■SYSTEM CONTROL

1. General

The air conditioning system has following controls.

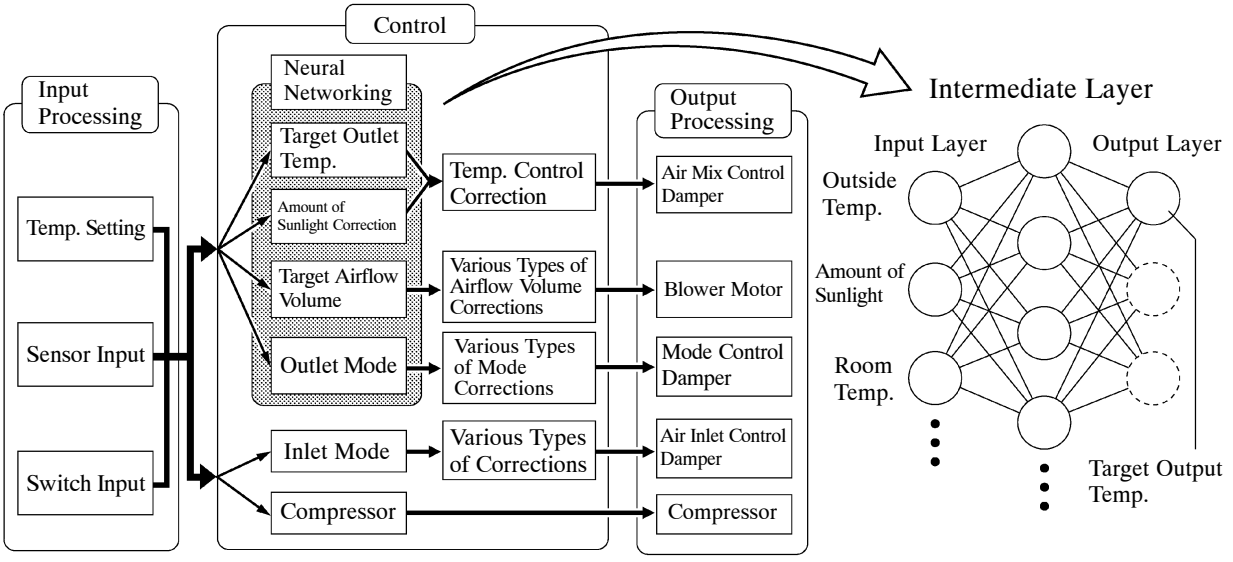
Control		Outline
Neural Network Control [See page BE-93]		This control is capable of effecting complex control by artificially simulating the information processing method of the nervous system of living organisms in order to establish a complex input/output relationship that is similar to a human brain.
Automatic Recirculation Control [See page BE-94]		Automatically changes the air inlet mode to the fresh air or recirculation air mode according to the level of harmful elements in the outside air, cabin temperature, and outside temperature.
Micro Dust and Pollen Filter Control [See page BE-95]		Activated by the micro dust and pollen filter switch operation. Switches the air vent to the FACE mode. Sends air which has passed through the clean air filter to the area around the upper part of the bodies of the driver and front passenger. This air is filtered by the clean air filter in order to remove pollen.
Outlet Air Temperature Control		Based on the temperature setting at the temperature control switch, the neural network control calculates the outlet air temperature based on the input signals from various sensors.
		The temperature setting for the driver and front passenger is controlled independently in order to provide a separate vehicle interior temperature for the right and left side of the vehicle. Thus, air conditioning that accommodates the occupants' preferences has been realized.
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 air outlets in accordance with the outlet mode that has been calculated by the neural network control based on the input signals from various sensors.
		In accordance with the engine coolant temperature, outside air temperature, amount of sunlight, required blower, outlet temperature, and vehicle speed conditions, this control automatically switches the blower outlet to the FOOT/DEF mode to prevent the window from becoming fogged when the outside air temperature is low.
Air Inlet Control		Automatically controls the air inlet control damper to achieve the calculated outlet air temperature that is required.
		Drives the servomotor (for air inlet) according to the operation of the air inlet control switch and moves the dampers to the FRESH or RECIRC position.
Electric Inverter Compressor Control [See page BE-96]	Compressor Speed Control	The A/C ECU calculates the target speed of the compressor based on the target evaporator temperature (which is calculated by the room temperature sensor, humidity sensor, ambient temperature sensor, and solar sensor) and the actual evaporator temperature that is detected by the evaporator temperature sensor in order to control the compressor speed.
		The A/C ECU calculates the target evaporator temperature, which includes corrections based on the vehicle interior humidity (which is obtained from the humidity sensor) and the windshield glass inner surface humidity (which is calculated from the humidity sensor, solar sensor, room temperature sensor, mode damper position, and wiper operation condition). Accordingly, the A/C ECU controls the compressor speed to an extent that would not inhibit the proper cooling performance or defogging performance.

