SECTION SN
SONAR SYSTEM

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BASIC INSPECTION

DIAGNOSIS AND REPAIR WORKFLOW

Work Flow

INFOID:0000000001193860

DETAILED FLOW

1.INTERVIEW FOR MALFUNCTION

Interview the conditions and environment when occurring any malfunction to the customer.

>> GO TO 2.

2.SYMPTOM CHECK

- Check the symptom from the customer's information.
- Check if any malfunction occurs other than the malfunction interviewed from the customer.

>> GO TO 3.

3.INSPECTION BEFORE DIAGNOSIS

Check the following conditions of the sensor.
- Check if the sonar sensor is not frozen.
- Check if snow, mud, or other foreign objects are not adhering to the sonar sensor.
- Check if there is no deformation, scratches, or other damage to the sonar sensor.
- Check if water has not accumulated in the sonar sensor.

Is the sensor condition normal?

YES >> GO TO 4.
NO >> Repair the sensor condition. GO TO 5.

4.MALFUNCTIONING PART EXTRACTION BY SYMPTOM DIAGNOSIS

Repair the malfunctioning part by the symptom diagnosis.

>> GO TO 5.

5.FINAL INSPECTION

Check that the sonar system activates normally.

Does the sonar system activate normally?

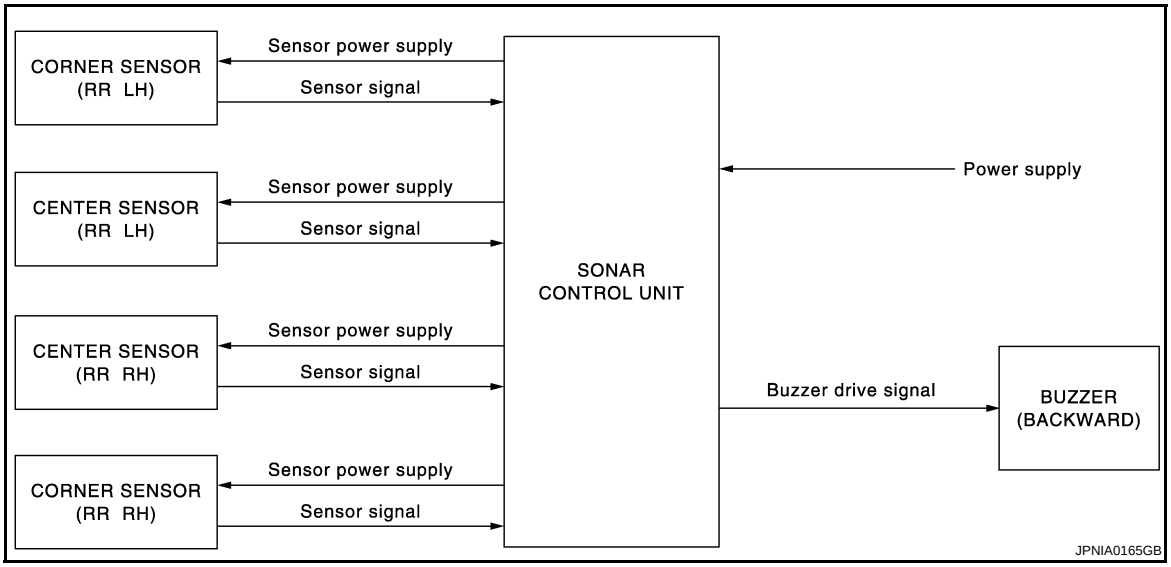
YES >> INSPECTION END
NO >> GO TO 1.

FUNCTION DIAGNOSIS

SONAR SYSTEM

System Diagram

INFOID:0000000001193861



System Description

INFOID:0000000001193862

- The sonar sensor installed to the rear bumper detects obstacles around the bumper.
- The distance between a bumper and obstacles is informed to the driver with different frequency of buzzer.

Activation condition

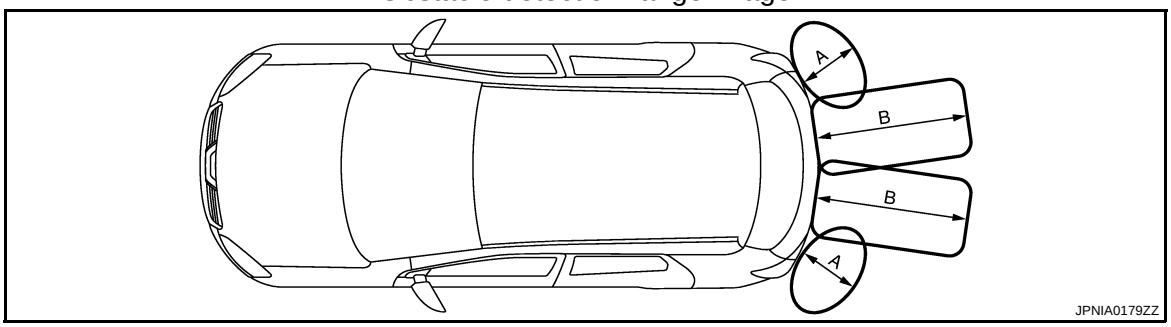
The rear sensor activates and outputs the warning buzzer in the following conditions.

