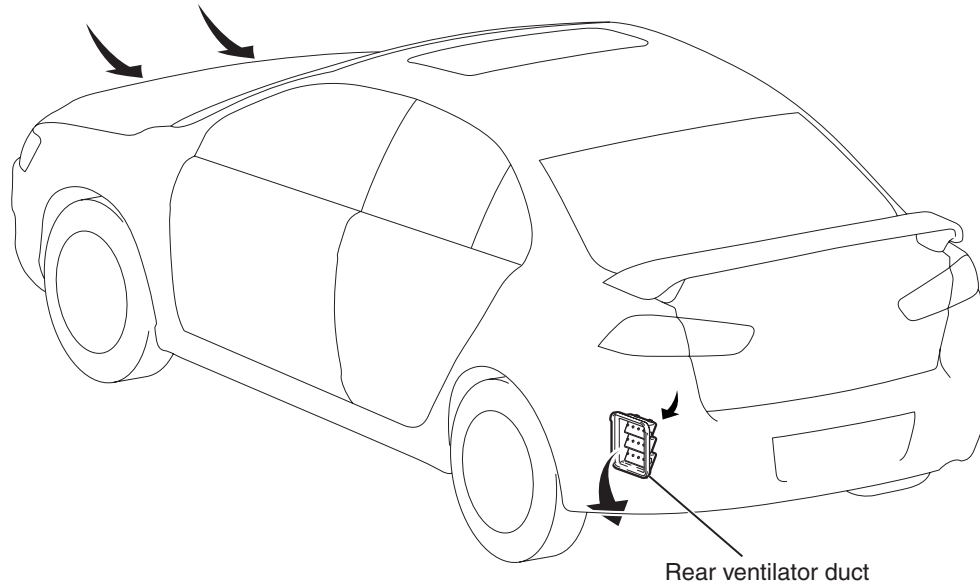


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The rear heater duct has been introduced, and the air distribution ratio to front and rear seats has been optimised in order to enhance the air heating performance for the rear seats, and to prevent the circulation of cooled air back to the front seats. <Vehicles with rear duct>

## VENTILATION SYSTEM

M2551002000554



Rear ventilator duct

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Fresh air is sucked from the front deck and exhausted through the air outlet behind the rear bumper. Optimizing areas of the outside air induction hole and the air outlet enhances ventilated air amount, reducing noise.

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## NOTES