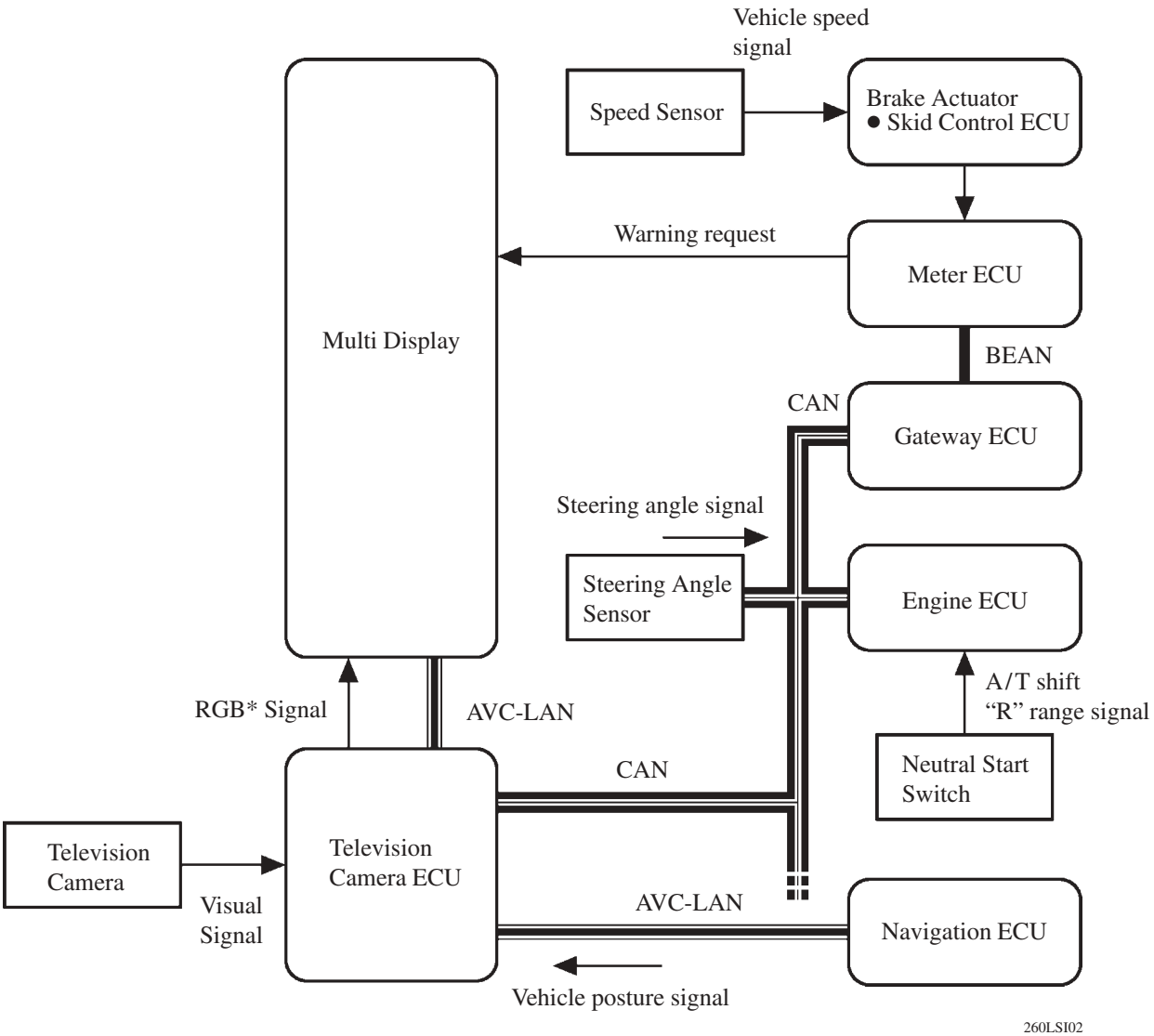
3. Back Guide Monitor

General

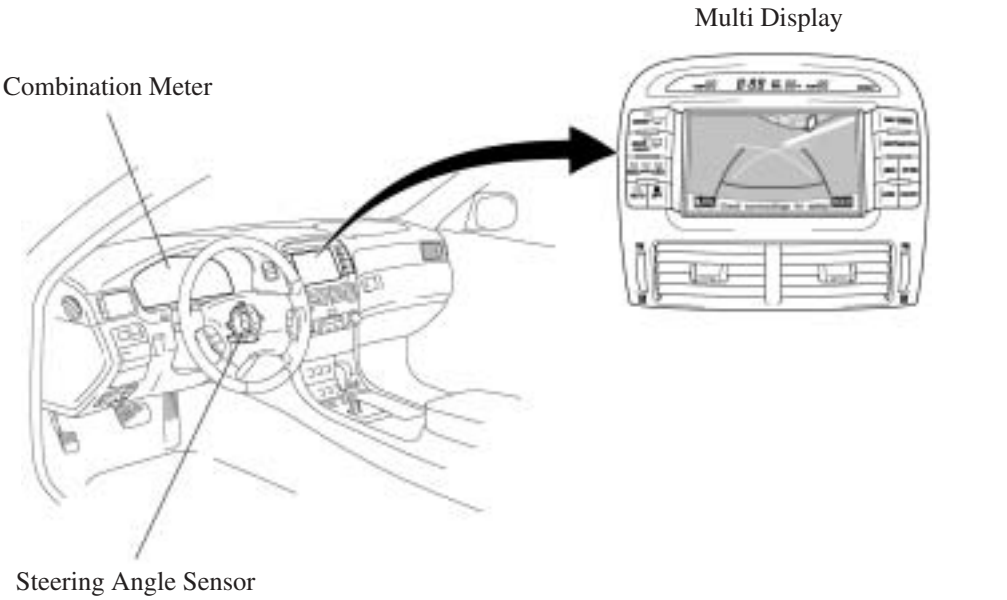
- This system has a television camera mounted on the luggage compartment door to display the rear view of the vehicle on the display panel of the multi display. The display panel also shows a composite view consisting of the rear view and parking guidelines to assist the driver in parking the vehicle by monitoring the rear view.
- With the ignition switch ON, if the driver shifts the shift lever to reverse, the display panel of the multi display switches to operate this system.
- This system consists of the following: television camera ECU, television camera, multi display, steering angle sensor, and navigation ECU.
- This system is equipped with a self-diagnosis system, which is operated on a dedicated window that appears on the display panel, just as in the navigation system.

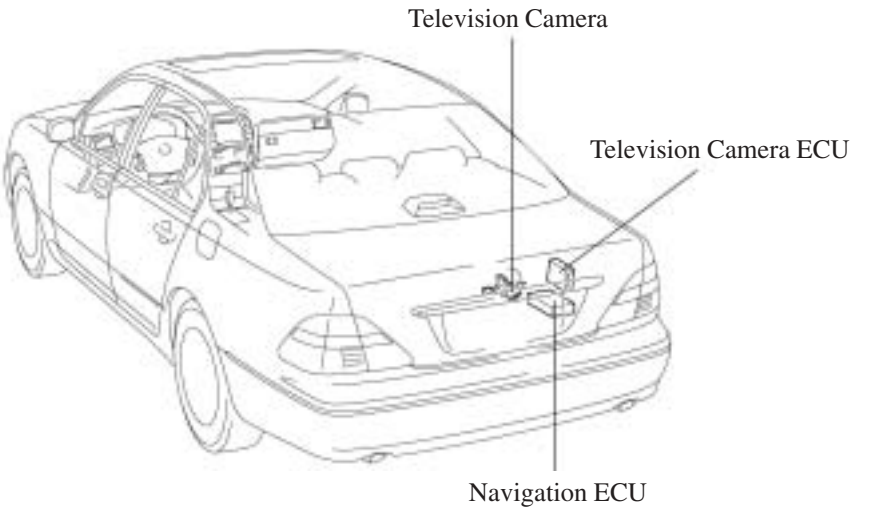
▶ System Diagram ◀



*RGB: Red, Green, Blue

Layout of Main Component





260LSI05

Function of Main Component

Item	Function
Television Camera	● Mounted on the luggage compartment door to transmit the view from the rear of the vehicle to the television camera ECU. ● A color video camera that uses a CCD (Charge Coupled Device) and a wide-angle lens.
Television Camera ECU	Transmits video signals, which contain a composite of the view from the rear of the vehicle taken with the television camera and the parking assist guidelines, to the multi display. Furthermore, it effects overall control of the system by receiving the signal from the sensors and the navigation ECU.
Multi Display	Receives video signals containing a composite of the view from the rear of the vehicle and the parking assist guideline signals from the television camera ECU, and displays them on the display panel.
Navigation ECU	Use the yaw rate detected by the gyro sensor that is built into the navigation ECU to transmit the movement of the vehicle to the television camera ECU.
Steering Angle Sensor	To detect the angle of the steering wheel and send the resulting signals to the television camera ECU through CAN communication. This sensor is also shared by the VSC function.
Vehicle Speed Signal	A vehicle speed signal transmitted by the combination meter.
Neutral Start Switch	Transmits a reverse shift position signal to the television camera ECU.