- Reverse signal ON (Power supply)
- Obstacle detection

Obstacle detection distance

- The sonar control unit controls the obstacle detection distance. The detection distance differs between the corner sensor and the center sensor.
- Obstacle detection distance is indicated by a variable beep frequency.

Obstacle detection range image



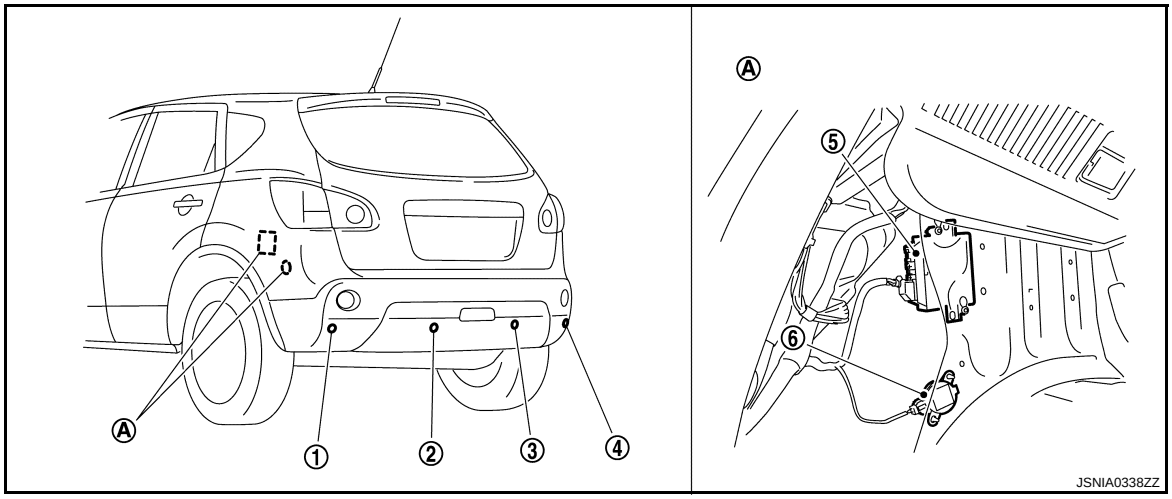
A. Approx. 60 cm (23.6 in) B. Approx. 180 cm (70.9 in)

NOTE:

- When an obstacle and distance of a bumper approach to less than 30 cm (11.8 in), a buzzer sound becomes a continuous sounds.
- The nearest sensor from the detected obstacle applies the buzzer output frequency if plural sensors detect any obstacle simultaneously.

Component Parts Location

INFOID:0000000001193863



1. Corner sensor rear LH
2. Center sensor rear LH
3. Center sensor rear RH
4. Corner sensor rear RH
5. Sonar control unit
6. Buzzer

A Inside luggage side lower finisher LH

Component Description

INFOID:0000000001193864

Component	Description
SONAR CONTROL UNIT	• The warning buzzer outputs by inputting the sensor signal from corner/center sensor. The warning buzzer outputs the separated buzzer. • When reverse signal is input, a power supply is input into sonar control unit.
CORNER/CENTER SENSOR	The obstacle distance is detected. The signal is transmitted to the sonar control unit.
BUZZER	The warning buzzer outputs with the signal from the sonar control unit.

DIAGNOSIS SYSTEM (SONAR CONTROL UNIT)

Diagnosis Description

INFOID:0000000001193865

DESCRIPTION

Buzzer sounds to indicate a malfunctioning sensor system when a malfunction/error occurs in the body, power supply, ground, or sensor signals of the center/corner sensor. Also, a buzzer sounds if a sonar control unit includes a malfunction/error.

