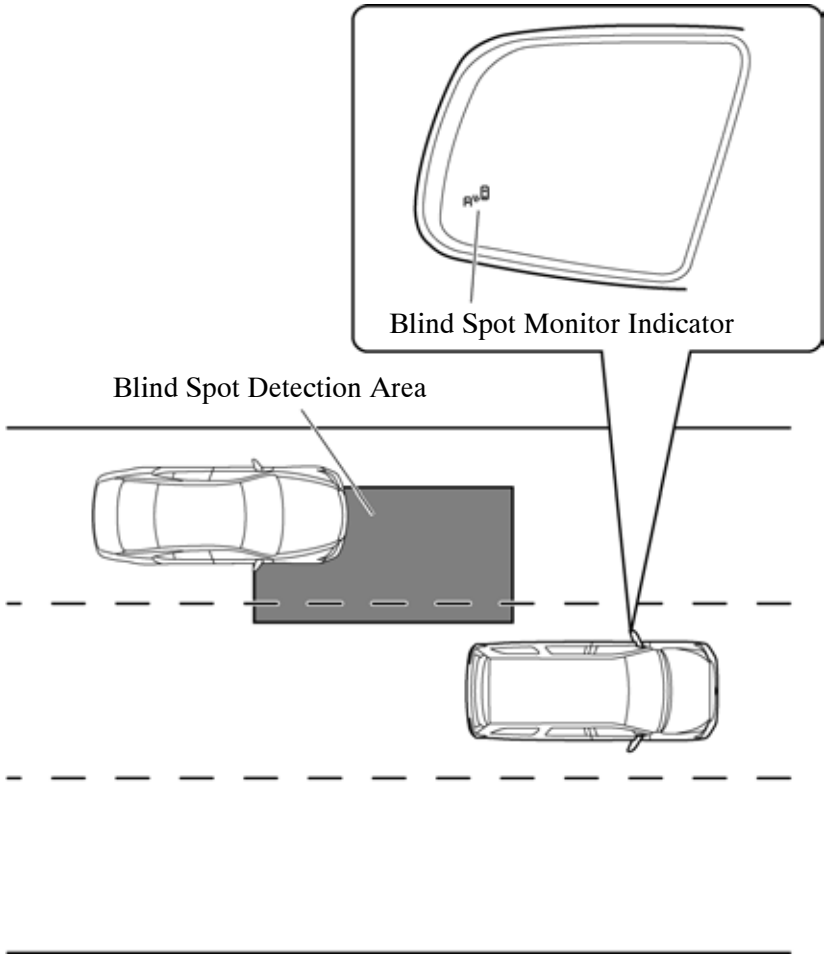
■ BLIND SPOT MONITOR SYSTEM

1. General

- In the blind spot monitor system, the blind spot monitor indicator, which is provided on the outer rear view mirror, illuminates*1 or blinks*2 when a vehicle running parallel enters the blind spot detection area. This informs the driver that a vehicle is approaching, thus assisting with safety confirmation when changing lanes.
- The blind spot monitor system consists of 2 blind spot monitor sensors, a steering sensor, outer rear view mirror assemblies LH and RH, a warning cancel switch assembly, a combination meter assembly and speed sensors.
- This system performs control using the 2 blind spot monitor sensors.

*1: When a vehicle has entered the blind spot detection area.
*2: When the turn signal switch is operated with a vehicle in the blind spot detection area.



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2. Precautions

The blind spot monitor system is not designed to detect the following types of vehicle and/or objects:

- Vehicles that enter the detection area from the opposite direction.
- Motorcycles, bicycles, pedestrians etc. that enter the detection area.*
- Following vehicle that are in the same lane.*
- Guardrails, walls, signs, parked vehicle and similar stationary objects that enter the detection area.*
- Vehicles driving 2 lanes across from your vehicle that enter the detection area.*

*: Depending on conditions, unnecessary detection of a vehicle and/or object may occur.

The blind spot monitor system may not detect vehicles correctly in the following conditions:

- During bad weather such as heavy rain, fog, snow etc.
- When there is a significant difference in speed between your vehicle and the vehicle that enters the detection area.
- When a vehicle is in the detection area from a stop and remains in the detection area as your vehicle accelerates.
- If a vehicle enters the detection area when driving up or down consecutive steep inclines.
- When driving on a road surface that is wet due to rain, previous rain, standing water etc.
- When multiple vehicles approach with only a small gap between each vehicle.
- When vehicle lanes are wide, and the vehicle in the next lane is too far away from your vehicle.
- When the vehicle that enters the detection area is traveling at about the same speed as your vehicle.
- When towing anything such as trailer, boat, etc.