(Continued)

Control	Outline
Electric Water Pump Control	When the blower motor is ON and the engine has been stopped by the hybrid control, the A/C ECU turns ON the electric water pump in accordance with the judgment of the air mix damper opening.
Rear Window Defogger Control	Switches the rear defogger and outside rear view mirror heaters ON for 15 minutes when the rear defogger button is pressed. Switches them OFF if the button is pressed while they are operating.
Ambient Temperature Indication Control	Based on the signals from the ambient temperature sensor, this control calculates the outside temperature, this value is then corrected in A/C ECU, and shown on the multi-information display.
Self-diagnosis	A DTC (Diagnostic Trouble Code) is stored in the memory when the A/C ECU detects a problem with the air conditioning system.

2. Neural Network Control

- In previous automatic air conditioning systems, the A/C 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 senses 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, or 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 A/C ECU. The A/C ECU can then effect 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, the A/C ECU controls the servomotors and blower motor in accordance with the control volumes that have been calculated by the neural network control.



: Neural Network Operation Range

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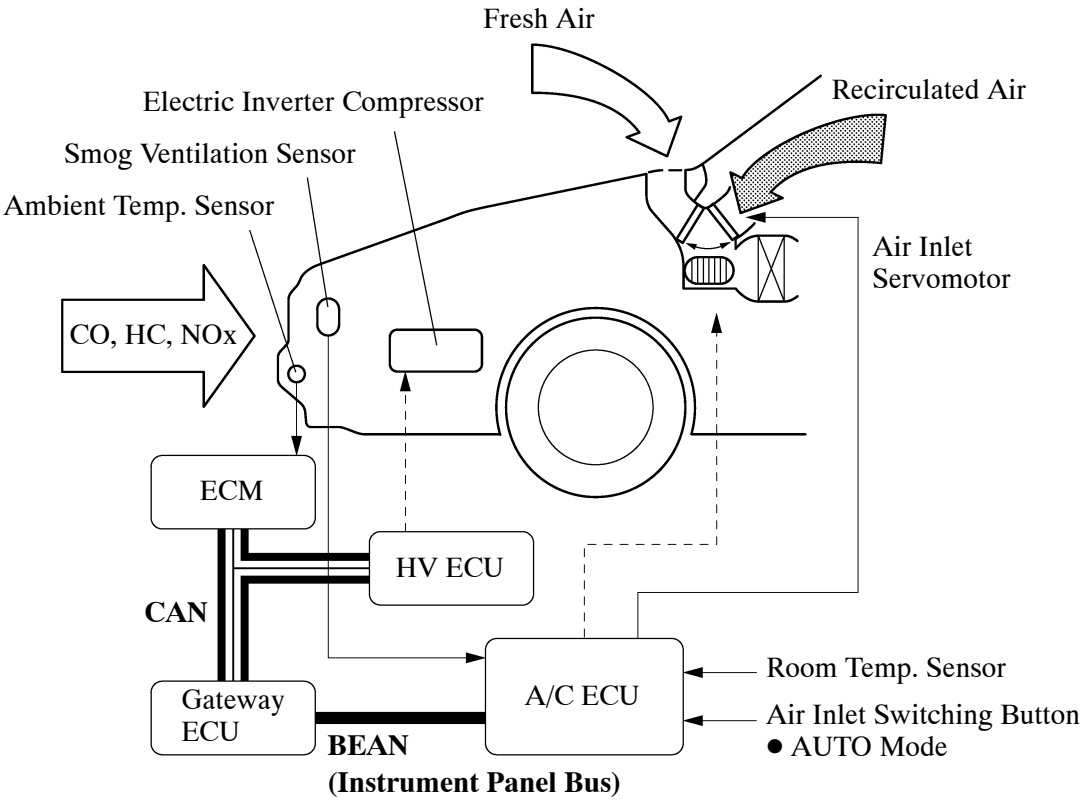
3. Automatic Recirculation Control