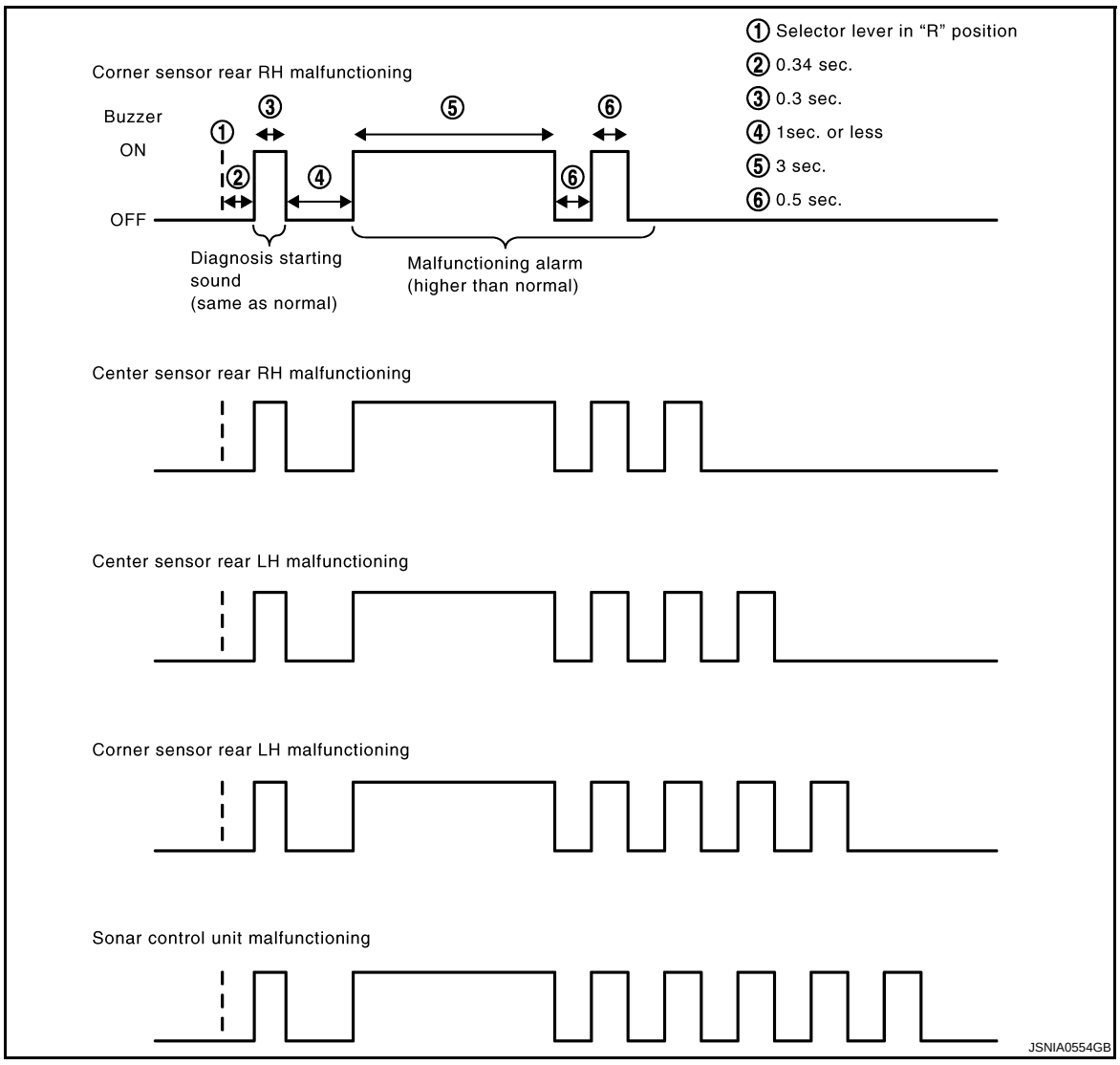
NOTE:

- Malfunctions are indicated by a sound of the buzzer. Therefore, errors/malfunctions cannot be identified when the buzzer system has a malfunction.
- Buzzer sounds to indicate a malfunctioning sensor system only once when turning ON the ignition switch and shifting the lever to the “REVERSE” position. For reconfirmation, shifting the lever to a position other than the reverse position and returning it to the “REVERSE” position enables to reconfirm the malfunction.
- Functions of the sonar system stop after indicating malfunctions/errors by the buzzer. (Buzzer does not sound if an obstacle is approaching to the sensor.)

Identifying malfunctioning sensor system

1. Turn the ignition switch ON. Shift lever to the “REVERSE” position.
2. Buzzer sounds once with the same sound range as heard at normal operations.
3. Then buzzer sounds with a higher sound range than normal operation. Malfunctioning sensor systems can be identified by the cycle (the number of buzzer sounds) of the buzzer sound.
   NOTE:

The sensors are indicated by a sound of the buzzer one by one when more than one sensor has a malfunction/error.



COMPONENT DIAGNOSIS

POWER SUPPLY AND GROUND CIRCUIT

SONAR CONTROL UNIT

SONAR CONTROL UNIT : Diagnosis Procedure

INFOID:0000000001193866

1.CHECK POWER SUPPLY CIRCUIT

1. Turn ignition switch ON.
2. Shift the shift position to “R” position.
3. Check voltage between sonar control unit harness connector terminal 1 and ground.