The blind spot monitor system may detect a vehicle and/or object unnecessarily under the following conditions:

- When vehicle lanes are narrow and a vehicle driving 2 lanes across from your vehicle enters the detection area.
- When on sharp bends and a following vehicle is present.

When under strong sunlight, the outside rear view mirror indicator may be difficult to see.

If a system malfunction is detected due to any of the following reasons, warning message appears on the multi-information display:

- There is a malfunction with the sensors.
- The sensors have become dirty.
- The outside temperature is extremely high or low.
- The sensor voltage has become abnormal.

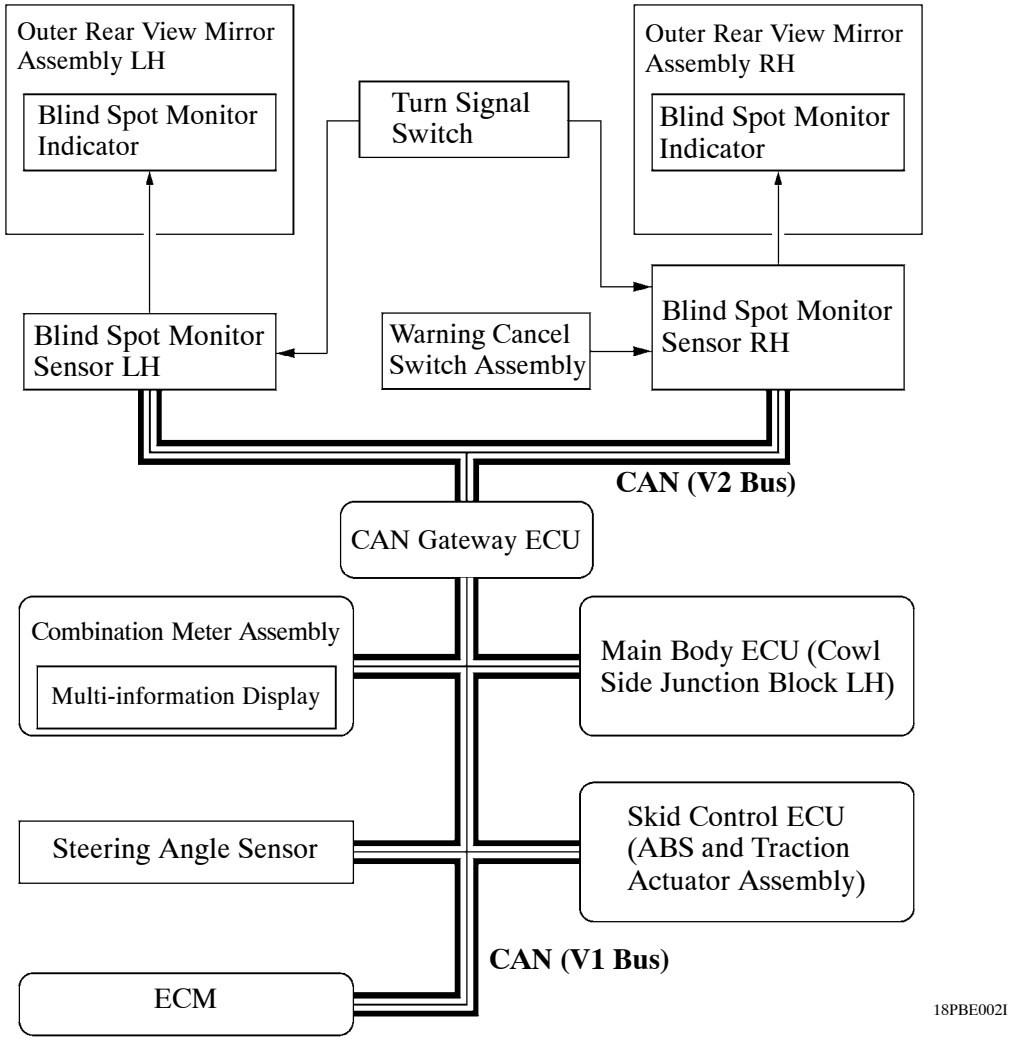
CAUTION

The driver is solely responsible for safe driving. Always drive safely, taking care to observe your surroundings.
The blind spot monitor system is a supplementary system which alerts the driver that a vehicle is present in the outside rear view mirror's blind spot. Do not overly rely on the blind spot monitor system. The system does not judge if it is safe to change lanes, therefore over reliance could cause an accident resulting in death or serious injury. According to conditions, the system may not function correctly. Therefore the driver's own visual confirmation of safety is necessary.