When the automatic recirculation control is operating, the A/C ECU automatically changes the air inlet mode to the fresh air or recirculate air mode based on signals from the smog ventilation, ambient temperature, and room temperature sensors when the AUTO air inlet mode is selected.

- The A/C ECU detects harmful elements (CO, HC, and NOx) based on smog ventilation sensor signals and automatically switches the air inlet mode to the recirculate air mode to prevent such harmful elements from entering the cabin.
- The A/C ECU detects room temperature based on a room temperature sensor signal and automatically switches the air inlet mode to the recirculate air mode to prevent the room temperature from becoming too high.
- The A/C ECU detects the outside temperature based on an ambient temperature sensor signal and automatically switches the air inlet mode to the fresh air mode to prevent the windshield from fogging up.



NOTE:

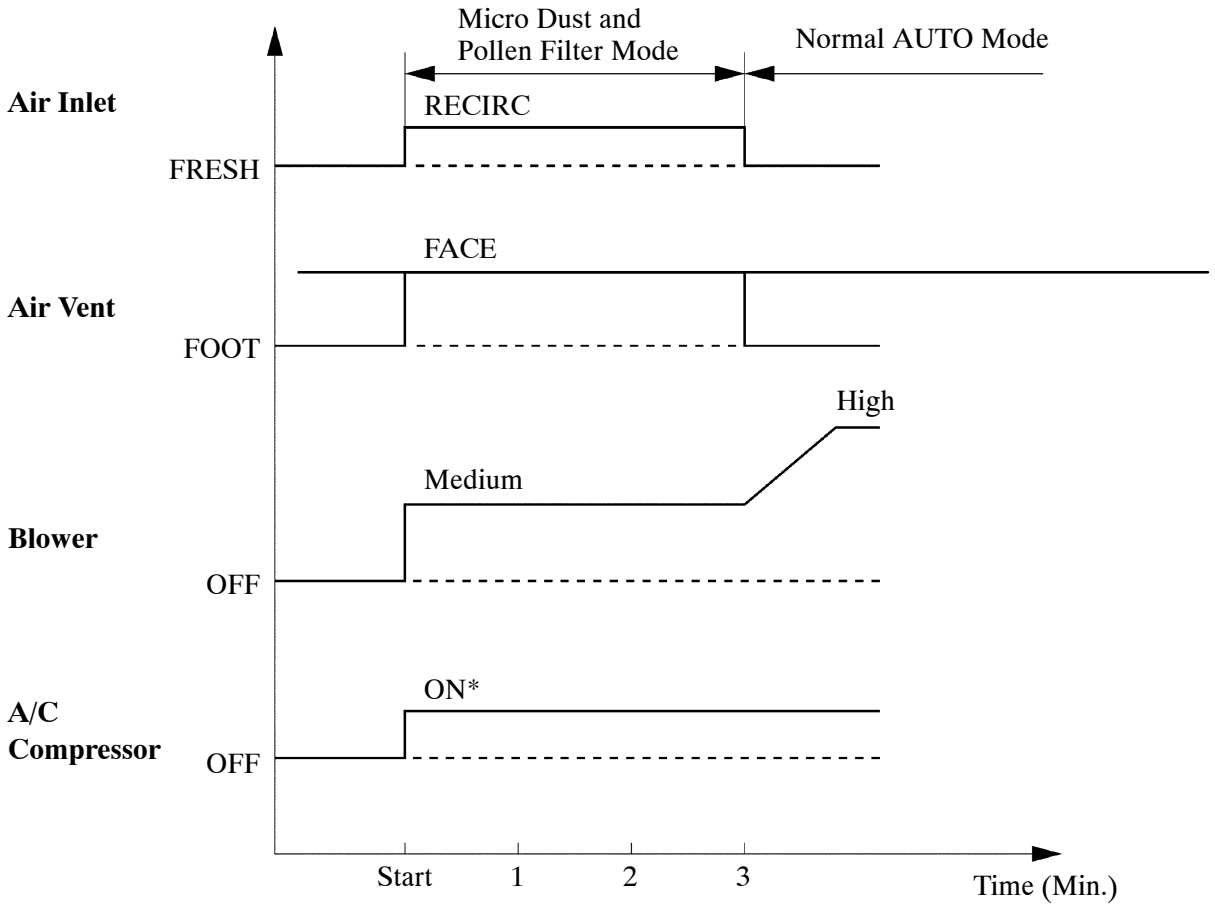
The smog ventilation sensor cannot detect elements such as the smoke from a bonfire or factory exhaust, foul or animal odors, and dirt or dust particles. Therefore, the air inlet modes are not switched in accordance with those elements.
Depending on the direction of the wind, the smog ventilation sensor might not be able to detect the undesirable elements, allowing the odor to enter the cabin.

