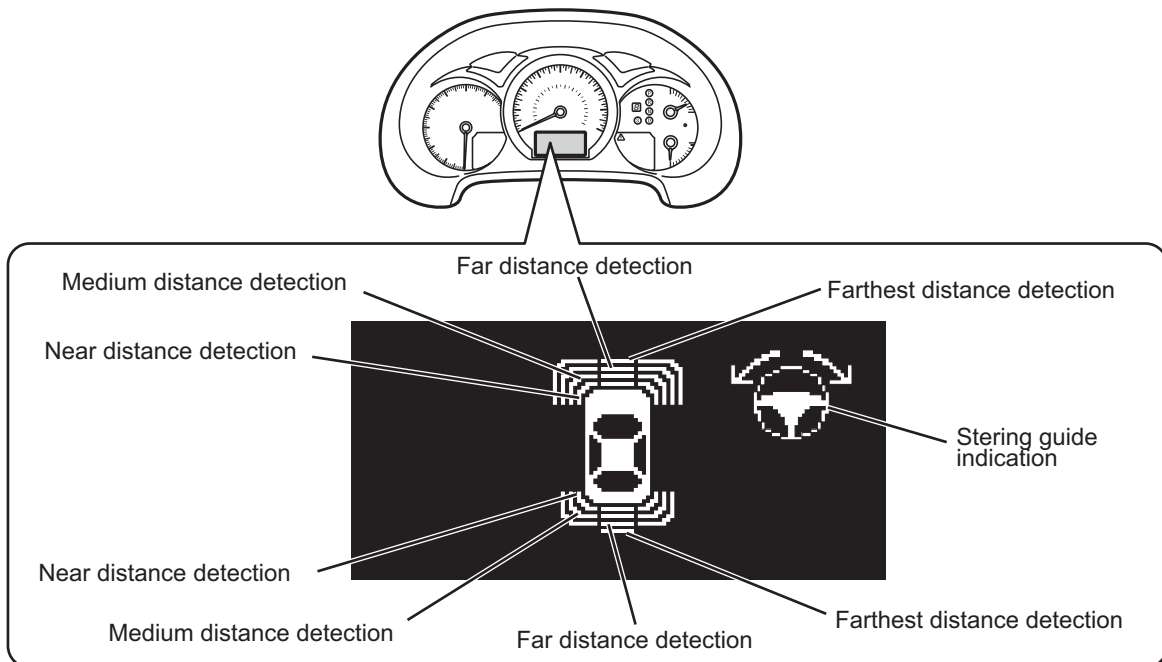


Display & Function

- When a sensor detects an obstacle, the display panels (the multi-information display and the screen) will graphically display the area of the sensor that detected the obstacle and the approximate distance to the obstacle.
- The clearance warning buzzer sounds in accordance with the indication of the obstacle detection. The buzzer sounds intermittently or continuously depending on the approximate distance from the individual sensor to the obstacle.
- Whether to show a graphic display or the buzzer sound volume can be adjusted through the customizable function. In addition, adjustments can be made by operating the EMV(Electro Multi Vision) information screen.

Indication of Multi-information Display

- If the rear corner sensor (rear corner sonar) detects an obstacle, the display will indicate the detection distances in three stages: far distance detection (approximately 50cm{19.7in.} to 37.5cm{14.8in.}), medium distance detection (approximately 37.5cm{14.8in.} to 25cm{9.8in.}), and near distance detection (approximately 25cm{9.8in.} or less).
- If the front sensors (dual sonars) detect an obstacle, the display will indicate the detection distances in four stages: farthest distance detection (approximately 100cm{39.4in.} to 50cm{19.7in.}), far distance detection (approximately 50cm{19.7in.} to 37.5cm{14.8in.}), medium distance detection (approximately 37.5cm{14.8in.} to 25cm{9.8in.}), and near distance detection (approximately 25cm{9.8in.} or less).
- If the back sensor (back sonar) detects an obstacle, the display will indicate the detection distances in three stages: farthest distance detection (approximately 150cm{59.1in.} to 60cm{23.6in.}), far distance detection (approximately 60cm{23.6in.} to 45cm{17.7in.}), medium distance detection (approximately 45cm{17.7in.} to 35cm{13.8in.}), and near distance detection (approximately 35cm{13.8in.} or less).
- The indicator light will flash during a near distance detection and illuminate during a detection of other distances. During an avoidance judgment of the dual sonars, the display will simultaneously indicate steering advice, in order to urge the driver to avoid the obstacle by turning the steering.
- When the system detects a sensor failure, it will show a warning in the detected distance display area.