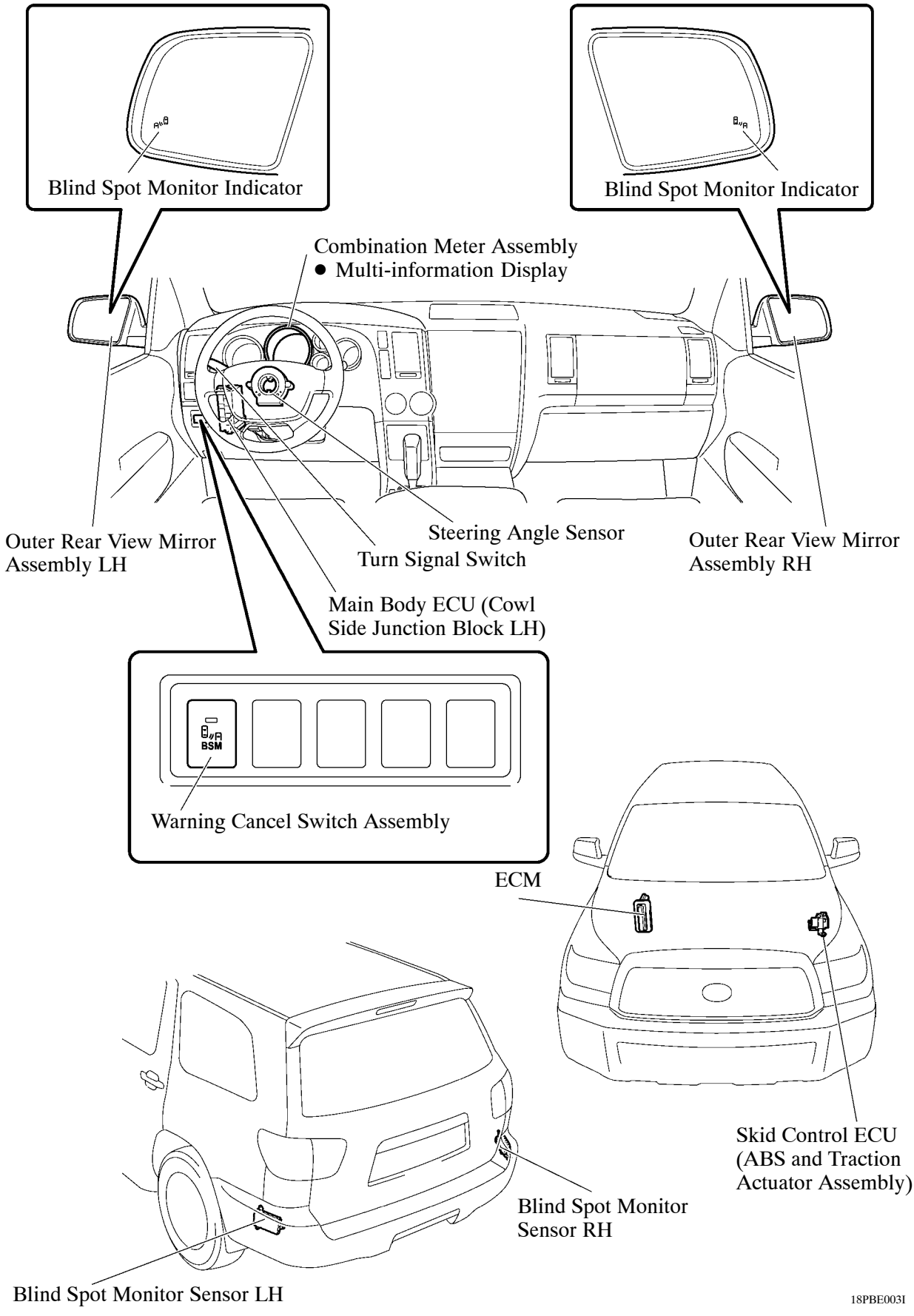
There is 1 blind spot monitor sensor installed on the left and right side of the vehicle rear bumper respectively. Observe the following to ensure the blind spot monitor system can function correctly.