4. Micro Dust and Pollen Filter Control

When the micro dust and pollen filter switch is pressed, the micro dust and pollen filter control is activated. Then, the air vent is switched to the FACE mode and recirculated pollen-free air flows in the area around the upper part of the bodies of the driver and front passenger.

- When the micro dust and pollen filter switch signal is input to the A/C ECU, the A/C ECU controls the A/C compressor, air inlet servomotor, air vent servomotor and blower motor as shown in the timing chart below.
- This control usually operates for approximately 3 minutes. However, when the outside temperature is low (5°C maximum), it will operate for approximately 1 minute.
- After this control stops operating, the A/C ECU controls the air conditioning system using the AUTO mode.

▶ Sample Timing Chart ◀



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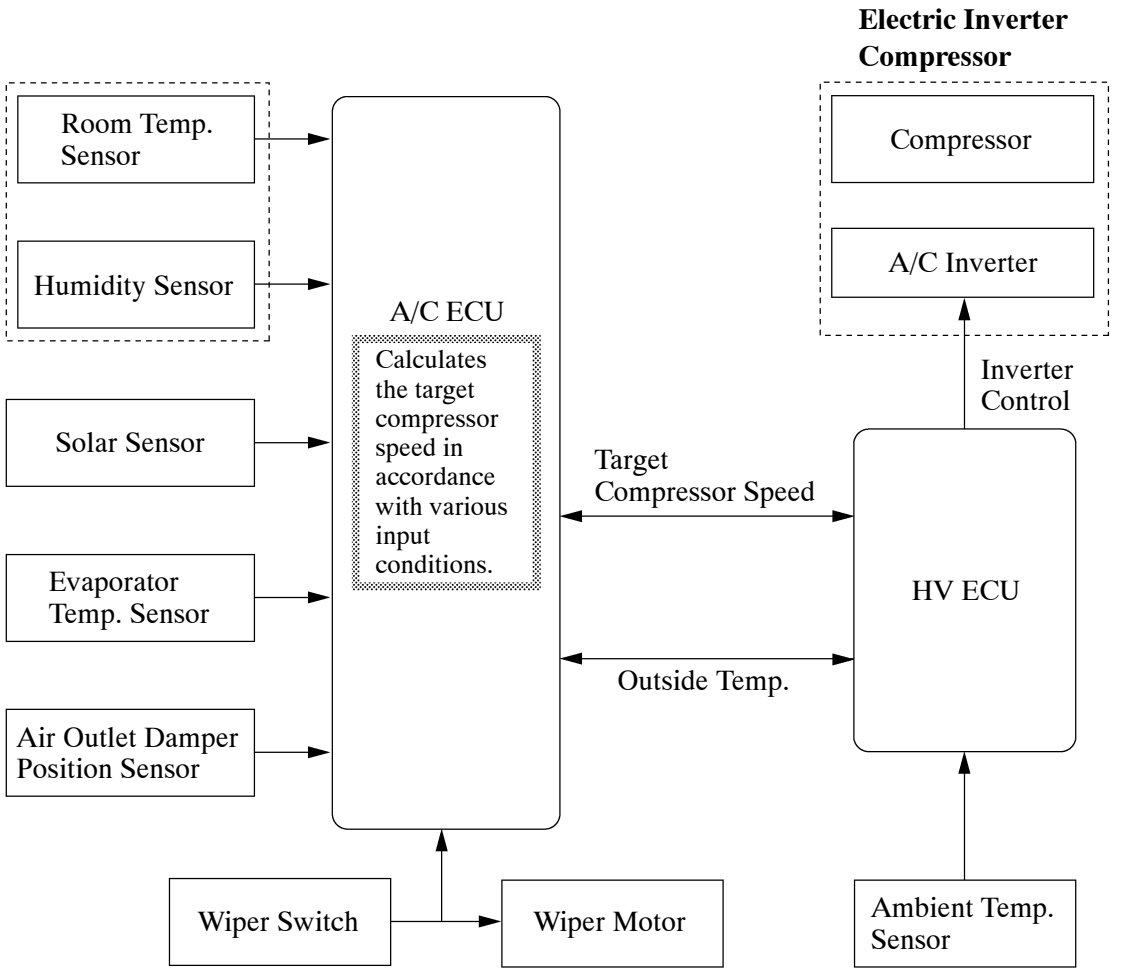
*: The A/C compressor turns ON only when the outside temperature is low.
The A/C compressor remains ON after the micro dust and pollen filter mode has been cancelled.

5. Electric Inverter Compressor Control

Compressor Speed Control

- The A/C ECU calculates the target compressor speed based on the target evaporator temperature (calculated from the room temperature sensor, humidity sensor, ambient temperature sensor, and solar sensor) and the actual evaporator temperature detected by the evaporator temperature sensor. Then, the A/C ECU transmits the target speed to the HV ECU. The HV ECU controls the A/C inverter based on the target speed data in order to control the compressor to a speed that suits the operating condition of the air conditioning system.
- The A/C ECU calculates the target evaporator temperature, which includes corrections based on the vehicle interior humidity (which is obtained from the humidity sensor) and the windshield glass inner surface humidity (which is calculated from the humidity sensor, solar sensor, room temperature sensor, mode damper position, and wiper operation condition). Accordingly, the A/C ECU controls the compressor speed to an extent that does not inhibit the proper cooling performance or defogging performance. As a result, comfort and low fuel consumption can be realized.