* This illustration is a typical example.

Indication of the Multi Display

- In addition to the combination meter, the distance detected by the sensor is shown on the screen (7-inch color liquid crystal wide display). There are two ways in which a detection is displayed on the screen: displayed in combination with the video image captured by the back monitor camera, and a full-screen display. When the back guide monitor is used, the display will appear in the upper right area of the back guide monitor screen. The full screen is used for display at other times.
- When an obstacle or a failure is detected, a warning display cuts in to the full screen in accordance with the sensor detection distance information transmitted by the clearance warning ECU via the BEAN (Body Electronics Area Network). When an obstacle is detected, the present steering direction will appear on the display in the form of the direction of the wheels*. When a sensor failure is detected, a mark that corresponds to the failure appears on the screen, accompanied by a message: "Check Sonar" or "Clean Sonar".
- When the front dual sonars detect an obstacle when the shift lever is in a position other than "P" or "R", the following color bars will illuminate: green for "absolute avoidance judgment"; yellow for "avoidance judgment" and "contact judgment" except during a near distance detection; and red for "contact judgment" during a near detection. The basic graphic displays are the same as those in the combination meter.
- If the front dual sonars detect an obstacle while the shift lever is in the "R" range, the following bars will flash or illuminate: flashing green for "absolute avoidance judgment", flashing yellow for "avoidance judgment" and "contact judgment" except during a near distance detection; and illuminating red for "contact judgment" during a near detection. The basic graphic displays are the same as those in the combination meter.
- If the rear clearance sonar detects an obstacle, the following bars will flash or illuminate: flashing yellow for a far distance or medium distance detection, and illuminating red for a near distance detection.
- When the back sonar detects an obstacle, the following bars will flash or illuminate to indicate the corresponding sensor area: flashing yellow for a farthest distance, far distance or medium distance detection, and illuminating red for a near distance detection.

❖ REFERENCE ❖

- * : When the shift lever is in the "R" position, the system will not provide a steering operation advice display in the Back guide monitor screen.



Back guide monitor screen



Usual display

(Contact/Avoidance judgment: Avoidance Judgment
Front & Front left-hand side corner sensor: Far distance detection
The present steering direction: Right)



Graphic Indication Example During
Sensor Failure Detection
(Open circuit)



(Sensor frozen display)

All screen displays

* This illustration is a typical example.

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Set up(In the Multi Display)

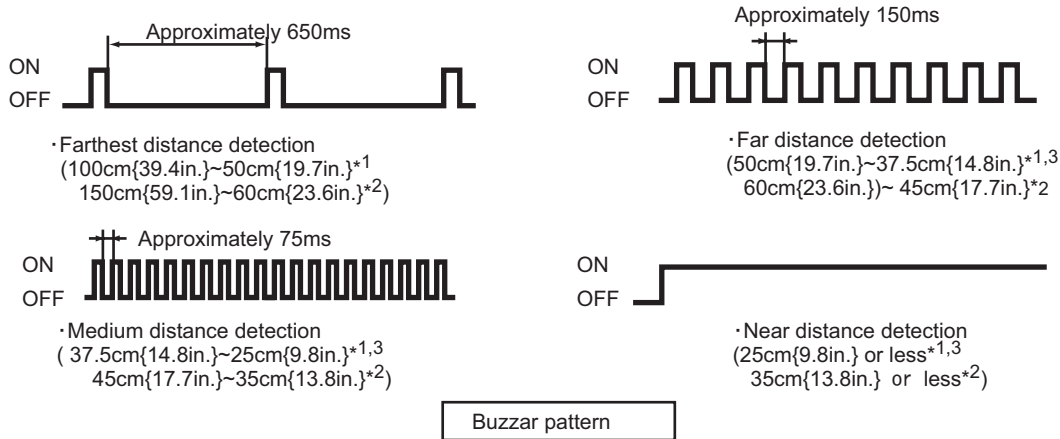
- The following settings can be made: buzzer sound volume (5 stages) display settings (Whether or not display during the "absolute avoidance judgement"), and turning OFF the screen (stopping the sonar display).
- The following three display patterns can be selected and set in case an obstacle is detected: "Static" (to show the display when an obstacle is detected), "Dynamic" (to show the display only during a contact judgment), and "Display OFF" (to not show the display).*