- Keep the sensor and its surrounding area on the bumper clean at all times.
- Do not subject the sensor or surrounding area on the bumper to a strong impact. If the sensor moves even slightly off position, the system may malfunction and vehicles that enter the detection area may not be detected. If the sensor or surrounding area is subject to a strong impact, always have the area inspected by your Toyota dealer.
- Do not disassemble the sensor or its surrounding area on the bumper.
- Do not attach accessories or stickers to the sensor or surrounding area on the bumper.
- Do not modify the sensor or surrounding area on the bumper.
- Do not paint the sensor or surrounding area on the bumper.

3. System Diagram



4. Layout of Main Components



5. Function of Main Components

Components		Function
Blind Spot Monitor Sensors LH and RH		● Radiate radar waves from the blind spot monitor sensor to the blind spot sensor detection area, use the reflected millimeter waves for detecting the presence of a vehicle, vehicle-to-vehicle distance and relative speed, and then transmit this information to the built-in signal processing circuit. ● The signal processing circuit determines if a vehicle is present, and illuminates or blinks the blind spot monitor indicator accordingly.
Warning Cancel Switch Assembly		Disables the blind spot monitor system operation when the switch is turned off.
Outer Rear View Mirror Assemblies LH and RH	Blind Spot Monitor Indicator	● Illuminates to inform the driver that a vehicle has been detected in the blind spot detection area. ● Flashes to inform the driver when the turn signal switch is operated if a vehicle has been detected in the blind spot detection area.
Combination Meter Assembly	Multi-information Display	The combination meter assembly is provided with a multi-information display to inform the driver of malfunctions in the blind spot monitor system.
Steering Angle Sensor		Transmits the steering angle signal to the blind spot monitor sensors LH and RH.
ECM		Transmits the reverse signal to the blind spot monitor sensor LH and RH.
Skid Control ECU (ABS and Traction Actuator Assembly)		Transmits the vehicle speed signal to the blind spot monitor sensor LH and RH.
Main Body ECU (Cowl Side Junction Block LH)		Transmits the destination signal to the blind spot monitor sensors LH and RH.

