

Control list

Control	Contents
Pre-Crash Seat Belt	If the Pre-Crash ECU determines that a collision is unavoidable, the motor retracts the belt to enhance the effectiveness of the pretensioner.
Pre-Crash Brake Assist Control	If the Pre-Crash ECU determines that a collision is unavoidable, this control provides assist by increasing the brake hydraulic pressure, thus enhancing the effectiveness of braking when the driver presses on the brake pedal.
AVS Control	If the Pre-Crash ECU determines that a collision is unavoidable, it sets the suspension shock absorbers to an appropriate amount of damping to suppress the nose dive that occurs during braking.

Millimeter Wave

- The millimeter waves occupy an extremely high frequency band of 30 to 300 GHz. Their wavelengths in a vacuum are extremely short, between 1 to 10mm. The millimeter waves are less likely to be affected by conditions such as rain, fog, or snow, and are able to exhibit superior performance to recognize objects. The pre-crash safety system uses a radar in the 76 GHz band.

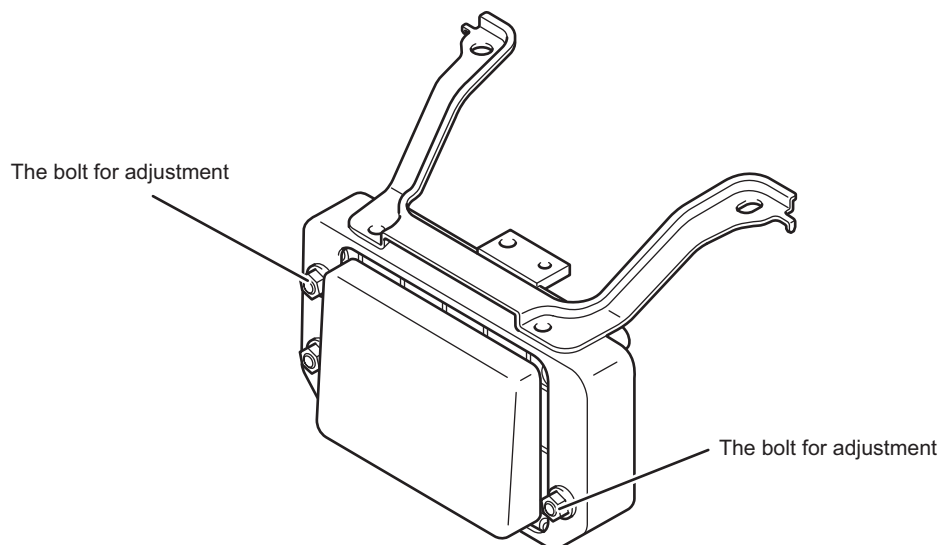
200kHz~	2MHz~	25MHz~	300MHz~	2GHz~	30GHz~
Long Wave	Medium Wave	Short Wave	Very High Frequency Wave	Ultra high Frequency Wave	Microwave
	AM Radio 1 MHz		FM Radio 80 MHz	Cellular Telephone 800 MHz	Millimeter Wave Radar Sensor 76 GHz

Main Wave Types and Frequencies

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Millimeter Wave Radar Sensor

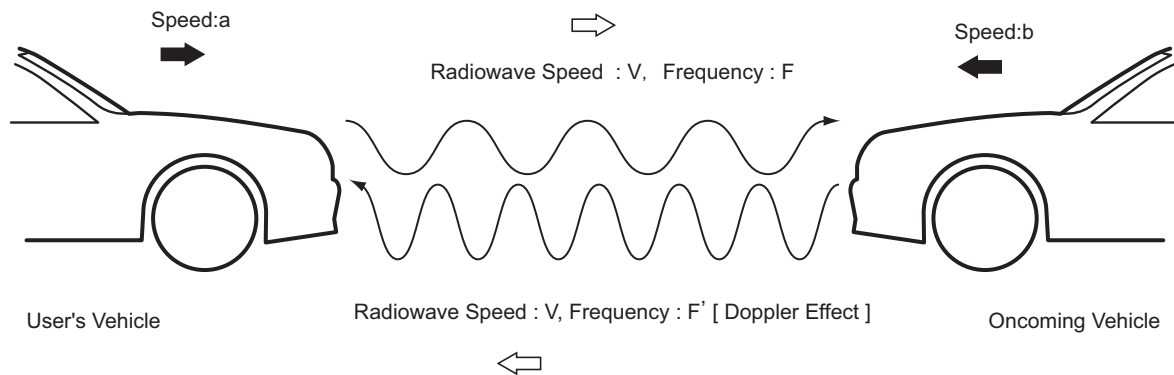
- The millimeter wave radar sensor is installed behind the front grille.
- To adjust the millimeter wave radar sensor, do so carefully using an Intelligent tester II and a level.



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Detection Method for Relative Distance and Relative Speed

- If an object is present within range of the millimeter wave radar sensor, the radar detects the distance to the object, the relative speed, and the direction based on the reflected waves. Based on these pieces of data, the Pre-Crash ECU determines whether a collision is unavoidable.
- The radar uses the angle of the reflected waves to detect the direction to the object, the length of time that elapses after the radiowaves are emitted and the reflected waves return to detect the distance, and the changes in the frequency (the Doppler effect) of the reflected waves to detect the speed of the object.
- Along a curve, the system estimates the radius of the curve based on data provided by the yaw rate sensor and the steering angle sensor, and makes appropriate corrections to the course of travel.

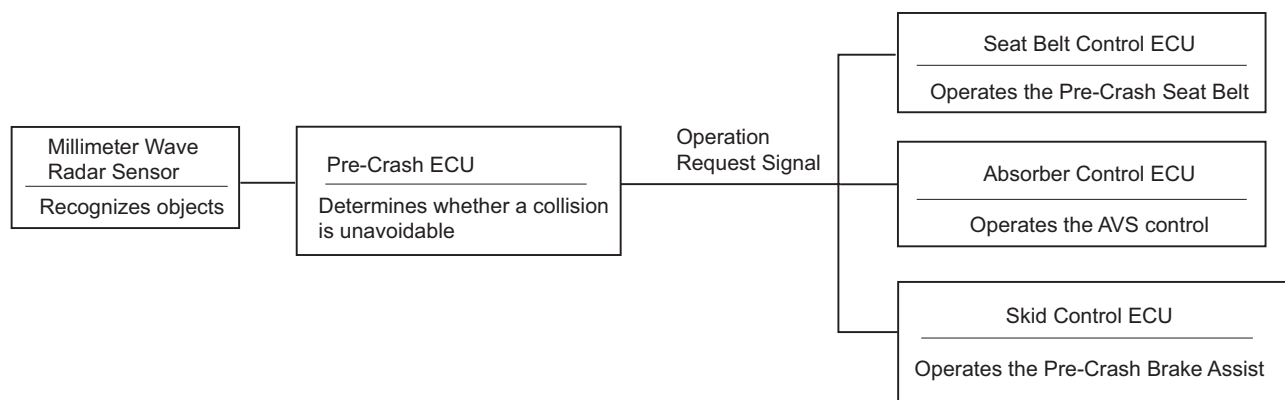


Doppler Effect Determines the speed (b) of the oncoming vehicle by applying $F' = V + b / V - a \times F$

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Pre-Crash ECU

- This ECU recognizes an obstacle through the millimeter wave radar sensor, determines whether a collision is unavoidable, and sends an action request signal to the ECUs.



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