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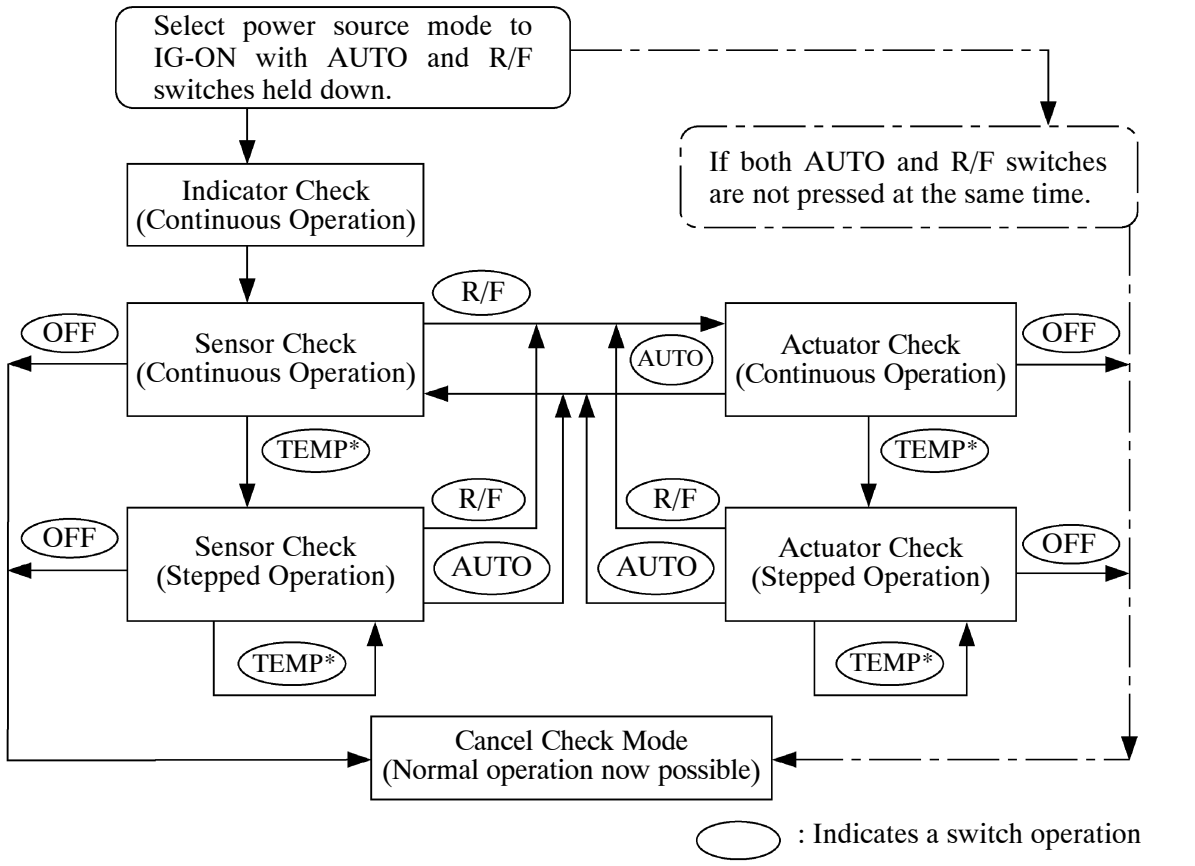
6. Self-diagnosis

- The A/C ECU has a self-diagnosis function. It stores any operation failures in the air conditioning system memory in the form of a malfunction code. By operating the air conditioning control switches, the stored malfunction codes are displayed on the multi display. Since diagnostic results are stored directly by electric power from the battery, they are not cleared even when the power source mode is selected to OFF.

▶ Functions ◀

Function	Outline
Indicator Check	Checks mode and temperature setting display.
Sensor Check	Checks the past and present malfunctions of the sensors, and clearing the past malfunction data.
Actuator Check	Checks against actuator check pattern if blower motor, servomotors and magnetic clutch are operating correctly according to signals from ECU.

- The check function can be started by the following procedure shown below.



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*: Driver side TEMP UP switch

- For details on the indicator check, sensor check, actuator check function, and clearing DTC of this system, refer to the 2007 LEXUS GS450h Repair Manual (Pub. No. RM02D0U).