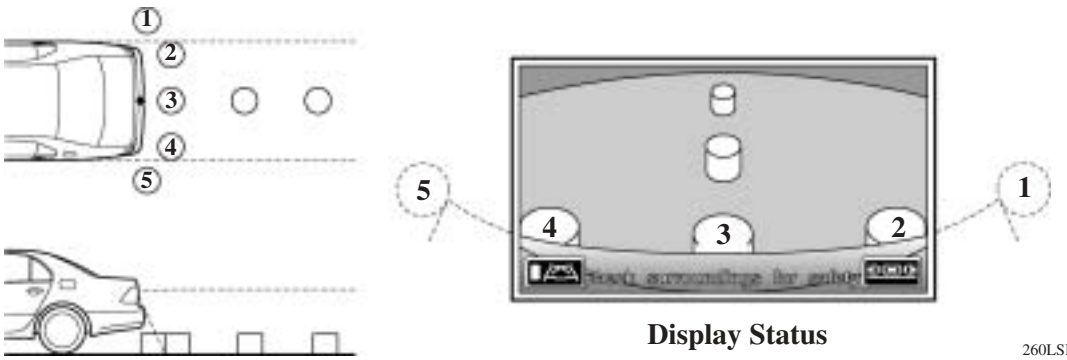
Construction

1) General

The television camera ECU controls the system by using information from the following sources: steering angle sensor signal, vehicle posture from the navigation ECU, vehicle speed signal, and neutral start switch signal.

2) Area Displayed on Screen

- On the multi display, objects on the right of the vehicle appear on the right side of the display panel, and objects on the left of the vehicle appear on the left side of the display panel.
- The television camera uses a wide-angle lens. The perceived distance from images that appear on the screen differs from the actual distance.



Display Status

260LSI06

NOTE: Area displayed on screen may vary according to vehicle status or road conditions.
The area covered by the television camera is limited. The television camera does not show objects close to either corner of the bumper or under bumper.

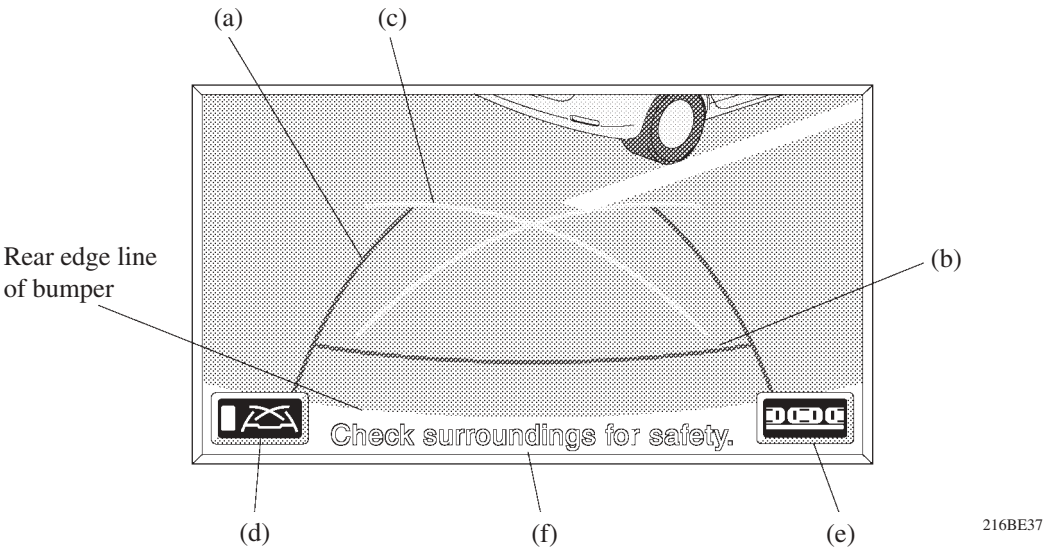
Description of Display

1) General

- This system displays in the following two modes: the manual assist mode used for parking the vehicle in a garage or parking area, and the serial parking assist mode, which assists the driver by providing the appropriate steering angle and timing during serial parking.
- The driver can switch the system modes by pressing the touch switch, although the display is initially set to the serial parking assist mode at the factory. The ECU stores in its memory the mode at the time the ignition switch is turned OFF. Therefore, the mode that is stored in the ECU appears when the ignition switch is subsequently turned ON.

