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<b>Service Category:</b> Audio/Visual/Telematics		<b>Section:</b> Park Assist/Monitoring
<b>Model Year:</b> 2008	<b>Model:</b> ES350	<b>Doc ID:</b> RM000000VJK010X
<b>Title:</b> PARK ASSIST / MONITORING: INTUITIVE PARKING ASSIST SYSTEM: SYSTEM DESCRIPTION (2008 ES350)		

## SYSTEM DESCRIPTION

### 1. GENERAL

- (a) This system uses ultrasonic sensors to detect any obstacles at the corners and the rear of the vehicle. The system then informs the driver of the distance between the sensors and the obstacles as well as their positions by indicating them on the multi-display or multi-information display and by sounding a buzzer.

### 2. FUNCTION OF COMPONENTS

COMPONENT	FUNCTION
Ultrasonic sensor (6)	Detects the distance between the vehicle and an obstacle
Clearance warning buzzer	Sounds the buzzer to inform the driver according to the distance to the obstacle
Multi-information display on the combination meter	Transmits a vehicle speed signal to the clearance warning ECU. <ul style="list-style-type: none"> <li>Displays the location of the obstacle and the approximate distance between the vehicle and the obstacle.</li> <li>Informs the driver if the ultrasonic sensors malfunction, or if they freeze or become dirty</li> </ul>
Clearance sonar main switch	Operating this switch allows the operation of intuitive parking assist to be enabled or disabled.
Multi-display	Displays the location of the obstacle and the approximate distance between the vehicle and the obstacle. The buzzer volume, distance required to sound the buzzer and distance required to trigger the display can be chosen on the setup screen for the intuitive parking assist system.
Clearance warning ECU	Judges the approximate distance between the vehicle and the obstacle based on the signals from the ultrasonic sensors and sends it to the multi-information display or the multi-display. Sounds the clearance warning buzzer.
ECM	Transmits a shift position signal to the clearance sonar ECU.

### 3. OPERATION EXPLANATION

- (a) The operating condition of each intuitive parking assist differs according to its installed position as shown in the table below:

INSTALLATION POSITION	OPERATING CONDITION
Front Corner Sensor	<ul style="list-style-type: none"> <li>Engine switch is ON (IG).</li> <li>Clearance sonar main switch is ON.</li> <li>Shift position is except P.</li> <li>Vehicle speed is approx. 10 km/h (6.2 mph) or less. The sensor stops operating when the vehicle speed exceeds 15 km/h (9.3 mph), and starts operating when the vehicle speed drops to below 10 km/h (6.2 mph).</li> </ul>
	<ul style="list-style-type: none"> <li>Engine switch is ON (IG).</li> <li>Clearance sonar main switch is ON.</li> </ul>

Rear Corner Sensor	<ul style="list-style-type: none"> <li>• Shift position is R.</li> <li>• Vehicle speed is approx. 10 km/h (6.2 mph) or less. The sensor stops operating when the vehicle speed exceeds 15 km/h (9.3 mph), and starts operating when the vehicle speed drops to below 10 km/h (6.2 mph).</li> </ul>
Rear Center Sensor	<ul style="list-style-type: none"> <li>• Engine switch is ON (IG).</li> <li>• Clearance sonar main switch is ON.</li> <li>• Shift position is R.</li> </ul>