1 – Ground : Approx. 12 V

Is the inspection result normal?

YES >> GO TO 2.
NO >> Check back-up lamp switch circuit or park/neutral position switch circuit.

2.CHECK GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect sonar control unit connector.
3. Check continuity between sonar control unit harness connector terminal 3 and ground.

3 – Ground : Continuity should exist.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace sonar control unit ground harness.

SENSOR POWER SUPPLY AND GROUND CIRCUIT

Description

INFOID:0000000001193867

The sonar control unit outputs sensor power supply to each sensor when the shift position to “R” position.

Diagnosis Procedure

INFOID:0000000001193868

1.CHECK CONTINUITY

1. Turn ignition switch OFF.
2. Disconnect sonar control unit connector, center sensor and corner sensor connector.
3. Check continuity between sonar control unit harness connector terminal 9 and each sensor harness connector terminal 1.

9 – 1 : Continuity should exist.

4. Check continuity between sonar control unit harness connector terminal 9 and ground.

9 – Ground : Continuity should not exist.

5. Check continuity between sonar control unit harness connector terminal 10 and each sensor harness connector terminal 3.

10 – 3 : Continuity should exist.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair harness or connector.

2.CHECK POWER SUPPLY CIRCUIT

1. Connect sonar control unit connector, center sensor and corner sensor connector.
2. Turn ignition switch ON.
3. Shift the shift position to “R” position.
4. Check voltage between each sensor harness connector terminal 1 and ground.

1 – Ground : Approx. 12 V

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace sonar control unit.

BUZZER DRIVE SIGNAL CIRCUIT

Description

INFOID:0000000001193869

The sonar control unit outputs the buzzer drive signal when the rear sonar detects the obstacle.

Diagnosis Procedure

INFOID:0000000001193870

1.CHECK HARNESS BUZZER CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect sonar control unit connector and buzzer connector.
3. Check continuity between sonar control unit harness connector terminals 2, 6 and buzzer harness connector terminals 2, 1.

2 – 2	**: Continuity should exist.**
6 – 1	**: Continuity should exist.**

4. Check continuity between sonar control unit harness connector terminal 2 and ground.

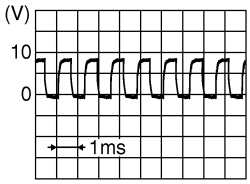
2 – Ground	**: Continuity should not exist.**

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair harness or connector.

2.CHECK BUZZER DRIVE SIGNAL

1. Connect sonar control unit connector and buzzer connector.
2. Bring an obstacle near to sound the buzzer.
3. Check signal between sonar control unit harness connector terminals 2 and 6.

2 – 6	**Waveform period changes due to the distance to an obstacle.**  JPNIA0232ZZ

Is the inspection result normal?

YES >> Replace buzzer.
NO >> Replace sonar control unit.

SENSOR SIGNAL CIRCUIT

Description

INFOID:0000000001193871

The sensor detects the distance to obstacles and outputs the signal to the sonar control unit.

Diagnosis Procedure

INFOID:0000000001193872

1.CHECK SENSOR POWER SUPPLY AND GROUND CIRCUIT

Check sensor power supply and ground circuit. Refer to SN-8, "Diagnosis Procedure".

Is inspection result normal?

YES >> GO TO 2.
NO >> Repair malfunctioning parts.

2.CHECK HARNESS SENSOR SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect sonar control unit connector and each sensor connector.
3. Check continuity between sonar control unit harness connector terminals 13, 14, 15, 16 and each sensor harness connector terminal 2.

13 – 2	**: Continuity should exist.**
14 – 2	**: Continuity should exist.**
15 – 2	**: Continuity should exist.**
16 – 2	**: Continuity should exist.**

4. Check continuity between sonar control unit harness connector terminals 13, 14, 15, 16 and ground.

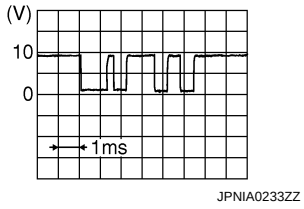
13 – Ground	**: Continuity should not exist.**
14 – Ground	**: Continuity should not exist.**
15 – Ground	**: Continuity should not exist.**
16 – Ground	**: Continuity should not exist.**

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair harness or connector.

3.CHECK SENSOR SIGNAL

1. Connect sonar control unit connector and each sensor connector.
2. Turn ignition switch ON.
3. Shift the shift position to “R” position.
4. Check signal between sonar control unit harness connector terminals 13, 14, 15, 16 and Ground.