2) Manual Assist Mode

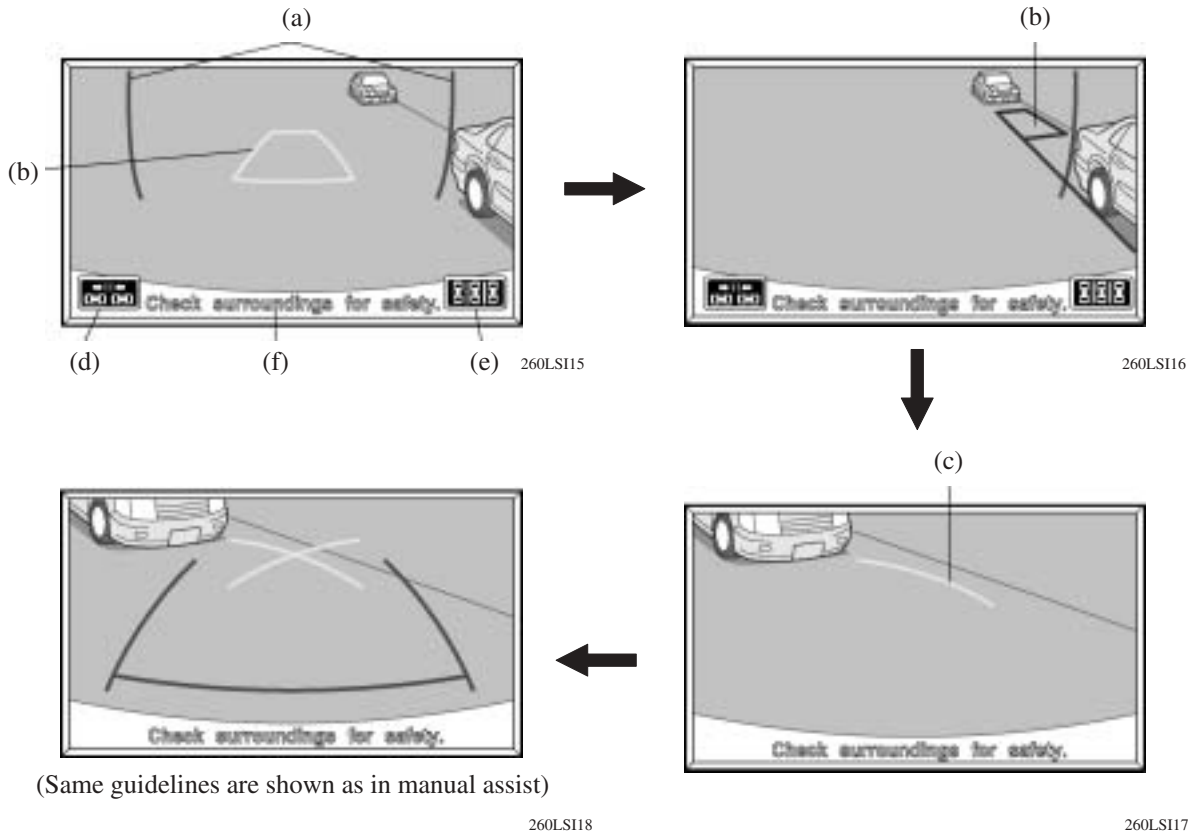
- When the system operates in the manual assist mode, fixed guidelines appear with the rear view of the vehicle as illustrated below. These guidelines can be used to assist the driver while backing the vehicle.
- In this mode, the driver can press the ON/OFF switch to delete all the guidelines.



Item			Description of Display
(a)	Vehicle Width Extension Line (Dark Green)		A guideline for assisting the driver's assessment of the width of the vehicle. {Length: 270 cm (8.9 ft.); Width: 220 cm (7.2 ft.)}
(b)	Distance Guide Line (Red)		A guideline that serves as a reference for the driver to assess the distance from the rear of the vehicle. {Approximately 50 cm (1.6 ft.) from rear end of bumper}
(c)	Parking Guide Line (Light Green)		A guideline indicating the prospective outer path of the vehicle when the steering is turned fully to the right or left end.
(d)	ON/OFF Switch		The display of the guidelines (a), (b), or (c) can be turned ON or OFF by pressing this switch.
(e)	Touch Switch	Manual Mode Switch	The system switches from the manual assist mode to the serial parking assist mode by pressing this switch.
		Serial Parking Assist Mode Switch	
(f)	Warning Message Display Area		Displays a warning message.

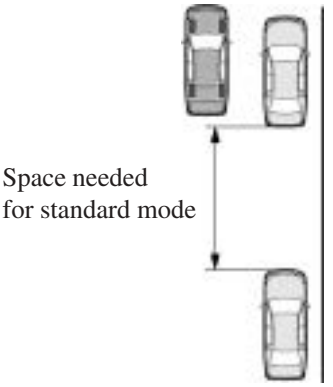
3) Serial Parking Assist Mode

- In this mode used for serial parking, the ECU switches the display of the guidelines in accordance with the parking maneuvers of the vehicle. This provides the driver with an appropriate steering angle and timing during serial parking.