❖ REFERENCE ❖

* : Shift lever is in a position other than "P" or "R"

Sound the Buzzer

- The sounding cycle of the buzzer becomes shorter as the obstacle gets closer, in accordance with the detection distance of the sensors:
 1/16 duty cycle during farthest distance detection (approximately 150ms ON, 650ms OFF), 1/7 duty cycle during far distance detection (approximately 150ms ON, 150ms OFF), and 1/3 duty cycle during medium distance detection (approximately 75ms ON, 75ms OFF).
 The buzzer will sound continuously during a near distance detection.



*1:Front and front corner sensors *3Rear corner sensors
 *2:Back sensors

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- If both the front and rear sensors detect obstacles simultaneously, the buzzer will sound under the following conditions.

Buzzer Sounding Cycles When Multiple Objects Are Detected(Second)

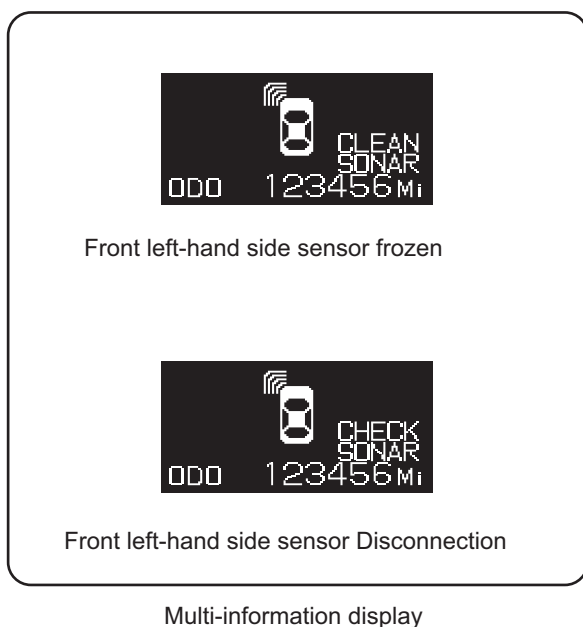
	Near distance detection	Medium distance detection	Far distance detection	Farthest distance detection
Near distance detection	Pattern A*1	Pattern B*2	Pattern B	Pattern B
Medium distance detection	Pattern B	0.15	0.15	0.15
Far distance detection	Pattern B	0.15	0.3	0.3
Farthest distance detection	Pattern B	0.15	0.3	0.8

❖REFERENCE❖

- *1 : Pattern A:The buzzer sounds repetitively for 0.05 seconds six times and 0.85 seconds once.
 *2 : Pattern B:The buzzer sounds repetitively for 0.05 seconds six times and 0.25 seconds once.

Initial Check

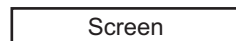
- After the driver turns the ignition ON and the clearance sonar main switch ON, the system will sound the buzzer for approximately 0.8 seconds, in order to diagnose the buzzer and detect sensor failures. If the driver turns the ignition ON while the clearance sonar main switch is already ON, the buzzer will not sound. If there is an open circuit failure in the sensor, the display will show a "sensor failure detection display". If a frozen sensor failure is detected for approximately 5 seconds or more, the display will show a "sensor frozen display". Even when failure detection is being displayed, the system will continue to monitor for sensor failures and will show a failure display if a failure is found.
- If a sensor (other than the one in which a failure is detected) detects an obstacle, or if a sensor failure occurs while the display shows a failure detection display, the graphic display area that corresponds to the sensor for which a failure has been detected will show a "sensor failure detection display". The buzzer will output a detection distance of the closest detection area.
- When the sensors revert to normal, the system will transfer to the detection operation at that time.
- If sonar does not perform a detection operation in any shift position, it performs a self-check only when the system power supply is ON and immediately after a shift lever position has been changed. If a failure has already been detected, the display continues (but the buzzer does not sound). Furthermore, while a signal is being transmitted as a result of the detection of a failure, the system can be restored from the failure and to detect the failure.