13 – Ground **14 – Ground** **15 – Ground** **16 – Ground**	 JPNIA0233ZZ

Is the inspection result normal?

YES >> Replace sonar control unit.
NO >> Replace malfunctioning sensor.

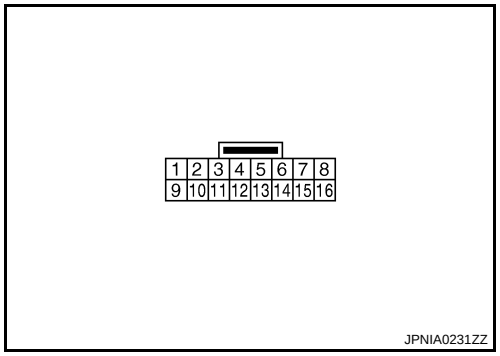
ECU DIAGNOSIS

SONAR CONTROL UNIT

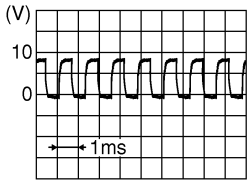
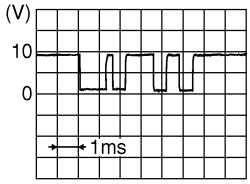
Reference Value

INFOID:0000000001193873

TERMINAL LAYOUT

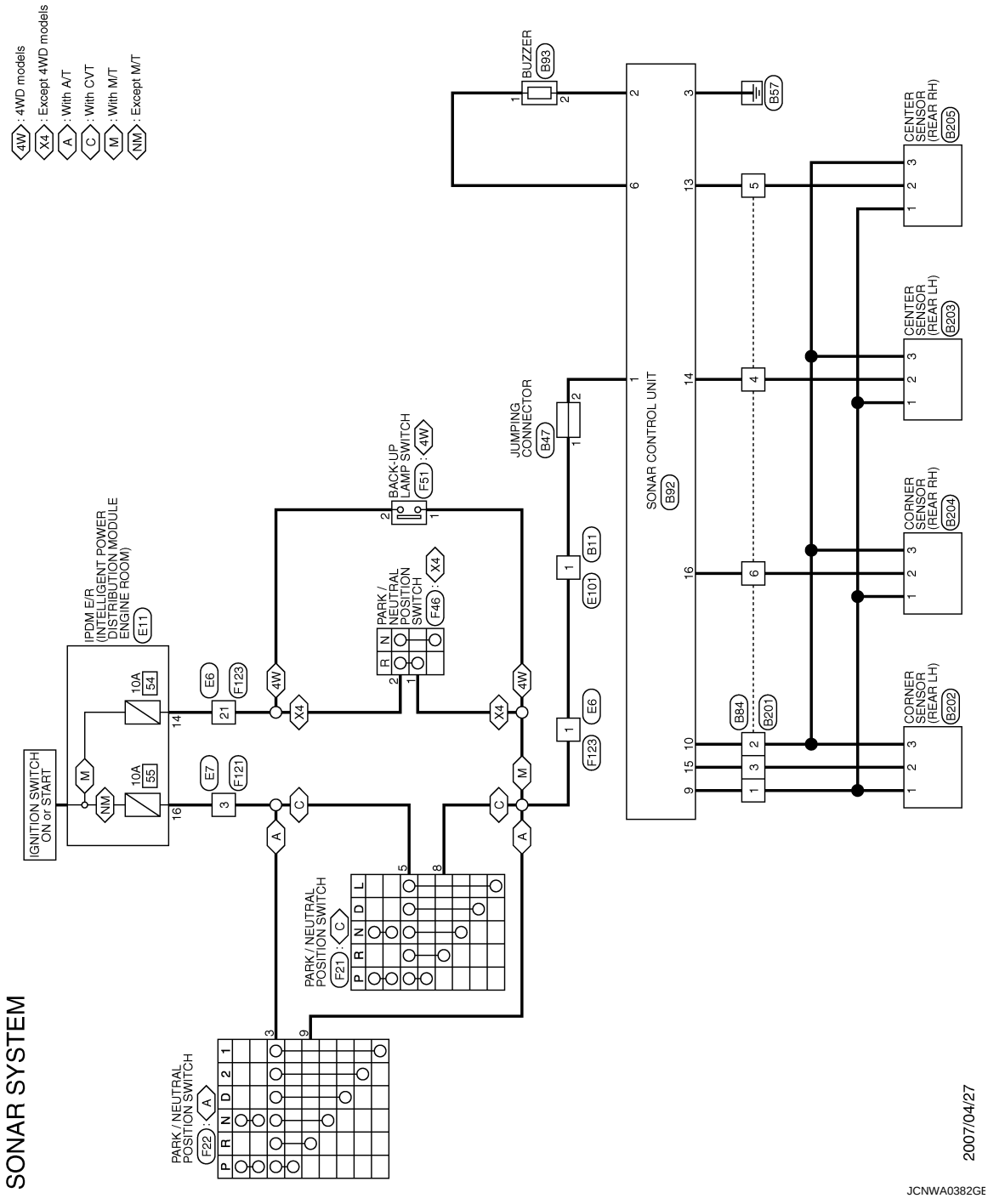


PHYSICAL VALUES

Terminal No. (Wire color)		Description		Condition		Reference value (Approx.)
+	–	Signal name	Input/ Output			
1 (Y/G)	Ground	Power supply	Input	Ignition switch ON	Selector lever in R position	12 V
2 (Y/L)	6 (Y/B)	Buzzer drive signal	Output	Ignition switch ON	When buzzer operation	Waveform period changes according to the distance to an obstacle.  JPNIA0232ZZ
3 (B)	Ground	GND	—	Ignition switch ON	—	0 V
9 (B/Y)	Ground	Sensor power supply	Output	Ignition switch ON	Shift position to “R” position	12 V
10 (B)	Ground	Sensor ground	—	Ignition switch ON	—	0 V
13 (O)	10 (B)	Center sensor signal RH	Input	Ignition switch ON	—	 JPNIA0233ZZ
14 (L)	10 (B)	Center sensor signal LH				
15 (R)	10 (B)	Corner sensor signal LH				
16 (LG)	10 (B)	Corner sensor signal RH				

Wiring Diagram - SONAR SYSTEM -

INFOID:0000000001193874



SONAR SYSTEM

Connector No.	B11
Connector Name	WIRE TO WIRE
Connector Type	TK10MW-NS8

Terminal No.	Color of Wire	Signal Name [Specification]
1	Y/G	–

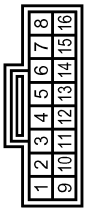
Connector No.	B47
Connector Name	JUMPING CONNECTOR
Connector Type	A02FW

Terminal No.	Color of Wire	Signal Name [Specification]
1	Y/G	–
2	Y/G	–