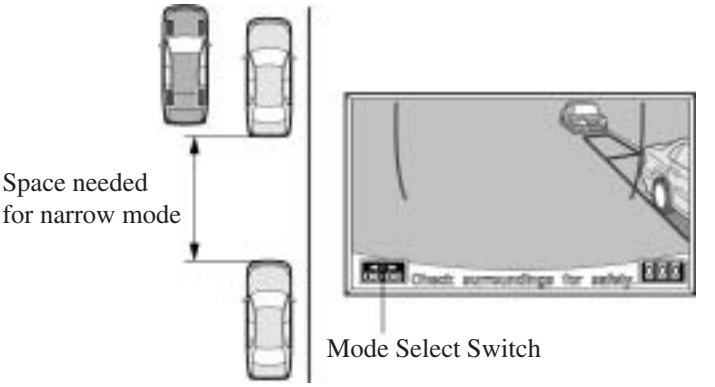


Item			Description of Display
(a)	Green Vertical Line (Light Green)		A guideline that serves as a reference position for starting serial parking.
(b)	Green Outline (Light Green)		A guideline that serves as a reference position for completing the intended parking. This guideline disappears once the vehicle starts moving backward.
(c)	Parking Guide Line (Dark Green)		A guideline indicating part of the prospective outer path of the vehicle when the steering is turned fully to the right or left end. This guideline appears only after the guidelines (a) and (b) disappear.
(d)	Mode Select Switch		Switches between the standard and narrow modes when this switch is pressed.
(e)	Touch Switch	Manual Mode Switch	The system switches from the serial parking assist mode to the manual assist mode when this switch is pressed.
		Serial Parking Assist Mode Switch	
(f)	Warning Message Display Area		Displays a warning message.

- In the serial parking assist mode, the driver can press the mode select switch to select the following two display modes: the standard mode and the narrow mode. The standard mode provides some leeway in the allowable parking space that determined by the television camera ECU. In the narrow mode, the allowable parking space becomes narrower. The narrow mode is designed for situations in which the parking space is narrower than the standard mode.
  This system is set to the standard mode at the factory. The ECU stores in its memory the mode at the time the ignition switch is turned OFF. Therefore, the mode that is stored in the ECU appears when the ignition switch is subsequently turned ON. When the system changes to the narrow mode, the mode select switch illuminates.



260LSI19



▶ **Display Status** ◀

260LSI20

4) Warning Message

- A warning message appears at the bottom or the center of the screen under the conditions listed below, regardless of whether the system is in the manual or serial parking assist mode.

▶ **Messages appearing at the bottom of the screen** ◀

Warning Message	Outline
Checks surroundings for safety	This message always appears during system operation.
System initializing	This message appears when the system is restarted if the television camera ECU detects that a battery terminal has been disconnected and subsequently reconnected.
System malfunction	This message is displayed when the vehicle is moved back furthermore, even through a message, “Steering wheel turned too far, Please return.”, is displayed in the center of the display and also the system judges it is impossible to perform the assist operation.

▶ **Messages appearing at the center of the screen** ◀

Warning Message	Outline
System not ready	This message appears if the system is started without initializing after a part is replaced.
Steering wheel turned too far, please return	This message is displayed when the system cannot perform the assist operation under the following situations: ● When the vehicle starts in the serial parking assist mode, the distance between your vehicle and the other parked vehicles is not approximately 1 m (3.3 ft.) (too far or too close). ● The steering wheel is turned too far.

Operation

Listed below are some examples of operating the system in the manual assist mode and serial parking assist mode.

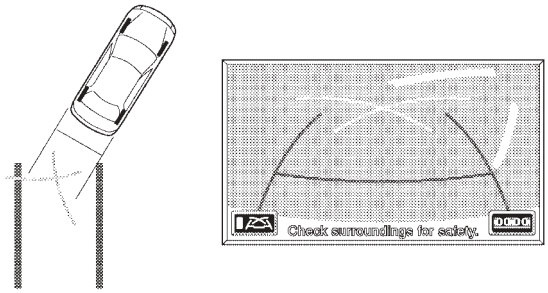
CAUTION

- Do not rely entirely on the rear view monitor system. Use caution, just as you would when backing up any vehicle.
- Never back up while looking only at the screen. The image on the screen may differ from actual conditions. If you back up while looking only at the screen, you may hit a vehicle or have an unexpected accident. When backing up, be sure to check visually behind and all around the vehicle, both directly and with mirrors, before proceeding.
- The risk of colliding with the vehicle parked in front is higher in the narrow mode, thus requiring a more accurate maneuver by the driver.

