■CONSTRUCTION AND OPERATION

1. Ultrasonic Sensor

Each ultrasonic sensor transmits ultrasonic waves, receives the reflected waves from an obstacle, and transmits a signal to the Clearance Sonar ECU regarding the distance to the obstacle.

- The frequency used by the sensors varies as shown below, depending on the installation position of the ultrasonic sensors.

Sensor	Frequency
Front & Rear Corner	45.7 kHz
Back	58.8 kHz

2. Buzzer

Depending on the detection distance and the detection area, the sound pattern of the buzzer will vary.

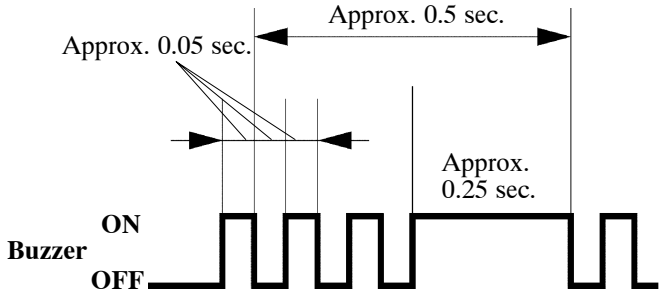
Detection Area	Detection Distance mm (in.)		Buzzer ON/OFF Time (msec.)	
			ON	OFF
Front Corner	Long	600 ± 60 to 400 ± 40 (23.6 ± 2.4 to 15.7 ± 1.6)	150 ± 15	150 ± 15
	Middle	400 ± 40 to 250 ± 30 (15.7 ± 1.6 to 9.8 ± 1.1)	75 ± 7.5	75 ± 7.5
	Short	250 ± 30 or less (9.8 ± 1.1 or less)	Continuous Sound	0
Rear Corner	Long	850 ± 90 to 520 ± 50 (33.5 ± 3.4 to 20.5 ± 2.1)	150 ± 15	150 ± 15
	Middle	520 ± 50 to 400 ± 40 (20.5 ± 2.1 to 15.7 ± 1.6)	75 ± 7.5	75 ± 7.5
	Short	400 ± 40 or less (15.7 ± 1.6 or less)	Continuous Sound	0
Back	Long	1800 ± 180 to 1150 ± 120 (70.9 ± 7.1 to 45.7 ± 4.6)	150 ± 15	150 ± 15
	Middle	1150 ± 120 to 850 ± 90 (45.7 ± 4.6 to 33.5 ± 3.4)	75 ± 7.5	75 ± 7.5
	Short	850 ± 90 or less (33.5 ± 3.4 or less)	Continuous Sound	0

- If two or more ultrasonic sensors detect obstacles, the ultrasonic sensor with the shortest detection distance to its obstacle will be alarmed by buzzer sounds. If the distances are the same, display priority is as follows: 1) back, 2) rear corner, 3) front corner.
- When the front corner, rear corner, and back sensors detect obstacles at the same time, the buzzer sounds as follows:

ON/OFF Time (msec.)

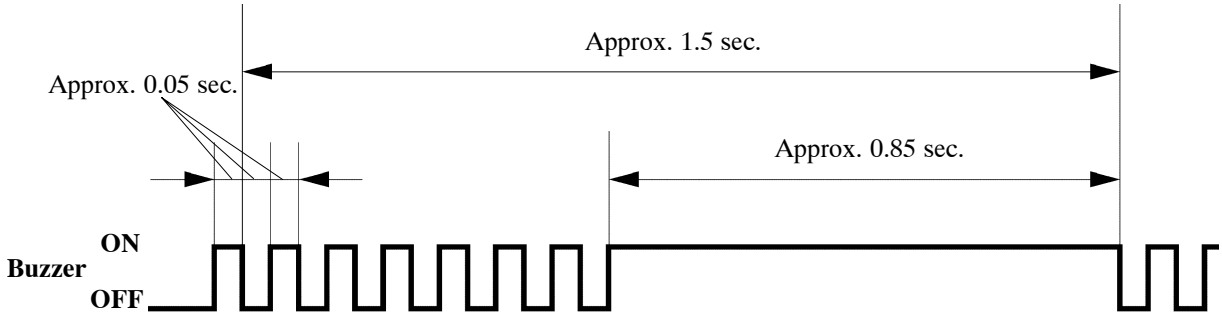
Rear \ Front	Short	Middle	Long	Not detected
Short	Timing 1	Timing 2	Timing 2	Continuous Sound/0
Middle	Timing 2	75/75	75/75	75/75
Long	Timing 2	75/75	150/150	150/150
Not detected	Continuous Sound/0	75/75	150/150	None

▶ Timing 1 ◀



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▶ Timing 2 ◀

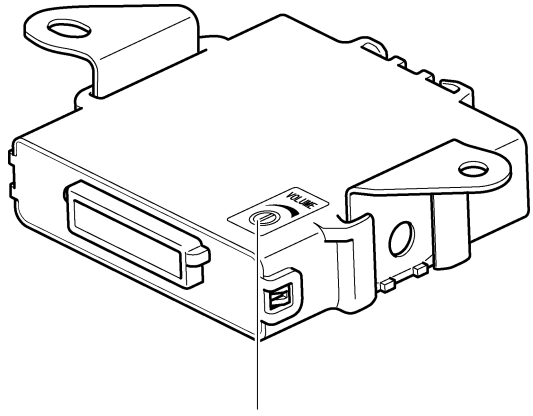


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3. Clearance Sonar ECU

- The Clearance Sonar ECU effects overall control of the system, including the switching of the transmitting and reception of the ultrasonic sensor signals, processing the received wave signals, determining the presence of obstacles, actuating the buzzer, and determining the presence of a malfunction in the sensors.
- The sound volume of the buzzer in the accessory meter can be adjusted at the Clearance Sonar ECU.



Buzzer Sound Volume

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■ DIAGNOSIS

If the Clearance Sonar ECU detects a malfunction in an ultrasonic sensor, the ECU blinks the indicator light in the accessory meter 5 times and also sounds the buzzer 5 times to inform the driver of the malfunction.