Connector No.	B84
Connector Name	WIRE TO WIRE
Connector Type	RS06MB

Terminal No.	Color of Wire	Signal Name [Specification]
1	B/Y	–
2	B	–
3	R	–
4	L	–
5	O	–
6	LG	–

Connector No.	B92
Connector Name	SONAR CONTROL UNIT
Connector Type	AMP 828929-2

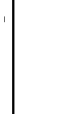


Terminal No.	Color of Wire	Signal Name [Specification]
1	Y/G	POWER SUPPLY
2	Y/L	BUZZER +
3	B	GROUND
6	Y/B	BUZZER –
9	B/Y	SENSOR POWER SUPPLY
10	B	SENSOR GROUND
13	O	CENTER SENSOR RH
14	L	CENTER SENSOR LH
15	R	CORNER SENSOR LH
16	LG	CORNER SENSOR RH

Connector No.	B93
Connector Name	BUZZER
Connector Type	AMP 174463-1

Terminal No.	Color of Wire	Signal Name [Specification]
1	Y/B	–
2	Y/L	–

Connector No.	B201
Connector Name	WIRE TO WIRE
Connector Type	RS06FB



Terminal No.	Color of Wire	Signal Name [Specification]
1	B/Y	–
2	B	–
3	R	–
4	L	–
5	O	–
6	LG	–

Connector No.	B202
Connector Name	CORNER SENSOR (REAR LH)
Connector Type	HIRSCHMANN-872-858-541

Terminal No.	Color of Wire	Signal Name [Specification]
1	B/Y	SENSOR POWER SUPPLY
2	R	SENSOR SIGNAL
3	B	SENSOR GROUND

Connector No.	B203
Connector Name	CENTER SENSOR (REAR LH)
Connector Type	HIRSCHMANN-872-858-541

Terminal No.	Color of Wire	Signal Name [Specification]
1	B/Y	SENSOR POWER SUPPLY
2	L	SENSOR SIGNAL
3	B	SENSOR GROUND

JCNWA0383GE

SONAR SYSTEM

Connector No.	B204
Connector Name	CORNER SENSOR (REAR RH)
Connector Type	HIRSCHMANN-872-858-541

Terminal No.	Color of Wire	Signal Name [Specification]
1	B/Y	SENSOR POWER SUPPLY
2	LG	SENSOR SIGNAL
3	B	SENSOR GROUND

Connector No.	B205
Connector Name	CENTER SENSOR (REAR RH)
Connector Type	HIRSCHMANN-872-858-541