Manual Assist Mode

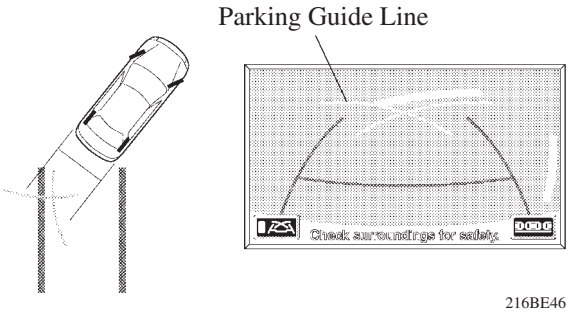
To use the manual assist mode to park the vehicle in the parking space illustrated on the left, perform the following procedure:

- Move the shift lever to reverse.
- Verify that the manual assist mode is selected.
- An image appears on the display panel as illustrated on the right.



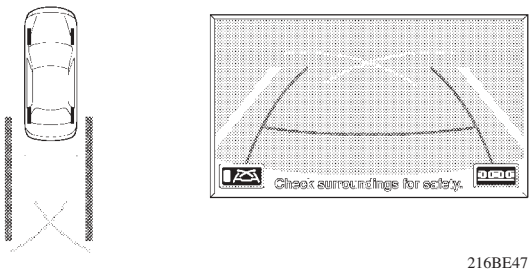
216BE45

- Back the vehicle and stop at the position in which the parking guideline comes in contact with the left side of the intended parking position.
- Turn the steering wheel fully to the right and back the vehicle.



216BE46

- Continue backing the vehicle until the vehicle is parallel to the plotted lines.
- Once the vehicle is parallel, aim the steering wheel straight ahead and back the vehicle to the target stop position.

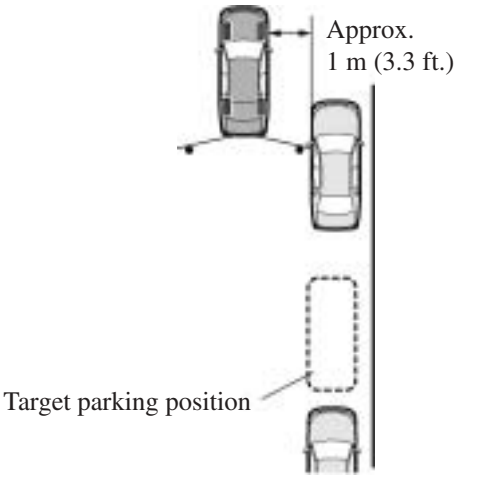


216BE47

Serial Parking Assist Mode

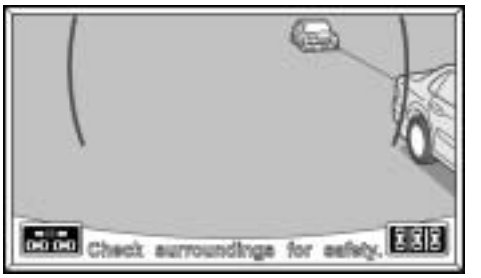
To use the serial parking assist mode to park the vehicle in the parking space illustrated on the left, perform the following procedure:

- Stop the vehicle parallel to the road or the curb, at a side-to-side clearance of about 1 m (3.3 ft.) from the parked vehicle, approximately one-half car length forward of the parked vehicle.



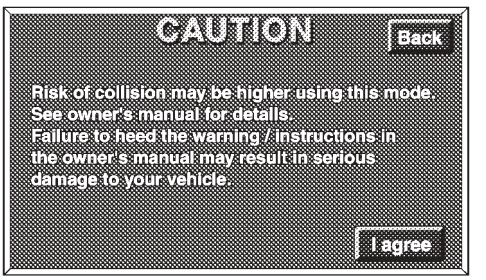
260LSI21

- Aim the steering wheel straight ahead and move the shift lever to reverse.
- Verify that the parallel parking assist mode is selected.
- An image shows on the display panel as illustrated on the right.



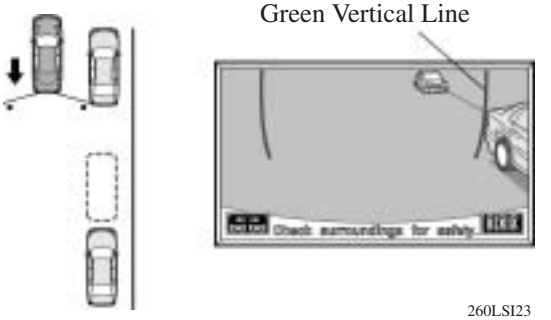
260LSI22

- Press the mode select switch to select either the standard mode or narrow mode.
  The message shown on the right appears if the narrow mode is selected.
  When the driver agrees to this message, the display changes to the narrow mode.