6. Construction and Operation

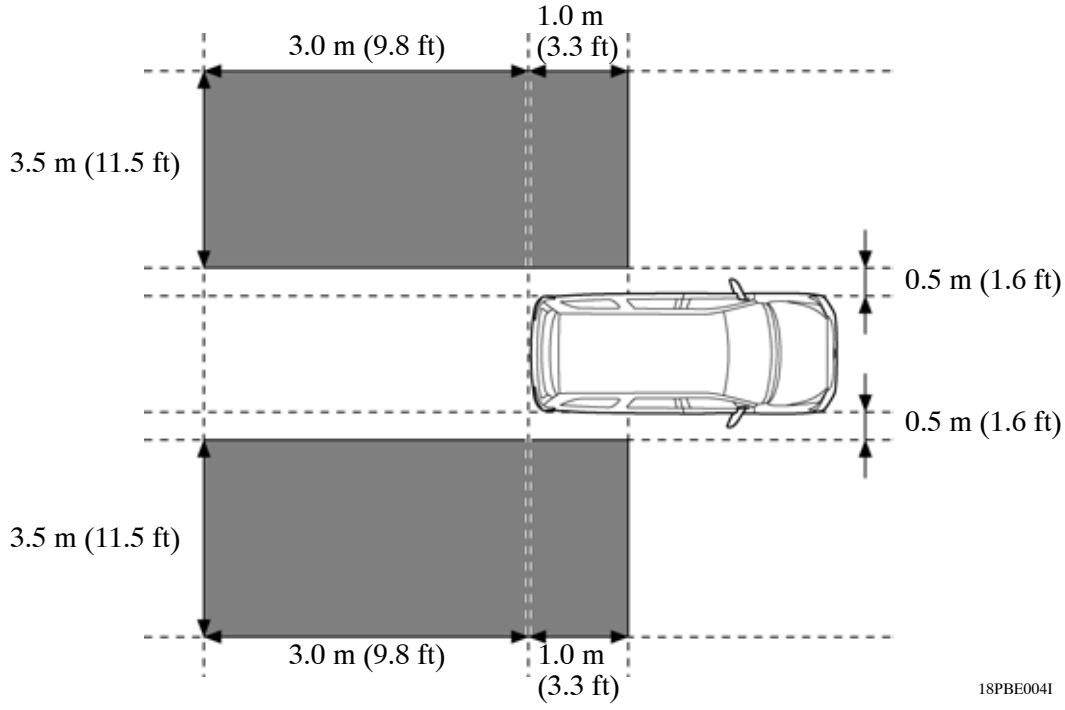
General

The blind spot monitor system operates when both of the following conditions are met:

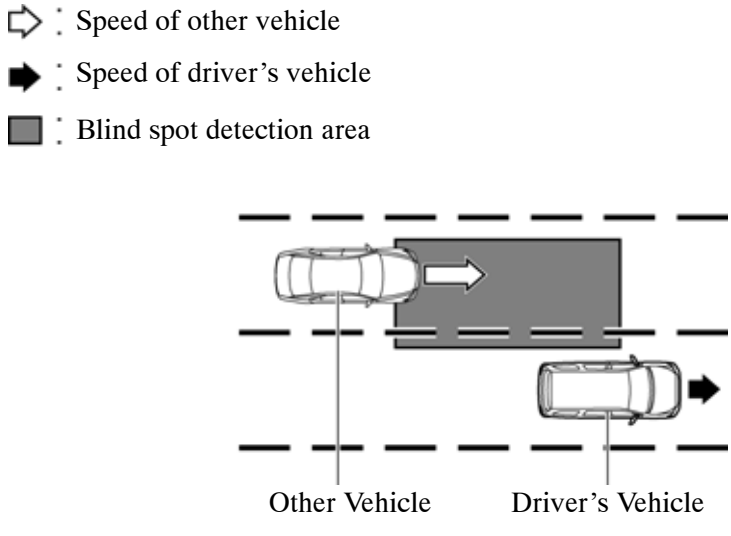
- The warning cancel switch assembly is on.
- The vehicle speed is greater than approximately 32 km/h (20 mph).

The blind spot monitor system can detect vehicles in its blind spot detection areas.

- The blind spot detection areas formed by the blind spot monitor sensors LH and RH are as shown below:



- The driver's vehicle is overtaken by another vehicle in the adjacent lane.

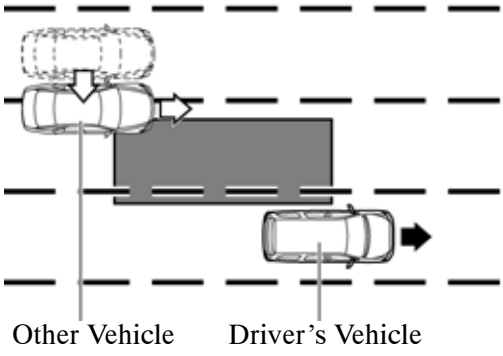


- When another vehicle enters the blind spot detection area of the driver's vehicle due to a lane change.

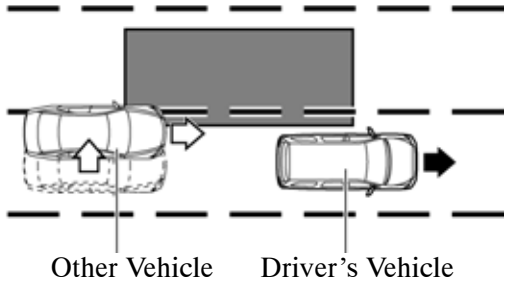
Speed of other vehicle

Speed of driver's vehicle

Blind spot detection area



The other vehicle enters the detection area during lane change (merge in) (Type 1).