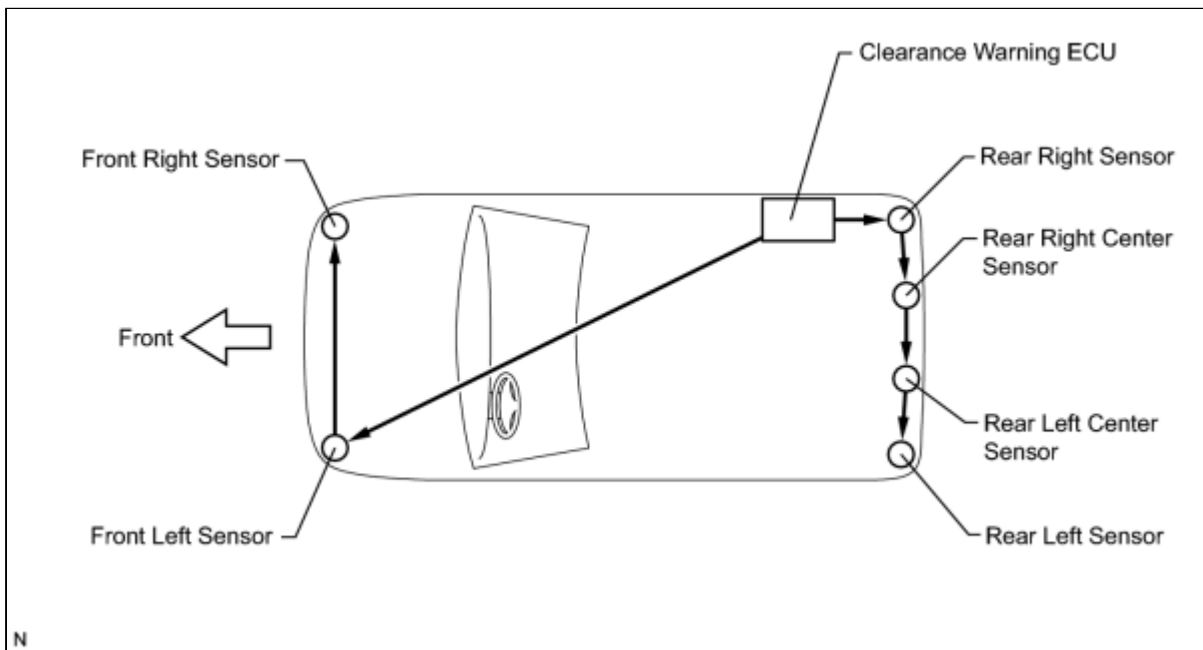
#### 4. ECU OR SENSORS WHICH COMMUNICATE THROUGH LIN COMMUNICATION

##### **HINT:**

- The clearance warning ECU and sensors communicate with each other using LIN communication.
- Allocation refers to the process of the clearance warning ECU setting aside IDs for the sensors.
- The vehicle has the sensors arranged in two groups. There is a front series and a rear series. The sensors are connected in a "daisy chain".

(a) Initialization mode:

An ID is allocated to each sensor and sensor diagnosis is performed.



(1) When any of the following conditions are met, the clearance warning ECU provides power to the first sensors in each series (front left sensor and rear right sensor):

- The engine switch is turned on (IG).
- The sensor operating conditions (described previously) are met and the clearance sonar main switch is turned on.
- Vehicle speed is below 25 km/h (15.5 mph).

(2) After the power is supplied, the front left sensor and rear right sensor enter standby mode to receive an ID from the ECU. When a certain amount of time has elapsed, the ECU sends an ID allocation signal to these sensors.

(3) The front left sensor and rear right sensors receive the ID allocation signal from the ECU and perform self-diagnosis. When the sensor self-diagnosis is complete, the ECU sends an ID allocation confirmation signal to the sensors.

(4) After the ID allocation confirmation is performed, the ECU provides power to the second sensors in each series (front right sensor and rear right center sensor) via the first sensors. In the same manner as the first sensors, the second sensors enter the standby mode. When a certain amount of time has elapsed, the ECU

sends an ID allocation signal to the second sensors.

(5) The above operation will be repeated until an ID is allocated to the last sensor, which is in the rear series (rear left sensor). Initialization ends when ID allocation to all ultrasonic sensors is complete.

(b) Detection mode:

After the initialization mode is complete, the system switches into the detection mode. In the detection mode, the clearance warning ECU sends information request signals and sensor activation signals to the ultrasonic sensors and receives detection result signals from the sensors.

(1) The clearance warning ECU regularly sends ID signals, information request signals, and sensor activation signals to an ultrasonic sensor according to the LIN schedule.

(2) When a certain amount of time has elapsed (sensor detection operation is complete), the clearance warning ECU sends an ID signal to the sensor to receive a detection result signal.

(3) The ultrasonic sensor sends a detection result signal or detection information signal to the ECU.

(4) The above operation is repeatedly performed for each ultrasonic sensor.