242BE33

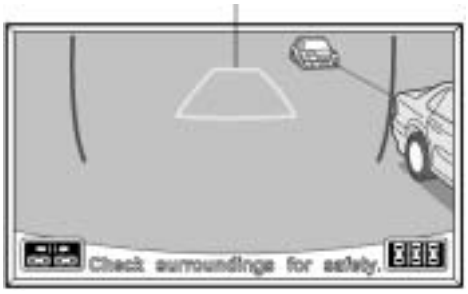
- Drive the vehicle straight back and stop when the green vertical line of the target parking position is aligned with the rear end of the parked vehicle.



260LSI23

- The green outline appears on the screen after 3 seconds elapse from the time the shift lever is moved to reverse, or if the steering wheel is turned with the vehicle at a standstill.

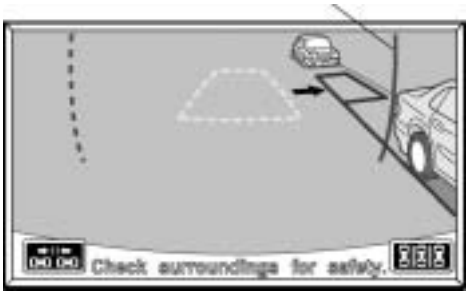
Green Outline



260LSI24

- Continue turning the steering wheel, and the green outline will move in the direction of the target parking position, while the outline changes into a shape as illustrated on the right. Keep turning the steering wheel until the green outline reaches the target parking position.
  At this time, the green vertical line opposite to the target parking position disappears when the steering wheel is turned more than 90 degrees.

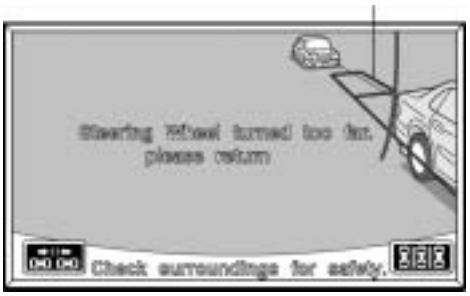
Green Outline



260LSI25

- However, if the steering wheel is turned too much, the message as shown in the right illustration is displayed and the green outline change to red to inform the driver that the assist operation is not capable.
  Also, when your vehicle is away from the shoulders too much, the same condition will occur even adjusting the green outline at the normal position.

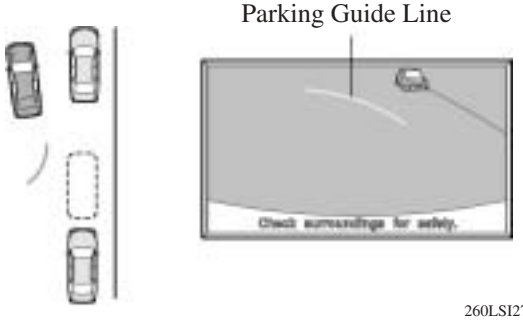
The green outline changes to red



260LSI26

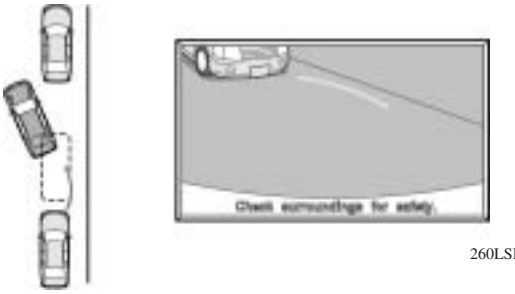
- Keep the steering wheel in the same position and start backing up. Then, the green vertical line and green outline disappear, and a parking guideline appears in the direction of the target parking position.

Parking Guide Line



260LSI27

- Keep the steering wheel in the same position and back up. Stop when the parking guide line reaches the left end of the target parking position.

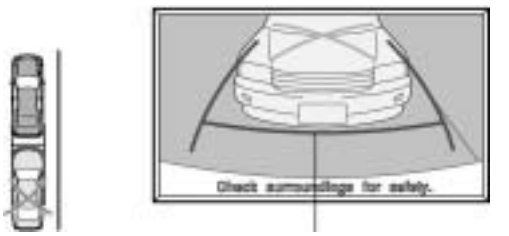


260LSI28

- With the vehicle at a standstill, fully turn the steering wheel in the opposite direction. Then, as illustrated on the right, the same guideline appears as in the manual assist mode.

260LSI29

- Using the distance guide line, slowly back the vehicle until the vehicle is parallel to the road or curb, while paying attention to the vehicles in front and in back. The parking maneuver is completed once the vehicle is parallel.