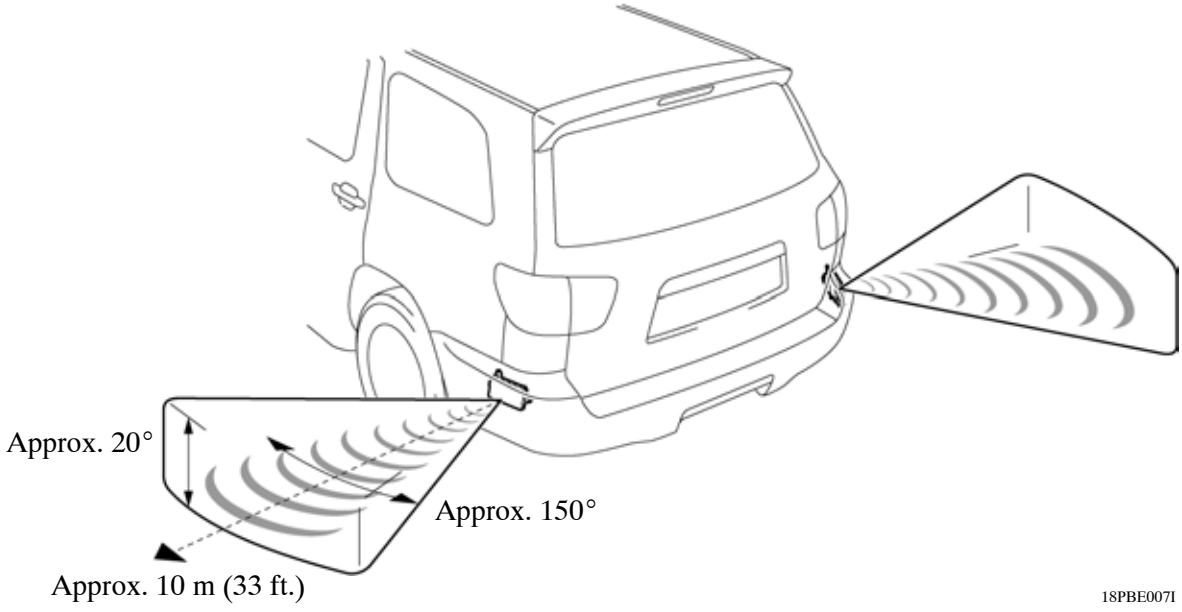


The other vehicle enters the detection area during lane change (merge in) (Type 2).

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Blind Spot Monitor Sensor

- The blind spot monitor sensor consists of a millimeter wave radar circuit and a signal processing circuit.
- The millimeter wave radar uses frequencies in the 24 GHz band.



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- The distance to the object, azimuth and relative speed are calculated from the information that is provided by the reflected millimeter wave radar as described below:

Item	Calculation Method
Distance	Calculated from the length of time that has elapsed from the time the waves of the millimeter wave radar have been emitted, until the reflected waves are received by the millimeter wave radar circuit. The detection distance is approx. 10 m (33 ft.).
Azimuth	Calculated from the reception angle of the millimeter wave radar reflections received. The detection angle has a horizontal range of approx. 150° and a vertical range of approx. 20°.
Relative Speed	Calculated by utilizing the change (Doppler effect*) that occurs in the frequency of the reflected millimeter wave radar waves.

*: The Doppler effect causes the observer to perceive the radio waves emitted by a moving object to be a higher frequency as it approaches, and to be a lower frequency as it recedes. This phenomenon is created because when an object is located far away, the radio waves are perceived at higher frequencies than those of the radio source. An SST is used if radar axis confirmation is needed. For details, refer to the Sequoia Repair Manual.

- In accordance with operation conditions, the blind spot monitor system promotes safety confirmation by using the blind spot monitor indicator to inform the driver that another vehicle has entered the blind spot monitor sensor detection area of the driver's vehicle.
- The blind spot monitor indicator informs the driver that a vehicle is present in the blind spot detection area by illuminating when the turn signal switch is not operated, and by flashing when a vehicle is present and the turn signal switch is operated.

Combination Meter Assembly

The combination meter assembly is provided with the multi-information display to inform the driver of a malfunction in the blind spot monitor system.

- Two types of warning messages are used for the blind spot monitor system, as described below. The blind spot monitor system will not operate when these messages appear in the combination meter assembly.

Multi-information Display	Detail
 18PBE010I	This message appears when the blind spot monitor sensor detects a system malfunction.
 18PBE009I	This message appears when the blind spot monitor sensor determines the following conditions: ● Dirty blind spot monitor sensor ● Poor weather condition ● Significantly high or low outside temperatures After these conditions have been eliminated, the system will operate normally.

7. Diagnosis

The blind spot monitor system is equipped with a diagnosis function which can display the multi-information display in the combination meter assembly. For details, refer to the Sequoia Service Bulletin.