Front left-hand side sensor frozen



Rear right-hand side sensor Disconnection

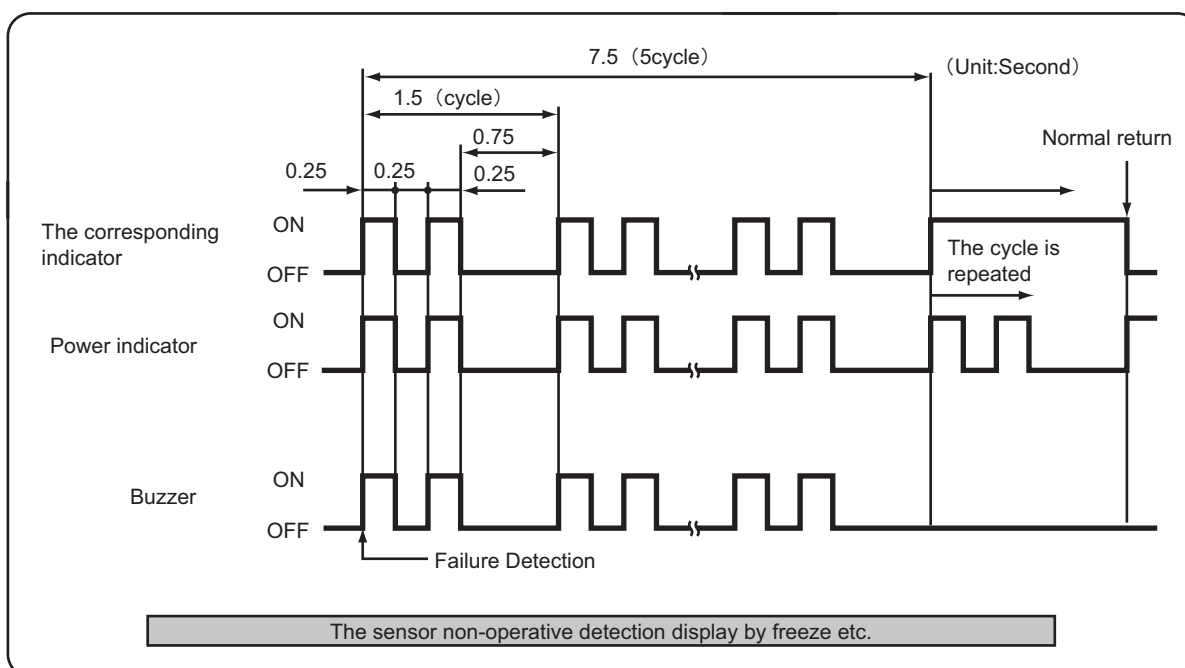
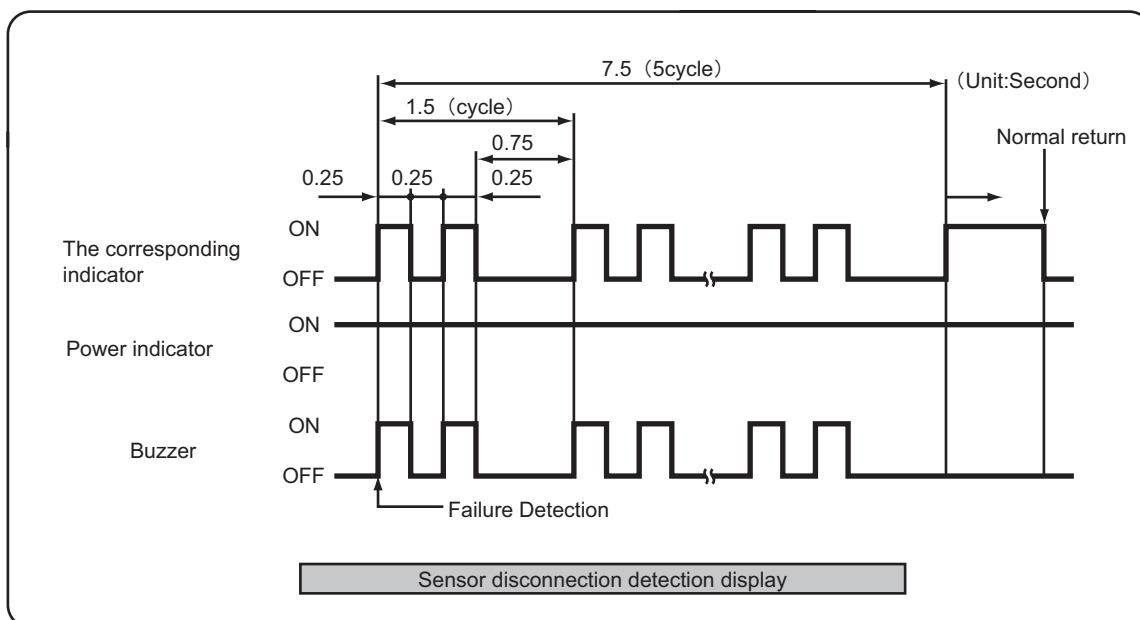