Terminal No.	Color of Wire	Signal Name [Specification]
1	B/Y	SENSOR POWER SUPPLY
2	O	SENSOR SIGNAL
3	B	SENSOR GROUND

Connector No.	E6
Connector Name	WIRE TO WIRE
Connector Type	TK24MW-1V

Terminal No.	Color of Wire	Signal Name [Specification]
1	Y/G	–
21	R/B	–

Connector No.	E7
Connector Name	WIRE TO WIRE
Connector Type	NS16MW-CS

Terminal No.	Color of Wire	Signal Name [Specification]
3	Y/R	–

Connector No.	E11
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	NS12FBR-CS

Terminal No.	Color of Wire	Signal Name [Specification]
14	R/B	–
16	Y/R	–

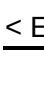
Connector No.	E101
Connector Name	WIRE TO WIRE
Connector Type	TK10FW-NS8

Terminal No.	Color of Wire	Signal Name [Specification]
1	Y/G	–

Connector No.	F21
Connector Name	PARK/NEUTRAL POSITION SWITCH
Connector Type	RK08FG

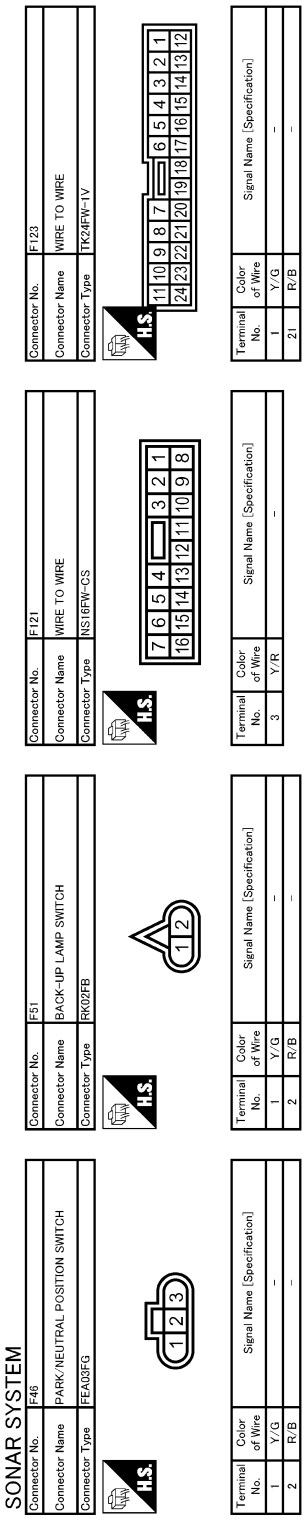
Terminal No.	Color of Wire	Signal Name [Specification]
5	Y/R	–
8	Y/G	–

Connector No.	F22
Connector Name	PARK/NEUTRAL POSITION SWITCH
Connector Type	YDX06FB-HS4



Terminal No.	Color of Wire	Signal Name [Specification]
3	Y/R	IGN
9	Y/G	R RANGE SWITCH

JCNWA0384GE



JCNWA0385GE

Fail Safe

INFOID:0000000001193875

The warning buzzer function shuts off when the sensor system error is detected.

SYMPTOM DIAGNOSIS

SONAR SYSTEM SYMPTOMS

Symptom Table

INFOID:0000000001193876

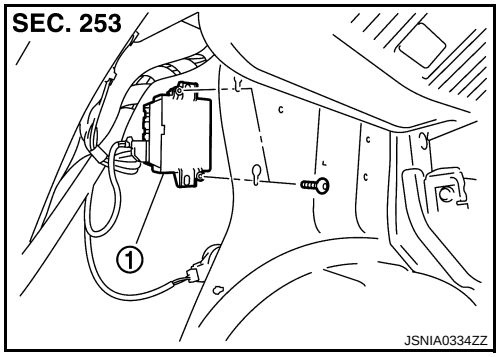
Symptom	Check item	Possible malfunction location / Action to take
All sonar sensors do not activate.	Error is detected automatically with self-diagnosis.	Sensor power supply and ground circuit (common part to each sensor) Refer to SN-8, "Diagnosis Procedure".
	Error is not detected automatically with self-diagnosis.	• Sonar control unit power supply and ground circuit Refer to SN-7, "SONAR CONTROL UNIT : Diagnosis Procedure". • Buzzer circuit Refer to SN-9, "Diagnosis Procedure".
Any sonar sensor does not activate.	Error is detected automatically with self-diagnosis.	• Sensor power supply and ground circuit (except common part to each sensor) Refer to SN-8, "Diagnosis Procedure". • Sensor signal circuit Refer to SN-10, "Diagnosis Procedure".