260LSI30

Distance Guide Line

Service Tip

If a battery terminal is disconnected, the assist function will not operate properly. This is because the present neutral steering point that is detected by the steering angle sensor dose not match the neutral steering point that is stored in the memory of the television camera ECU.
Therefore, if the television camera ECU detects that a battery terminal has been disconnected and the system is operated again by subsequently reconnecting the battery terminal, a "System initializing" warning message appears at the bottom of the screen. When this occurs, take one of the following corrective actions:

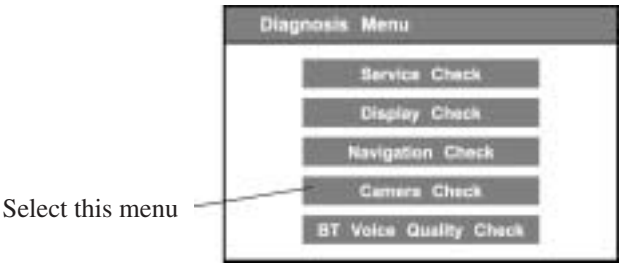
- With the ignition switch ON and the vehicle at a standstill, fully turn the steering wheel to the right, then fully turn it to the left (this procedure can be started either with a right or left turn).
- Drive the vehicle for approximately 5 minutes on a road with a minimal number of curves.

Initialize Function During Part Replacement

- The initialize function must invariably be performed whenever one of the conditions indicated in the table below occurs.

Parts Name	Condition	Initialize Item
Television Camera	● Camera position has shifted. ● Removal and reassembly ● Replacement ● Deformed when the mounted area is struck.	Camera Position Adjustment – Vertical Position – Horizontal Position – Roll Angle
Television Camera ECU	Replacement	● Neutral steering point in memory ● Maximum side-to-side steering angle in memory ● Camera Position Adjustment – Vertical Position – Horizontal Position – Roll Angle
Steering Angle Sensor	● Replacement ● Removal and reassembly	Neutral steering point in memory

- The initialize function described above is performed on the diagnosis menu screen.
- The method for starting the diagnosis menu screen is the same as in the navigation system.



259LSI19

- Refer to the LEXUS LS430 Repair Manual Supplement (Pub. No. RM1049E) for detailed instructions for operating the diagnosis menu screen and the initialize function.

Fail-Safe Function

The table below indicates the conditions of detecting malfunctions in the sensors and ECUs in this system.

Malfunction Parts	Detection Item	Function	
		Manual Assist Mode	Serial Parking Assist Mode
Steering Angle Sensor	Communication malfunction between the steering angle sensor and television camera ECU	—	Switching to the manual assist mode automatically
	Transmission of signal of incompletion of neutral steering point correction	—	Displays "System initializing"
Television Camera	Transmission of television camera malfunction signal	Stop signal reception and displays a dark screen	
Television Camera ECU	Malfunction of television camera ECU unit	Stops system operation	
Navigation ECU	● No response from navigation ECU ● Transmission of navigation ECU malfunction signal	—	Switching to the manual assist mode automatically

Self-Diagnosis Function

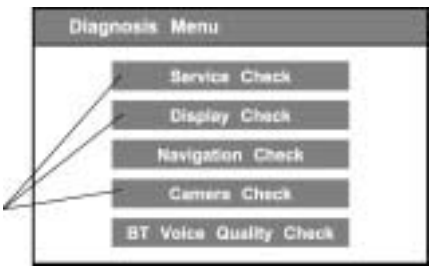
- The back guide monitor system is equipped with a self-diagnosis system and can display the diagnosis menus shown on the right.
  The diagnosis menu that pertains to this system contains the following three Items:

a) Service Check Menu

b) Display Check

c) Camera Check

These menu



259LSI19

- The method for starting the diagnosis menu screen is the same as in the navigation system.
- For details, see the LEXUS LS430 Repair Manual Supplement (Pub. No. RM1049E).

Precaution for LEXUS Parking Assist System

- The television camera uses a wide-angle lens. The perceived distance from images that appear on the screen differs from the actual distance.
- In the following cases, it may become difficult to see the images on the screen, but this is not a malfunction.
  - In the dark (for example, at night)
  - When the temperature near the lens is very high or low
  - When water droplets are adhering to the television camera, or when humidity is high. (for example, when it rains)
  - When foreign matter (for example, mud) is adhering to the television camera lens
  - When the sun or the beam of headlights is shining directly into the television camera lens
- If a bright light (for example, sunlight reflected off the vehicle body) is picked up by the television camera, the smear effect, peculiar to the CCD camera, may occur. For details of the smear effect, see page 134.