* This illustration is a typical example.

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- After the conditions for activating the system are met and a system check results in a failure, the corresponding indicator light will blink or illuminate continuously as illustrated below. Also, the buzzer will sound as illustrated below. If the system detects an open circuit in a sensor, it will illuminate the power indicator light continuously. If the system detects an inoperative, frozen sensor due to the adhesion of snow or ice, the power indicator light will also blink.
- If a failure occurs while detecting an obstacle, the system will give priority to sound the buzzer with a sounding pattern that indicates the distance to the obstacle.

- On the screen, the display will indicate the failure detection items.
- On the screenw, the failure detection items will appear in the full screen indication mode. The system will use the full screen indication mode to interrupt the display with a failure item mark and a message corresponding to a failure detection item. When the driver operates the screen selector switch to access another screen, the system will cancel the full screen indication of any subsequent clearance sonar failure items. If the screen changes as a result of a change in the display indication condition (such as the main switch or the vehicle speed), without the driver operating the screen selector switch, the system will revert to full screen indication when the display indication conditions are reestablished.

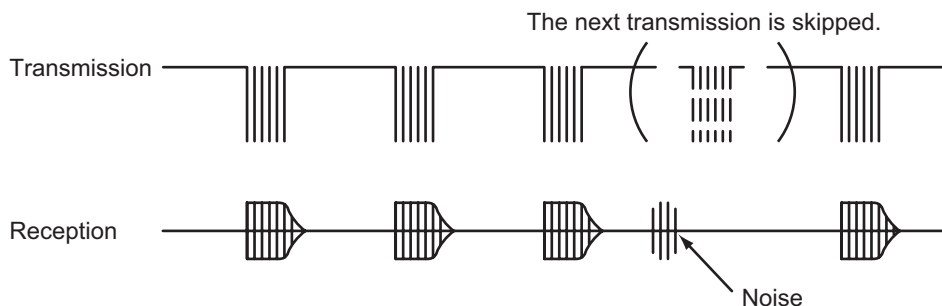


Processing Detected Ultrasound Noise

- If a sonar detects a noise during its pre-transmission noise monitoring interval, that sensor skips the subsequent transmission to prevent erroneous detection. The following are some of the possible noises: the vehicle's own horn, horn of other vehicles, motorcycle engine sound, air brake sound of large vehicles, and the ultrasound noise emitted by other vehicles equipped with the sonar system*.
- Only the sensor that detected an ultrasound noise skips a transmission, and other sensors will continue their transmission in the normal manner.

❖REFERENCE❖

*It is not a reason effective in all ultrasound noises.



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