ON-VEHICLE REPAIR

SONAR CONTROL UNIT

Exploded View

INFOID:0000000001193877



1. Sonar control unit

Removal and Installation

INFOID:0000000001193878

REMOVAL

1. Remove the luggage side lower finisher (LH). Refer to INT-24, "Exploded View".
2. Remove sonar control unit.

INSTALLATION

Install in the reverse order of removal.

SONAR SENSOR

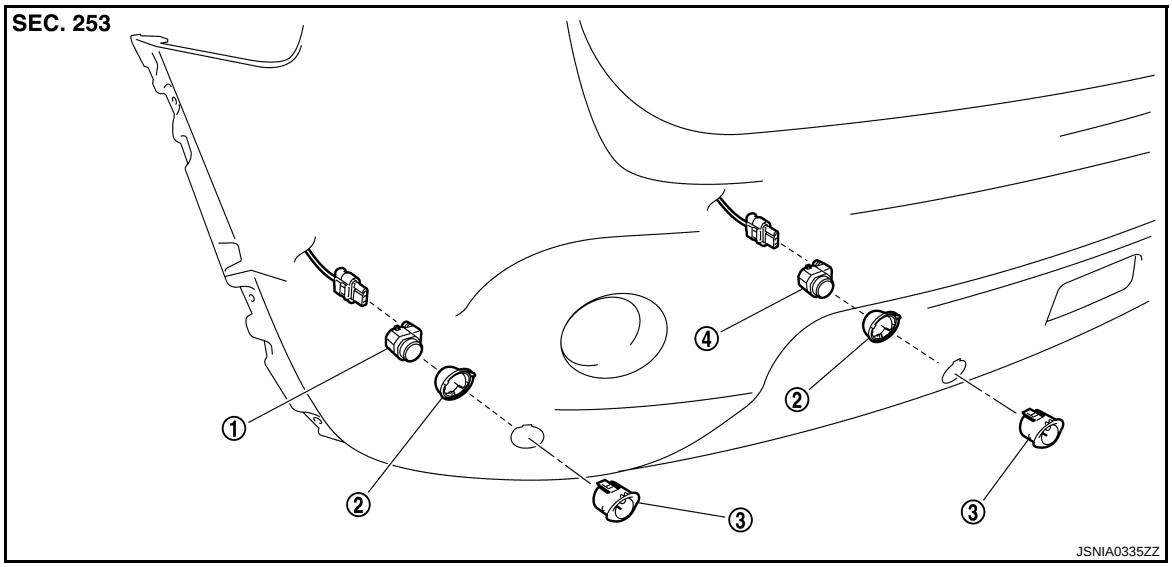
Exploded View

INFOID:0000000001193879

REMOVAL

Refer to EXT-14, "Exploded View".

DISASSEMBLY



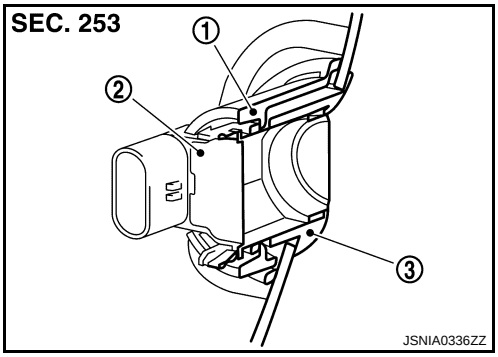
1. Corner sensor rear LH
2. Clip
3. Finisher
4. Center sensor rear LH

Removal and Installation

INFOID:0000000001193880

REMOVAL

1. Remove the rear bumper fascia. Refer to EXT-14, "Exploded View".
2. Separate the sensor (2) and the clip (1) from the finisher (3).
3. Separate the finisher from the rear bumper fascia.



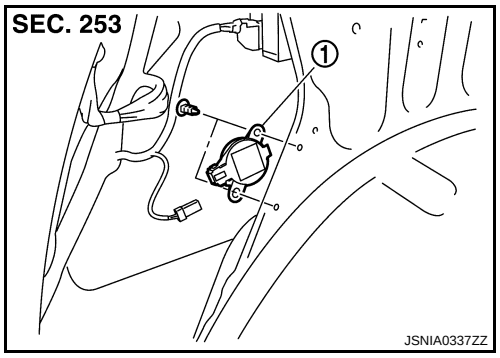
INSTALLATION

Install in the reverse order of removal.

BUZZER

Exploded View

INFOID:0000000001193881



1. Buzzer

Removal and Installation

INFOID:0000000001193882

REMOVAL

1. Remove the luggage side lower finisher (LH). Refer to INT-24, "Exploded View".
2. Remove the buzzer.

INSTALLATION

Install in the reverse order of removal.